LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

DOCTORAL THESIS

Trade Frictions, Trade Policies, and the Interwar Business Cycle

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Abstract

Trade Frictions, Trade Policies, and the Interwar Business Cycle

by Thilo Nils Hendrik ALBERS

This dissertation is composed of six chapters. Based on a comparison with other recessions throughout history, the first chapter motivates studying the Great Depression from a trade perspective. The second chapter sets the stage for such an endeavour. It introduces a new macroeconomic dataset for the interwar period and investigates the prelude and global impact of the Great Depression. Highlighting the variation of its severity along two dimensions, depth and duration, within and across countries, it conjectures that trade must have played an important role for the global extent of the crisis. The third chapter tests this conjecture by resurrecting the concept of the trade multiplier. Based on a causal estimate of the multiplier and auxiliary data, it demonstrates that the trade channel can explain significant proportions of the initial depth of the Depression in small open economies. If the fall of trade was important for propagating the Depression, analysing trade frictions is imperative. The fourth chapter thus turns to the analysis of retaliatory trade policies in response to currency devaluations. It shows that tariff retaliation was an important feature of interwar protectionism. Its effects on trade were large, which casts doubts on the unqualified favourable assessment of unilateral currency depreciations. Relating to the literature on the post-war distance puzzle, the fifth chapter assesses the relative importance of tariffs and transport costs during the interwar period. Not only were tariffs the dominant trade friction during this period, but their increase rendered distance-related trade costs relatively less important. Finally, the sixth chapter draws implications for the academic and political discourse.

Acknowledgements

Doing a PhD is a demanding journey: it needs the right preparation, some travel money, the right fellow travellers, the right compass, people that show you the way, and those who keep your hopes up in hard times. I have been blessed all of these things and, foremost, individuals. These acknowledgements are devoted to them.

My interest in the subject of economic history originated in my days as an undergraduate student in Münster. I had made quite a journey of getting there in the first place. Thanks to one of my high school teachers, Stefan Juncker, I started to study geography and economics. While geography was my first interest, my fascination soon transitioned to economics. At first, I enjoyed constitutional economics with its philosophical focus and thought-provoking insights. Above all, this was due to one of my teachers: Christian Müller. While my interest changed within the field, I learned a very important lesson: studying a variety of social science literature rather than only looking in one's own turf is worthwhile. At some point I wanted to earn some money as a student and a research assistant job opened up at the Institute for Economic and Social History at University of Münster. Martin Uebele and Ulrich Pfister employed me, but more important than the earnings, was their ability to spark my interest in economic history. It is hard to find adequate words for my gratitude for their support in the earlier and later days of my time at university. I have also very much enjoyed my time during my second Masters degree (in economics) back in Münster and Martin Uebele and Ulrich Pfister were an important reason for that. Both of them had also encouraged me to apply for a Masters at LSE, where I met my future PhD supervisors Albrecht Ritschl and Olivier Accominotti for the first time. Both of them have been very supportive ever since, for which I want to thank them dearly. During the Masters in Economic History at LSE, I met a funny mix of people, many of which pursued academic careers in economic history: Felix Ward, Filip Novkomet, Andrea Papadia, Leo Kukic, Peter Bendt, and Stefan Nikolic. After all these years, we still share our fascination for the subject matter just like we did back then. I have always enjoyed our conversations about research and beyond.

Equipped with the generous financial support of the *ESRC* and later on the *EHS*, I started my PhD at LSE with an inspiring cohort of fellow travellers: Bernardo, Brian, Flora, Franz, Joe, Maxine, Rebecca, Nuno, and Yasin. Two of my fellow students from the Masters, Andrea and Leo, started the PhD with me. I want to thank them in particular for their friendship, stimulating discussions, and support throughout the years. We would mix with the older PhD students, the younger ones, and the exchange students for social and academic events. There is a long list of people I have in mind, but I can only name a few here: Kike, Greta, Sam, Katja, Mattia, Oliver, Peter, Sandra, Daniel, Friedrich and Gerardo. I have immensely benefitted from learning about your research, ideas, comments, and your decency as colleagues beyond professional aspects of my life at LSE. I also want to thank the *Department of Economic History* as a whole for providing me with a unique environment to do research and to learn from others. Again the list is too long to be spelled out, but I want to particularly thank Alejandra Irigoin, Neil Cummins, Eric Schneider, Leigh Gardner, Max Schulze, Joan Roses, Gerben Baker, and Steve Broadberry. I think this department provides a fantastic environment to produce innovative research. There are two main reasons for that. First, one can work much more freely than some graduate programs allow their students to do. Second and more importantly, one is exposed to so many different topics, geographies, methodologies, and hypotheses. I have always enjoyed this mix, and I am convinced, that it is valuable. However, even in a free research environment one needs a compass. Foremost, I thus want to thank Albrecht and Olivier for their guidance.

Beyond the department, I had the privilege to meet a wide range of academics that provided me with feedback on my work at workshops, conferences, seminars, and on my written or submitted work. I cannot name all, but want to name a few. I want to thank Steve Broadberry, Michael Bordo, Kris Mitchener, and Moritz Schularick, who have provided oral or written feedback to parts of the material presented in this thesis. Paul Sharp has become a friend as much as an academic mentor when we met up during my visits to Copenhagen. The same goes for my former colleague at Humboldt Marvin Suesse. Foremost, I want to thank Chris Meissner, whom I have only met a few times in person throughout the years. However, Chris' feedback via email on much of the work contained in this thesis was invaluable. Finally, I want to thank my examiners Barry Eichengreen and Nick Crafts for making time to read my thesis and examine me.

I also want to thank my co-authors of my three projects on the economics of persistence and change. This work did not make it into the thesis in order to keep it centred on one episode and topic. Yet, as an economic historian I am fascinated with economic, political, and societal change in the *long* and *short run*. You will only find the *short run* in this thesis, but I have benefited from the insights, methodologies, and exchange with my co-authors on the projects that focus on the *long run*. The work with Gabriel Ahlfeldt, Kris Behrens, Christian Hilber, and Felix Weinhardt on *Prime Locations* has sharpened my view on the amount of variation that lies in front of us if we go beyond the national level. My work with Morten Jerven and Marvin Suesse on the *African Fiscal State* has contributed immensely to my understanding of the role of the state. Finally, my work with Moritz Schularick and Charlotte Bartels on *German Wealth Inequality in the Long Run* has deepened my understanding of national accounting. In the process of all the above projects, I have also taught myself how to manage large datasets, a skill, that would come in handy for this thesis.

There is a number of people that have nothing to do with my PhD directly, but who have suffered from me doing it. I want to thank all my friends and former flatmates from times in Münster, Washington D.C., Granada, Bonn, Berlin and London. In particular, I want to thank my flatmate and friend Dorit, who proofread my thesis.

My parents Ilka and Karl were always incredibly understanding of their workaholic son. I have learned so much from them and my interest in the broader social sciences is very much rooted in the critical discussions that I enjoyed as a teenager with them. My sister Janika, who is unfortunately no longer with us, has always pushed me to work hard. She has pushed me to apply for places such as LSE that seem so out of reach when you grew up in a small rural town in Northern Germany. I know you would be proud of me. I would just love to tell you about how you have helped me to get here. We could then raise the glasses and celebrate together as we did in the good old days. In particular, I also want to thank my brother Hakon. Who could better understand the challenges of doing a PhD in economic history than somebody who is doing a PhD in economic history and economic growth? Thank you so much for your help, emotional support, and foremost your understanding. This, of course, also extents to Lisa and my little nephew Mika, whom I have both seen way too little.

Most of all, I want to thank my partner Suse for her love throughout this endeavour and for bringing me to all these interesting places around the world. You have shown me so often how important it is to widen the horizon and that being critical of one's own opinion and preconceptions of the world is one of the biggest virtues.

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For Janika

Chapter 1

Introduction

"What distinguishes the 'scientific' economist from all the other people who think, talk, and write about economic topics is a command of techniques that we class under three heads: history, statistics, and 'theory.' The three together make up what we shall call Economic Analysis."

Schumpeter (1954, p. 12)

Abstract

Why is studying the Great Depression still relevant to the economist and economic historian after all these years? How do the only two truly global macroeconomic crises in modern economic history compare? Why would we study the role of trade linkages for the transmission of the Great Depression? How can we frame the historiography of the Great Depression in terms of focus, methodology, and data? The following introduction aims to provide partial answers to these questions. Apart from outlining the motivation for the research presented here, it situates the thesis in the large corpus of research on the Great Depression.

Rather than being a garden-variety recession without far-reaching consequences, the *Great Recession* of 2007 changed the economic, social, and political discourse. While some of its consequences are more disputed than others, its impact on macroeconomic research is undeniable. The crisis has led to the second renaissance[1] of economic history in recent decades or as Barry Eichengreen quipped: “This has been a good crisis for economic history” (Jones et al., 2012). It has sparked renewed data collection efforts resulting in cross-country datasets covering the late 19th century until today.[2] Showcasing the value of economic history, studies based on these novel datasets have deepened our understanding of financial crises substantially. They could do so by studying more data, more countries, and more crises. Without doubt, much is to learn from many data points rather than a few (Bernanke, 1995). Without doubt, this second renaissance has been a success on both counts, for the subject of economic history and the economics profession. It is now much more common to draw conclusions for modern macroeconomics from the variations of history.

Why, then, study the Great Depression and not all crises during the last 150 years? When painting crises on the “large canvas” of macroeconomic history (Schularick and Taylor, 2012, p. 1029) much of the paint comes from two events: the *Great Recession* and the *Great Depression*. While this alone could justify an in-depth study of the latter crisis, another concern appears to be more pressing. Each colour represents a different country on the large canvas of crises in economic history and even though the colours cluster around the two aforementioned crises on the painting, they are often treated as if they do not blend — or as if the crisis was not transmitted from one country to the other. Yet, the unifying feature of the *Great Recession* and the *Great Depression* is not their magnitude per se, but precisely that they dimmed economic prospects around the globe. This makes the two crises qualitatively different from all the other ones. Neglecting the element of transmission and pooling all crises together is thus neither innocent nor innocuous. If we want to study global economic crises, the number of observations is effectively reduced to two. Studying the Great Depression has thus lost none of its relevance even after almost 90 years.

This thesis shall not be understood as a critique of the admirable studies of

[1]The recent work in the growth and development literature can be thought of as the first renaissance. Acemoglu et al.’s (2001) “Colonial Origins” article has been one of the most-cited contributions in economics since its publication.

[2]To name a few: Reinhart and Rogoff (2011); Jordá et al. (2017). Of course, there have been earlier efforts (see e.g. Bordo et al., 2001; Barro and Ursúa, 2008).

the second renaissance of economic history. As a complement, it shall be an exploration into what parts of the picture go missing when drawing on the large canvas. That much is to learn for the economist from specific episodes or even cases has led to a renewed interest in studies of such kind.[3] One hopes that this appreciation will ultimately transform into a third renaissance of economic history and fully restore the missing history edge of the Schumpeterian triangle of theory, statistics, and history for the scientific economist. This thesis shall be a modest contribution towards this goal by highlighting the value of studying a specific episode. Zooming in on the interwar period, its rich historiography, its contemporary literature, its financial and economic press, and its hidden data treasures, it focuses on how the colours blend on the canvas of macroeconomic history in this crisis-ridden episode or, in other words, on how linkages between countries made the crisis global.

Rather than using the financial or monetary brush, which attracted so much well-deserved attention, this thesis paints the picture from a trade perspective. As such, and not at least because of its structure as a collection of articles, it neither aims nor pretends to be a full account of the Great Depression. Nor shall the focus on trade obscure my admiration for or imply the invalidity of other approaches towards analysing the Depression.[4] However, I hope to convince both, the economist and the economic historian, of the value of studying the various facets of trade during the Great Depression by showcasing five tools from the economic historian's paint box:

(i) The power of data

Once we gather and construct new data, we can settle old questions and explore new lines of inquiry.

(ii) Identification from history

History provides a wealth of cases where relevant elasticities can be identified in a causal manner because of historical or political accidents.

(iii) Resurrecting old, but relevant concepts

This thesis resurrects the concept of the trade multiplier, initially developed in the 1930s, and shows its relevance for explaining the transmission of crises.

[3] An indication of this renewed interest is the publication of such studies in top-5 general interest economics journals. For the Great Depression, see, for example, a study on the 1936 veteran's bonus in the United States (Hausman, 2016) and Kris Mitchener's work on banking in the Great Depression in the United States (Carlson and Mitchener, 2009; Mitchener and Richardson, forthcoming). For studies beyond the Great Depression, see for example the recent work on initial public offerings in late imperial Germany by Lehmann-Hasemeyer and Streb (2016).

[4] This, of course, echoes Kindleberger's (1986) scepticism towards monocausal explanations.

(iv) The case study

Case studies such as the one presented here on retaliatory tariffs can highlight the potential relevance of largely neglected lines of inquiry.

(v) The time lapse

Some policies such as tariffs, are faster implemented than dismantled. When assessing their effect we could either analyse the episode during which they are dismantled or employ the time lapse and thus focus on the period when they are implemented.

Before we delve into the contribution of each chapter using one or more of these tools, it is important to situate this thesis in the historiography and macro-historical research. Providing more evidence on the claims made in the previous paragraphs, Section 1.1 of this introductory chapter highlights why it is important to study the Great Depression from a trade perspective. Rather than providing a full literature review of the Great Depression, Section 1.2 provides an overview about how different types of data and econometric techniques have been used in the literature on the Great Depression over time. Section 1.3 outlines the methodological approach of this thesis as well as the contribution of each chapter.

1.1 Why Studying the Great Depression from a Trade Perspective?

Recessions, small and large, happen relatively frequently. The defining feature of a global crisis is neither the coincidence of such recessions around the globe nor their depth per se, but that the recessionary impulses are transmitted from one or more countries to others.[5] If global crises were common events, results from studying the Great Depression would be much more limited to its historical value. However, global recessions are rare and, given the criterion that will be discussed later, global economic crises even rarer. Out of eight relatively global recessions since the late 19th century, only two qualify as global economic crises – the Great Recession and the Great Depression. Employing descriptive statistics and informative cross-country correlations for the period from 1870-2016, the first part of this section highlights the rarity of global recessions. Furthermore, it shows that the Depression still serves as *the* benchmark for global economic crisis. It thus elucidates why understanding the Depression remains the "Holy Grail of macroeconomics" (Bernanke, 1995, p.1) after all these years.

The second part of the section shifts the focus from the description of crises throughout time to the explanation of the transmission of the Great Depression across space. It briefly outlines the related literature, which has identified three main channels: the monetary architecture, the financial system, and trade interlinkages. The review of the contemporary academic discourses, case studies on small countries, financial and economic newspapers, analyses of trade costs, and studies on business cycle comovement lead to the conjecture that trade might have mattered more for the transmission of the Great Depression than reflected in the historiography. This insight calls for analysing the breakdown of trade not only as a consequence of the crisis but as a contributing factor to the Great Depression.[6]

[5] This definition inevitably follows from the comparison of the Great Recession and Great Depression by Almunia et al. (2010, p. 22).

[6] In their comparison of the Great Depression and Great Recession Grossman and Meissner (2010, p. 331) make the same distinction. They argue: "Overall, the collapse of global trade seems to have been as much a symptom as an important cause in the global Great Depression."

1.1.1 The Great Depression on the Canvas of Macroeconomic History

Looking at the large canvas of macroeconomic history, how was the Great Depression different from other crisis episodes? This section recasts some stylised business cycle facts in light of the Great Depression to elucidate its exceptionalism.[7] Employing summary statistics about the incidence and depth of crises and the level of international comovement allows us to distinguish normal recessions from global recessions, and ultimately global crises. For this purpose, the GDP per capita data from the *Maddison Project Database* are an invaluable source (Bolt et al., 2018). By focusing on growth rates and cyclical fluctuations, we can circumvent many problems that plague this database[8] and fully enjoy the excellent coverage across space and time. A balanced sample of 27 countries[9] with complete annual coverage from 1870-2016 facilitates a relatively global and consistent comparison of recessions throughout time.

The Globality of Economic Crises

According to the above definition, a global crisis episode occurs when two conditions are met: (i) a significant part of the world economy is in recession and (ii) these recessions are not independent but transmitted from one or several countries to others. Fortunately, we can test both conditions easily with the available data. Condition (i) can be expressed statistically by the proportion of countries in the sample that are in recession. Condition (ii) is likely to be fulfilled if a high value of average bilateral business cycle comovement is observed in the data.[10] For illustrative purposes and acknowledging its deeply a-theoretical

[7]Some of the following graphs and tables will not seem completely unfamiliar to the reader. Statistics, graphs, and tables of similar nature appear in the literature on crisis severity (see e.g. Bordo et al., 2001), the business cycle comovement literature (see e.g. Baxter and Kouparitsas, 2005; Jordá et al., 2018), and comparisons between the Great Depression and Great Recession popularised by Eichengreen and O'Rourke (Almunia et al., 2010). Perhaps slightly different from the aforementioned authors, I recast all these statistics in the light of the Great Depression versus the Great Recession *and* all other crisis episodes.

[8]In particular, the comparability of the GDP-levels across countries, which is very sensitive to the ppp-adjustment (Bolt et al., 2018).

[9]See Appendix 1A.2 for a list. According to the new release of the Maddison database (Bolt et al., 2018), the dataset covers at least 66 % of World GDP in 1929. Unfortunately, it lacks data for Africa, the Middle East, and large parts of Asia. Nonetheless, it covers both developed and developing countries reasonably well.

[10]There are some important reservations against equating comovement with transmission (Forbes and Rigobon, 2002). Nevertheless, the value of these bilateral correlations will become apparent. The results presented here would suggest that, at least to some degree, they constitute a summary measure of transmission. Prima facie this is the case because episodes with high recession incidence, but low global comovement exist.

nature, a "crisis globality index" can be calculated by multiplying the two measures.[11] Its intuition is straightforward and best illustrated with extreme cases: the crisis globality index takes the value one if all countries are in recession in a given year and there exists perfect global comovement. If there is perfect global comovement but no incidence of crisis, the index takes a value of zero. Finally, if all countries in the sample are in recession but their economies do not comove, the index likewise takes a value of zero.[12] Finally, to distinguish global economic crises from global recessions, let us define them as tail events in the distribution of the value of the globality index. A global crisis is defined as such, if the observed value in the index lies outside of the 99 % confidence interval of the observed distribution of crisis globality for 1873–2016, i.e. it deviates $2.58 * \sigma \approx 24.9$ points from the crisis globality mean $\mu = 4.73$.[13]

Figure 1.1 illustrates the incidence of recessions, global business cycle comovement, and the globality index of economic crises. Eight global recessions occurred during peacetime, two of which were so severe that they could be called global economic crises. The following paragraphs briefly discuss their significance and probable causes drawing heavily on the work by Bordo et al. (2001) and Bordo and Haubrich (2010).

The upper left-hand figure suggests that recessions were very frequent in the pre-WW1 period. This is not necessarily at odds with previous research, which found that crises were less frequent in this period than in others (Bordo et al., 2001). Not every recession turns into what that literature defines as banking, financial, or currency crisis. Most likely, the high incidence of recessions pre-1914 simply reflects the fact that many countries were still very much reliant on agricultural produce. A bumper crop would lead to an upswing in economic activity whereas a failed one would trigger a recession.[14] As year-to-year variations in the harvest are a function of local weather conditions, recessions linked to the

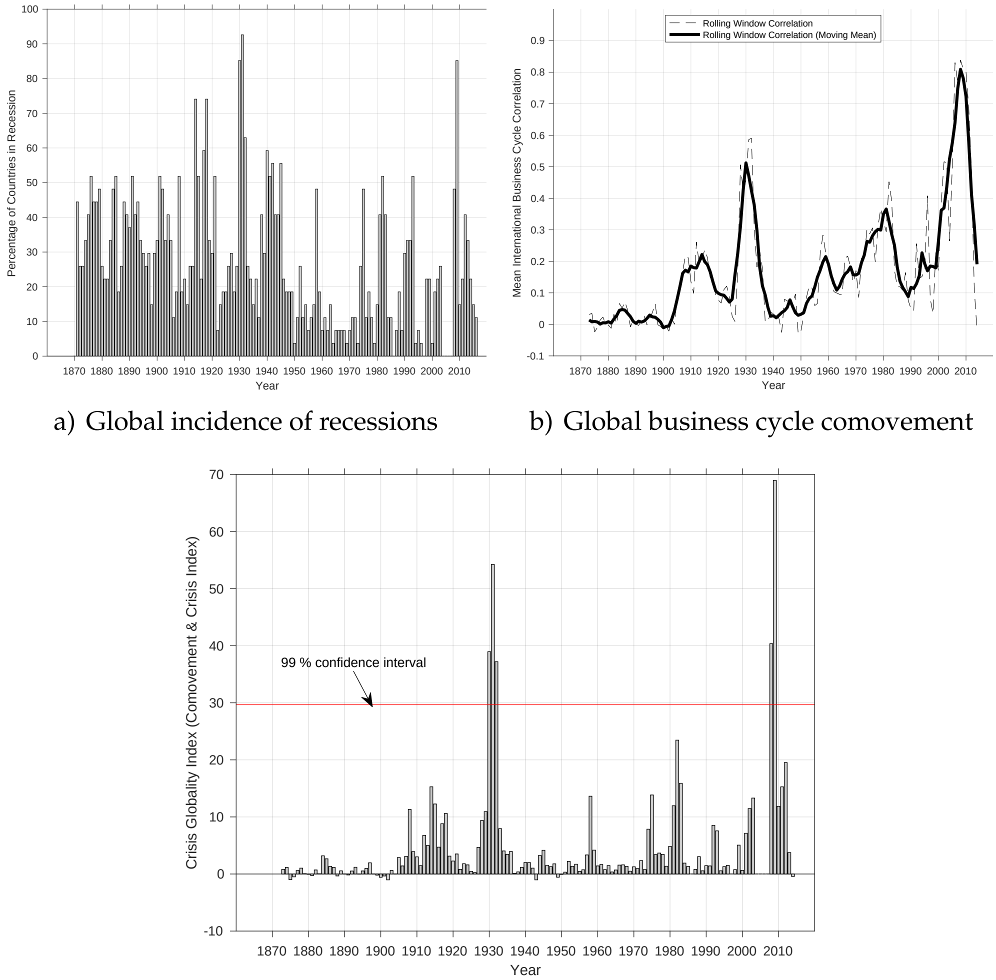
[11] In a political science context globality seems to have a plethora of meanings, but here it is supposed to be simply understood as "the quality of having worldwide inclusiveness, reach, or relevance" (Oxford Dictionary).

[12] For the precise statistical definitions used for the following figures, the reader is referred to Appendix 1A.1. Technically, the index can take negative values as business cycle comovement can be negative. While there are some theoretical possibilities why this might be the case, there is virtually no practical relevance of this case as can be seen below.

[13] Strictly speaking, the distribution of recessions is not normal and thus one might want to interpret this confidence interval with care. For the same reason, global recessions are thus best-defined by eyeballing rather than attaching too much significance to another confidence interval boundary (say 68 % as $\mu + \sigma \approx 14.4$).

[14] For the pre-World War I period, this also holds true for the most developed countries of the time. See Timoshenko (1930) for an excellent discussion on the reliance of the general business cycle on agriculture in the United States.

FIGURE 1.1: The incidence of recessions & business cycle comovement



a) Global incidence of recessions

b) Global business cycle comovement

c) Crisis globality index

Underlying Data Source: Balanced 27 country sample 1870-2016 from the updated Maddison database (Bolt et al., 2018). A recession is defined as a year of negative GDP p.c. growth. Comovement is measured as the bilateral movement of the cyclical components between the GDP p.c. series of these countries. For more details, see Appendix 1A.1.

harvests are necessarily idiosyncratic by their very nature. This would also explain why the average global business cycle comovement, as shown in the upper right-hand figure, was virtually zero until 1900. In consequence, the crisis globality index remained at low levels until the crisis of 1907, which earns that crisis the title of being the first global recession in the sample based on the above definitions.[15]

Yet, the Great Depression dwarfs the crisis of 1907 on both counts – the level

[15]In contrast and perhaps unexpectedly so, the crisis of 1893 does not show up in the globality measure. See Bordo and Haubrich (2010) for a detailed description of both crises.

of international comovement and the incidence of recessions around the globe.[16] Moving on for the moment, the immediate post-war period was dominated by the *Golden Age* of European growth. Except for the recession of 1957/1958, which was induced by a monetary tightening by the Federal Reserve (Bordo and Haubrich, 2010), recessions were infrequent. In consequence, the crisis globality index would remain at low levels until the early 1970s even though comovement was high due to the fixed exchange rate regime. After this calm period, relatively global recessions would appear about once a decade. The oil shock of 1973 coupled with interest hikes marked the first global recession in this episode and was soon followed by another one in 1981. Tight monetary policy by the United States serves as a possible explanation for this recession (Bordo and Haubrich, 2010). In the early 1990s, the first gulf war and a monetary tightening by the Federal Reserve led to a global recession. Likewise, the bust of the tech bubble in 2001 was a relatively global event (Bordo and Haubrich, 2010). The Great Recession of 2008 marks the most recent global economic crisis, and according to the index, it was also the most global crisis since 1870. Compared to the 1930s, this is rather driven by the unprecedented levels of comovement than the number of countries in recession.[17]

In sum, there have been eight global economic recessions in peacetime since 1870. Among those, the Great Depression and the Great Recession stand out in terms of the two defining features of global crises: a high degree of comovement and a significant portion of the world economy in recession. Global recessions are rare. Global *crises* are even rarer. While the graphs presented here reflect this insight in a new fashion, it corresponds well to the literatures on international comovement and crises (see e.g. Bordo et al., 2001; Backus and Kehoe, 1992; Jordá et al., 2018). With two observations for truly global economic crises at hand, the Great Depression is as relevant as ever for understanding the transmission of crises. This especially rings true, as the Great Depression has remained the ultimate benchmark case even after 2007.

The Great Depression as a Benchmark of Global Recessions

The previous part of this section identifies the Great Depression and Great Recession as the only two global economic crises. While the globality measure takes into account whether a recession spreads, it abstracts from other dimensions of

[16]This resonates well with the study by Mathy and Meissner (2011), who find that trade linkages and fixed exchange rates can explain much of this comovement.

[17]For a discussion of this increased amount of comovement and its financial causes, see Rey (2016), Ward (2017), and Jordá et al. (2018).

the extent of economic crises. To understand the significance of the Great Depression as the benchmark case for global recessions, it is useful to compare the initial depth and length of the Great Depression, Great Recession, and all other recessions from 1870 until 2016. The duration of the initial downturn is defined as the number of years of negative growth following the peak. Following Harding and Pagan (2002), depth is defined as the cumulative loss relative to the pre-recession peak during this period. It can be interpreted as the percentage of peak-GDPs lost over the spell of the recession.[18] Two caveats are worth noting with regard to these statistics. Using annual data for calculating such statistics is not innocuous (Chapter 2). Moreover, the definition employed here is most useful to assess the initial downturn rather than the crisis as a whole.[19] Nonetheless, Table 1.1 shows that these recession statistics are informative in their own right.

It becomes apparent that the Great Depression was a unique event in France, Germany, and the United States. The differences in duration and depth of the initial downturn of this crisis relative to all other recessions including the most recent crisis are so large that they are unlikely to be influenced by the exact definitions used. It is only for the United Kingdom that the Great Depression and Great Recession are comparable in duration and depth. Table 1.1 also provides the corresponding statistics for the remaining 23 countries in the sample. Like for France, Germany, and the United States, the uniqueness of the Great Depression stands out. This holds true when the sample is split by the sample median of the GDP per capita in 2015 ($\widetilde{GDP\ pc}_{2015}$). Yet, the large standard deviations across recessions and measures suggest that this sample is everything but homogenous.[20] The heterogeneity of the experience during the Great Depression will be at the centre of attention in Chapter 3 of this thesis, which investigates the trade channel of the Great Depression. Like for the large countries, the Great Recession does not seem all too different from all other crisis.

If so, how was the Great Recession different from all other crises? The final

[18] To provide the intuition, consider the following example. Country i's economy goes into recession for three years. In the first year of the crisis, GDP is 80 % of peak-GDP, in the second one 70 % of peak-GDP, and in the third one 50 % of peak-GDP. Then country i has lost a full year of peak-GDP when reaching the trough in year three. Unlike in Harding and Pagan (2002), the cumulative loss is not calculated using log-differences. This would introduce relatively large imprecision for the larger crises as log-differences are only an approximation of growth rates. The Harding-Pagan algorithm is not used to date the recessions as for annual data it would virtually yield the same results to the ones based on the definition above.

[19] It does neither take into account the speed of the recovery nor double-dip recessions. In the case of the Great Depression, France presents such a case. For details and a more meaningful measure to assess the depth of the Great Depression as a whole, see Chapter 2.

[20] See also Appendix 1A.2 for the results for each country.

TABLE 1.1: THE EXCEPTIONALISM OF THE GREAT DEPRESSION RELATIVE TO OTHER RECESSIONS, 1870–2016

	Initial Downturn of..						
Crisis	**Great Depression**		**Great Recession**		**All Other Recessions**		
Variable	Duration	Depth	Duration	Depth	Number	Duration	Depth
Unit	Years	Peak-Trough Cum. Loss in %	Years	Peak-Trough Cum. Loss in %		Years	Peak-Trough Cum. Loss in %
GDP							
Four Large Western Countries							
France	3	-30	2	-4	18	1.39 (0.70)	-4 (3)
Germany	4	-32	1	-5	12	1.33 (0.65)	-4 (5)
United Kingdom	2	-8	2	-8	14	1.93 (1.07)	-4 (3)
United States	4	-86	2	-6	22	1.27 (0.46)	-3 (4)
23 Other Countries							
Pooled	2.87 (1.29)	-32 (28)	1.74 (1.63)	-9 (18)	18.83 (5.40)	1.63 (0.66)	-8 (5)
Above $\widetilde{GDP\ pc}_{2015}$	3.25 (1.60)	-31 (28)	1.75 (0.87)	-6 (3)	17.42 (4.42)	1.41 (0.26)	-5 (3)
Below $\widetilde{GDP\ pc}_{2015}$	2.45 (0.69)	-32 (30)	1.73 (2.24)	-13 (26)	20.36 (6.14)	1.86 (0.89)	-11 (5)
Trade							
World	4	-82	1	-12	11	1.36 (0.67)	-6 (6)

Note: Own calculation. A recession year is defined as a year of negative growth. The length of a crisis/recession is the spell of consecutive years of negative growth. The cumulative loss is relative to the peak GDP preceding the first recession year of a crisis spell (see Harding and Pagan, 2002, p. 370 for a discussion). It can be thus interpreted as the % of peak-GDPs lost in the initial downturn. Where appropriate, the brackets indicate standard deviations. For the basket of 23 "other countries," these are defined relative to the mean crisis length and depth of the country and not pooled over all crises in all countries. For the individual results for each county and more details on the computation of the statistics, see Appendix 1A.2. The measures for world trade are computed correspondingly using a volume index from Federico and Tena-Junguito (2016b).
Underlying Data Source: Balanced 27 country sample 1870-2016 from the updated Maddison Project Database (Bolt et al., 2018). For the volume index of world trade, Giovanni Federico kindly provided the post-WW II data from his *voxeu* column (Federico and Tena-Junguito, 2016a). The pre-WW II data is taken from Federico and Tena-Junguito (2016b).

row in Table 1.1 shows the same recession statistics as before for a volume index of world trade (Federico and Tena-Junguito, 2016b). Compared to all other reversals in the last 150 years, the reversal associated it with Great Recession was quite severe though not nearly as severe as the one associated with the Great Depression.[21] As trade links the economies around the world together, these data provide yet another marker for the globality of the two crises.

More generally, comparing the depth and duration of the Great Recession relative to all other recessions suggests that the defining feature of this crisis was neither its depth nor its duration. Instead, it was its global reach that made the Great

[21] Using annual data underplays the fall of world trade during the Great Recession as it started in mid-2008 and reached bottom in mid-2009. Naturally, this flattens the amplitude. See Almunia et al. (2010) for a comparison of high-frequency data.

Recession "great."[22] Being just as global, the Great Depression was "greater" with respect to the severity of the crisis and thus remains the benchmark case. While global recessions occur once in a while, the number of observations for truly global crises equals $n = 2$. Studying the potential transmission channels of the Great Depression is thus imperative for the economist and economic historian alike.

[22]Of course, this point is not entirely new. While not using correlations as I do here, Almunia et al. (2010) make this observation in their introduction to their seminal comparison of the Great Depression and Great Recession.

1.1.2 How Colours Blend - The Transmission of the Great Depression

What, then, made the crisis that we now call the Great Depression global? Two views can be thought of as both opposing and complementary. Eichengreen (2004) distinguishes the "US-centric" and "global" view on the causes of the Great Depression. This categorisation proves also helpful for analysing the transmission of the Depression even though a relabelling to the "centre-periphery" and the "gold standard" view is more suitable.

On the one end of this artificial spectrum, not quoting the many qualifications the respective authors make, lies the idea that the crisis spread from the industrialised countries to the rest of the world. In other words: If there had been another exchange rate regime and more central bank cooperation, there would have been a similar global crisis. Whether the crisis in the industrial world was ultimately the consequence of the political, social, and economic dislocations of World War I (Lewis, 1949), the absence of economic hegemony (Kindleberger, 1986), the German debt problem (Ritschl, 2002), a classical boom-bust cycle (Eichengreen and Mitchener, 2004), or misled American central bank policies (Friedman and Schwartz, 1963) followed by the stock market crash and a drop in consumption (Romer, 1993), appears to be a second order categorisation in this context. Implicitly, these views have in common that national economic crises in advanced economies, whatever their origin might have been, spread to the rest of the world.

In contrast, and again with daring oversimplification, the gold standard literature proposes a systemic flaw (see e.g. Eichengreen, 1992; Bernanke, 1995). The monetary regime did not only knit economies around the world together, thus propelling shocks, but was itself causal to the Depression. The ideological orthodoxy of keeping the fixed exchange rate led to high interest rates. The ensuing deflation depressed the domestic economy through the debt deflation channel (Fisher, 1933), the sticky wage channel (Bernanke and Carey, 1996), and the banking crisis channel (Bernanke and James, 1991). For these three channels to work, no direct contagion is necessary or in Peter Temin's (1993, p. 90) words: "The effect of the gold standard at this point [the inception of the Great Depression] was largely psychological, but - pace Norman - no less real for that."

It is clear that the Great Depression does not have one cause. Proponents of either view simply attach a greater weight to theirs. If we acknowledge, as proponents of the "gold standard" view typically do (Eichengreen, 2004), some explanatory power for the "centre-periphery" perspective and recall the globality of the Great Depression, the natural question becomes how the crisis spread. Typically, researchers ascribe importance to three channels of transmission: the monetary architecture, the financial system, and trade linkages. Firstly, that fixed exchange rates cause greater comovement is conventional wisdom. This insight provides another, though not primary, building block of the gold standard view of the Great Depression (Eichengreen and Sachs, 1985; Eichengreen, 1992).[23] Secondly and equally well-proven by now, scholars ascribe great importance to the financial channel: Sudden withdrawals of positions, public or private, from abroad propelled the Depression globally (Temin, 1993; Accominotti, 2012b; Accominotti and Eichengreen, 2016; Accominotti, forthcoming). Finally, Irwin (2012, p. 110f) and Grossman and Meissner (2010, p. 330-332) highlight the potential relevance of the trade channel:[24] The loss of foreign demand, either through the fall in income abroad or the increase of trade barriers, would lead to the fall of income in the domestic economy. In short, the Great Depression was transmitted through monetary, financial, and trade channels.

Notwithstanding the contributions above and other exceptions,[25] the trade channel has received considerably less attention than the other two. Yet, there are good reasons to believe that it mattered for the transmission of the Depression. The following paragraphs summarise these reasons by recalling the academic discourse of contemporaries, evidence from financial and economic newspapers from the 1930s, and modern studies of the Great Depression relating to

[23]The gold standard orthodoxy paired with limited central bank cooperation are the key arguments of the gold standard view. Its architecture as a gold exchange standard makes the interwar gold standard distinct from its precursor, which broke up in 1914. The differences between exchange rate regimes throughout modern economic history is perhaps nowhere better summarised than in Eichengreen's (2008) "Globalizing Capital."

[24]Both employ back-of-the-envelope calculations for this purpose.

[25]Two other works from the relatively recent literature provide evidence for the trade channel's importance. Kindleberger (1986, Chapter 14) highlights the lack of demand from the advanced countries as one of five important factors in making the Depression global. However, this point is a subset of his hegemony-hypothesis. Mathy and Meissner (2011) highlight the importance of trade links for international business cycle comovement. A number of country-specific studies point to the importance of the trade for small open economies (see below for details). Beyond these, there exists a large literature on trade during the interwar years. In contrast to the above work, however, this stream of literature analyses the fall in trade as a consequence of the Depression, not as a contributing factor. It will thus be discussed in detail at a later point in this thesis.

specific countries, the analyses of trade costs, and business cycle comovement.

The academic discourse in the 1930s offers both, theoretical and empirical evidence on the role of trade for the Great Depression. On the theoretical side, Harrod (1933) highlighted the role of trade for short-term business fluctuations by introducing the concept of a trade multiplier. Neither, the conceptual underpinning nor the timing of Harrod's work can be thought of as coincidental. He certainly was heavily influenced by Keynes, whom he had met at Cambridge and who would bring the multiplier concept to economics a few years later through his *General Theory*. Moreover, Harrod witnessed the largest fall in trade during his lifetime while writing his book on international economics. Discussions about the trade multiplier concept continued and included well-known economists such as Stolper (1947). The discourse about the role of trade for business cycle fluctuations was not limited to theory. The work by Polak (1939) can be thought of as a precursor to the modern business cycle comovement literature. Polak analysed correlations of business cycles across countries and concluded that two factors spread the Great Depression: trade and the fixed exchange rate regime. A closer look at the academic discourse of the 1930s suggests that researchers attached importance to the trade channel.

Contemporary newspapers perfectly mirror this view. The universe of financial newspapers is large and, back then as today, the news cycle was tainted by short-term developments. Yet, there are some exceptions to this rule. The editorials and yearly supplements of *The Economist* often take a more long-run view and are thus an indispensable source. In particular, the *Commercial History & Review*, typically published in the beginning of February, provides an overview of the economic development in the previous year not only for Britain but for a large number of countries. Especially for small countries, the lack of foreign demand frequently features explanations for the dire economic situation throughout the 1930s.[26] Reports from contemporary newspaper correspondents support the notion that trade linkages mattered for the global spread of the crisis.

Likewise, one cannot avoid this impression when studying the abundant country-specific narratives of the interwar period. If we look beyond the United States and other large economies of the time, the importance ascribed to external forces increases dramatically.[27] Typically, country-specific studies of small

[26] See, for example, the 1932 report for Norway (The Economist, 1933a, p. 23). At this point, and given the nature of an introduction, no attempt is made to provide full references that led to my impression from these reports (The Economist, 1930, 1931b, 1932a, 1933a, 1934, 1935).

[27] Much of the historiography of the Great Depression focuses on the United States. In the United States, contagion through trade could not have played an important role simply because

economies historicise the Great Depression around the question to what extent the downturn was driven by external macroeconomic forces. The study by Valentine (1987) on Australia is a prime example of such framing, but it is a recurrent theme (see e.g. Safarian, 1959, for Canada).[28] If, at least in parts, the recession was external for these countries, investigating the trade channel as one of the three external forces cited above is important.

The modern economic history and economics literatures provide two additional reasons to investigate the effect of trade on income during economic crises. Firstly, the late 1920s and early 1930s were marked by ever increasing tariffs. Based on earlier work (Eichengreen and Irwin, 2010), Irwin (2012) provides an authoritative treatment of commercial policy during this period. The presented narrative focuses on the role of the gold standard for higher tariffs, but in his earlier work Irwin (1993b) also highlights the advent of "pernicious bilateralism." Discrete beggar-my-neighbour policies led to unprecedented protectionism. Indeed, more technical studies by Madsen (2001) and Jacks et al. (2011) have highlighted that much of the trade bust during this period was driven by commercial policies. If trade matters for income as conventional wisdom holds,[29] its demise could have spread the Great Depression around the world.[30] Secondly, a final clue emanates from a strand of literature that is not particularly focused on the interwar period. The fact that trade integration leads to higher business cycle comovement has transformed from a striking empirical finding (Frankel and Rose, 1998) to conventional wisdom in the business cycle literature (Baxter and Kouparitsas, 2005).[31] More recently, Mathy and Meissner (2011) have confirmed this general finding for the interwar period: stronger trade ties led to higher comovement. Even if we abstract from definitional and technical issues that plague studies of

exports were such a small part of GDP (Romer, 1993). For Germany, the debt problem takes the centre stage (Ritschl, 2002).

[28]The value of such case studies, either in book or article form, also becomes apparent when reassessing conventional wisdom. Choudhri and Kochin (1980) had posited that Spain never experienced a Depression to make the point that it was solely the gold standard that drove countries into recession. This statement has developed quite a legacy in the historiography (see e.g. Temin, 1993). However, the new GDP estimates by Prados de la Escosura (2016) prove this point wrong, and indeed, the work presented in this thesis will substantiate this impression.

[29]See, for example, Donaldson (2015), who provides a concise and illuminating review of the gains from trade literature.

[30]As Irwin (2012) points out, the question of how much the erection of trade barriers or the fall in trade more generally affected incomes is never really confronted even though often implicitly discussed. This is certainly a fair assessment of the literature. Irwin himself provides a back-of-the-envelope calculation to tackle this question. Other exceptions to the rule are discussed in Chapter 3.

[31]This result is not limited to GDP comovement. Likewise, trade links have been found to be important in spreading currency crises in post-war cross-country studies (Glick and Rose, 1999).

bilateral cross-country correlations (Forbes and Rigobon, 2002) and potential endogeneity issues, this literature suffers from a severe caveat regarding its metric. It is difficult to interpret the predicted increase in comovement as measured by the correlation coefficient in a manner that allows us to draw wider conclusions. What this type of research provides evidence for, however, is that trade linkages propagate economic crises more generally and that they did so in the case of the Great Depression in particular.

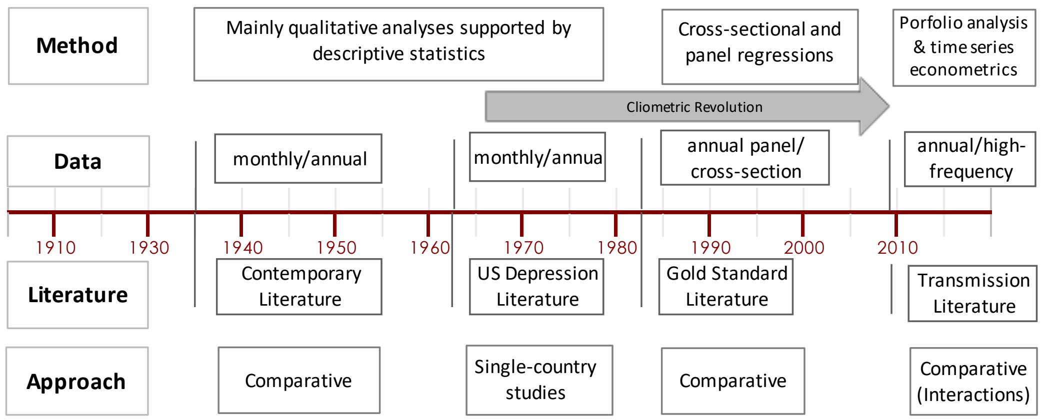
In sum, the importance of financial and monetary linkages for propelling the Great Depression is well-established. However, evidence on the trade channel is much scarcer. Using back-of-the-envelope calculations, Grossman and Meissner (2010) and Irwin (2012) discuss to what extent the fall of global trade was a consequence *and* cause of the Depression. The more indirect evidence cited above corroborates the potential relevance of the trade channel. Given these indications, the first part of the thesis aims to provide a thorough investigation of the importance of trade for spreading the Great Depression. Two ingredients are needed for this analysis. Chapter 2 provides a novel macroeconomic dataset for the interwar period, which includes estimates of monthly economic activity indices for 28 countries. Unlike existing datasets, it thus provides a large number of data points in the cross-sectional *and* time-series dimension. Based on these new data, Chapter 3 introduces a, to the best of my knowledge, novel empirical strategy to explore the power of the trade channel. The results emanating from these chapters suggest that the trade channel was more important than reflected in the historiography. It thus serves as a complementary explanation for the transmission of the Great Depression.[32] If so, studying trade policies (Chapter 4) and costs (Chapter 5) is imperative. The concluding chapter will tie the first and second part of this thesis together by speculating about the role of protectionism for the global fall of incomes. Before beginning the analysis, however, it is useful to ask a historiographic question. If the assertions about the literature above and the evidence presented in this thesis are warranted, why is there relatively little evidence on the trade channel? The following section of this introduction argues that this paucity can be understood in light of the historiography's evolution and the computational constraints of the past.

[32]By no means do the results imply that the trade channel is a substitute explanation for the monetary and financial channels of the Great Depression. It is not useful to think of these channels as competing or as Eichengreen and Mitchener (2004) put it in a more general context: "a horserace is not the appropriate context in which to assess theories of the Great Depression."

1.2 Research on the Great Depression - A Methodological Perspective

The historiography of the Great Depression is rich, diverse, and not easily summarised. Instead of attempting to provide a comprehensive review of the literature,[33] the following section focuses on how the empirics of the Great Depression have evolved over time in terms of geographical scope, data, and methodology.[34] It highlights, how the recent relaxation of computational constraints has opened up new avenues to analyse the transmission of the Great Depression.

FIGURE 1.2: Research on the Great Depression by methodology & data type



Note: Modified version of Albers (2013).

Figure 1.2 identifies four important waves of empirical research. In practice, these waves blend into each other and each of them had more qualitative

[33]Such attempt would be unlikely to add anything to the excellent existing literature reviews. To get a balanced view of the historiography of the Great Depression, the following set of reviews is worthwhile reading: Kindleberger's (1986) introductory and concluding chapter on mono-causal versus multi-causal explanations with brief references to the large interpretations, the sensible review by Eichengreen (2004) on linking the national and international spheres, and the first two Chapters of Crafts and Fearon (2013b) as a review with references to the recent crisis. For a neoclassical perspective, see Ohanian's (2017) review of Eichengreen's (2014) "Hall of Mirrors." To avoid repetition, I will review the trade literature on the Great Depression in the respective chapters. For an extensive and excellent review of the existing material on trade during the Great Depression, see Irwin (2012).

[34]This classification draws heavily on my unpublished Master thesis submitted to the University of Münster in 2013. I have, however, modified the graph and text to such an extent that this reference to my earlier work shall not imply that it is a mere restatement.

harbingers.[35] Among the four waves, the *Gold Standard Literature* is certainly the most dominant interpretation of the Great Depression nowadays. Much of what the *Contemporary Literature* explored has been embedded in the *Gold Standard Literature* and the *US Depression Literature*. The same holds true for the empirical *Transmission Literature*, which is, as I shall argue, still in its infancy. Before we tie the threads together, however, it is worthwhile to look at each of the waves separately.

The *Contemporary Literature* focused on the causes of the Depression in small and large countries. Many authors focused on single countries, in particular the United States, Britain, and Germany. However, there were also comparative contributions. For example, Lester (1937) compared the recessions in the mid-1920s and 1930s across Scandinavia. Furthermore, he contextualised the Norwegian and Danish experience with that of other countries. Beyond such regional approaches, a truly comparative business cycle literature emerged. The work by Burns and Mitchell (1946) on the United States, France, Germany, and Great Britain provided a start. With a strong emphasis on the 1920s, Wagemann (1931) provides a comparative perspective on business cycles in the industrial and industrialising world. Beyond the business cycle literature, significant attempts were undertaken to understand the Depression in its international context and significance. By using averaged indices of industrial production, Strakosch (1935) compared the recoveries from the Depression between countries that stayed on the gold standard and those who left. Polak (1939) even used correlation analysis and conjectured that the crisis spread through fixed exchange rates and the lack of foreign demand. Finally, Lewis' (1949) analysis of the relevance of World War I as well as Ohlin's (1931) and Nurkse's (1944) work for the League of Nations constitute prime examples of early comparative analyses of the Great Depression.

According to Eichengreen (2004), the *Gold Standard Literature* was preceded by the *US Depression Literature*. The unifying feature of this wave of literature is its focus on the crisis in the United States. In their seminal work "A monetary history of the United States," Friedman and Schwartz (1963) provide a monetary interpretation of the Depression. They draw the picture of the American monetary policy failure by employing the historical narrative, analysing the key players, and by employing descriptive statistics. Temin's (1976) early work provides

[35] Moreover and inevitably, this focus on methodology in combination with a timeline will lead to some serious thematic omissions. Illuminating research focusing on the US Depression continues until this day. Romer's (1993) work on the magnitude of the US shock and the work by Mitchener and Richardson (forthcoming) on banking are only two of many notable examples.

the Keynesian antithesis, arguing that an autonomous fall in consumption caused the variation in the money supply and ultimately the Depression. As opposing as these views are, they have two common features. They focus almost exclusively on the domestic economy and policies of the United States (Eichengreen, 2004) and they broadly share the same methodology.[36] Research existed on countries outside of the United States, but was usually no less nationally focused. In some of these contributions, the seeds of the cliometric revolution became visible.[37] At the same time, economic historians had started to historicise national experiences during the Depression. Like Friedman and Schwartz, they would use simple descriptive statistics and the historical narrative to sketch the evolution of the crisis in the respective country or region.[38] Naturally, the comparative element was stronger than for the US-centred contributions. As mentioned above, the role of internal versus external factors is a recurrent theme in such histories. Yet, it took Kindleberger's (1986) work as a harbinger of the *Gold Standard Literature* to shift the focus of the literature back to the international dimension of the crisis.

The *Gold Standard Literature* pioneered the understanding of the Great Depression from a thematic and methodological point of view. Eichengreen's (1992) authoritative treatment of the international dimension of the crisis and the role of the gold standard soon became a reference work of the Great Depression. While *Golden Fetters* employs a statistical narrative using descriptive statistics in the fashion of Friedman and Schwartz, many studies of this wave of research relied on cross-country regressions (Choudhri and Kochin, 1980; Eichengreen and Sachs, 1985; Campa, 1990; Temin, 1991). Independent of the precise statistical approach, shifting the focus from one to many countries improved the "ability to identify — in the strict econometric sense — the forces responsible for the world depression" (Bernanke, 1995, p. 2). The use of cross-sectional regressions and later panel approaches became popular in macroeconomics around the same time. The new technological possibilities enabled researchers of the *Gold Standard Literature* to run cross-country regressions and thus illuminate statistical relationships at a much-reduced cost. In contrast to other fields in macroeconomics,

[36] Unlike Friedman and Schwartz, Temin includes some regression analysis in his work.

[37] A good example of this is the work by Benjamin and Kochin (1979) on unemployment in interwar Britain, which tries to make the argument that unemployment was high because of unemployment benefits. Eichengreen (1987) has largely refuted this general claim with much better data.

[38] For example, see Safarian (1959) for Canada, Drummond (1972) for the British Empire, and Raupach (1972) for Eastern Europe.

this new freedom was used with care.[39] Not only does theory im- or explicitly guide the gold standard view of the Great Depression,[40] but non-historians such as Bernanke contributing to this literature do get the history right.[41] The success of the *Gold Standard Literature* as reflected in its importance for modern macroeconomics and its dominance as an interpretation of the Great Depression thus demonstrates the power of the Schumpeterian triangle. Yet, it is not the end of historiography.

For the succeeding empirical *Transmission Literature*, Temin's (1993) influential article on the transmission of the Great Depression set the stage. Temin argues that both the gold standard orthodoxy *and* financial interlinkages spread the crisis. The *Transmission Literature* is thus different from the *Gold Standard Literature* because it shifts the focus towards direct interlinkages and away from the "gold orthodoxy." This view paved the way for a literature that analyses micro-data on portfolios of central banks and private entities as well as international lending more generally to better understand the pathology of financial and currency crises (Accominotti, 2009, 2012b; Accominotti and Eichengreen, 2016; Macher, forthcoming; Accominotti, forthcoming). For these purposes, unlike for the second stream of the *Transmission Literature*, annual data is often sufficient.

This second stream of literature started to evolve recently. It rests on the premise that high frequency data is useful to analyse the propagation of crises for three reasons. Firstly, it easier to account for — or perhaps even abstract from — feedback effects when using high frequency data. Secondly, more data points simply provide more variation. As the Great Depression happened in a relatively short amount of time, high frequency data makes it easier to identify statistical relationships. Finally, the quality of the variation matters. The summation of data from monthly or quarterly to annual frequency compresses the variation in time series data. This can make it challenging to draw inferences for the transmission of crises.[42] In contrast, the time series and cross-country variation inherent in high frequency panel data has enabled researchers to bring new evidence to old

[39]In hindsight, the first-generation cross-country growth literature (see Durlauf and Quah, 1999, for a review) presents the opposite case. In the light of the second-generation growth literature following Acemoglu et al. (2001), much of the earlier work now appears questionable. The "robust evidence" from the "two million regressions" paper by Sala-I-Martin (1997) serves as the case in point.

[40]See, for example, Eichengreen and Sachs (1986) for an explicit theoretical contribution.

[41]They do so by either informing their work by Eichengreen's *Golden Fetters* (see e.g. Bernanke, 1995, for a good example) or joining forces with historians (Bernanke and James, 1991).

[42] This was already pointed out by Burns and Mitchell (1946). See Chapter 2 for details and further references.

questions and to ask new ones (Mathy and Meissner, 2011; Accominotti, 2012a; Ritschl and Sarferaz, 2014; Mitchener and Wandschneider, 2015).

While this line of inquiry has produced illuminating results, it is still in its infancy. The reason is technology. Prior to the advances in computing, large amounts of data could only be processed in specialised facilities. In consequence, one could simply not exploit the variation of monthly or quarterly panel data to analyse the transmission of the Great Depression and thus few such datasets exist. Chapter 2 shall discuss the shortcomings of the existing materials and provide a new foundation for research on the transmission of the Great Depression – *The Interwar Macroeconomic Dataset*. Perhaps contrary to what one might expect, the interwar period is a data-rich rather than data-scarce research environment. Chapter 3 aims to contribute directly to this literature by analysing the trade channel.

It is only in recent years, that the technological revolution in computing has made the macroeconometric approach workable. Researchers can now analyse large datasets much more easily. In many ways, such datasets have the potential to refine our view of the Great Depression by empirically pulling the threads together from all waves of research. They can be employed to assess the international importance of the American (Friedman and Schwartz, 1963; Romer, 1993) and German (Ritschl, 2002) Depressions relative to the systemic forces proposed by the *Gold Standard Literature*. Equally important, they will enable researchers to place case studies in a wider context more easily, thus avoiding the trap of finding exceptionalism everywhere. Most importantly, however, they provide the foundation to analyse interlinkages in a quantitative manner. While the *Contemporary Literature* and *Gold Standard Literature* are comparative too, the new element of the *Transmission Literature* is to analyse the interlinkages rather than comparing the outcomes.

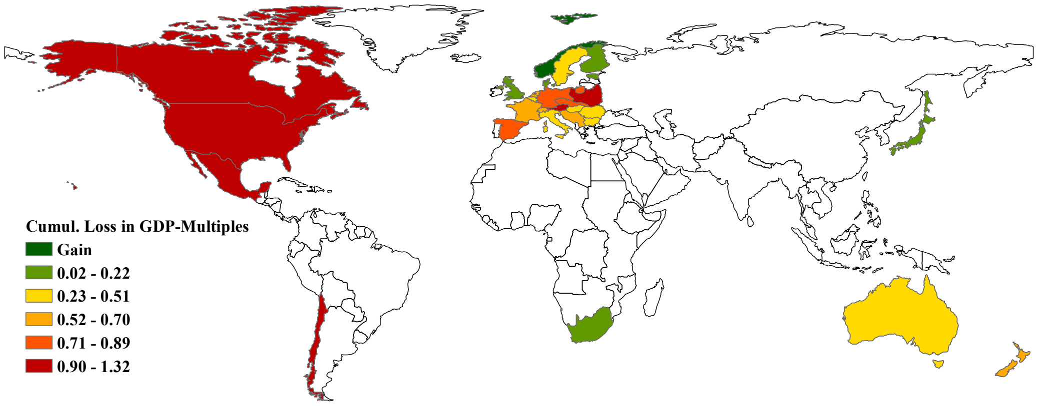
1.3 Contribution & Methodology

The previous parts of this chapter make the case for studying the Great Depression from a trade perspective and place this thesis in the historiography. It is now time to shift the focus from the motivations to the findings. The following paragraphs shall highlight the contribution of each chapter, which I aim to make to deepen our understanding of the Great Depression. As outlined above, economic history provides a variety of tools, five of which I employ in this thesis: the *(i) power of data*, *(ii) Identification from history*, *(iii) Resurrecting old, but relevant concepts*, the *(iv) case study*, and the *(v) time lapse*.

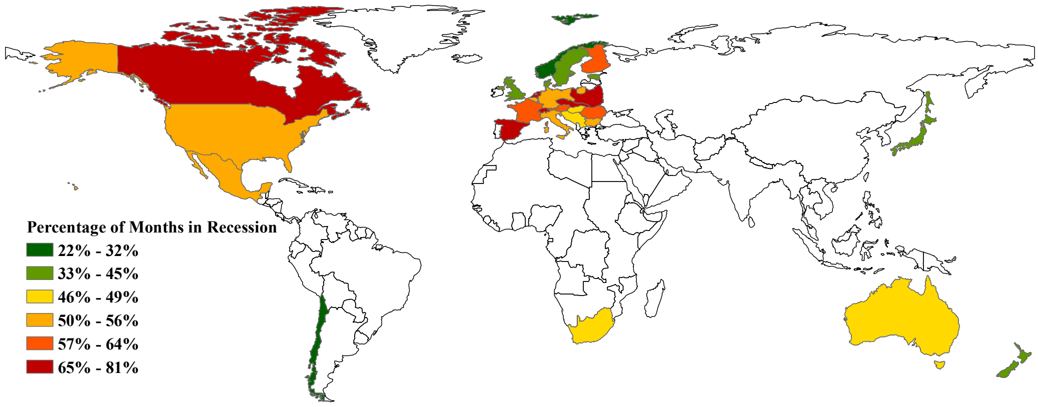
Chapter 2: A New Dataset for Research on the Depression

The methodological review of the empirical Great Depression literature above reveals that research on the transmission of the Great Depression requires high-frequency data. Highlighting the *(i) power of data*, Chapter 2 sets out to provide a large novel dataset on the Great Depression – *The Interwar Macroeconomic Dataset*. Beyond collecting and documenting more than 1,000 monthly macroeconomic time series, it provides monthly economic activity indices for 28 countries from all continents. While the chapter focuses mainly on the estimation of the indices and provides descriptive statistics, the value of the high-frequency data becomes apparent immediately. Burns and Mitchell (1946) had posited that high-frequency data is necessary to analyse the length and depth of recessions as annual data will flatten the amplitude and may even hide smaller recessions. Chapter 2 will show that this is the case indeed. Analysing the prelude to the Great Depression, the novel economic activity indices reveal that steady growth was far from universal even in the second half of the 1920s. Unlike an analysis based on annual data would suggest, two thirds of a sample of 28 countries suffered severe or mild recessions: Monetary and financial instability, agricultural crises, and labour conflict, often related to the direct or indirect consequences of World War I, continued to plague economies around the globe.

Beyond showing that economic instability was widespread throughout the 1920s, the chapter illustrates the *(i) power of data* in an explorative manner. The high frequency of the data facilitates a more sensible global comparison of the severity of the Great Depression than annual data would do. Specifically, the chapter analyses the cumulative loss and duration of the Great Depression. Figure 1.3 illustrates the variation along these dimensions of the crisis. The cumulative loss is defined as the annual peak-GDPs lost in a period of six years. The duration of the Depression is defined as the percentage of months in recession during the same period.



a) Cumulative loss, 6 years into crisis (multiples of peak-GDP p.c.)



b) Percentage of months in recession, 6 years into crisis

FIGURE 1.3: Mapping the severity of the Great Depression

Note: See Chapter 2 for details. In particular, see Table A2.1 in Appendix 2A.8. I thank Peter Groote (Groningen) for providing me with a shapefile with 1930 boundaries.

What emerges from these maps is a geographical pattern that would be consistent with the view that trade played an important role for spreading the Depression. Not only does the cumulative loss exhibit strong patterns of spatial autocorrelation, but the same holds largely true for the duration of the Depression. While Chapter 2 highlights the potential relevance of the trade channel, Chapter 3 takes this hypothesis to the test.

Chapter 3: Resurrecting the Trade Multiplier

Beyond the *(i) power of data*, Chapter 3 employs two further tools from the economic historian's paint box: *(ii) Identification from history* and *(iii) Resurrecting old, but relevant concepts*. The chapter constitutes the first attempt to analyse the role of the trade multiplier in spreading the Depression in a strictly causal manner. Moreover, it resurrects the concept of the trade multiplier for the analysis of short-run macroeconomic fluctuations. Contemporaries such as Polak (1939) were convinced that trade propagated the crisis. Harrod had posited the concept of a trade multiplier akin to its fiscal counterpart in 1933. Yet, the concept of the trade multiplier has largely vanished from economics and the economic history discourse.[43] The results of the inquiry render this circumstance unfortunate. The trade multiplier is large and thus can explain substantial parts of the initial downturn in small open economies. If it was not for the fall in export demand, some of these countries would not have suffered a downturn in the initial phase of the Depression at all.

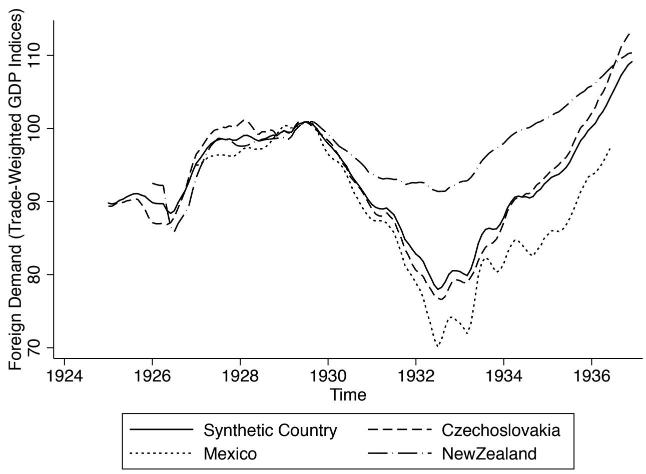


FIGURE 1.4: Varying exposure to foreign demand shocks

Notes: Own calculation. See Chapter 3 for details.

How can we identify the impact of a fall in exports on national income? What is ultimately needed is an exogenous variation in exports. History can provide just that. Small countries traded to different degrees with large countries due to geographical proximity and historical links such as colonial ties. The Great Depression evolved differently across the three largest global importers: Germany, Great Britain, and the United States. Because of the variation in pre-Depression

[43]There are some notable exceptions that are discussed in the chapter.

trade links, or more precisely, the varying proportions of exports to Germany, Great Britain, and the United States, small open economies were exposed to varying shocks in foreign demand. Figure 1.4 illustrates precisely this variation. It weighs the quarterly per capita GDP of the three big importers by their respective share in the export markets of Czechoslovakia, Mexico, and New Zealand. As a baseline, the "synthetic country" simulates a small country that would trade to the same degree with the three large ones. The magnitude of the shock can be thought of as the deviation from the synthetic country. The shocks in foreign demand were relevant for the export sector of small open economies. The differential in this shock allows me to causally estimate the magnitude of the foreign trade multiplier. I find the multiplier to be at least .7. Given the disastrous fall in trade, this multiplier is large enough to explain significant parts of the beginning of the Great Depression in small open economies.

If the loss of export markets mattered so much for small open economies, then investigating trade policies and trade frictions is important. Ultimately, this could allow us to speculate about the role of protectionism for the depth of the Depression. Chapter 4 offers a qualitative and quantitative inquiry into retaliatory commercial policies, a form of protectionism so emblematic for the interwar period.

Chapter 4: The Commercial Policy Case - Currency Devaluations and Beggar-my-neighbour penalties

While Eichengreen and Sachs (1985) had initially cautioned against an unqualified benevolent assessment of the devaluations because of their beggar-my-neighbour character, the subsequent literature has almost exclusively highlighted the positive reflationary element for the devaluing countries (see e.g. Campa, 1990; Bernanke, 1995). This might have led to the impression that unilateral currency devaluations such as those of the 1930s are not costly. However, an important externality of the currency depreciations in 1931 has not been adequately accounted for in the cliometric literature. As a *(iv) case study* of their effect on commercial policy, Chapter 4 explores their political and economic costs.

In particular, it analyses the importance of the retaliatory motive in the imposition of trade barriers by gold bloc countries in response to the depreciations abroad. Demonstrating the *(i) power of data*, it relies on an existing dataset on trade costs, and newly compiled ones for Swiss quotas and French tariffs. These data and the fact that the foreign exit from gold was exogenous to the gold bloc countries' commercial policies allow me to distinguish discriminatory from general trade cost increases. With *(ii) Identification from history*, I can thus analyse the absolute and relative importance of discriminatory commercial policies, which are henceforth referred to as beggar-my-neighbour penalties. The penalties' magnitude in ad valorem equivalent terms was similar to the tariff reductions achieved by modern trade treaties such as NAFTA — just with the opposite sign. According to a back-of-the-envelope calculation, the corresponding effects on trade were large in absolute and relative terms. The quantitative results thus indicate that the unilateral currency depreciations came at a high price in economic terms.

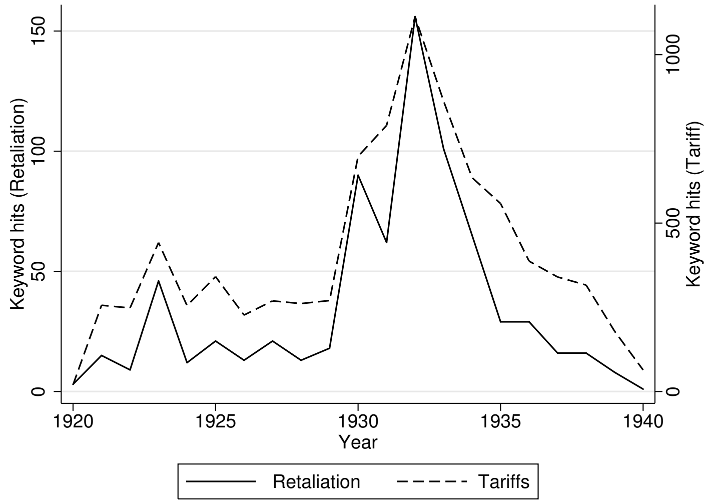


FIGURE 1.5: The rhetoric of retaliation

Source: Own calculation from the *Manchester Guardian* digital archive by ProQuest.
Notes: See Chapter 4 for details.

As such quantitative analysis would fall short to capture the disruption caused in the commercial policy environment, Chapter 4 also analyses contemporary newspaper articles. These allow me to trace the escalation of retaliatory commercial policies for the Anglo-French commercial relationship. Following the devaluations, the rhetoric of economic nationalism soon replaced initial leniency and international understanding. Ultimately, this led to a poisonous tit-for-tat of retaliatory measures. Figure 1.5 highlights this narrative in a tractable manner. It plots the annual frequency of keywords relating to retaliatory phrases and tariffs in the *Manchester Guardian*. Confirming the more detailed analysis of the newspapers, the coincidence of the peak of retaliatory rhetoric with the wave of devaluations in late 1931 suggests that the unilateral currency devaluations came at a high political price.

The contribution of this chapter is thus twofold. Firstly, it provides a complementary explanation for the rapid rise of protectionism during the 1930s by highlighting the political economy implications of the devaluations and retaliatory tariffs. Secondly, it demonstrates the economic value of cooperation by showing the cost of non-cooperation. The devaluations were a success for the countries depreciating and a key to recovery. However, their unilateral nature imposed large costs on the non-devaluing countries and the commercial policy environment more generally. The corresponding magnitude of the gap between the potential benefits to the world as a whole[44] and the realised ones thus implies that the currency depreciations were a success *and* failure at the same time. While there might not have been an alternative to their unilateral nature in the 1930s, this may not hold true for other policy environments in different times.

Chapter 5: Solving Modern Puzzles with Historical Insights

Chapter 5 showcases the final tool from the economic historian's paint box: the *(v) time lapse*. The so-called distance puzzle of international trade has attracted much attention in the trade literature. Replicating the core finding by Disdier and Head (2008), Figure 1.7b) summarises its essence. Despite globalisation and falling transport costs, the sensitivity of trade to distance has increased during the post-war period.

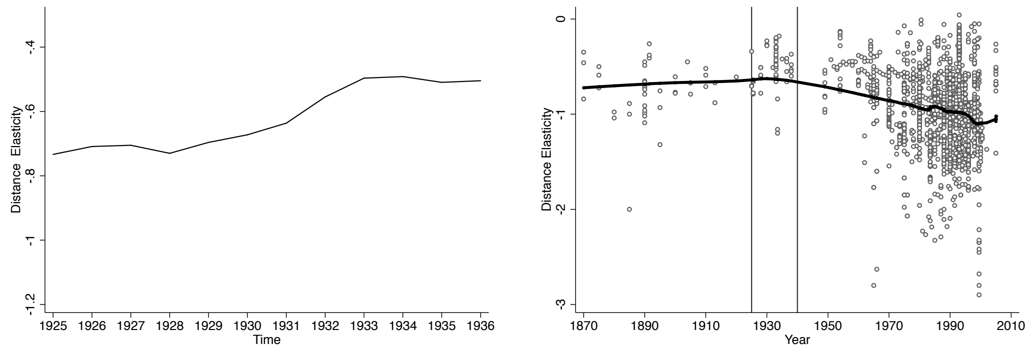
One way to resolve this puzzle is the following: The distance elasticity measures the relative rather than absolute importance of distance for international trade.[45] As the fetters of trade put in place during and before the war were slowly unravelled in the post-war period, distance regained its importance for international trade. While transport costs might have fallen, the tariff barriers did so much faster, resulting in a relative increase in the importance of distance.

If we want to test this proposition, we can employ the *(v) time lapse*. Chapter 5 analyses the distance elasticity throughout the interwar period. If the above hypothesis is true, we would expect a reverse distance puzzle in the interwar period: As policymakers quickly erected tariff walls, distance should have become less of an obstacle to trade. This is precisely what happened to European trade as Figure 1.7a) illustrates: The elasticity of trade with respect to distance decreases in absolute terms. Interestingly, the magnitudes of the interwar and post-war distance puzzle as measured by the distance elasticity are very comparable. Because

[44] As outlined by Eichengreen and Sachs (1985, 1986).

[45] See also Yotov (2012).

FIGURE 1.6: The distance puzzle in the short- and long-run



a) Distance elasticity in the interwar years b) Distance elasticity in the long-run

Note: For details on and sources of Figure 1.7a), see Chapter 5. The data for Figure 1.7b) is from Head and Mayer (2014) and illustrates the main graph & finding in Disdier and Head (2008). The solid line is the Lowess curve. Outliers with an elasticity smaller than -3 are excluded to improve expositional clarity.

tariffs are much faster imposed than unravelled, the *(v) time lapse* facilitates the assessment of the relative importance of tariffs and distance for trade.

To back up this prima facie evidence, the chapter seeks micro-level evidence. After deriving an import demand function to demonstrate the mechanism and to explore a potential empirical setup, Chapter 5 employs once again *(ii) Identification from history* and the *(i) power of data* to causally test the proposed mechanism. While protectionism was widespread, some countries refrained from changing their tariff codes and instituting quotas in the initial phases of the Depression. Despite not making any legal changes, Swiss tariffs increased in this period. This was due to the fact that, unlike today, virtually all tariffs were of specific rather than ad valorem nature. As a small country Switzerland could not influence world prices, but the world price levels would exogenously change the effective protection expressed in ad valorem terms. Employing a novel good-level dataset allows me to estimate good-specific distance elasticities and analyse how much they were influenced by tariff changes. I find substantial evidence for the proposed channel.

Beyond aiming to solve a prominent puzzle in the trade literature, Chapter 5 highlights that it were political trade barriers, not transport costs, that drove the trade bust associated with the Great Depression.

1.4 Overall Contribution of the Thesis

This thesis is composed of four stand-alone chapters. By emphasising the role of trade for the transmission of the Great Depression, the first two chapters contribute to a better understanding of the global nature of the crisis, the interactions between large and small economies, and the heterogeneity in the severity of the Great Depression. Based on the premise that trade was important, the remaining two chapters analyse the role of trade costs in the 1920s and 1930s. They contribute to the trade and Great Depression literatures by qualitatively and quantitatively highlighting the costs associated with beggar-my-neighbour policies, showing that political barriers were important for the fall of world trade during this period, and analysing the effects of tariff increases on other trade frictions. The conclusion pulls the threads together by providing a speculative estimate of the impact of protectionism on incomes during the Great Depression. These thematic contributions aside, the core contribution of this thesis lies in providing the economics and economic history research communities with a new data foundation. These data might facilitate a new type of empirical research on the transmission of the Great Depression. May they keep the Schumpeterian triangle in mind and get the history right.

1.5 Appendices

Appendix 1A Recession Statistics

1A.1 Measuring the Globality of Economic Crises

To operationalise condition (i) in statistical terms, let us define the global incidence of recession GR in t as the proportion of the N countries in the sample that experience negative growth as indicated by $R_{i,t}$.

$$GR_t = \sum_{i=1}^{N=27} R_{i,t} \Big/ N \tag{1.1}$$

To operationalise condition (ii) in statistical terms, let us define the global business cycle comovement ρ_{World_t} as:

$$\bar{\rho}_{World_t} = \sum_{i}^{N} \sum_{j}^{N} \rho_{ij,t}(C_{GDP_{i,t}}, C_{GDP_{j,t}}) \Big/ \frac{N(N-1)}{2} \tag{1.2}$$

where $C_{GDP_{i,t}}$ denotes the cyclical component of the logarithmised GDP in moving window t for country i.[46] The moving window of y years centred at year t. If $y = 5$ as in the graphs in the main text, the correlation $\rho_{ij,t}(C_{GDP_{i,t}}, C_{GDP_{j,t}})$ of countries i and j is based on data points in $t-2, t-1, t, t+1, t+2$. The term $\sum_i^N \sum_j^N \rho_{ij,t}$ describes the sum all off-diagonal elements in the lower triangle of the correlation matrix ρ_t at time frame t, which has $\frac{N(N-1)}{2}$ elements.

For illustrative purposes, the globality of economic crisis CG_t can be summarised as the product of the two measures:

$$CG_t = \bar{\rho}_{World_t}\, GR_t \tag{1.3}$$

[46]The cyclical component is isolated using the HP-filter (Hodrick and Prescott, 1997) with the parameter $\lambda = 6.25$. Using the CF-filter (Christiano and Fitzgerald, 2003) yields qualitatively similar results.

1A.2 Comparing Recessions

TABLE A1.1: COUNTRY RESULTS

	Initial Downturn of..						
Crisis	**Great Depression**		**Great Recession**		**All Other Recessions**		
Variable	Length	Depth	Length	Depth	Number	Length	Depth
Unit	Years	Peak-Trough Cum. Loss in %	Years	Peak-Trough Cum. Loss in %		Years	Peak-Trough Cum. Loss in %
Australia	5	-46	1	0	20	1.25 (0.44)	-5 (8)
Austria	4	-58	1	-4	17	1.71 (1.49)	-10 (38)
Belgium	4	-21	2	-3	15	1.07 (0.26)	-1 (1)
Brazil	3	-25	1	-1	25	1.56 (0.71)	-8 (10)
Canada	5	-95	2	-4	15	1.47 (0.64)	-5 (4)
Chile	3	-93	1	-3	24	1.33 (0.70)	-8 (11)
Colombia	2	-6	0	0	6	4.50 (7.15)	-18 (36)
Denmark	1	-4	2	-8	14	1.29 (0.47)	-2 (2)
Finland	3	-13	1	-9	12	2.08 (1.44)	-9 (13)
France	3	-30	2	-4	18	1.39 (0.70)	-4 (3)
Germany	4	-32	1	-5	12	1.33 (0.65)	-4 (5)
Greece	2	-12	6	-85	21	1.57 (0.87)	-10 (15)
Italy	2	-12	2	-9	13	1.54 (0.78)	-4 (4)
Japan	2	-18	2	-7	21	1.29 (0.46)	-3 (3)
Netherlands	6	-53	1	-4	15	1.40 (0.51)	-3 (3)
New Zealand	3	-38	2	-3	27	1.37 (0.56)	-7 (7)
Norway	1	-8	4	-13	14	1.36 (0.63)	-3 (3)
Peru	3	-59	0	0	19	1.79 (1.08)	-18 (40)
Portugal	1	-11	1	-3	21	1.62 (0.74)	-5 (5)
Spain	2	-15	6	-37	19	1.63 (0.90)	-11 (19)
Sri Lanka	3	-30	0	0	26	1.50 (0.58)	-6 (7)
Sweden	2	-9	2	-7	16	1.25 (0.58)	-3 (3)
Switzerland	3	-13	1	-3	23	1.43 (0.66)	-6 (6)
United Kingdom	2	-8	2	-8	14	1.93 (1.07)	-4 (3)
United States	4	-86	2	-6	22	1.27 (0.46)	-3 (4)
Uruguay	3	-75	0	0	26	1.62 (0.94)	-16 (22)
Venezuela	3	-12	2	-11	24	1.79 (1.47)	-14 (22)

Note: Own calculation. See above for methodology.

Underlying Data Source: Balanced 27 country sample 1870-2016 from the updated Maddison database (Bolt et al., 2018).

Chapter 2

The Prelude and Global Impact of The Great Depression

Abstract

Based on a novel dataset of about 1150 time series, this study provides monthly economic activity estimates for 28 countries during the Great Depression. Due to their high frequency, the indices reveal that steady growth was far from universal even in the second half of the 1920s. Monetary and financial instability, agricultural crises, and labor conflict continued to plague economies around the globe. The high frequency of the data also facilitates a global comparison of the severity of the Great Depression along two dimensions: the cumulative loss and duration. The variation along these two dimensions across and within countries indicates a rising importance of the trade channel at the later stages of the crisis. Finally, the study highlights promising avenues for future research on the Great Depression.

2.1 Introduction

The Great Depression has served as a yardstick for the depth, speed and international extent of all economic crises ever since the early 1930s. While a consensus on the causes of the crisis has emerged, empirical research on its transmission is far less developed.[1] This incongruity is no coincidence. The absence of an adequate monthly macroeconomic indicator has been a recurring hurdle for the latter type of research. Such an indicator would be representative of the whole economy, would come at a monthly or quarterly frequency, and would be available for a large number of countries. Yet, scholars find themselves in a trilemma as the current state-of-the-art datasets fulfil at most two of these three requirements. GDP per capita datasets covering many countries typically come at annual frequency (e.g. Barro and Ursúa, 2010). Monthly panel-datasets are available for the industrial sector only (e.g. Mitchener and Wandschneider, 2015). Finally, attempts to estimate quarterly and monthly GDP have been limited to the United Kingdom (Hayes and Turner, 2007; Mitchell et al., 2012), the United States (Balke and Gordon, 1986), and Germany (Ritschl, 2002). To break this data trilemma, I draw on a novel dataset encompassing 1149 macroeconomic time series to estimate monthly economic activity indices for 28 countries.

The new economic activity indices are superior to the commonly employed industrial production indices for three reasons. Firstly, industrialisation levels were still low in most countries during the interwar period and thus the focus on the industrial sector might be misleading.[2] Secondly, a closer look at the existing monthly and annual industrial production indices reveals that the statistical capacity to collect and aggregate data for such indices varied substantially across countries.[3] Finally, Rodrik (2013) and Bénétrix et al. (2015) provide evidence for unconditional convergence in the industrial sector. This relationship was present in the interwar period, inherently leading to higher growth rates in this sector in

[1]For the pivotal role of the gold standard, see for example Eichengreen (1992) and Bernanke (1995). See Romer (1993) on the Depression in the United States. For two examples of research on the transmission from a time series perspective, see Mathy and Meissner (2011) and Ritschl and Sarferaz (2014).

[2]See Bairoch (1982) for estimates of industrial production per capita and Statistisches Reichsamt (1936) for industrial employment shares.

[3]See League of Nations (1933b, p. 157) and League of Nations (1945, p. 144f) for an overview about the methodologies across countries. For example, the Japanese monthly industrial production index is an unweighted average of eight series, whereas the German one contains 60 series weighted by employment.

less industrialised countries.[4] Naturally, this caveat particularly cautions against the use of industrial production as a proxy for GDP, especially when comparing recessions in a cross-sectional manner (such as in Choudhri and Kochin, 1980; Eichengreen and Sachs, 1985; Romer, 1993). Due to the mechanical "convergence bias," less industrialised countries would appear to enter the crisis later, to start the recovery earlier, and to experience less severe crises.[5] As a remedy for these problems, this study offers a new set of monthly economic activity estimates building on the long tradition of business cycle research emanating from the period and carrying importance through to today (Burns and Mitchell, 1946; Stock and Watson, 1989). The relatively simple algorithm presented here marries a composite economic indicator based on a large number of high-frequency (monthly) economic variables with the trend and variance of low-frequency (annual) GDP per capita data.

The broad geographical coverage and the high-frequency nature of the resulting indices, interpretable in levels and comparable across countries, make the reassessment of the prelude and extent of the Great Depression a worthwhile endeavour. It allows me to draw new conclusions and highlight promising avenues for future research. Typically, the second half of the 1920s is thought of as a period of growth, which kept the unsolved problems related to the massive social, political and economic changes after the Great War beneath the surface (Lewis, 1949; Kindleberger, 1986). However, the higher frequency of the data makes it possible to unearth recessions otherwise hidden in annual summation. In fact, two thirds of the economies in the sample experienced recessions in the period 1926–1928. They were plagued by labor unrest, agricultural crises, and financial and currency instability. The problems described by Lewis had thus never really disappeared from the surface.

While widespread, the recessions of the second half of the 1920s were typically short. Rarely did they spill over to other countries. In contrast, the onset of the Great Depression was very synchronised and caught up to most countries in 1929. No country, not even Spain, as frequently suggested (Choudhri and Kochin,

[4]See Figure A2.1 in Appendix 2A.1. In contrast, GDP data does not suffer from this property during this or any other period (Roses and Wolf, 2010; Rodrik, 2013).

[5]Furthermore, macroeconomic policy choices are likely to be correlated with development, which could result in misleading correlations. For example, Meissner (2005) shows that the adoption of the gold standard was a function of economic development in the classical gold standard period. This is not to question the finding that gold standard adherence was an important predictor for the depth of the Great Depression. Indeed, a number of panel studies confirmed the initial result by Eichengreen and Sachs (Bernanke, 1995; Mitchener and Wandschneider, 2015).

1980; Temin, 1993), could escape the Depression. The high frequency of the indices also allows me to make a sensible comparison of the severity of the Great Depression along two dimensions: the cumulative loss and duration. Interestingly, a number of countries experienced relatively prolonged recessions without them being as deep as the Canadian or American ones. This finding coupled with the global geography of the Depression suggests an important role of the trade channel, which has drawn renewed interest in light of the Great Recession (see e.g. Grossman and Meissner, 2010). While the precise identification of the magnitude of effect of trade destruction on income goes beyond the scope of this study, these observations call for a closer analysis of this channel.

This study contributes to the literature of the Great Depression by uncovering the recessions of the second half of the 1920s and by highlighting the role of the trade channel. Beyond these findings, the new interwar macroeconomic dataset will facilitate further research on the transmission of the Great Depression. The cross-country coverage of annual economic indicators has greatly improved since the beginnings of the "gold standard" literature. Campa (1990) added ten Latin American countries to the original sample by Eichengreen and Sachs (1985). Bernanke (1995) employs a dataset of up to 26 countries in his panel regressions. Yet the annual frequency of the datasets underlying these studies makes it difficult to assess the transmission of the Great Depression from a time series perspective. Recent research, relying on the limited amount of high-frequency cross-country data available, has illustrated the potential of such data to settle open questions and analyse channels of transmission (see e.g. Wolf, 2008; Mathy and Meissner, 2011; Ritschl and Sarferaz, 2014; Mitchener and Wandschneider, 2015). The data presented in this study lays the foundation to develop this research further by providing high-frequency data for a large number of countries.

The remainder of the paper first introduces the disaggregated dataset, the aggregation method and economic activity indices. It then discusses the prelude, scale, and extent of the Great Depression. The final section highlights promising avenues for future research.

2.2 The Interwar Macroeconomic Dataset

While qualitative business cycle chronologies, theoretical explanations for the movement of the economy, and rudimentary empirical work already existed at the end of the 19th century,[6] World War I was a watershed moment for business cycle research. To create business cycle chronologies, Burns and Mitchell (1946) pioneered empirical business cycle research by rigorously applying basic statistical methodology to a wide variety of series.[7] Following the NBER's efforts, statistical offices around the world started to systematically collect and publish business cycle data in an effort to "making the national economy measurable" (Tooze, 1998, p. 220). This study builds on these developments in at least three respects. The first part of this section describes the sources of the disaggregated data underlying the study. The existence of these data is itself a product of the increasing data collection efforts of the national and international statistical offices of the time. The dataset consists of 1149 series for 28 countries covering the period between 1925 and 1936.[8] It thus provides about 150,000 data points for future research to analyse the global spread and causes of the Great Depression. The second part describes the algorithm for estimating indices of economic activity, a concept itself originating in the interwar period. The final part of the section discusses the business cycle dating methodology, which can be traced back to the seminal work of Burns and Mitchell.

2.2.1 The Raw Data

The new dataset is predominantly based on two compendia: the "Statistisches Handbuch der Weltwirtschaft" by the Statistisches Reichsamt (1936, 1937) and the "International Abstract of Economic Statistics" by the International Statistical Institute (Tinbergen, 1934; Methorst, 1938), consisting of two volumes each.[9] Both organisations did not actually create new series, but gathered them from existing sources such as national statistical offices, League of Nations publications, central banks, periodicals such as *The Economist*, and other publications such as *Lloyds Register of Shipping*. The editors of the compendia classified the series by broader categories and, where necessary, documented them in great detail.[10] Contemporaries praised the *Handbuch* for its coverage and accuracy (see e.g. Mitic, 1936).

[6] See for example Mitchell (1913).

[7] As early as 1927, Mitchell published an extensive monograph discussing business cycles and setting the agenda for his collaborative work with Burns (Burns and Mitchell, 1946).

[8] For a few countries the period is shorter, but always covers the immediate run-up to the Great Depression. Appendix 2A.13 documents the country coverage. All raw data as well as a detailed appendix are made available online.

[9] In rare cases, data from country-specific sources were added as documented in the appendix.

[10] The editors made no attempts to gather the exact same set of series for every country. While this comes at the cost of a varying coverage across countries, it precludes the possibility that they estimated proxy series.

Crosschecks with the original sources did not indicate any inaccuracies. In fact, some data from this compendium had been used in previous research (Wolf, 2008; Mitchener and Wandschneider, 2015), but the wealth of data has neither been sourced nor made available in a digital format. The same holds true for the *International Abstract* (see e.g. Eichengreen, 1982), for which Jan Tinbergen and later Methorst gathered macroeconomic time series for the International Conference of Economic Services in London in 1934 and the International Statistical Institute in The Hague. The editors requested business cycle data from national agencies, which were then published in the two volumes. Like for the *Handbuch*, crosschecks with the statistical yearbooks of the respective countries revealed that the series included in the *International Abstract* are the same as in the government statistics. Both compendia provide a reliable and invaluable source for interwar macroeconomic time series. They facilitate the estimation of monthly economic activity indices for a total of 28 countries on six continents. In comparison to the widely-used annual industrial production datasets (Campa, 1990; Bernanke, 1995), a potential caveat of the novel monthly dataset is the limited coverage for the Latin American, Asian and African continents. Future research should aim to improve the country coverage for these continents.

In terms of variables, the coverage of the interwar macroeconomic dataset spans from bankruptcies to coal production, sales, interest rates, exports, and unemployment figures. Details for each series such as the unit, source and, if applicable, minor adjustments are detailed in Appendix 2A.15. The data is perhaps best described by the following two breakdowns. Of the 1149 time series, about 55 % are expressed in nominal terms such as the total amount of bank clearings in British pounds. This leaves 45 % of the dataset as real variables such as the number of unemployed adults and tons of steel exported. Another way to characterise the data is to classify it by type: the group of production, consumption and unemployment variables, the group of trade variables, and the group of variables related to money and banking make up about 30 % of the raw data each. The remaining 10 % are price indices of all sorts.[11] In the aggregate, the dataset is thus quite balanced in terms of nominal and real variables and covers a wide variety of economic sectors. In contrast, the number and nature of series recorded by the national statistical agencies differed substantially. On average, there are about 40 indicators available per country, ranging from 17 (Spain) to 127 (United

[11] For the estimation of the economic activity indices and to verify their robustness, all indicators but the price indices are used. Nevertheless, I provide and document the latter as they could be of interest for future research.

States).

The efforts to collect macroeconomic data depended on the size of the country, its economic structure, its administrative capacity, and perhaps a historical orientation towards bureaucracy. Unfortunately, it is impossible to gather a large and identical set of series for each country. This, however, should not deter us from estimating economic activity indices. Each available series contains information about the unobserved state of the economy. Robustness checks in previous studies on historical business cycles typically show that extending or truncating the number of series has little influence on the final results (see e.g. Sarferaz and Uebele, 2009; Ritschl et al., 2016). Appendix 2A.15 demonstrates that this study is no exception to this rule by showing how little estimates for each country vary when extending or truncating the number of indicator series used. Moreover, even if it were possible, it is not clear to what extent having the exact same series for each country would improve our ability to measure economic activity. For example, in countries with low levels of industrialisation, the amount of machinery produced is not necessarily a meaningful indicator for the state of the economy. In this sense and given the budget constraints of statistical offices, the fact that certain economic indicators were collected, and others not provides a contemporary assessment of what were important determinants of economic activity.

While the robustness checks suggest that the varying number of indicators collected is not a major concern for the validity of the results, varying administrative capacity across countries may influence the quality of the collected series itself. It is certainly true that the level of sophistication of data collection varied across country. For example, Norwegian statisticians would collect data on bank clearings of banks in Oslo only, whereas the American ones would provide data for banks in- and outside of New York. Furthermore, some statistical agencies removed seasonal fluctuations from the data while others did not. Finally, the precision with which the data were recorded might differ across countries. Some of these concerns are mitigated by the statistical techniques applied in the next section. For example, seasonal adjustment is performed for all series. Yet, some differences in data quality may remain. An ad hoc solution to assess their impact on the results of this study is to relate the outcome variables of interest to a measure for administrative capacity. The total number of series collected by country serves as a reasonable proxy for this variable: not only were more advanced statistical agencies better at collecting data, they would also simply collect more data. Figure A2.12 in Appendix 2A.5 shows that no meaningful relationship between this proxy for administrative capacity and the outcome variables of interest exists. While imperfect, this exercise suggests that even if differences in data quality were to affect the results across countries, they would do so in a non-systematic way.[12]

In sum, this study relies on a large set of macroeconomic data containing information about specific industries, sectors and prices for many countries. Future research could capitalise on this wide coverage. As a starting point, however, this study employs these data to estimate monthly economic activity indicators.

2.2.2 Estimating Economic Activity Indicators

While the estimation methodology has changed over time, the intellectual foundations for the creation of economic activity indices lie in the interwar period. After Mitchell (1919) had created the first industrial production index in the modern sense,[13] statistical agencies around the world followed suit. Unsatisfied with the narrowness of these indicators and the time lag of publication, American and British companies and newspapers became engaged in measuring business activity.[14] They went beyond production numbers by including measures of unemployment, financial activity, and internal trade. Their objective was "to indicate the fluctuations in economic activity of the community as a whole" rather than industrial production only (Crowther, 1934, p. 242 & 243). In condensing the common movement of their parts through averaging, such indices aimed to approximate the unobserved state of the economy or the "reference cycle" as Burns and Mitchell (1946) coined it.[15] Soon, these indices gained recognition in academic

[12] I thank an anonymous referee for suggesting this robustness check. The reader may be reminded that differences in data quality exist in all cross-country studies, be they modern or historical. This is particularly true for the material underlying historical national accounts, which are frequently used for cross-country GDP comparisons.

[13] He did so to distinguish real economic movements from the price fluctuations associated with World War I (Betz, 1930, p. 288). In contrast, price indices date back to as early as the 18$^{\text{th}}$ century (Mitchell, 1915, p. 6).

[14] Crowther (1934, p. 245) provides details on American business activity indices provided in the *New York Times*, the *Annalist*, *The Econostat*, and by the business forecasting organisation *Babson's Reports Inc.*. See Heard and Beede (1933) for the composition of the index by the American Telephone and Telegraph Company. See Rhodes (1937) and Mitchell et al. (2012) for a discussion of the British index of business activity by *The Economist*.

[15] Initially, Burns and Mitchell were not too fond of the use of a single index. They considered GDP the only possible measure that could be used as a single index. As national income measures were unavailable at a high frequency, they dated the turning points of many series to derive reference dates (see Burns and Mitchell 1946, p. 72f and Section 2.2.3).

circles.[16] The profound idea of condensing the comovement of many macroeconomic time series into one indicator still lies at the heart of the modern empirical business cycle literature (see e.g. Stock and Watson, 1989) and the efforts by statistical agencies such as the OECD to provide composite economic indicators. The algorithm in Figure 2.1 builds on this idea as well as the methodological progress achieved in the past decades.

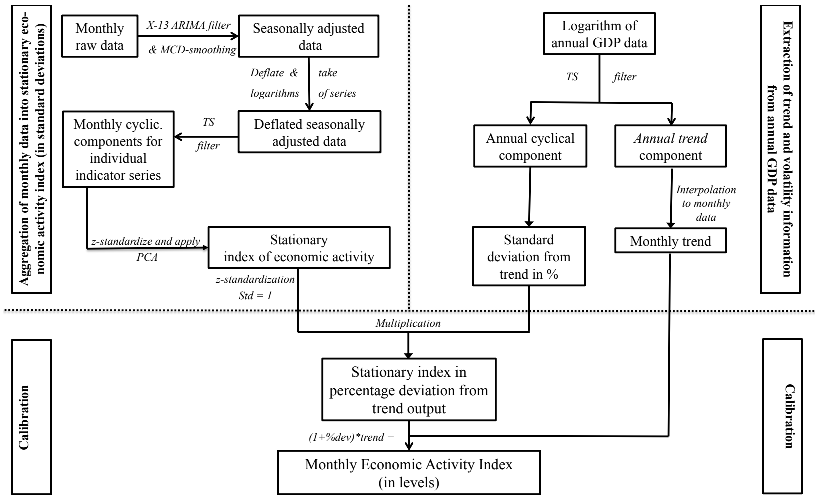


FIGURE 2.1: Aggregation procedure

The algorithm can be separated into two major processes, which are joined in a final calibration exercise. The operations on the left-hand side of Figure 2.1 aggregate the high-frequency (monthly) raw data into a stationary composite economic indicator in four steps. Assessing the resulting aggregate stationary index of economic activity component for the depth and duration of the Depression,

[16] See, for example, Heard and Beede (1933) and Rhodes (1937). When the index by *The Economist* was first presented at a meeting of the *Royal Statistical Society*, it was met by both, admiration and skepticism (see the comments to the paper given by Crowther, 1934). Schumpeter (1939, p. 24) pointed out that the unit of such indices has no meaning as they consist of diverse series without a common scale. This study overcomes this problem by using a widely-accepted reference series (GDP per capita) to scale the indices.

however, would be misleading.[17] First, the stationary composite economic indicator is expressed in standard deviations from the trend. This unit is not readily interpretable. Second, computing turning points and recession statistics based on data in levels is clearly preferable (Harding and Pagan, 2002). How can we recover meaningful levels for the economic activity indices? The operations on the right-hand side of Figure 2.1 extract information about the trend growth and volatility of economic activity from annual GDP per capita data. Based on the assumption that the annual GDP per capita estimates capture the trend and volatility reasonably well, this information is then used to calibrate the high-frequency (monthly) data. This calibration makes it possible to recover an index in levels and ensures its comparability across countries. Starting on the left-hand side, the following paragraphs describe each step of the algorithm.[18]

The first step removes the noise and seasonality from the raw data. Seasonality might blur the variation of interest and could distort the final index.[19] Like many modern statistical offices, this study thus employs the X-13 ARIMA-SEATS program by the US Census Bureau to remove such patterns. Beyond seasonality, the indicators vary in their noise patterns. These differences mostly stem from measurement error or simply the nature of the series. Thus, their smoothness, or more technically the ratio of the irregular to the trend-cycle component, varies substantially. A high ratio could either simply conceal the information contained in a series or, even worse, distort the final index. As a remedy, Burns and Mitchell (1946, p. 57) had smoothed such series with a moving average. The OECD adopted this strategy in a more formalised manner called the MCD (Months for Cyclical Dominance) smoother (Nilsson, 2000; OECD, 2012), which is the approach followed here. The MCD smoother applies a moving average

[17] The aggregate stationary index of economic activity measures economic activity relative to the overall trend in economic activity. In periods of sustained negative growth, this underlying trend becomes negative. In periods of sustained positive growth, this trend becomes positive. Consequently, considerable parts of the information about the severity of the Depression and the strength of the recovery respectively would be captured by the trend component in such economic environments. Exclusively focusing the analysis on the cyclical component would thus be misleading.

[18] A step-by-step empirical description of the algorithm using French and British data is provided in Appendix 2A.2.

[19] For example, similarity in seasonal employment opportunities might lead to spurious correlations in otherwise unrelated series. Such a correlation would influence the weighting of the series in the final index. While based on less sophisticated methodology, seasonal adjustment procedures were in widespread use by statistical agencies as early as the 1930s (see League of Nations, 1936a, p. 167). Because some central bank series have little month-to-month variation, those are not seasonally adjusted. Appendix 2A.15 provides the corresponding documentation for every series.

based on the number of months that are needed for the trend-cycle component to dominate the irregular (noise) component (see Shiskin, 1973, for a discussion). Hence erratic series such as goods transported on railways are smoothed, whereas smooth ones such as unemployment remain unaltered.[20]

In the second step, the algorithm deflates all nominal variables by the respective country's wholesale price index to avoid combining nominal and real economic series.[21] The third step involves applying a time series filter to the data in order to separate the trend and cyclical component of each series. This step is necessary, as the following Principal Component Analysis requires stationary data. Because the stationary index is later calibrated on the trend and standard deviation annual data, it is important that the filter extracts the same trend irrespectively of the frequency of the data. This lies at the core of Ravn's and Uhlig's (2002) approach to adjusting the Hodrick-Prescott (1997) filter for the frequency of observations.[22] It is also a characteristic of bandpass filters such as the Christiano-Fitzgerald (2003) filter. Given the criticism of the properties of the Hodrick-Prescott filter in the past and present (see e.g. Harvey and Jaeger, 1993; Canova, 1998; Hamilton, 2017), it is important to point out that neither the final indices nor the estimated weights vary in an economically meaningful manner with the choice of either of the filters (Appendix 2A.16). After filtering, and as common in the literature, all cyclical components of the indicator series are z-standardised. This procedure ensures their comparability by imposing zero means and unit standard deviations.

In the fourth step, the algorithm creates a stationary composite economic activity indicator based on these standardised cyclical components. The OECD apparently employs simple averages (OECD, 2012, p. 8). This might be a sensible approach if only a few series have been pre-selected by country experts. However, an agnostic and potentially more reliable way to estimate the weights is Principal Component Analysis.[23] Principal Component Analysis is a way to

[20]As is common, I cap the maximum MCD parameter at 6 (Nilsson and Gyomai, 2011) and use a centred moving average. Appendix 2A.15 documents the MCD parameter for every indicator series. For a discussion of the advantages of noise reduction in a factor model setting, see Dahl et al. (2009).

[21]Only central bank series are not deflated. Too often, such a procedure seems to introduce variation into otherwise relatively constant series (e.g. bank rates). The results are not unduly influenced by the deflation procedure. Appendix 2A.15 provides an estimate for each country excluding all deflated nominal variables.

[22]Ravn and Uhlig develop a rule to adjust the λ parameter for the frequency of observations, resulting in the parameters $\lambda = 6.25$ for annual and $\lambda = 129,600$ for monthly data. These ensure that the same trend is filtered out at different frequencies, be it monthly or annual data.

[23]The amount of data to process sets limitations to the model selection and thus this study does not rely on the most recent advances in this field (see e.g. Otrok and Whiteman, 1998; Kose

summarise the data and estimate the unobserved state of the economy. This state is proxied by the principal components of the dataset. The first principal component is the eigenvector explaining most of the data's variance multiplied by the dataset. The estimated eigenvector containing the coefficients for the first principal component indicates which series comove most strongly. When applying Principal Component Analysis to the interwar macroeconomic dataset, the sign of the coefficients is almost always as expected. For example, unemployment would have a negative sign, whereas the coefficient for employment would be positive. Appendix 2A.15 documents the coefficients for each variable by country. After z-standardising the first principal component, the algorithm arrives at a stationary composite economic indicator with zero mean and a standard deviation of one.

The right-hand side of Figure 2.1 describes how to provide this indicator with a meaningful scale based on annual GDP per capita data.[24] While its frequency is lower, annual GDP data captures the broad trend of the aggregate economic movement and the general intensity of fluctuations in economic activity reasonably well. This insight forms the underlying rationale to use the GDP's trend and standard deviation to scale the above index.

The algorithm filters the logarithmised annual GDP data with the Hodrick-Prescott filter (or alternatively Christiano-Fitzgerald filter), thus expressing the resulting cyclical component in percentage deviations from trend. The standard deviation of this cyclical component can be used to calibrate the stationary aggregate index of economic activity (see e.g. in Ritschl et al., 2016, for annual long-run US data). As mentioned above, the Hodrick-Prescott filter has the attractive property of filtering out the same cycle of a time series across different frequencies of the data once the parameters suggested by Ravn and Uhlig (2002) are used. This makes the standard deviation comparable across frequencies. The algorithm thus applies the standard deviation of the annual cyclical component

et al., 2003; Ritschl et al., 2016). Mitchell et al. (2012) provide a mixed frequency model to estimate monthly GDPs for interwar Britain based on the model by Proietti and Moauro (2006). However, Principal Component Analysis typically yields very similar results and is also frequently employed in the business cycle literature (see e.g. Stock and Watson, 2002).

[24] Appendix 2A.13 lists the sources for each country. For many countries, "interwar specific estimates" in constant prices of the national currency exist. Those were given preference over commonly used data from Barro and Ursúa (2008) and Maddison (Bolt and van Zanden, 2013). However, the differences to these datasets are generally small except for Denmark and Switzerland. To avoid the endpoint problem of time series filters, I use GDP data for all years between 1920 and 1938 to decompose the GDP into trend and cycle. Naturally, the standard deviation is only calculated for the period for which monthly data are available.

as the measure of volatility to the monthly stationary composite economic indicator. By doing this, the algorithm marries the left and the right-hand side of Figure 2.1 and achieves the first aim of the algorithm: it now provides a stationary indicator with an interpretable scale – the percentage deviation from the trend in real output per capita. However, any such measure of economic activity is incomplete. In order to analyse recessions, it is clearly preferable to have an indicator available in levels (Harding and Pagan, 2002). For this last step, the algorithm again exploits the annual data. It converts the annual trend component (from above) into a monthly equivalent by using a cubic spline interpolation. It then multiplies these synthetic monthly observations describing the broad GDP trend by the scaled composite economic indicator to arrive at the monthly economic activity index scaled to GDP per capita central to this study.[25]

How comparable and robust are these economic activity estimates? In terms of comparability across countries, the resulting monthly indices are preferable to the commonly used industrial production indicators. They do not suffer from the mechanical convergence problem described above. Furthermore, their scale relies on a widely accepted concept - real GDP per capita. In terms of the inclusion or exclusion of certain variables, Appendix 2A.15 demonstrates their robustness for every country in the sample. It presents five different estimates of the composite economic indicator, each of which includes certain subsets of the available series.[26] The resulting indices remain very similar across specifications. This also

[25]An alternative procedure to recover the levels of the economic activity indices would be the Chow-Lin extrapolation (Chow and Lin, 1971). This univariate method could be used to extrapolate the cyclical annual GDP data with the monthly stationary economic activity indicator. Thereafter, one could combine the extrapolated monthly data with the trend. This would ensure that the high-frequency data is fully consistent with the annual national accounts. While such consistency is certainly a desirable feature for modern data, it is not clear that this holds for historical national accounts. Given the well-known imprecision of historical national accounts with respect to year-to-year changes, the algorithm applied in this study is preferred. It only requires that the annual GDP data captures the trend and volatility well rather than the exact GDP in each year of the sample. Nonetheless and reassuringly, the growth rates of the economic activity indices match those of annual GDP p.c. data closely when collapsed to annual frequency (see Figure A2.10 in Appendix 2A.3).

[26]Indices based on *Core Indicators* include only real variables from the *Production, Sales, Employment, Transport* group. Indices labelled *Economic Activity* include the *Core Indicators* and their nominal counterparts as well as other series strongly related to economic activity such as retail sales, stock market indicators and certain bank series such as clearings. Moreover, they include total exports and imports. The preferred index, *Economic Activity (excluding potentially collinear series)*, is the same as the economic activity one, but excludes potentially collinear series (I thank an anonymous referee for pointing this out). Two additional versions of the index are estimated. The *Economic Activity & Trade* index adds all trade variables to the *Economic Activity* index. Finally, the *All Indicators* index represents a "kitchen sink" approach, including all variables but prices.

holds true for the exclusion of all (deflated) nominal and trade data. The robustness using a different filter, the Christiano-Fitzgerald filter, is demonstrated in Appendix 2A.16.[27] A main criticism against the Hodrick-Prescott filter is that it introduces spurious correlations between variables. If so, this might matter for the weighting as the results of the Principal Component Analysis and thus ultimately the weighting depends on the correlation between variables. Appendix 2A.16 verifies that the estimated weights are not unduly influenced by the choice of the filter. It compares the weights estimated on the basis of data filtered by the Hodrick-Prescott filter, Christiano-Fitzgerald filter, and the linear projection approach suggested by Hamilton (2017). Indeed, the estimated weights differ little across filters in virtually all cases. Finally, three additional exercises demonstrate the plausibility of the results. Firstly, Figure A2.10 in Appendix 2A.3 demonstrates the strong correlation between annual GDP p.c. growth rates and the corresponding growth rates of the economic activity indices when collapsed to annual frequency. Secondly, as one would expect based on the historiography of the Great Depression (e.g. Eichengreen, 1992; Bernanke, 1995), Figure A2.11 in Appendix 2A.4 shows that prices and economic activity exhibited a strong positive correlation during this period.[28] Thirdly, Figure A2.13 in Appendix 2A.6 illustrates that the algorithm yields very similar results to the quarterly and monthly GDP estimates for Great Britain by Hayes and Turner (2007) and Mitchell et al. (2012). In sum, the indices are robust against a variety of specifications and with respect to a number of plausibility checks.

2.2.3 Dating Turning Points & Computing Recession Statistics

There are two main approaches towards dating business cycles: "date then average" and "average then date" (Stock and Watson, 2010). Burns and Mitchell (1946, p. 72f) followed the former approach. The NBER research group analysed hundreds of individual series to capture aggregate economic activity and, by continuous re-evaluation, Burns and Mitchell (1946, p. 77) set dates based "on a study of

[27] At a first glance, the similarity of the results might come as a surprise. When the focus lies on the cyclical component only, the choice of the filter influences results strongly in other areas of business cycle research (see e.g. Canova, 1998, for the computation of "business cycle facts"). In contrast, this study is concerned with estimating an economic activity indicator in levels. While the dissection into trend and cycle might differ, the combination of the two should be very similar. This is precisely what the results in Appendix 2A.16 corroborate.

[28] I thank an anonymous referee for pointing me towards this plausibility check.

whatever evidence had been marshaled."[29] These dates have to become known as the NBER reference dates. While this "date then average" approach might be the adequate strategy for setting reference dates, it prevents the computation of recession statistics such as the cumulative loss. Furthermore, Burns and Mitchell (1946) chose their approach precisely because no encompassing measure such as GDP was available at a high-enough frequency (Harding and Pagan, 2002, p. 73). As the major contribution of this study is to provide such a measure, the "average then date" approach is followed using the economic activity indicators calculated above.

In order to identify turning points, this study adopts the well-established dating procedure outlined in Bry and Boschan (1971), which Harding and Pagan (2002) formalised and popularised. It relies on the series in levels rather than the detrended indicator. It identifies peaks and troughs in the logarithm of the series, where at any time t a peak in a series is defined by a value that is larger than the k preceding and following values (or smaller in the case of a trough). Following Bry's and Boschan's initial suggestion for monthly data (Harding and Pagan, 2016, p. 28), k is set to 5.[30] The classification of observations into expansions, recessions, peaks and troughs facilitates the calculation of two types of recession statistics. Firstly, this study provides a measure of the duration of economic downturns. This is simply the percentage of months in recession for a given period in the 1920s and 1930s. Secondly, it provides a measure of the depth of the crisis. To make this measure comparable across countries and to abstract from temporary but short-lived increases in economic activity, I fix the time dimension. After indexing the economic activity estimate on its last pre-Depression peak, I calculate the cumulative loss (or gain) for each country 72 months into crisis as the integral between a horizontal line starting from the pre-Depression peak and the actual data. Dividing this cumulative loss or gain by 12 (months), I arrive at the multiple of annual peak-GDPs lost (or gained) during the first six years of crisis. Figure A2.14 in Appendix 2A.7 provides a graphical illustration as well as the corresponding formula.[31]

[29] See Moore and Zarnowitz (1986) for a concise discussion of the emergence of business cycle chronologies.

[30] Additional restrictions are the following. A phase (contraction or expansion) has to last at least 5 months. Furthermore, the minimum length for the duration of a complete expansion-contraction cycle is set to 15 months. For the calculations in this study, I employ Philippe Bracke's (2013) implementation of the Harding-Pagan algorithm for Stata.

[31] I have experimented with other definitions, but this one seems to be the most meaningful in this context. Short stabilisations make the amplitude or cumulative loss as defined by Harding

Since Harding's and Pagan's (2002) seminal contribution, using an algorithm rather than expert knowledge to identify turning points has become a staple in the literature.[32] The underlying reason for this development is twofold. Firstly, applying the same well-defined criterion across a sample of countries ensures consistency. Secondly and more importantly, the turning points identified by the Harding-Pagan procedure are typically very close to those provided by the NBER or similar bodies in other countries. This is no different in the case of this study as Tables A2.4-A2.10 in Appendix 2A.11 and Table A2.11 in Appendix 2A.12 show. The turning points identified in this study are consistent with previous chronologies in the cases where the latter exist. They are also consistent with the classifications of quarters into expansions and contractions by the *League of Nations* and Wagemann (1931), for which the precise methodology and underlying data are unknown. Hence, not only do the comparisons to the existing material validate the turning points identified in this study, they also highlight this study's contribution to the knowledge about interwar business cycles by providing internationally comparable data on turning points for 28 countries.

2.3 The Scale, Scope and Timing of the Great Depression

Equipped with the monthly economic activity indices, we can now reassess the prelude and severity of the Great Depression. The discussion of the results will highlight the advantages of the new economic activity indices, both in terms of frequency and coverage of the economy.

2.3.1 The Prelude to the Great Depression

Early research on the interwar period typically split the 1920s into two halves: whereas the direct effects of the Great War dominated the first one, stable growth resumed in the second one (Lewis, 1949; Kindleberger, 1986). Lewis (1949, p. 50) argued that the effects associated with the war had not vanished but were "were no longer visible on the surface." This study suggests otherwise. Table 2.1 uncovers a large number of recessions around the globe by widening the geographical

and Pagan (2002, p. 370) a poor measure. One can certainly agree with Bordo et al. (2001, p. 55) that there is no single best measure for the severity of crises.

[32] For recent applications to GDP, credit and commodity price cycles, see Bordo and Haubrich (2010), Jordá et al. (2017), Reinhart et al. (2016).

scope, relying on economic activity rather than industrial production data, and, most importantly, increasing the frequency of observations. Columns two and three show the turning points of the business cycle for the period January 1926 – December 1928. The remaining three columns show how much of the time was spent in recession during these 36 months. Naturally, the results based on monthly and quarterly data agree closely. However, if the same data are collapsed to annual frequency most of the moderate recessions disappear. This highlights the importance of high-frequency macroeconomic data when analysing recessions: employing annual rather than monthly or quarterly data obscures the more moderate recessions.[33] Linking the results presented in Table 2.1 with country-specific studies, the following discussion of the recessions in the period 1926–1928 highlights the origins of the widespread instability of the interwar business cycle. Contrary to Lewis' judgement, the various readjustment problems after World War I had indeed never left the surface. Financial and monetary instability (Kindleberger, 1986; Eichengreen, 1992; Eichengreen and Mitchener, 2004), commodity prices and production (Lewis, 1949; Kindleberger, 1986), and labor conflict (see e.g. Ritschl and Straumann, 2010) continued to plague economies around the world.

World War I had disrupted the monetary and financial system. The lifting of wartime controls led to increases in prices and a boom and bust phase in the early 1920s (Eichengreen, 1992, p. 108). Moreover, hyperinflation ravaged the German and Austrian financial and banking systems. The new data show that the monetary and financial turmoil continued even in the second half of the 1920s by producing moderate and severe recessions. They were often symptomatic of the struggle to stabilise money and credit, which were tightly linked during this period (Schularick and Taylor, 2012). According to contemporary Austrian thinkers such as Hayek and Mises, the departure from the gold standard in many countries allowed banking systems to create excessive amounts of credit in the early and mid-1920s (see Eichengreen and Mitchener, 2004, for an overview).[34] Indeed, financial and banking crises plagued Austria from spring to autumn in 1926 and Japan from mid-1926 until early 1927 as Tinbergen (1934) documents. Spain, too,

[33] See Tables A2.4-A2.10 in Appendix 2A.11 for extensive references to these recessions from contemporary business cycle chronologists.

[34] See, for example, Hayek's (1933) critique of loose monetary policy in the 1920s and in particular in 1927, which he considered the main reason for the Great Depression.

TABLE 2.1: RECESSIONS, JANUARY 1926 – DECEMBER 1928

Country	Turning points (Month)		Percentage of time in recession according to data frequency: Jan 1926-Dec 1928		
	Peak(s)	Trough(s)	Monthly	Quarterly	Annual
Strong recessions (percentage of months in recession > 30%)					
Estonia	Jan-26 Jul-28	Jul-27 Feb-29	64	42	67
Australia	Nov-26	May-28	50	33	67
Italy	Mar-26	Sep-27	50	50	33
New Zealand	Apr-26	Jul-27	42	33	67
Great Britain	Nov-25 Aug-27	Jul-26 Feb-28	36	42	33
France	Aug-26	Aug-27	33	33	33
Germany	Feb-25 Feb-28	Feb-26 Oct-28	31	33	33
Moderate recessions (5% < percentage of months in recession < 30%)					
Denmark	Sep-25	Oct-26	28	25	-
Norway	May-25	Sep-26	25	25	33
Japan	Jul-26	Feb-27	19	25	-
Austria	Feb-26	Aug-26	17	17	-
Spain	Nov-25	Jun-26	17	17	-
United States	May-27	Oct-27	14	17	-
Belgium	Nov-26	Apr-27	14	17	-
South Africa	Aug-26	Jan-27	14	25	-
Finland	Sep-28	Mar-32	8	-	-
No or negligible recessions (percentage of months in recession < 5%)					
Poland	Jun-25	Jan-26	3	8	-
Canada	-	-	-	-	-
Czechoslovakia	-	-	-	-	-
Hungary	-	-	-	-	-
Netherlands	-	-	-	-	-
Sweden	-	-	-	-	-
Switzerland	-	-	-	-	-

Notes: Columns 2-3 display turning points relevant for the period 1926–1928. Turning points for 1925 are only shown if the recession lasted until 1926. Columns 4-6 show the percentage of time in recession in 1926-1928 according to the same data at different frequencies. Shaded rows indicate whether results for low-frequency (annual) and high-frequency data disagree. Recessions are defined as discussed in Section 2.2.3. For Australia and New Zealand, the data only starts in 1926. Hence the GDPs of 1925 and 1926 were compared to judge whether 1926 was a recession year based on the annual frequency. The corresponding recession profiles with shaded areas for all countries can be found in Figure A2.15 in Appendix 2A.10. See Tables A2.4-A2.10 in Appendix 2A.11 for detailed references to these recessions from contemporary business cycle chronologists.

experienced a minor banking crisis in 1924–1925 (Martlín-Aceña, 1984), the effects of which were still felt in 1926 (The Economist, 1927, p. 18).[35] Elsewhere

[35] According to her recession profile (Figure A2.15 in Appendix 2A.10), Spain was in recession until May 1925, experienced a brief recovery until November, and went to recession again in December 1925.

central bankers tried to arrest stock market bubbles by tightening monetary policy. Such an attempt in May 1927, with some time lag according to the indices presented here and the NBER's classification of turning points (Table A2.7 in Appendix 2A.11), sent the German economy into recession in early 1928 even though there was no bubble in the first place (Voth, 2003).

Besides financial instability, monetary instability ensued in the second half of the 1920s. In Belgium and France, fiscal struggles undermined the confidence in the domestic currency. Inflation and exchange rate crises prevailed. Stabilisation could only be achieved at the cost of deflation, a trade-off policymakers were ultimately willing to accept (Eichengreen, 1992, Chapter 6). Such forced deflations translated into severe contractions. France was in recession from mid-1926 until a year later. A slightly milder contraction prevailed in Belgium from the end of 1925 until April 1927 (see also Tinbergen, 1934, p. 18). Although they originated in the deliberate decision to establish the "old, honest crown" (Lester, 1937, p. 440), the Danish and Norwegian recessions in 1925–1926 also fall into this category. Similarly, Mussolini's effort to return to gold caused a long contraction in Italy, beginning in early 1926 and lasting until autumn 1927 (Mattesini and Quintieri, 1997, p. 271). In sum, financial and monetary instability led to many of the recessions displayed in Table 2.1.

As early as 1931, the League of Nations (1931, p. 37) had pointed to another structural weakness of the interwar economic order. Heavily indebted commodity exporters suffered from falling raw material prices, which often led to balance of payment crises. The Australian recession from the end of 1926 until mid-1928 (see Valentine, 1987) and the contraction in New Zealand from May 1927 until July 1927 (see Timoshenko, 1933, p. 63) provide prime examples of such crises. The heavy reliance on primary exports also caused recessions in European agricultural economies. In Finland, a bad harvest and the subsequent credit tightness marked the turning point of the business cycle in mid-1928 (The Economist, 1929a, p. 22). Estonia likewise suffered from bad harvests two years in a row such that she spent most of the period 1926–1928 in recession (The Economist, 1928, 1929a). The business cycle of agricultural countries remained tightly linked to the harvest, debt burden, and the global commodity price level.

Moving from the agricultural to the industrialised parts of the interwar world, a third set of problems were related to labor conflict. In Germany and the United Kingdom, real wage growth stripped out productivity growth (Broadberry and Ritschl, 1995). The growing conflict between labor and capital in the United Kingdom culminated in 1926 with the coal stoppage and a brief general strike (Lewis, 1949, p. 44), both of which were major causes for the 1926 contraction in Great Britain.[36] The short recession in the second half of 1927 in the United States, often forgotten because of its brevity, was partially due to strikes (Tinbergen, 1934, p. 202).[37] While the least important of the three factors cited above, labor conflict was part of the post-war instability in the industrialised world (Ritschl and Straumann, 2010, p. 174).

The new economic activity dataset reveals that the problems caused by the World War I had never really disappeared. It facilitates uncovering contractions otherwise hidden in annual summation. Agricultural problems, monetary and financial instability, and labor conflict led to frequent recessions around the globe. While the transition from the pre-World War I world worked more smoothly for some countries than for others, stable growth was far from universal even in the second half of the 1920s. Yet, these recessions were local, their timing mostly idiosyncratic and they hardly spilled over to other countries. This would only change when the recession that would become the Great Depression began to unfold globally in the first half of 1929.[38]

2.3.2 The Severity of the Depression – A Bird's Eye View

The new indices also facilitate a more sensible comparison of the severity of the Great Depression along two dimensions: the depth and duration of the crisis. Previous research making cross-country comparisons of the depth of the Great Depression has so far relied on annual industrial production (see e.g. Romer, 1993)[39] or GDP data (see e.g. Crafts and Fearon, 2013a). However, the summation by years flattens the amplitude and precludes a sensible analysis of the duration

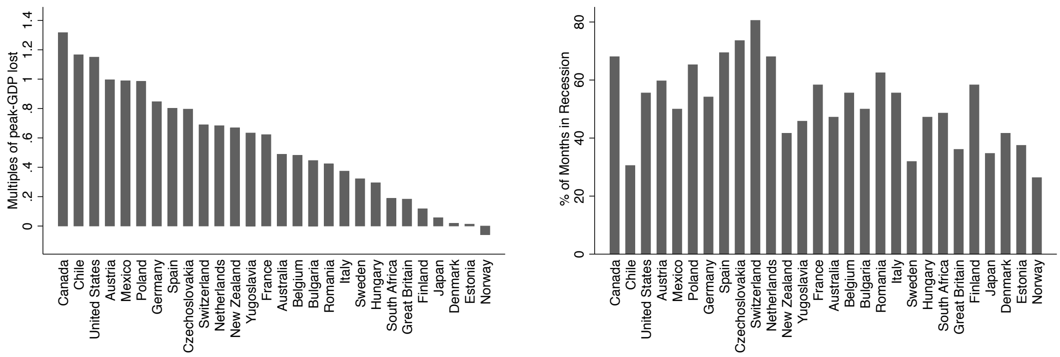
[36] According to Great Britain's recession profile (Figure A2.15 in Appendix 2A.10), the peak of the business cycle was reached in November 1925. However, this fluctuation would not have become a recession if the economy had not fallen off the cliff in April and May due to the coal stoppage and general strike.

[37] At least equally important, however, seems to have been the Mississippi flood and the temporary closure of Ford Motor Company plants. See also Hatton and Thomas (2010) on labor market institutions in the United States and United Kingdom during the 1920s.

[38] As previous research has pointed out (see e.g. Romer, 1993), the onset of the Great Depression was highly synchronised. The business cycle dating documented in Table A2.11 in Appendix 2A.12 puts this finding on a broader empirical footing. Minor differences in the dating expectedly prevail as Romer relied on industrial production data.

[39] Table A2.3 in Appendix 2A.9 compares the results of this study to Romer's (2004) peak-to-trough values of annual industrial production for 13 countries. The differences in the relative severity of the Depression indicated are quite stark. According to Romer's data, for example, the Depression was most severe in the United States, whereas the economic activity data indicates that Canada experienced the most severe recession. Such differences are perfectly plausible in light of the expected "unconditional convergence bias" when using industrial production data.

(Burns and Mitchell, 1946, p. 204). The analysis of monthly or quarterly data is thus strictly preferable.[40] The duration of the crisis, defined as the percentage of months in recession in the six years following the last pre-Depression peak, takes into account the length of the actual crisis and the steadiness of the recovery. The depth of the crisis, defined as the cumulative loss from this peak in multiples of the annualised pre-crisis peak-GDP per capita (see Section 2.2.3), is a measure that combines the length with the amplitude of the crisis. While these measures are obviously correlated, their graphic comparison in Figure 2.2 highlights different types of recessions. While some countries experienced rather prolonged and mild crises, others experienced deep but relatively short crises. The bar charts also highlight a second, more pronounced, variation: the variation in the severity of the Great Depression across countries.



a) Cumulative loss, 6 years into crisis (multiples of peak-GDP p.c.)

b) Percentage of months in recession, 6 years into crisis

FIGURE 2.2: The severity of the Great Depression

Note: In both bar charts, countries are ordered by the severity of the Great Depression as measured by the cumulative loss six years into crisis. See Table A2.1 in Appendix 2A.8 for the exact figures and the same measures computed for five years into crisis.

Some comparisons help to understand the relevance of these two types of variation, which is marked even among those countries that had left the gold standard early or were not adhering to it at all. Six years into crisis and despite having left the gold standard relatively early, Canada had lost 1.32 times

[40] If we were instead to use the only other available high frequency indicator, industrial production, the results suffer from the problems described in the beginning of this article, the mechanical convergence bias in particular. Table A2.2 in Appendix 2A.9 provides recession statistics for the limited number of available industrial production indices and compares them to the ones presented here.

its annualised peak-output and spent 68 % of the 72 months after the peak in recession. In contrast, Chile experienced a similarly deep Depression, but only spent about a third of the time after the peak in recession. Norway had earned a cumulative gain of around 6 % of the peak-GDP and spent only 26 % of the months in recession. While the Spanish Depression was not as deep as the Canadian one, losing cumulatively "only" 80 % worth of the annualised peak-GDP, she had spent as much time as Canada in recession. This finding is particularly important as Spain was one of the few countries that had never joined the gold standard during the interwar years.[41] In seminal studies based on industrial production data (Choudhri and Kochin, 1980; Temin, 1993), the authors suggest that Spain had "virtually escaped" the Great Depression because of this. Neither the monthly economic activity indices nor the contemporary qualitative statements and raw data by the International Statistical Institute (Methorst, 1938, p. 71) lend any credibility to this idea.[42] In spite of not wearing the "golden straightjacket," Spain experienced a relatively persistent and deep Depression before the Civil War broke out in 1936. How can we reconcile this fact with the importance of the gold standard channel?

The consensus view among leading contemporary economists was that foreign demand played an important role for transmitting the Depression (Polak, 1939, p. 79). Indeed, the crisis had inspired Harrod (1933) to postulate the idea of a foreign trade multiplier even before Keynes published the *General Theory* (see also Stolper, 1947; Polak, 1947, for a discussion). While the focus of the literature on the Great Depression has shifted towards financial instability and the currency experiences of the 1930s (Eichengreen, 1992; Bernanke, 1995), Friedman (1978), Mattesini and Quintieri (1997) and Perri and Quadrini (2002) have underlined the importance of the trade channel for small open economies.[43] Based on these insights and surveying the literature on the Great Depression in light of the

[41] This does not, however, mean that Spain was floating throughout the 1930s. Urban (2009) shows that Spain was de facto pegged against the French Franc in the mid-1930s. I thank an anonymous referee for pointing this out.

[42] Likewise, the annual GDP estimates by Prados de la Escosura (2016, p. 20) suggest that the Spanish Depression "was milder than in the U.S. but similar in intensity to Western Europe's average."

[43] In contrast, similar studies for the United States find only small effects (Crucini and Kahn, 1996; Irwin, 1998). The underlying reason is the relatively small share of trade in national income. There exists, of course, a large body of literature on the effects of tariffs on trade in the interwar period as surveyed by Irwin (2012). However, estimates of the effect of trade destruction on income are scarce. A back-of-the envelope calculation would suggest that a tenth of the fall of in GDP could be attributed to rising trade barriers, but as Irwin (2012, p. 112) himself points out "it is hard to put much faith in this number."

recent crisis, Grossman and Meissner (2010) conjecture that the drop in foreign demand through income losses and mounting trade barriers in the large countries may have been pivotal for the course of the Depression in small countries. The geographical pattern of the Great Depression is certainly consistent with such a claim. The countries least affected by the world's Depression were the Scandinavian ones. Their major trading partner, the United Kingdom, was experiencing a less severe crisis than most other countries. In contrast, the German crisis and move towards autarky certainly intensified and prolonged the crises in Central and Eastern Europe, for which Germany was by far the most important trading partner. In particular, crises in South East Europe tended to be less severe than the German crisis, but at least of similar length. The same holds true for Spain, whose trade with Germany, the United States, and France made up about 40 % of her export market (Statistisches Reichsamt, 1936, p. 283). Likewise, the deep Depression in the United States is likely to have amplified the Canadian, Mexican and Chilean recessions through the fall in foreign demand from their largest trading partner (see e.g. Horn, 1984, for Canada). More generally, the spatial pattern of the Depression and its duration in Eastern Europe and Spain lend support to the trade-channel hypothesis. Perhaps, countries had not only selected themselves into currency blocs based on historical trade flows (Wolf and Ritschl, 2011), but the depth of their crises itself was predetermined by the pre-crisis trade links and the performance of their main trading partners. Clearly, further research is needed for making more definite statements.

The discussion of the trade channel should not conceal the importance of the gold orthodoxy for the length and depth of the Depression (Eichengreen, 1992). Indeed, the gold standard countries France, Belgium, Switzerland, and the Netherlands suffered prolonged recessions. The inspection of their recession profiles (see Figure A2.15 in Appendix 2A.10) suggests that a sustainable recovery only began after the exit from gold. Equally consistent with the gold standard view of the Great Depression, the recessions in the sterling bloc were milder than elsewhere. Nevertheless, the geographical pattern lends support to the idea that different channels might have mattered at different times during the course of the Great Depression.

2.4 Future Directions

Research on the transmission and depth of the Great Depression has suffered from the absence of a reliable macroeconomic indicator, which comes at a monthly or quarterly frequency, is available for a large number of countries, and covers all sectors of the economy. As a remedy, the present study provides monthly economic activity data for a large number of countries. The high frequency of the indices allows me to unearth recessions in the second half of the 1920s, which remain otherwise hidden in annual summation. Indeed, the problems related to World War I had never left the surface. Financial and monetary instability, labor unrest, and commodity price swings had continued to plague countries around the globe until the Great Depression began. This finding and the data acquired for this study provide a foundation for future country case studies on this period as well as the Great Depression itself. The finding of a relatively persistent Depression in Spain serves as a case in point. However, many smaller economies, especially in Eastern Europe, also deserve more attention.

The value of the new dataset for future research, however, extends far beyond case studies. It facilitates a reassessment of the Great Depression from a global time series perspective. Ben Bernanke (1995, p. 1) once noted that the emergence of the gold standard literature increased our ability, in a strictly econometric sense, to identify the causes of the Great Depression by extending the number of observations from one country to many. The same shall hold true for furthering our understanding of the transmission of the Great Depression by extending the number of observations in the time dimension. In this vein, a particularly promising avenue for future research is quantifying the impact of the drop of foreign demand through income losses and tariffs on small open economies. Assessing the severity of the Great Depression along two dimensions, its depth and duration, suggests that the trade channel was more important in spreading the crisis than reflected in the literature on the Great Depression. While this insight remains speculative at this point, the present study lays the foundation to settle this and other open questions about the Great Depression.

2.5 Appendices

Appendix 2A Data & Robustness

2A.1 Unconditional Convergence in Industrial Production

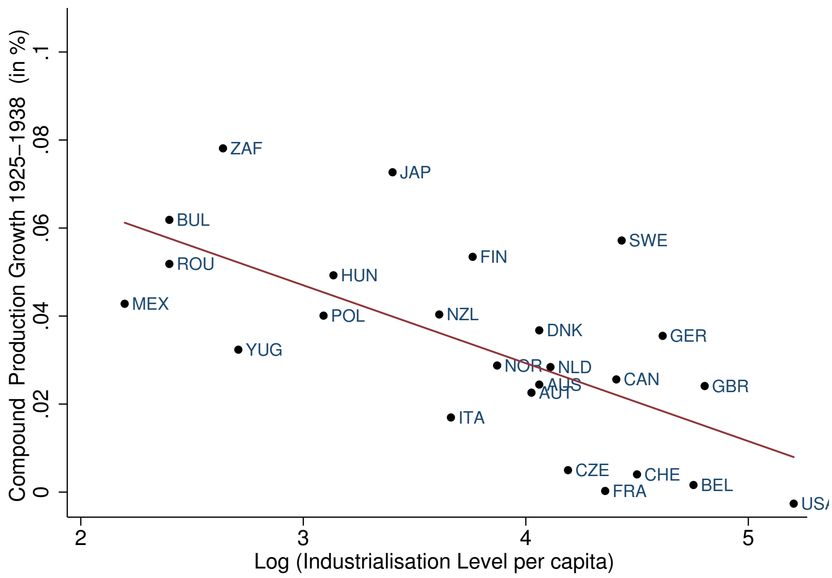


FIGURE A2.1: Beta convergence in the industrial sector

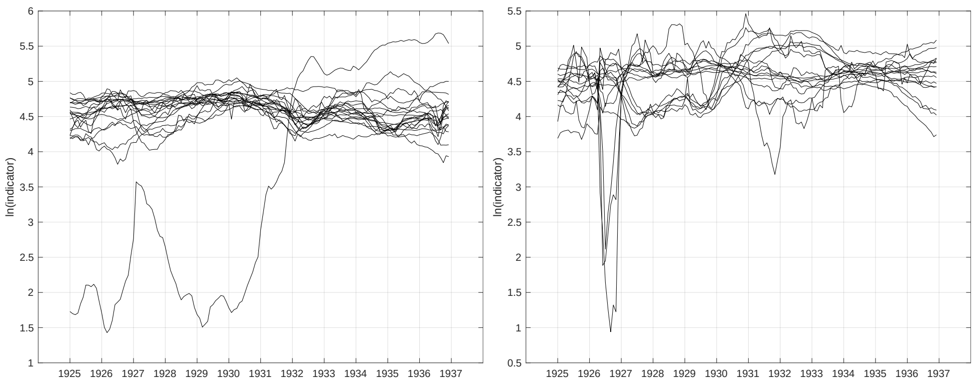
Sources: The industrialisation levels per capita are from Bairoch (1982) and refer to 1928. For the sources for the industrial production indices, see Appendix 2A.14. The slope of the regression line is -.018.

2A.2 Step by step example of the algorithm

This section provides a graphical step-by-step example of the algorithm using the French (left panel) and British (right panel) data. Corresponding to the discussion of the algorithm in Section 2.2.2 in the main text, it discusses the aggregation of the monthly data, the extraction of the trend and volatility information from the annual data, and the calibration of the monthly data using this information.

Aggregation of disaggregated monthly data

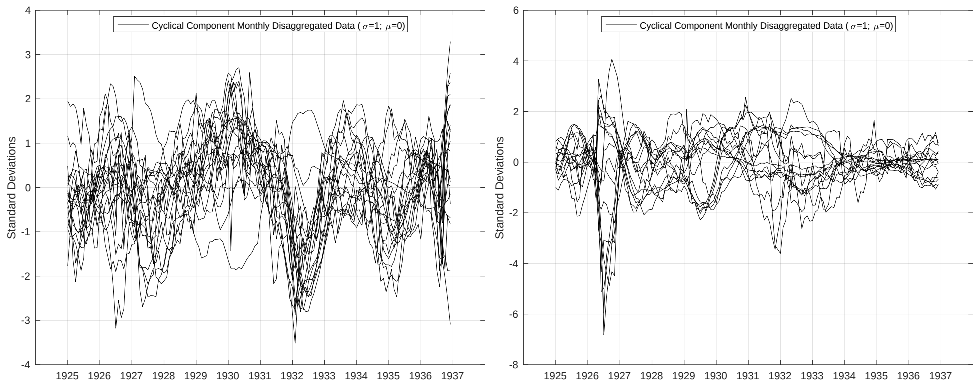
- After adjusting the disaggregated monthly economic indicators for seasonality, smoothing them where necessary, and deflating them, one has a substantial number of indicator series per country (subsample used: *Economic Activity without potentially collinear series*). To improve the expositional clarity each series has been converted to an index with the base $1925 - 1936$.



a) France b) Great Britain

FIGURE A2.2: Disaggregated indicators in levels

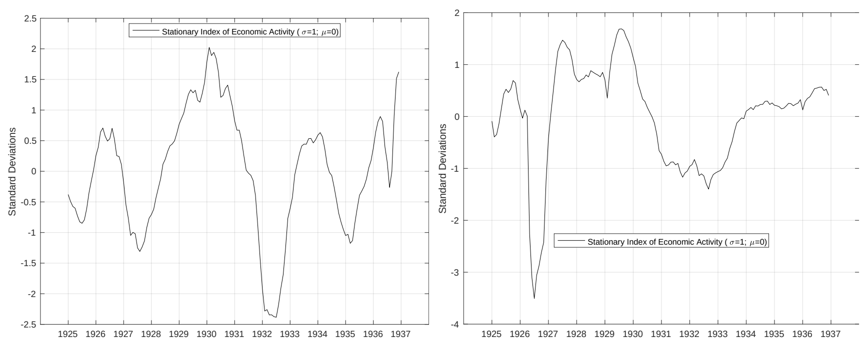
- It becomes apparent that the trends of these indicators series differ substantially. For example, the series that is very different from all the others in the left plot above refers to the number of un-matched requests by job-seekers, which grew rapidly from the beginning until the end of the sample. Another example for an indicator with such a strong trend would be electricity consumption as there was a strong positive secular trend in electrification. When comparing and merging different series, the trends of individual indicators are not meaningful. It is thus necessary to remove indicator-specific trends, which do not play any role henceforth. The algorithm applies a times series filter to remove them (either the HP or CF filter). The plot below displays the resulting *z-standardised* cyclical data (mean $\mu = 0$ and standard deviation $\sigma = 1$):



a) France b) Great Britain

FIGURE A2.3: Disaggregated indicators - cyclical components

- The z-standardisation makes the data comparable across indicators. For each series the deviations from the trend are now expressed in terms of standard deviations.
- On these data, the algorithm runs *Principal Component Analysis* in order to extract the monthly aggregate cyclical movement of economic activity relative to an unobserved trend that the economy is following. I normalise the first principal component to the mean $\mu = 0$ and the standard deviation $\sigma = 1$.



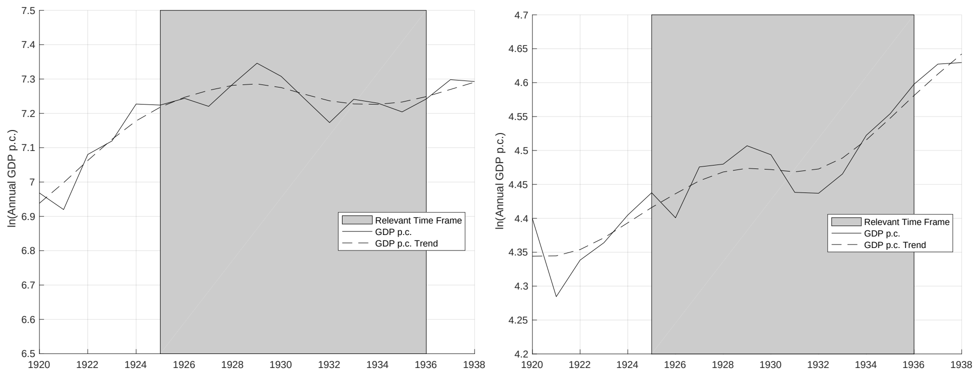
a) France b) Great Britain

FIGURE A2.4: Stationary index of economic activity (first principal component)

Trend & Volatility Information from Annual Data

- Annual GDP data capture both the overall *trend* and the degree of *volatility* of economic activity reasonably well.

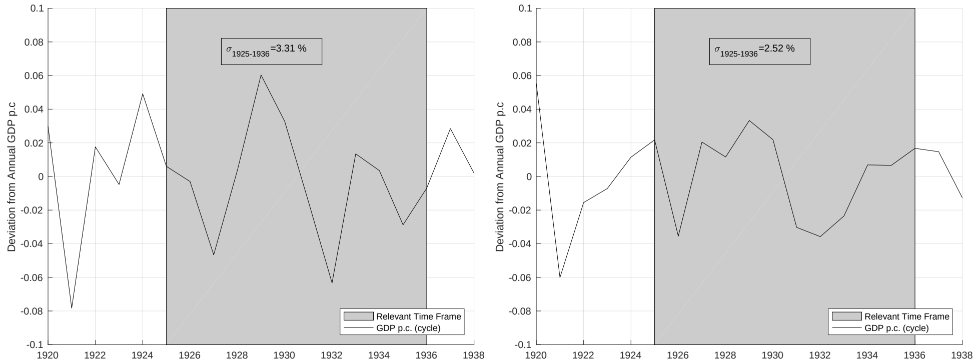
- The graph below presents the annual GDP data in logarithms, as well as its broad trend as identified by the time series filter (in this case the HP-filter). The shaded area indicates the years for which monthly data is available.



a) France b) Great Britain

FIGURE A2.5: Annual GDP p.c. - raw data and trend in logarithms

- The algorithm now extracts the standard deviation of the cyclical component of the annual GDP data for the window, for which monthly data are available ($\sigma_{FR} = 3.31\%$ and $\sigma_{UK} = 2.52\%$). The algorithm employs this standard deviation to scale the stationary monthly aggregate index. This is possible, because the HP- and CF-filter filter out the same trend irrespectively of the observational frequency (monthly, quarterly, or annual). Hence the standard deviation of the extracted cyclical component does not differ (in an economically meaningful manner) across these frequencies.

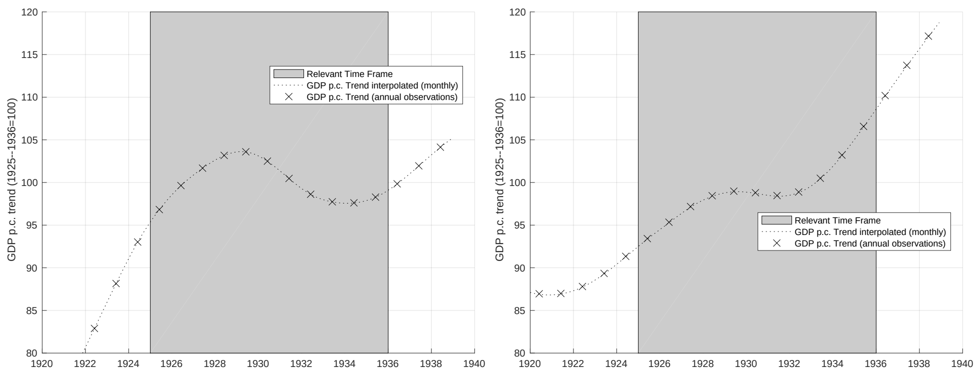


a) France b) Great Britain

FIGURE A2.6: Annual GDP p.c. - cycle

- The dissection of the annual data into cycle and trend (Figure A2.5) proves helpful in a second way. Being a long-term trend, it is reasonable to interpolate between the annual data points.[44]

- This step provides me with a trend estimate of economic activity.



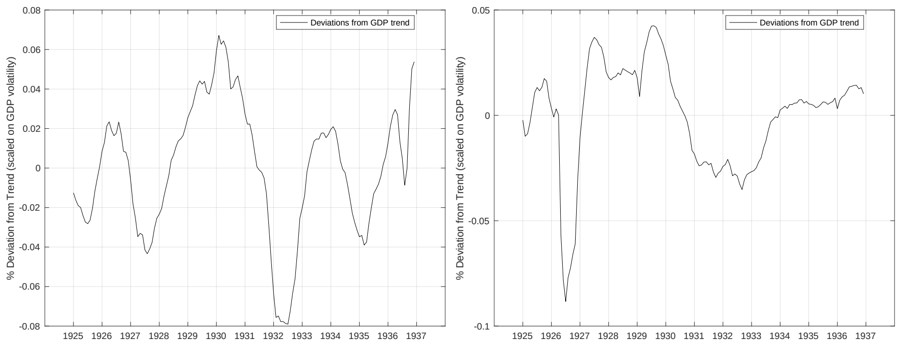
a) France b) Great Britain

FIGURE A2.7: Annual GDP p.c. - trend

[44]The conversion of the trend from $ln(GDP)$ to $GDP = e^{ln(GDP)}$ and conversion to an index is performed for expositional clarity. It has no effect on the results.

Calibration of the monthly index with annual trend and volatility Information

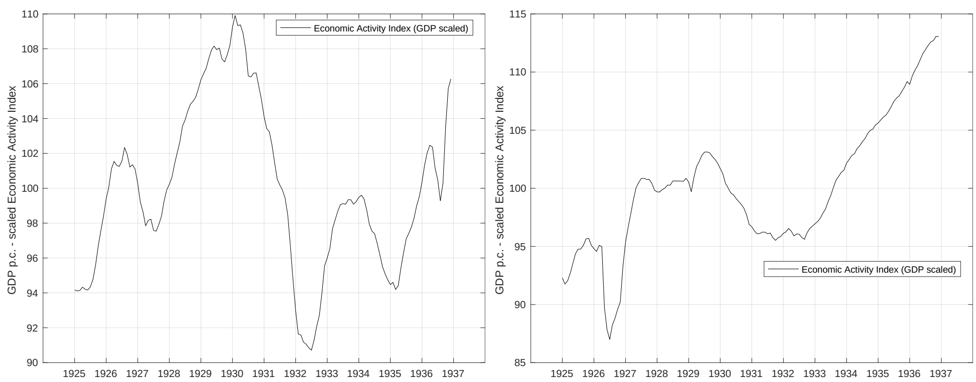
- As mentioned above, the algorithm employs the standard deviation from the annual GDP data (% deviation from the trend) to scale the monthly cyclical index. This is achieved by multiplying the stationary index of economic activity shown in Figure A2.4, which is normalised to $\sigma = 1$ and $\mu = 0$, by the standard deviation from the annual data shown in Figure A2.6 ($\sigma_{FR} = 3.31\%$ and $\sigma_{UK} = 2.52\%$). The scale is now interpretable as percentage deviations from the (GDP p.c.) trend.



a) France b) Great Britain

FIGURE A2.8: Stationary index of economic activity - calibrated on standard deviation of annual GDP p.c. data

- Multiplying the GDP p.c. trend (Figure A2.7) by 1+ the cyclical component above (Figure A2.8) results in the final economic activity index in levels.



a) France b) Great Britain

FIGURE A2.9: Economic activity index in levels - calibrated on GDP p.c. volatility and trend

2A.3 Consistency with Annual GDP Data

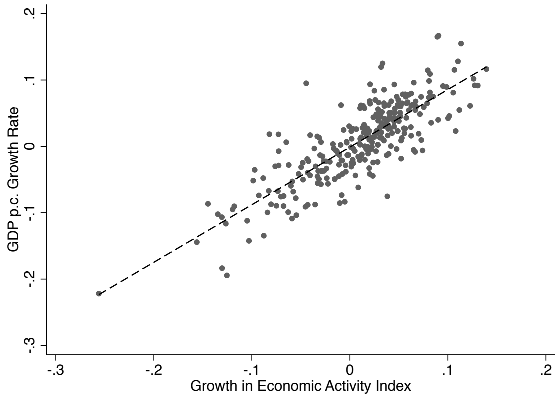


FIGURE A2.10: Consistency with annual GDP p.c. data

Sources: For annual GDP p.c. data, see Appendix 2A.13. The monthly economic activity index is collapsed to annual data by averaging. For both variables the growth rates are calculated as log-differences relative to the previous year. The number of observations is 291, the slope of the regression line is $\beta \approx .87$ and the robust $t \approx 23$.

2A.4 Correlation Between Prices and Economic Activity

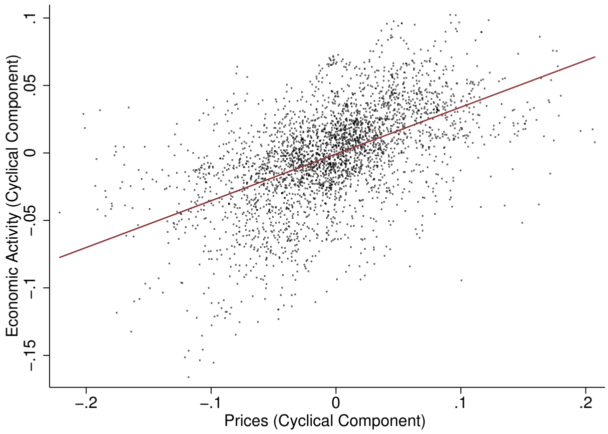
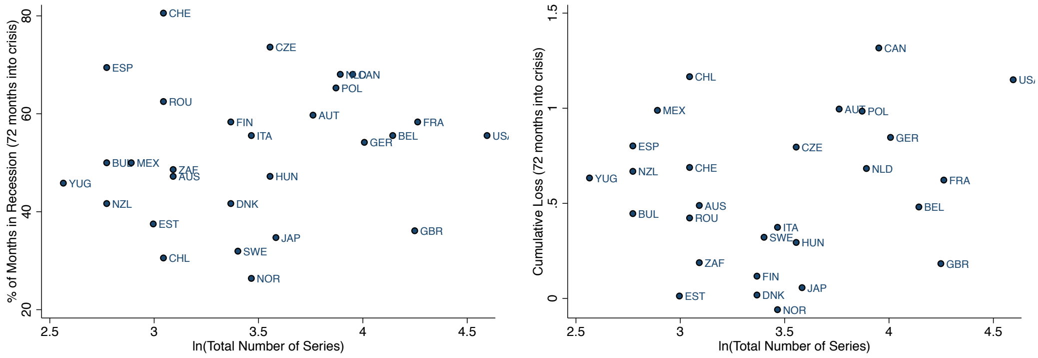


FIGURE A2.11: The correlation between prices and economic activity

Sources: estimates in this paper (cyclical components of wholesale prices and economic activity). The plot consists of 2622 data points. The coefficient for the cyclical component of the prices in a regression with country fixed effects is .4 and the $R^2 \approx .32$. The correlation coefficient is $\rho \approx .57$. These estimates are based on a balanced sample from January 1926– June 1935. Using an unbalanced sample does not affect this result in a qualitatively or quantitatively significant manner.

2A.5 Data Quality and Results



a) Time in recession vs. data quality proxy b) Cumulative loss vs. data quality proxy

FIGURE A2.12: Relationship of data quality & outcome variables of interest

Note: The "Total Number of Series" variable refers to the total number of series collected for the economic activity indicator based on all available series (see Appendix 2A.15). This variable is used as a proxy for data quality (see text). The cumulative loss can be interpreted as the multiple of the annualised peak-GDP lost (see text).

2A.6 Comparison with High-frequency Estimates for the United Kingdom

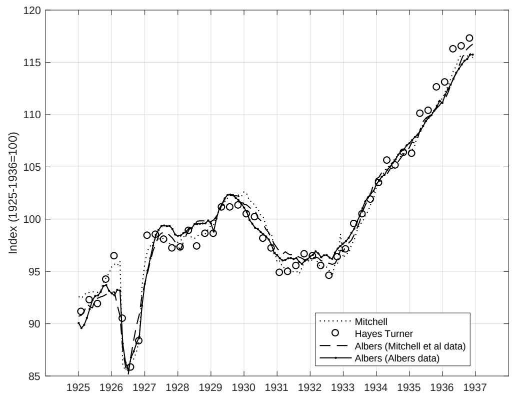


FIGURE A2.13: Comparison of high-frequency GDP estimates for Interwar Britain

Note: The figure shows the estimates by Mitchell et al. (2012) and Hayes and Turner (2007). These estimates are not per capita estimates, but total GDP estimates. For the sake of comparison and in contrast to the rest of this study, I thus scale the composite economic indicator to the trend and standard deviation of total annual GDP. The graphs show that the algorithm applied in this paper yields very similar results. They display two versions, one estimated with the Mitchell et. al data and one version with the larger new dataset (Albers data). I thank Solomos Solomou for sharing the raw data from Mitchell et al. (2012).

The figure illustrates the good fit of the index with existing high-frequency GDP estimates for the United Kingdom. The correlation between cyclical components of the Mitchell et al. index and the index estimated in this paper at the typical frequency of 12-96 months (filtered with the filter by Christiano and Fitzgerald (2003)) is 97 % (Pearson) and 90 % (Spearman).

2A.7 Calculating the Cumulative Loss

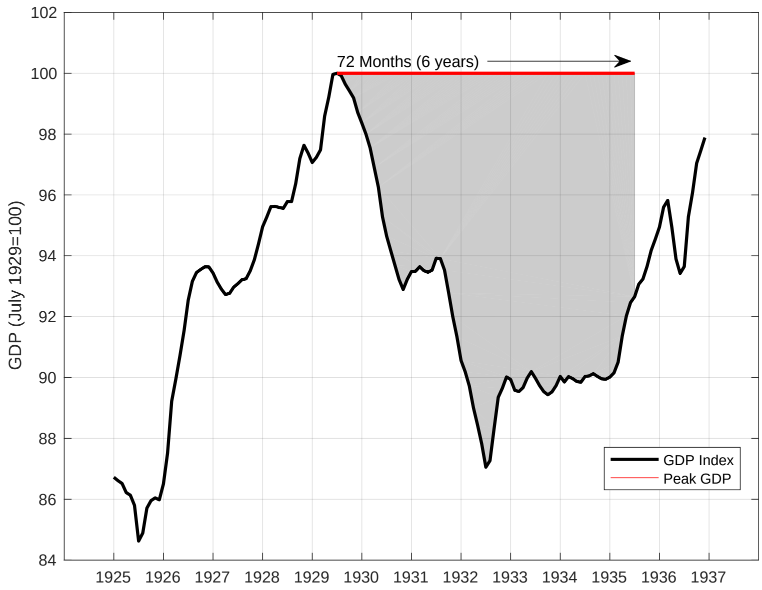


FIGURE A2.14: Cumulative loss - Belgium

The index is re-based to the peak in economic activity/GDP $y_P = 100$. The shaded area, the difference between the peak-economic activity/GDP $y_P = 100$ and the observed economic activity/GDP y_{P+t} in month t, is the integral of interest. The cumulative loss 6 years into crisis expressed in multiples of the peak-economic activity/GDP y_L can be calculated as:

$$y_L = \frac{\sum_{t=1}^{72} y_{P+t} - y_P}{12} \Bigg/ y_P \tag{2.1}$$

2A.8 Recession Statistics - Overview

TABLE A2.1: RECESSION STATISTICS

Variable	Months in recession (1926–1928)	Last pre-Depression peak	Cumulative loss (72 months after peak)	Cumulative loss (60 months after peak)	Months in recession (72 months after peak)	Months in Recession (60 months after peak)
Unit	%	Month	% of annualised peak value	% of annualised peak value	%	%
Australia	50	Feb-29	49	43	47	57
Austria	17	Aug-29	100	79	60	72
Belgium	14	Jul-29	48	39	56	67
Bulgaria		Apr-29	45	37	50	60
Canada	0	Feb-29	132	106	68	82
Chile		Dec-29	117	106	31	37
Czechoslovakia	0	May-29	80	61	74	78
Denmark	28	Dec-30	2	8	42	47
Estonia	64	Apr-30	1	13	38	45
Finland	8	Sep-28	12	18	58	70
France	33	Feb-30	62	51	58	68
Germany	31	May-29	85	77	54	65
Great Britain	36	Aug-29	18	21	36	43
Hungary	0	Aug-29	29	28	47	57
Italy	50	Jun-29	37	32	56	67
Japan	19	Nov-29	6	15	35	42
Mexico		Oct-29	99	86	50	60
Netherlands	0	Jul-29	68	53	68	80
New Zealand	42	Dec-29	67	67	42	50
Norway	25	Jul-30	-6	5	26	32
Poland	3	Apr-29	98	77	65	78
Romania		Dec-29	42	39	63	67
South Africa	14	Jul-29	19	32	49	58
Spain	17	Dec-29	80	61	69	63
Sweden	0	Mar-30	32	37	32	38
Switzerland	0	May-29	69	51	81	77
United States	14	Aug-29	115	96	56	65
Yugoslavia		Dec-29	63	52	46	55

Note: Turning points have been calculated with the Stata SBBQ plugin by Philippe Bracke according to the methodology in Harding and Pagan (2002). The window and phase parameters are set to 5 and the cycle parameter to 15, except for Finland where the cycle parameter is set to 30. The last pre-Depression peak is defined as the last peak occurring between January 1928 and December 1930 according to the Harding-Pagan methodology.

2A.9 Recession Statistics - Monthly Industrial Production vs. Economic Activity Data

TABLE A2.2: RECESSION STATISTICS (72 MONTHS INTO CRISIS)

	Industrial Production		Economic Activity	
	Cumulative loss	Percentage of months in recession	Cumulative loss	Percentage of months in recession
Austria	174	56	100	60
Belgium	157	75	48	56
Canada	193	67	132	68
Czechoslovakia	170	74	80	74
Denmark	-24	50	2	42
France	146	71	62	58
Germany	170	75	85	54
Great Britain	56	51	18	36
Japan	-101	14	6	35
Norway	56	46	-6	26
Poland	219	65	98	65
Sweden	1	17	32	32
United States	199	68	115	56

Note: The loss data can be read in percentages of the peak value. Negative values indicate that a cumulative gain had been achieved. Turning points have been calculated with the Stata SBBQ plugin by Philippe Bracke according to the methodology in Harding and Pagan (2002). The window, phase and cycle parameters are set to 5, 5, and 15 respectively. All industrial production data has been seasonally-adjusted and smoothed (see country appendices). The last pre-Depression peak is defined as the last peak occurring between January 1928 and December 1930.

TABLE A2.3: COMPARISON WITH ROMER'S ANNUAL INDUSTRIAL PRODUCTION DATA

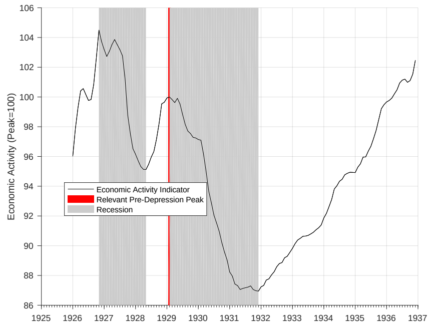
Indicator	Industrial Production		Economic Activity	
	Value	Relative severity	Value	Relative severity
Source	Romer (2004)		This study	
Frequency	Annual		Monthly	
Measure	Peak-to-trough loss		Cumulative loss	
Unit	%	%	%	%
United States	46.8	100	115	100
Poland	46.6	100	98	85
Canada	42.2	90	132	115
Germany	41.8	89	85	74
Czechoslovakia	40.4	86	80	70
Netherlands	37.4	80	68	59
Italy	33	71	37	32
France	31.3	67	62	54
Belgium	30.6	65	48	42
Denmark	16.5	35	2	2
Great Britain	16.2	35	18	16
Sweden	10.3	22	32	28
Japan	8.5	18	6	5

Note: The relative severity is measured as the loss of country i in terms of the loss of the United States. The cumulative loss refers to the 6 years following the pre-Depression peak.

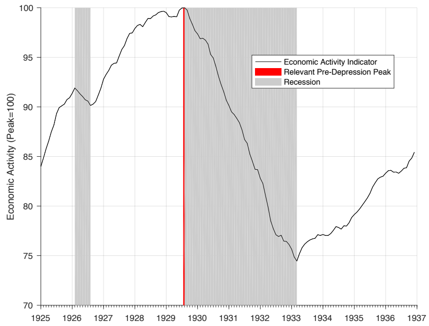
2A.10 Recession Profiles

The shaded areas in the following graphs show the results of the dating algorithm for each country.

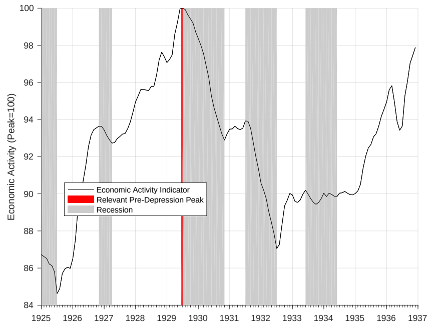
FIGURE A2.15: Recession dating



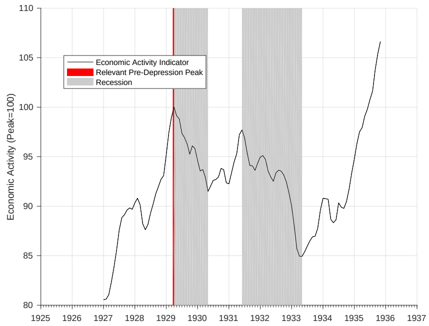
a) Australia



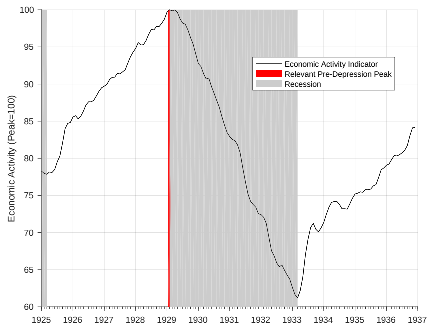
b) Austria



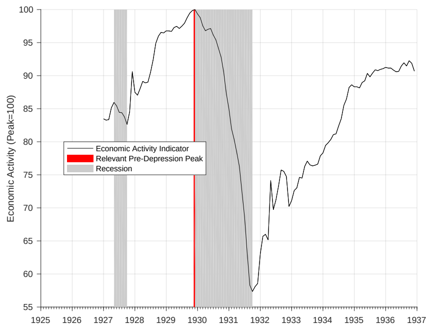
c) Belgium



d) Bulgaria



e) Canada

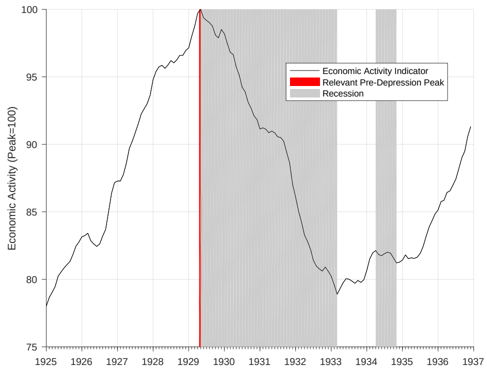


f) Chile

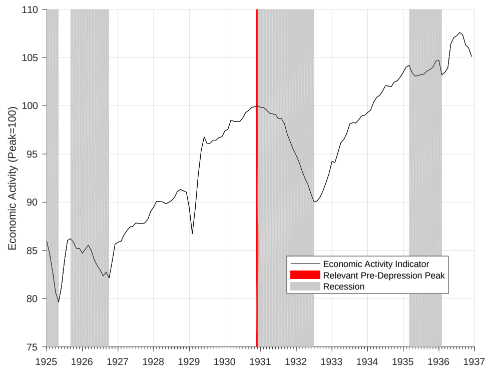
Note: Own calculation (see text). Turning points and recessions defined using the Harding-Pagan algorithm.

Figure continues on the following page.

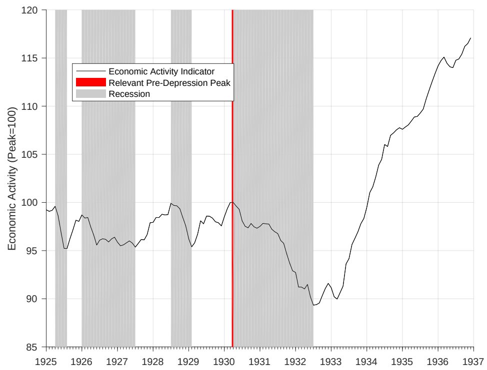
Recession dating continued



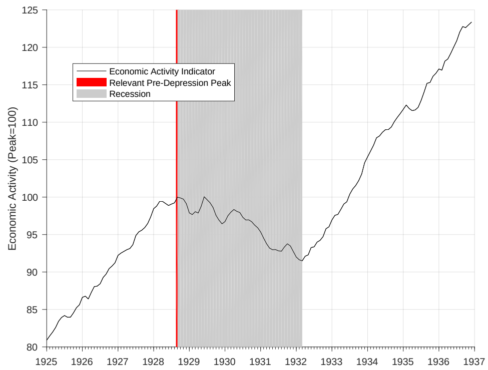
g) Czechoslovakia



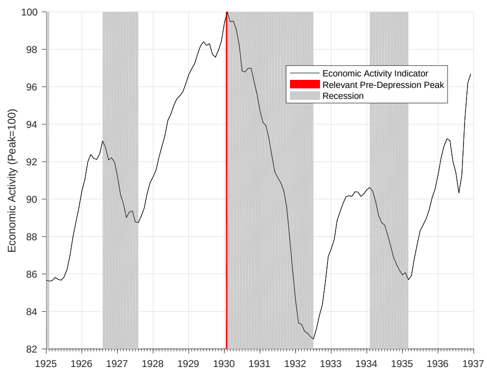
h) Denmark



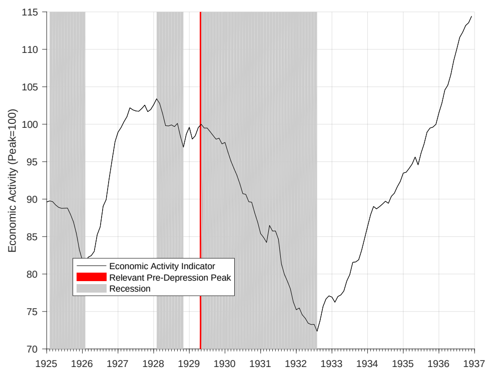
i) Estonia



j) Finland



k) France

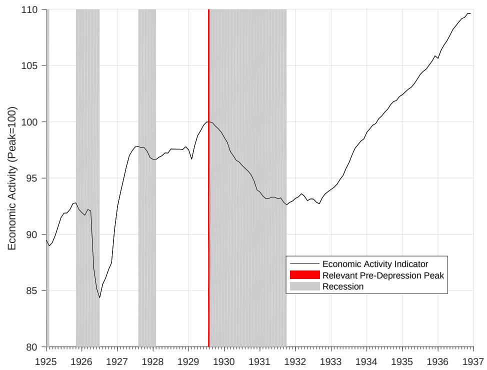


l) Germany

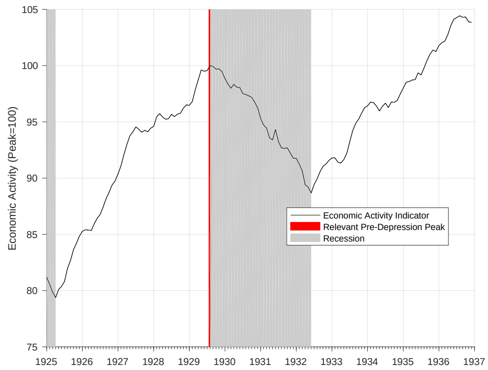
Note: Own calculation (see text). Turning points and recessions defined using the Harding-Pagan algorithm.

Figure continues on the following page.

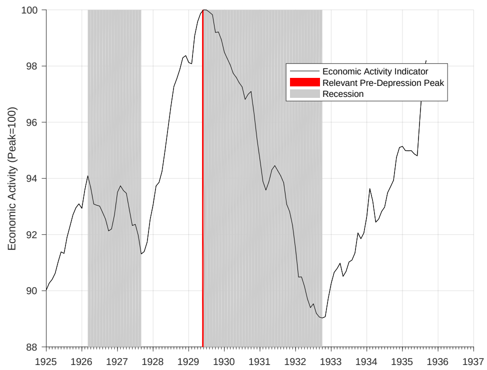
Recession dating continued



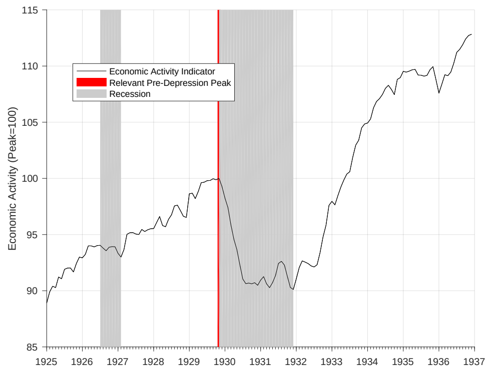
m) Great Britain



n) Hungary



o) Italy



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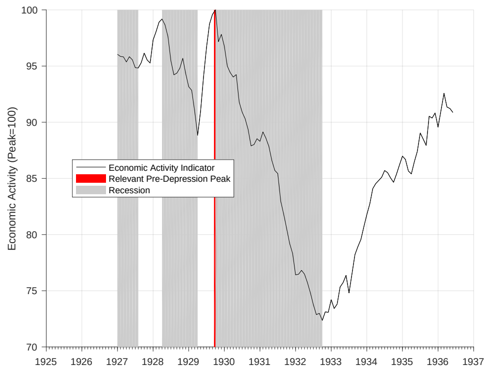

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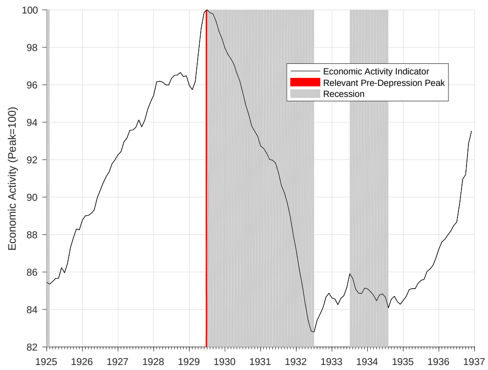
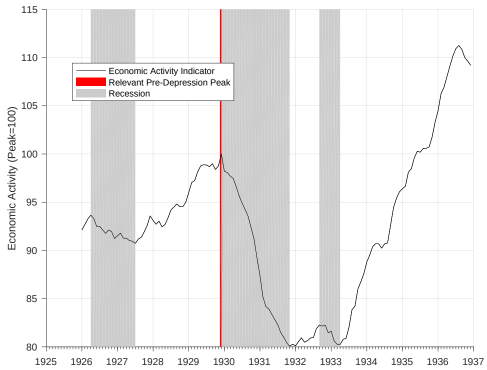


r) Netherlands

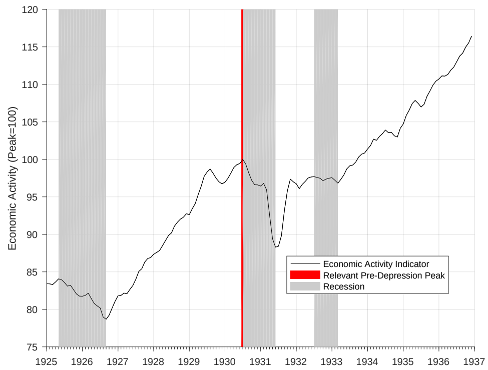
Note: Own calculation (see text). Turning points and recessions defined using the Harding-Pagan algorithm.

Figure continues on the following page.

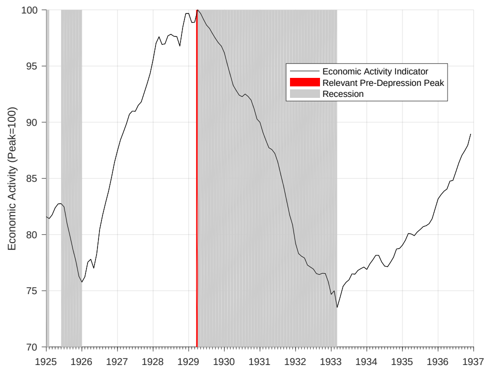
Recession dating continued



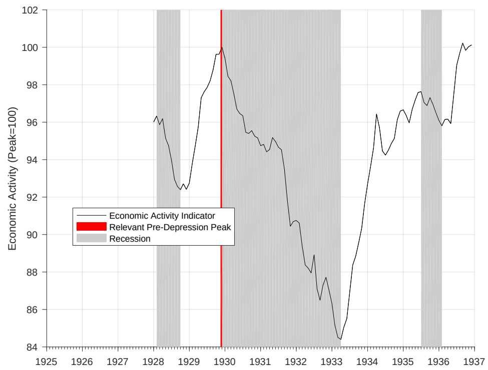
s) New Zealand



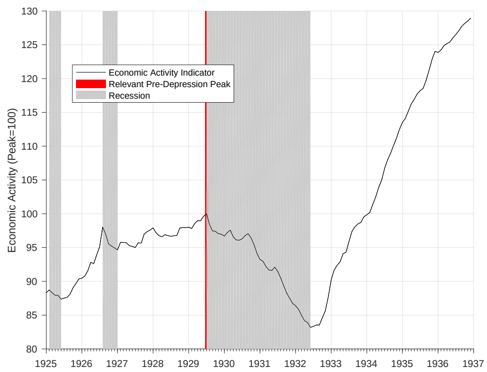
t) Norway



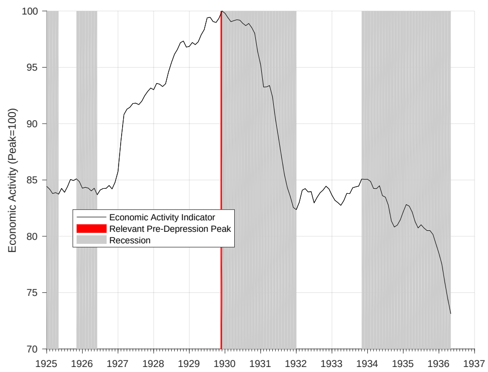
u) Poland



v) Romania



w) South Africa



x) Spain

Note: Own calculation (see text). Turning points and recessions defined using the Harding-Pagan algorithm.

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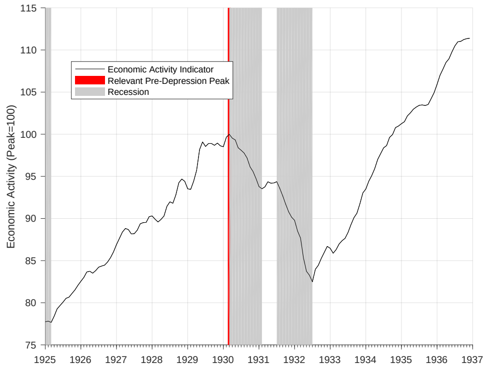
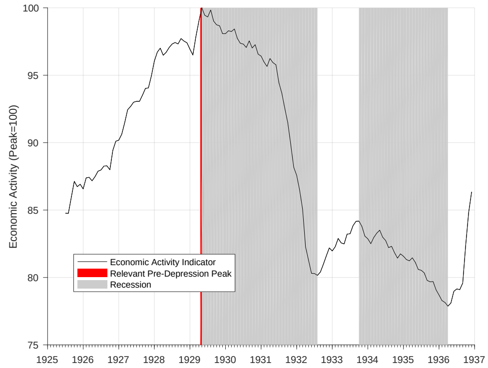
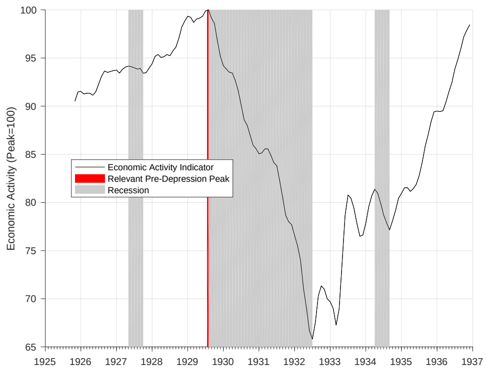
Recession dating concluding



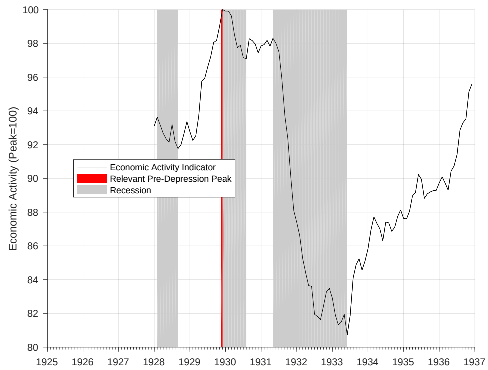
y) Sweden



z) Switzerland



aa) United States



ab) Yugoslavia

Note: Own calculation (see text). Turning points and recessions defined using the Harding-Pagan algorithm.

2A.11 Comparison to Earlier Chronologies and Qualitative Sources on Recessions - 1926–1928

TABLE A2.4: Comparison to earlier chronologies and qualitative sources on recessions - 1926–1928

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Australia	**1926 (Q4) – 1928 (Q2)**			**1926/1927 (Q4) – 1928 (Q2)**	1926 (Q2) – 1926 (Q4), 1927 (Q4) – ...	1927(Q1)/1928 (Q1) – ..	Apparently based on visual inspection, Boehm (1993, p. 19) dates the beginning of the recession to 1927 (Q4). In contrast, Schedvin (1988, p. 44) dates the start of the recession to 1927/1928.
Austria	**1926 (Q1) – 1926 (Q3)**				**1926 (Q1) – 1926 (Q2/Q4)**	1924 (Q3) – 1926 (Q3)	
Belgium	**1926 (Q4) – 1927 (Q2)**				**1927 (Q1) – 1927 (Q3)**	no recession	**For 1927, the chronology states "slight depression due to monetary reconstruction" (Tinbergen, 1934, p. 18).**
Canada	**no recession**		**no recession**		**no recession**		Cross and Bergevin (2012)
Czechoslovakia	no recession				1926 (Q1) – 1926 (Q2/Q4)	1925 (Q4) – 1926 (Q3)	Wagemann's classification indicates recession in the first part of 1926, but according to the conventional dating method used in this study, this dip was too small to qualify as a recession.

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.5: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONTINUED)

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Denmark	**1925 (Q4) – 1926(Q4)**		**1925 (Q2) – 1926 (Q4)**		1926 (Q1) – 1927 (Q4)	1924 (Q4) – 1927 (Q4)	**"The peak of this cycle is somewhat difficult to determine in the case of Denmark, in part because of the labour disputes in the first half of 1925. " (Klovland, 1998, p. 328). The dating procedure employed here considers the peak in the end of 1925 as a new cycle.**
Estonia	**1926 (Q1) – 1927 (Q3), 1928 (Q3) – 1929 (Q1)**						**1926: In relation to a League of Nations loan and general credit stringency, the article highlights the "difficult agricultural situation" (The Economist, 1927, p. 20). 1928: "The economic position showed a decided upward curve during the first half-year, but during the last six months there was a marked decline" (The Economist, 1929a, p. 23).**

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.6: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONTINUED)

Country	Quarters in recession (according to different chronologies)						Other qualitative references / comments / sources
	This Study	NBER	Single Country Studies		Contemporary - unknown methodology		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Finland	**1928 (Q4) – 1932 (Q1)**				**1928 (Q3) –...**	**1928 (Q4) –...**	"The economic progress which marked the last few years reached its climax in 1928 only to slacken in some spheres, and even fall off to some extent[...]" (The Economist, 1929a, p. 22).
France	**1926 (Q3) – 1927 (Q3)**	**1926 (Q3/Q4) – 1927 (Q2/Q3)**			**1926 (Q3) – 1927 (Q2)**	**1926 (Q4) – 1927 (Q2)**	
Germany	**1925 (Q1) – 1926 (Q1), 1928 (Q1) – 1928 (Q4)**	**1925 (Q2) – 1926 (Q1/Q2), 1928 (Q2) –1928 (Q4) (see comment)**			**1926(Q1) – 1926 (Q3)**, 1928 (Q1) – ...	1925 (Q3) – 1926 (Q1), **1928 (Q1/Q4)–1928 (Q4)**	**There is a disagreement between Schmidt (1934, p. 131) and Burns and Mitchell (1946, p. 79) regarding the 1928 recession (both NBER publications). The NBER dates the start of the Depression to 1929 (Q2), but does not, unlike Schmidt (1934), classify the recession starting in 1928 (Q2) as one. This is at odds with more recent evidence (Ritschl, 2002; Voth, 2003). However, the League of Nations (1931, p. 109) resolves this conflicting evidence by recording growth in the first quarter of 1929 as do Ritschl's quarterly GDP estimates.**

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.7: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONTINUED)

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Great Britain	**1925 (Q4) - 1926 (Q3), 1927 (Q3) – 1928 (Q1)**	1924 (Q4) – 1926 (Q3) , **1927(Q2)–1928(Q2)**		1924 (Q4) – 1926 (Q3) , **1927(Q2)–1928(Q2)**	1926 (Q2) - 1926 (Q4), **1927 (Q4) – 1928 (Q2/Q3)**	1926 (Q2) - 1926 (Q4), 1927 (Q4) – 1928 (Q3)	**While Chadha and Nolan (2002) confirm the NBER date, Mitchell et al. (2012) do not find any contraction using a 3 months moving average and monthly GDP data. However, they acknowledge that results differ if this smoothing is not performed. Chadha's and Nolan's dates are shown as they are the ones published online by the National Institute of Economic and Social Research, the UK's NBER-equivalent. Likewise, Morys (2014, p. 246) highlights the 1925–1926 recession.**

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.8: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONTINUED)

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Hungary	**no recession**				**no recession**		
Italy	**1926 (Q2) – 1927 (Q3)**				**1926 (Q2) – 1927 (Q2)**/1928 (Q2)]	**1926 (Q3) – 1927 (Q2)** / 1928 (Q1)	
Japan	**1926 (Q3) – 1927 (Q1)**			1924 (Q1) – 1926 (Q4)	**1926 (Q2) / 1927 (Q2) – 1927 (Q3)**	**1926 (Q2) / 1927 (Q2) – 1927 (Q3)**	Fujino (1966, p. 66)
Netherlands	**no recession**				**no recession**	1925 (Q2) – 1926 (Q1)/ 1926 (Q2)	**The chronology provided in the International Abstract of Economic Statistics only reports growth and prosperity for this period and stationary conditions for 1926 (Tinbergen, 1934, p. 137). Wagemann's classification only shows 1926(Q1) as contractionary and hence does not qualify as a recession.**
New Zealand	**1926 (Q2) – 1927 (Q3)**						**For 1926-1927, the chronology provided in the *International Abstract of Economic Statistics* reports "export prices lower by about 20 %. Trade balance unfavorable in 1926. Some depression and unemployment developed in 1927" (Tinbergen, 1934, p. 152).**

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.9: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONTINUED)

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Norway	**1925 (Q2) – 1926 (Q3)**		**1925 (Q2) – 1926 (Q3)**		1926 (Q1) – 1928 (Q1)	1925 (Q1) – 1927 (Q4)	Klovland (2015, p. 36)
Poland	**1925 (Q3) – 1926 (Q1)**				1926 (Q1) – 1926 (Q2)	**1925 (Q2) – 1926 (Q1)**	
South Africa	**1926 (Q2) – 1927 (Q1)**			**1926 (Q2) – 1926 (Q4)**			Schumann (1934)
Spain	**1925(Q4) – 1926 (Q2)**						**The commercial history review for 1926 summarises Spanish business conditions in 1926 as follows:"Business has been dull, but has maintained itself in encouraging fashion during the long process of liquidation, which seems to have come to an end. Mining and textile industries have had the worst experience, but the collieries were affected by the English strike" (The Economist, 1927, p. 18).**

Table continues on the following page.

Note: please refer to the end of the table for extensive notes and references.

TABLE A2.10: COMPARISON TO EARLIER CHRONOLOGIES AND QUALITATIVE SOURCES ON RECESSIONS - 1926–1928 (CONCLUDING)

Country	**Quarters in recession (according to different chronologies)**						**Other qualitative references / comments / sources**
	This Study	**NBER**	**Single Country Studies**		**Contemporary - unknown methodology**		
	Based on monthly data	*Based on monthly & quarterly data*	*Based on industrial production*	*Based on mixed series / methodology*	*Wagemann (data unknown)*	*League of Nations (data unknown)*	
Sweden	**no recession**		1926 (Q2) – 1926 (Q4)		**no recession**	**no recession**	Klovland (1998)
Switzerland	**no recession**						**Except for a potential recession in 1925 (League of Nations, 1931, p. 107), no references could be found.**
United States	**1927(Q2) – 1927(Q4)**	1926 (Q4) – 1927 (Q4)	**1927(Q2) – 1927(Q3)**		**1927 (Q4)** [Stagnation in previous quarters]	**1927(Q3) – 1927(Q4)**	Romer (1999, p. 30)

Note: Like the League of Nations (1931, p. 109), Wagemann (1931, p. 301) classifies a quarter as either "upward movement", "high-level stationary economic activity","downward movement", or "low-level stationary economic activity." A recession is noted down in the above table if there were at least 2 subsequent quarters of downward movement or the "low-level stationary economic activity" was sustained for more than a year. Unfortunately, information about the underlying methodology and data could not be found. In multiple cases, the League's and Wagemann's classification differ substantially. As Wagemann's and the League's classification end in 1930 and 1931 respectively, "..." refers to cases where the end of the recession is unknown based on these authors' classification. The NBER data is from Burns and Mitchell (1946, p. 78f) unless otherwise noted in the comments. If no data is given in a certain column, this means that no business cycle chronology based on monthly or quarterly data could be found for the period under consideration. Allowing for a one-quarter difference, agreement between previous research and the dating presented in this study is marked in bold letters.

2A.12 The onset of the Great Depression - Comparison to Earlier Research

TABLE A2.11: THE ONSET OF THE GREAT DEPRESSION - TURNING POINTS

Country	This study	Burns and Mitchell (1946)	Romer (2004)
Before mid-1929			
Finland	1928-Q3		
Australia	1929-Q1		
Canada	1929-Q1		1929-Q2
Bulgaria	1929-Q2		
Czechoslovakia	**1929-Q2**		**1929-Q4**
Germany	**1929-Q2**	**1929-Q2**	**1928-Q1**
Italy	1929-Q2		1929-Q3
Poland	1929-Q2		1929-Q1
Switzerland	**1929-Q2**		**1929-Q4**
Mid 1929- December 1929			
Austria	1929-Q3		
Belgium	1929-Q3		1929-Q3
Great Britain	**1929-Q3**	**1929-Q3**	**1930-Q1**
Hungary	1929-Q3		
Netherlands	1929-Q3		1929-Q4
South Africa	**1929-Q3**		**1930-Q1**
United States	1929-Q3	1929-Q3	1929-Q3
Chile	1929-Q4		
Japan	1929-Q4		1930-Q1
Mexico	1929-Q4		
New Zealand	1929-Q4		
Romania	1929-Q4		
Spain	1929-Q4		
Yugoslavia	1929-Q4		
After 1929			
France	1930-Q1		1930-Q2
Sweden	1930-Q1	1930-Q1	1930-Q2
Estonia	1930-Q2		
Norway	1930-Q3		
Denmark	1930-Q4		1930-Q4

Notes: The NBER dates are from Burns and Mitchell (1946, p. 78f) for Germany, France, and Great Britain. For the United States, the official NBER date is shown, which is August 1929 rather than June 1929. Romer (2004) provides turning points for the above countries in the *Encyclopaedia Britannica*. Most likely, those are based on industrial production indices. Differences of more than two quarters in the pre-Depression peak between Romer's study and the dates found in this study are marked in bold.

2A.13 Annual Data - Per Capita GDPs

For many countries, "interwar specific estimates" in constant prices of the national currency exist. Those were given preference over commonly used data from Barro and Ursúa (2008) and Maddison (Bolt and van Zanden, 2013). However, the differences to these datasets are generally small except for Denmark and Switzerland. To avoid the endpoint problem of time series filters, I use GDP data for all years between 1920 and 1938 to decompose the series into trend and cycle. Naturally, the standard deviation is only calculated for the period for which monthly data are available.

TABLE A2.12: DATA SOURCES ANNUAL

Country	Annual Indicator			Population
	Type	Unit	Source	Source
Australia	GDP	2010 Dollars	Hutchinson and Ploeckl (2016)	Hutchinson and Ploeckl (2016)
Austria	GNP	(2008 = 100)	Barro and Ursúa (2010)	Kausel et al. (1965, p. 44)
Belgium	GNP	1936-8 m Belgian Franc	Buyst (1997)	Broadberry and Klein (2012)
Bulgaria	GDP	m 1939 Lev	Bank of Greece et al. (2014)	Bank of Greece et al. (2014)
Canada	GNP[45]	(2008 = 100)	Barro and Ursúa (2010)	Maddison (2007)
Chile	GDP	(2008 = 100)	Barro and Ursúa (2010)	Díaz et al. (2007, p. 124)
Czechoslovakia	GDP[46]	m 1929 Czech Crowns	Pryor et al. (1971, p. 47)	Broadberry and Klein (2012)
Denmark	GDP	m 1929 Danish Crowns	Bjerke (1955)[47]	Hansen (1976, p. 203)
Estonia	GDP	m 1929 Estonian crowns	Valge (2003)[48]	Valge (2003)
Finland	GDP	1926 Prices in m Marka	Smits et al. (2009)	Broadberry and Klein (2012)
France	GDP	m 1905-1913 Francs	Mitchell (2003a, p. 909)	Broadberry and Klein (2012)

[45] I calculate the growth rate of the GNP series in 1920 prices to project the GNP of 1925 backwards.

[46] I scale the 1929 benchmark estimate with the GDP volume index. Both are found in Pryor et al. (1971).

[47] From 1930 onwards, I splice in the official GDP series in constant 1935 dollars. Bjerke noted that his deflation method would certainly underestimate the fall in output. Indeed the fall is more pronounced in the official series.

[48] The GDP observation for 1923 is excluded in the calculation of the trend. It would imply a growth rate of more than 30 % from 1923 to 1924.

DATA SOURCES ANNUAL (CONTINUED)

Country	Annual Indicator			Population
	Type	Unit	Source	Source
Germany	GDP	(2008 = 100)	Barro and Ursúa (2010)	Broadberry and Klein (2012)
Great Britain	GDP	1938 m Pounds	Sefton and Weale (1995, p. 188-189); Thomas et al. (2010)	Broadberry and Klein (2012)
Hungary	NNP	m 1938/1939 pengos	Eckstein (1955)[49]	Broadberry and Klein (2012)
Italy	GDP	m 1938 Lira	Baffigi (2011)	Broadberry and Klein (2012)
Japan	GDP	m 1934-1936 Yen	Ōkawa et al. (1974), Smits et al. (2009)	Statistics Japan (2017)
Mexico	GDP	Millions of Mexican Pesos 1970	Smits et al. (2009)	Maddison (2007)
Netherlands	GDP	m 1913 Guilders	Smits et al. (2009)	Broadberry and Klein (2012)
New Zealand	GNP	m 1911 Pounds	Rankin (1992, p. 61)	Rankin (1992, p. 58)
Norway	GDP	m Kroner (1938 prices)	Central Bureau of Statistics Norway (1952, p. 128)	Grytten (2004, p. 275)
Poland	GDP[50]	1990 GKS	Roses and Wolf (2010, p. 190), Broadberry and Klein (2012)	Broadberry and Klein (2012)
Romania	GDP	m US $ PPP 2000	Savoiu and Manea (2014)	Bank of Greece et al. (2014)
South Africa	GNP	(2008 = 100)	Barro and Ursúa (2010).	Frankema and Jerven (2014)
Spain	GDP	2011 EKS	Prados de la Escosura (2016)	Prados de la Escosura (2016)
Sweden	GDP	m Swedish Crowns (1913 prices)	Johansson (1967, p. 161)	Johansson (1967, p. 157)
Switzerland	GNP[51]	m 1925 Swiss Frank	Gerlach and Gerlach-Kristen (2005), Historical Statistics of Switzerland (2016a, Q.16a)	Broadberry and Klein (2012)
United States	GDP	m 2009 US Dollars	Johnston and Williamson (2008)	Johnston and Williamson (2008)
Yugoslavia	NI	m Dinar (1938 prices)	Bank of Greece et al. (2014)	Bank of Greece et al. (2014)

[49]Compounding interpolation for 1921-1923. Data had to be adjusted from fiscal years to calendar years.

[50]I interpolate between the years 1925 and 1929 as no estimates are available. For this I use the 1922 estimate in Roses and Wolf (2010, p. 190) and GDP data from Broadberry and Klein (2012) for 1929 onwards. While this linear interpolation is far from perfect, it corresponds well with the growth path of industrial production estimates (see Mitchell, 2014).

[51]The official GDP estimate seems flawed as the service sector is deflated heavily, which leads to real income estimates that are inconceivable given the contemporary description of the Great Depression in Switzerland (Methorst, 1938, p. 222). Therefore I use Gerlach and Gerlach-Kristen (2005) estimate of real economic activity (based on National Income from 1930 on) to calculate a Real GDP in 1925 prices. The nominal GDP for 1925 is from Historical Statistics of Switzerland (2016a, Q.16a).

2A.14 Annual Data - Manufacturing / IP indices

All data indices are from League of Nations (1945, p. 134), except for the following:

- Bulgaria: Ivanov and Tooze (2007)
- Yugoslavia: Stajić (1957)
- Mexico: Mitchell (2014)
- Switzerland: Historical Statistics of Switzerland (2016b)
- South Africa: Archer (1989, p. 18)

2A.15 Monthly Data - Country Sheets

This section provides source sheets for each country. The abbreviation *STATI* refers to data from the Statistische Handbuch der Weltwirtschaft, the abbreviation *IAES* to those from the International Abstract of Economic Statistics. The countries are ordered by continent. Column 3 reports whether the series was seasonally adjusted, which is true for all series but the central bank ones. The seasonal adjustment has been carried out by using the X-13 ARIMA plugin of the IRIS toolbox for Matlab. Column 4 reports the MCD-smoothing parameter. The remaining columns report the coefficients of the first principal component from the Principal Component Analysis, estimated with the SVD (singular value decomposition) algorithm. They are normalized by the absolute sum of the estimated coefficients. This has no impact on the index, but improves readability. They can be interpreted as the weights in percentage terms. Indices are only shown if more than seven series are available for estimating the respective version of the index.

Europe

Austria

TABLE A2.13: DATA AUSTRIA

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production	Index (1923/1931=100)	STATI	✓	2	0.04	0.03	0.05	0.03	0.03
Cattle sold at St. Marx	1000s	IAES	✓	6	-0.01	-0.01	-0.01	-0.01	-0.01
Beer (wort) - production	1000 hl	IAES	✓	5	0.03	0.03	0.04	0.03	0.03
Lignite - production	1000 t	STATI	✓	4	0.02	0.01	0.02	0.01	0.01
Coal - production	1000 t	IAES	✓	6	0.02	0.01	0.01	0.01	0.01
Iron ore - production	1000 t	STATI	✓	6	0.05	0.04	0.05	0.04	0.03
Paper - production	1000 t	STATI	✓	6	0.03	0.02	0.02	0.02	0.02
Cardboard - production	1000 t	STATI	✓	6	0.04	0.03	0.04	0.03	0.03
Electricity - production	m kWh	STATI	✓	4	0.04	0.04		0.04	0.03
Electricity in Vienna - consumption	m kWh	IAES	✓	3	0.04	0.03	0.04	0.03	0.03
Iron Industries - orders	Index (100="normal")	STATI	✓	3	0.04	0.03	0.04	0.03	0.03
Pig iron - production	Index (100="normal")	IAES	✓	6	0.04	0.03	0.05	0.03	0.03
Steel - production	Index (100="normal")	IAES	✓	6	0.05	0.04	0.05	0.04	0.04
Semi-processed metal goods - production	Index (100="normal")	IAES	✓	6	0.05	0.04	0.05	0.04	0.04
Cotton mills - orders	Index (1923/31=100)	STATI	✓	2	0.03	0.02	0.03	0.02	0.02
Capital goods - turnover	Index (1923/31=100)	STATI	✓	1		0.04	0.05	0.04	0.03
Consumption goods - turnover	Index (1923/31=100)	STATI	✓	6		0.02	0.03	0.02	0.02
Transported goods - railways	Cars per day	STATI	✓	3	0.04	0.03	0.04	0.03	0.03
Transported goods - railways	ton-kilometers per day	STATI	✓	3	0.04	0.03	0.04	0.03	0.03
Unemployed - registered job seekers	1000s	STATI	✓	0	-0.05	-0.04	-0.04	-0.04	-0.03
Unemployment - benefit recipients	1000s	STATI	✓	0	-0.05	-0.04		-0.04	-0.03
Unemployed in Vienna	1000s	STATI	✓	0	-0.04	-0.03		-0.03	-0.03
Unemployment - job hunting advertisements	1000s	IAES	✓	1	-0.04	-0.03	-0.04	-0.03	-0.03
Unemployment - job advertisements	1000s	IAES	✓	5	0.04	0.03	0.04	0.03	0.03
Unemployment - filled vacancies	1000s	IAES	✓	5	0.04	0.03		0.03	0.03
Overseas emigrants	Individuals	IAES	✓	4	0.03	0.02	0.03	0.02	0.02
Company register of Vienna, Lower Austria, Burgenland - new companies	Number	IAES	✓	6	-0.01	-0.00	-0.00	-0.00	-0.00
Company register of Vienna, Lower Austria, Burgenland - failures	Number	IAES	✓	6	-0.01	-0.01	-0.01	-0.01	-0.01
Company register of Vienna, Lower Austria, Burgenland - companies dissolved	Number	IAES	✓	4	0.00	0.00	0.01	0.00	0.00
Company register of Vienna, Lower Austria, Burgenland - liquidations	Number	IAES	✓	4	-0.01	-0.01		-0.01	-0.01
Bankruptcies	Number	STATI	✓	6	-0.02	-0.02		-0.02	-0.01
Company liquidations - total	Number	STATI	✓	4	-0.04	-0.03	-0.04	-0.03	-0.03
Trade									
Imports - total	m Schilling	STATI	✓	3		0.03	0.04	0.03	0.03
Exports - total	m Schilling	STATI	✓	2		0.03	0.04	0.03	0.03
Prices									
Wholesale prices - general index	Index (1914(1-6)=100)	STATI	✓	1					
Wholesale prices - food	Index (1914(1-6)=100)	STATI	✓	1					
Wholesale prices - industrial goods	Index (1914(1-6)=100)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - currency in circulation	m Schilling	STATI		0					0.01
Central bank - bank rate	%	STATI		0					-0.01
Central bank - deposits	m Schilling	STATI		0					-0.01
Central bank - giro turnover	m Schilling	STATI	✓	4		0.02	0.03	0.02	0.02
Private banks - postal cheque turnover	m Schilling	STATI	✓	3		0.02		0.02	0.02
Private banks - interest on 30 day call money	%	STATI	✓	0					-0.02
New capital in GMbH & stock companies	m Schilling	STATI	✓	6		0.00	0.01	0.00	0.00
Stock market - 35 industrial shares	Index (1923/32=100)	STATI	✓	1		0.03	0.04	0.03	0.03
Securities - turnover	m Schilling	IAES	✓	4		0.02	0.02	0.02	0.02
Number of Variables					30	39	31	39	43
Variance explained					50	48	47	48	44

Comments

- *Total exports & imports*: quarterly values for 1925 have been converted to monthly values by dividing them by 3.
- *Unemployed - registered job seekers*: values for January and February 1925 were missing and assumed to take those of March 1925.

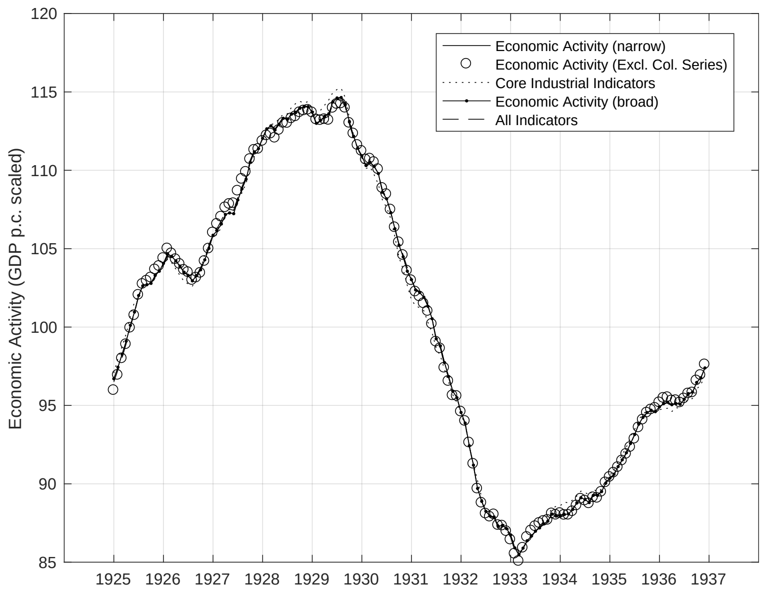


FIGURE A2.16: Economic Activity Index (GDP p.c. scale) - Austria (Level)

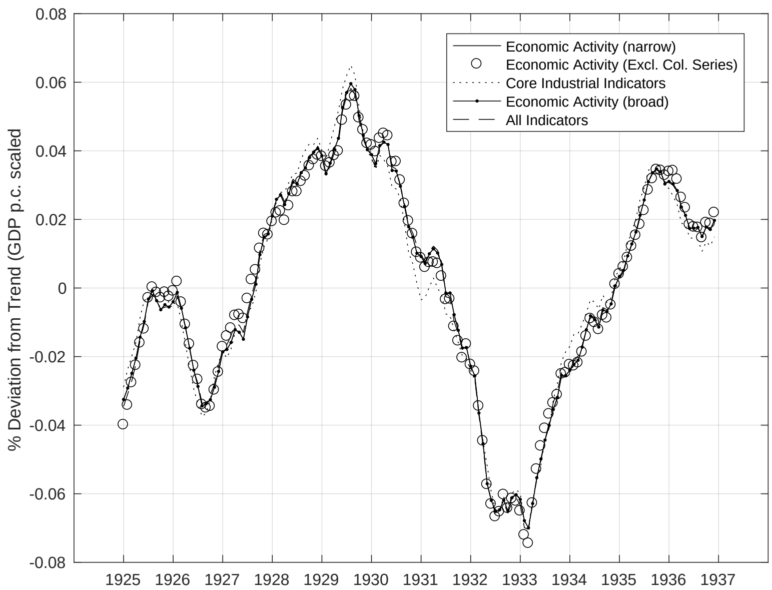


FIGURE A2.17: Economic Activity Index (GDP p.c. scale) - Austria (Cycle)

Belgium

TABLE A2.14: DATA BELGIUM

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1923/1925)	STATI	✓	3	0.06	0.05	0.08	0.03	0.03
Glass industry - production	Index (1923/1925)	STATI	✓	3	0.05	0.04	0.07	0.02	0.02
Coal - production	1000 tons	STATI	✓	6	0.04	0.03		0.02	0.02
Coal - storage	1000 tons	STATI	✓	0	-0.04	-0.03	-0.05	-0.01	-0.01
Pig iron - production	1000 tons	STATI	✓	2	0.05	0.04	0.07	0.02	0.02
Crude steel - production	1000 tons	STATI	✓	2	0.05	0.04	0.07	0.02	0.02
Steel mills - ingots	1000 tons	STATI	✓	2	0.05	0.05		0.02	0.02
Steel mills - wrought steel	1000 tons	STATI	✓	2	0.05	0.04		0.02	0.02
Shipping - ships incoming (Port of Antwerp)	m tons	IAES	✓	6	0.05	0.05	0.07	0.03	0.02
Shipping - ships incoming (Port of Ghent)	1000 tons	IAES	✓	5	0.05	0.04		0.02	0.02
Railways - goods transported	1000 tons	STATI	✓	3	0.05	0.05	0.07	0.02	0.02
Unemployed - full-time workers	Individuals	STATI	✓	6	-0.06	-0.05	-0.07	-0.03	-0.02
Insured unemployed - full-time workers	%	STATI	✓	2	-0.05	-0.04		-0.03	-0.02
Unemployment - working days lost due to unemployment of insured workers	Days	IAES	✓	2	-0.06	-0.05		-0.03	-0.02
Unemployed - part-time workers	1000s	IAES	✓	3	-0.06	-0.05	-0.07	-0.02	-0.02
Proportion of applicants to job offers	%	IAES	✓	2	-0.05	-0.05		-0.03	-0.02
Textiles - production	Index (1923/1925)	STATI	✓	3	0.04	0.04	0.06	0.02	0.02
Wool - production	tons	STATI	✓	6	0.03	0.02		0.01	0.01
Coke - production	1000 tons	IAES	✓	2	0.06	0.05		0.03	0.02
Furnaces in Blast (End of Month)	Number	IAES	✓	1	0.05	0.04	0.07	0.02	0.02
Tax receipts - direct taxation	m Francs	IAES	✓	3		0.00	-0.00	-0.00	-0.00
Trade									
Tax receipts - customs and excise	m Francs	IAES	✓	4				-0.02	-0.02
Total imports (quantity)	m tons	IAES	✓	4		0.04	0.06	0.03	0.02
Total exports (quantity)	m tons	IAES	✓	5		0.04	0.07	0.03	0.02
Imports - raw materials and semi-manufactured goods (Quantity)	m tons	IAES	✓	4				0.03	0.02
Imports - raw materials and semi-manufactured goods (value)	b Francs	IAES	✓	2				0.03	0.02
Exports - manufactured goods (quantity)	m tons	IAES	✓	6				0.02	0.02
Exports - manufactured goods (value)	b Francs	IAES	✓	6				0.02	0.02
Imports - foodstuffs and drinks	m Francs	STATI	✓	3				0.01	0.01
Imports - manufactured goods	m Francs	STATI	✓	2				0.02	0.01
Exports - foodstuffs and drinks	m Francs	STATI	✓	3				0.00	0.00
Exports - raw materials and semi-manufactured goods	m Francs	STATI	✓	4				0.02	0.02
Imports - cotton	tons	STATI	✓	6				0.02	0.02
Imports - wool	tons	STATI	✓	5				0.01	0.01
Imports - coal	1000 tons	STATI	✓	4				0.01	0.01
Imports - coke	1000 tons	STATI	✓	2				0.02	0.02
Imports - iron ore	1000 tons	STATI	✓	4				0.03	0.02
Imports - pig iron	1000 tons	STATI	✓	4				0.03	0.02
Imports - machines	m Francs	STATI	✓	2				0.02	0.01
Exports - coal	1000 tons	STATI	✓	4				0.01	0.01
Exports - iron bars	1000 tons	STATI	✓	6				0.02	0.01
Exports - zinc	tons	STATI	✓	6				0.01	0.01
Exports - zinc sheets	tons	STATI	✓	6				0.02	0.02
Exports - machines	m Francs	STATI	✓	5				0.02	0.02
Exports - textiles	m Francs	STATI	✓	4				0.02	0.02
Exports - cotton fabrics	tons	STATI	✓	6				0.03	0.02
Exports - Glassware	m Francs	STATI	✓	6				0.02	0.02
Exports - plate glass	tons	STATI	✓	6				0.03	0.02
Exports - chemical products	m Francs	STATI	✓	6				0.01	0.01
Prices									
Wholesale prices (general index)	Index (April 1914)	STATI	✓	0					
Wholesale prices - elastic goods	Index (April 1914)	STATI	✓	0					
Retail prices	Index (April 1914)	STATI	✓	0					
Consumer prices	Index (1921)	STATI	✓	0					
Foodstuff prices	Index (1921)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - currency in circulation	m Francs	STATI		0					-0.00
Central bank - public deposits	m Francs	STATI		0					0.00
Central bank - private deposits	m Francs	STATI		0					0.00
Central bank - bank rate	m Francs	STATI		0					-0.01
Market rate	%	STATI	✓	1					-0.01
Clearings - Brussels and provinces	m Francs	STATI	✓	4		0.00	-0.00	0.00	0.00
Giro cheques - turnover	m Francs	STATI	✓	2					0.00
Caisse Generale d'Epargne (savings bank) - saving deposits	m Francs	STATI	✓	0					-0.02
Caisse Generale d'Epargne (savings bank) - new deposits	m Francs	IAES	✓	3		-0.02	-0.04	-0.01	-0.01
Caisse Generale d'Epargne (savings bank) - withdrawals	m Francs	IAES	✓	3					-0.02
Registered mortgages	m Francs	IAES	✓	6		-0.02	-0.03	-0.00	-0.00
Stock market index	Index (1928 = 100)	STATI	✓	1		0.03	0.04	0.02	0.02
Number of Variables					20	27	18	53	63
Variance explained					59	49	47	42	39

Comments

- *Wholesale prices - elastic goods*: values for January and February 1931 are linearly interpolated.
- *Railways - goods transported*: The first 8 months of 1925 were extrapolated by splicing in a deflated series of total railway receipts.

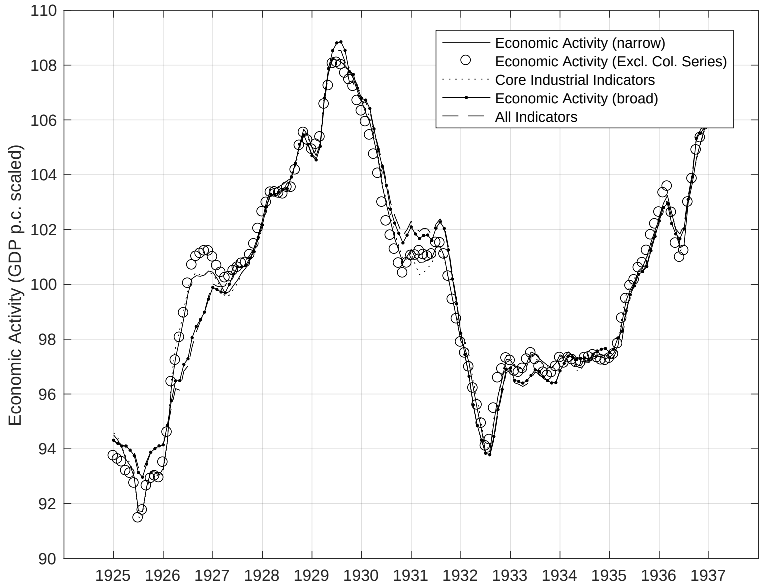


FIGURE A2.18: Economic Activity Index (GDP p.c. scale) - Belgium (Level)

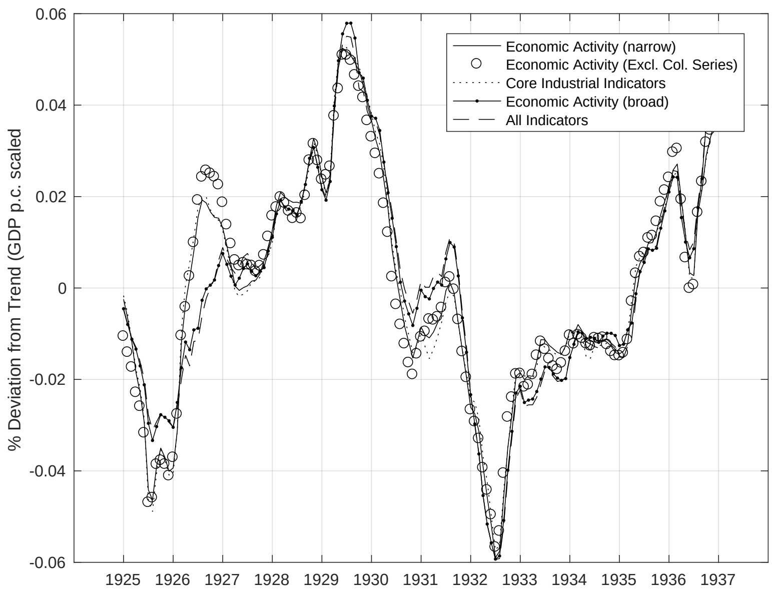


FIGURE A2.19: Economic Activity Index (GDP p.c. scale) - Belgium (Cycle)

Bulgaria

TABLE A2.15: DATA BULGARIA

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Coal production (state-owned mines)	tons	BM	✓	6		0.11	0.11	0.11	0.07
Coal production (privately-owned mines)	tons	BM	✓	6		0.12	0.12	0.12	0.06
Government income - direct taxes	1000 Lev	BM	✓	5		0.01	0.01	0.01	0.01
Employed workers	1000s	STATI	✓	3		0.14	0.14	0.14	0.08
Railway index	Index (1932/1934)	STATI	✓	4		0.14	0.14	0.14	0.08
Trade									
Total imports	m Lev	STATI	✓	3		0.18	0.18	0.18	0.10
Total exports	m Lev	STATI	✓	6		0.14	0.14	0.14	0.07
Prices									
Wholesale prices - general index	Index (1932/1934)	STATI	✓	1					
Wholesale prices - foodstuff (excluding meat)	Index (1932/34)	STATI	✓	1					
Wholesale Prices - meat	Index (1932/34)	STATI	✓	1					
Consumer prices	Index (1933/1934)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold stock		STATI		0					0.07
Central bank - foreign exchange holdings	m Lev	STATI		0					0.11
Central bank - bills of exchange and advances	m Lev	STATI		0					0.07
Central bank - advances to the government	m Lev	STATI		0					-0.05
Central bank - currency in circulation	m Lev	STATI		0					0.05
Central bank - deposits	m Lev	STATI		0					0.06
Central bank - bank rate	%	STATI		0					-0.01
Protested bills of exchange	m Lev	STATI	✓	2		-0.03	-0.03	-0.03	-0.01
Clearings	m Lev	STATI	✓	3		0.14	0.14	0.14	0.08
Number of Variables					4	9	9	9	16
Variance explained					52	36	36	36	32

Comments

- *Railway index* : two series have been linked via re-basing.
- *All price series*: series have been linked via re-basing.
- *Coal Production (State-owned Mines):* Excludes mines other than the one in Pernik from 1934 on. However, those mines produced negligible amounts.
- BM is the abbreviation for the Bulgarian *Bulletin mensuel by the Direction Général de la Statistique, various issues*.
- The stabilization in 1932 is not visible in the GDP's by Bank of Greece et al. (2014), but is very marked in the Maddison GDP estimates (Bolt and van Zanden, 2013).

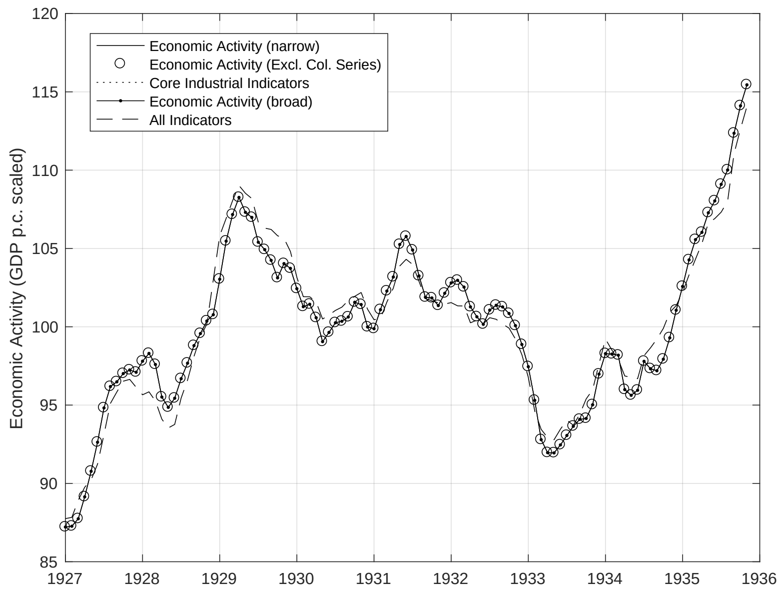


FIGURE A2.20: Economic Activity Index (GDP p.c. scale) - Bulgaria (Level)

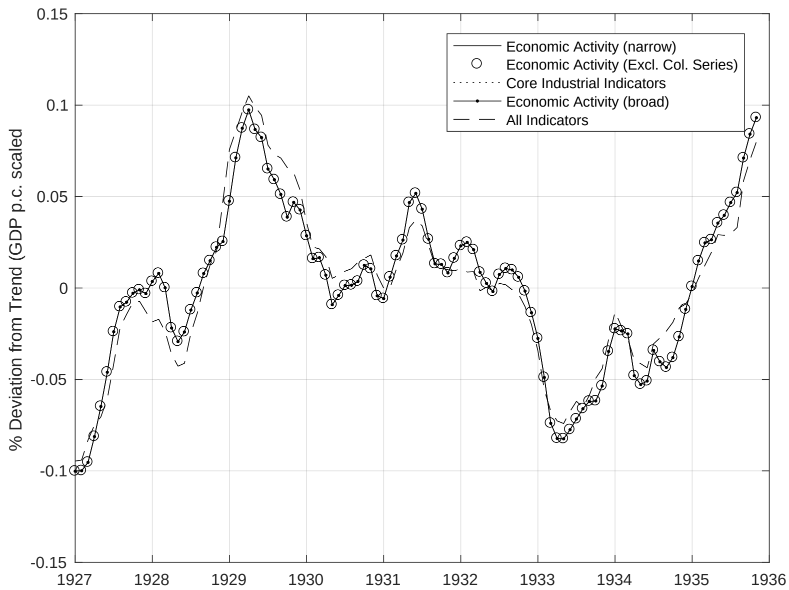


FIGURE A2.21: Economic Activity Index (GDP p.c. scale) - Bulgaria (Cycle)

Czechoslovakia

TABLE A2.16: DATA CZECHOSLOVAKIA

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production (official index)	Index (1929)	STATI	✓	0	0.11	0.08	0.11	0.04	0.04
Coal - production	1000 tons	STATI	✓	4	0.10	0.07	0.09	0.04	0.03
Lignite - production	1000 tons	STATI	✓	6	0.10	0.08		0.04	0.04
Coke - production	1000 tons	STATI	✓	0	0.11	0.08	0.10	0.04	0.04
Railways - transported goods	1000 tons	STATI	✓	3	0.11	0.08	0.10	0.04	0.04
Railways - national car loadings	1000s	IAES	✓	4	0.10	0.08		0.04	0.04
Railways - international car loadings	1000s	IAES	✓	3	0.10	0.07		0.04	0.03
Unemployed job seekers	Number	STATI	✓	0	-0.10	-0.08	-0.10	-0.04	-0.04
Bankruptcies	Number	STATI	✓	6	-0.10	-0.07	-0.09	-0.04	-0.03
Liquidations	Number	STATI	✓	2	-0.07	-0.05	-0.07	-0.02	-0.02
Trade									
Imports - total	m Crowns	STATI	✓	3		0.07	0.09	0.04	0.04
Exports - total	m Crowns	STATI	✓	3		0.07	0.09	0.04	0.04
Imports - foodstuff	m Crowns	STATI	✓	6				0.02	0.02
Imports - raw materials	m Crowns	STATI	✓	3				0.04	0.04
Imports - fully-manufactured goods	m Crowns	STATI	✓	4				0.04	0.04
Exports - foodstuff	m Crowns	STATI	✓	3				0.02	0.02
Exports - raw materials	m Crowns	STATI	✓	3				0.03	0.03
Exports - fully-manufactured goods	m Crowns	STATI	✓	3				0.04	0.04
Imports - cotton	tons	STATI	✓	4				0.03	0.02
Imports - wool	tons	STATI	✓	6				0.03	0.02
Imports - machines	m Crowns	STATI	✓	3				0.04	0.04
Exports - iron bars	1000 tons	STATI	✓	5				0.04	0.04
Exports - cotton fabrics	m Crowns	STATI	✓	3				0.04	0.04
Exports - woolen fabrics	m Crowns	STATI	✓	3				0.04	0.04
Exports - leather and leather goods	m Crowns	STATI	✓	3				0.04	0.03
Exports - glass	m Crowns	STATI	✓	5				0.04	0.03
Prices									
Wholesale prices - general index	Index (1 Jul, 1914)	STATI	✓	0					
Wholesale prices - foodstuff	Index (1 Jul, 1914)	STATI	✓	1					
Consumer prices - general index	Index (1 Jul, 1914)	STATI	✓	2					
Consumer prices - food	Index (1 Jul, 1914)	STATI	✓	2					
Consumer prices - clothes	Index (1 Jul, 1914)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - bills of exchange and advances	m Crowns	STATI		0					-0.00
Central bank - currency in circulation	m Crowns	STATI		0					0.02
Central bank - deposits	m Crowns	STATI		0					-0.01
Clearings	m Crowns	STATI	✓	3		0.01	0.01	0.00	0.00
Clearings - giro cheques (saving banks)	m Crowns	STATI	✓	6		-0.02		-0.01	-0.01
Central bank - Bank rate	%	STATI		0					-0.00
Saving banks - deposits	m Crowns	STATI	✓	0					-0.03
Stock market - industrial and logistics stocks	Index (3. January 1927)	STATI	✓	0		0.07	0.09	0.03	0.03
Bond market index	Index (3. January 1927)	STATI	✓	0		-0.03	-0.04	-0.01	-0.01
Number of Variables					10	16	12	30	35
Variance explained					76	62	63	58	52

Comments

- *Consumer prices - general index*: There is a new basket from 1930 on, but no apparent change in the series.
- *Central bank - currency in circulation*: Excludes 10 and 20 Crowns bills from 1932 on.
- *Stock and security market indices*: Until 1926 beginning of the month, thereafter end of the week averages.

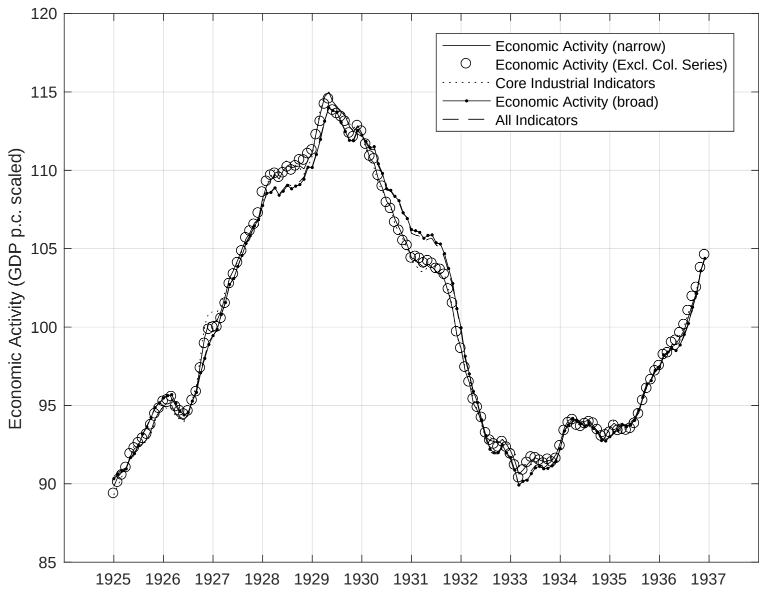


FIGURE A2.22: Economic Activity Index (GDP p.c. scale) - Czechoslovakia (Level)

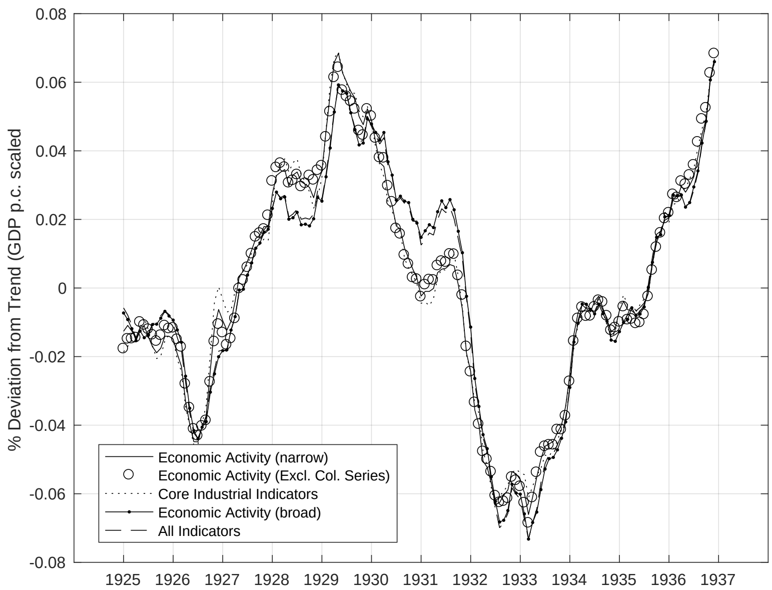


FIGURE A2.23: Economic Activity Index (GDP p.c. scale) - Czechoslovakia (Cycle)

Denmark

TABLE A2.17: DATA DENMARK

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production	Index	Klovland (1998)	✓	3		0.09	0.11	0.06	0.05
Shipbuilding - constructions started	1000 register tons	STATI	✓	5		0.10	0.12	0.07	0.06
Shipbuilding - constructions finished	1000 register tons	STATI	✓	5		0.10	0.12	0.07	0.06
Shipping - goods incoming	1000 tons	STATI	✓	0		0.08	0.10	0.06	0.04
Shipping - goods outgoing	1000 tons	STATI	✓	2		0.08	0.09	0.05	0.04
Bankruptcies	Number	STATI	✓	6		-0.08	-0.09	-0.06	-0.05
Unemployed union members	%	STATI	✓	1		-0.10	-0.11	-0.07	-0.06
Trade									
Imports - total	m Crowns	STATI	✓	4		0.10	0.12	0.07	0.06
Exports - total	m Crowns	STATI	✓	5		0.10	0.11	0.07	0.06
Imports - wheat	1000 tons	STATI	✓	4				-0.02	-0.01
Imports - corn	1000 tons	STATI	✓	4				-0.04	-0.03
Imports - oil cakes	1000 tons	STATI	✓	6				0.05	0.04
Imports - textiles	m Crowns	STATI	✓	3				0.06	0.05
Exports - cattle	1000s	STATI	✓	3				0.01	0.00
Exports - butter	1000 tons	STATI	✓	6				0.04	0.03
Exports - eggs	m eggs	STATI	✓	6				-0.03	-0.03
Exports - bacon	1000 tons	STATI	✓	3				-0.04	-0.03
Prices									
Maritime freight rates	Index (1932/1934)	STATI	✓	0					
Wholesale prices - general index	Index (1932/1934)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold stock	m Crowns	STATI		0					0.05
Central bank - foreign exchange	m Crowns	STATI		0					0.03
Central bank - deposits	m Crowns	STATI		0					-0.02
Central bank - currency in circulation	m Crowns	STATI		0					0.04
Central bank - bank rate	%	STATI		0					-0.01
Commercial banks - bills of exchange	m Crowns	STATI	✓	1					0.01
Commercial banks - advances	m Crowns	STATI	✓	1					0.01
Commercial banks - deposits	m Crowns	STATI	✓	1					0.02
Stocks - general index	Index (1/7/1914=100)	STATI	✓	1		0.10	0.11	0.07	0.06
Bonds - general index	Index (1/7/1914=100)	STATI	✓	0		0.03	0.04	0.02	0.02
Stocks - turnover	m Crowns	STATI	✓	6		0.00		0.00	-0.00
Bonds - turnover	m Crowns	STATI	✓	6		-0.04		-0.03	-0.02
Number of Variables					7	13	10	21	29
Variance explained					59	46	52	36	30

Comments

- *Maritime freight rates:* Two indices have been linked via re-basing.
- *Union unemployment*: Values for April and May 1925 were missing and hence linearly interpolated.
- *Wholesale prices*: Two indices have been linked via re-basing.

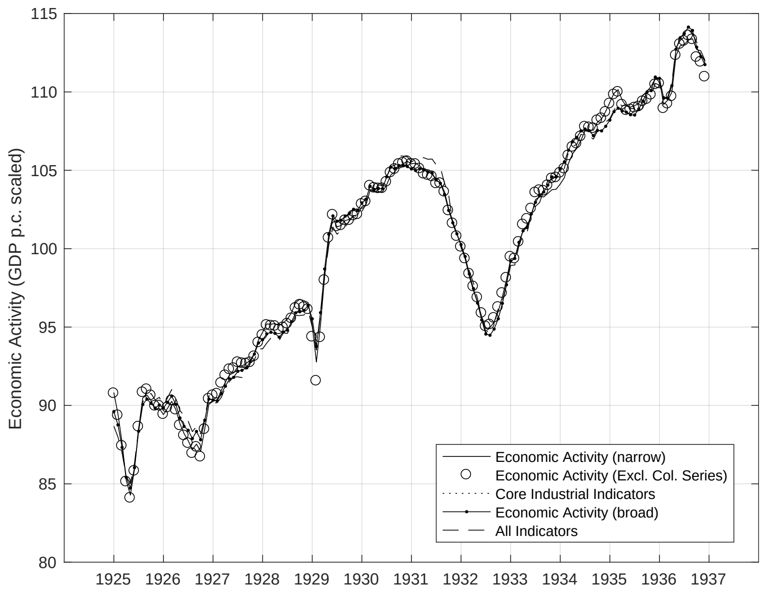


FIGURE A2.24: Economic Activity Index (GDP p.c. scale) - Denmark (Level)

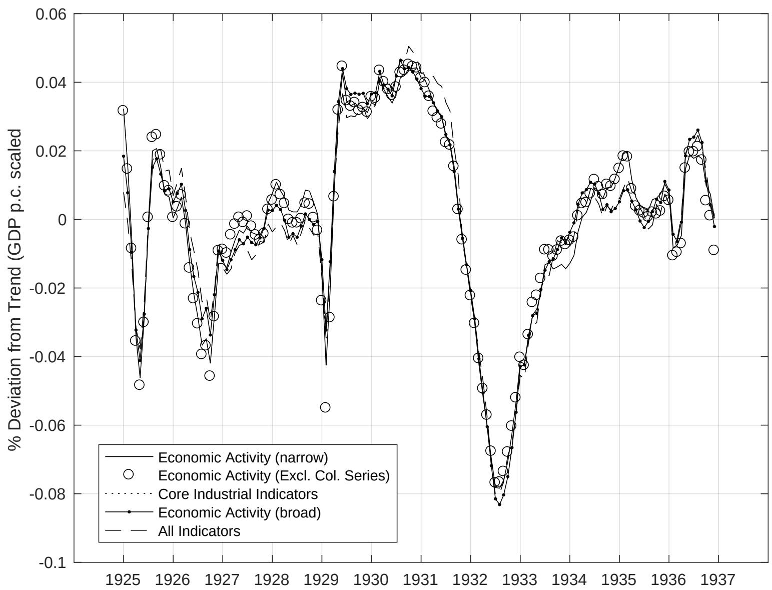


FIGURE A2.25: Economic Activity Index (GDP p.c. scale) - Denmark (Cycle)

Estonia

TABLE A2.18: DATA ESTONIA

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Employment - mining and industry	Number	STATI	✓	1		0.15	0.15	0.10	0.08
Railways - transported goods	1000 tons	STATI	✓	3		0.13	0.13	0.09	0.06
Incoming ships - transported goods	1000 net register tons	STATI	✓	6		0.11	0.11	0.08	0.05
Unemployed	Number	STATI	✓	3		-0.15	-0.15	-0.11	-0.08
Trade									
Imports - total	1000 Crowns	STATI	✓	3		0.16	0.16	0.12	0.08
Exports - total	1000 Crowns	STATI	✓	3		0.16	0.16	0.11	0.08
Exports - flax	tons	STATI	✓	6				0.02	0.02
Exports - butter	tons	STATI	✓	4				0.06	0.05
Exports - eggs	1000s	STATI	✓	6				0.05	0.03
Exports - sawn wood	1000 cubic meters	STATI	✓	6				0.06	0.04
Exports - paper	tons	STATI	✓	6				0.10	0.07
Prices									
Wholesale prices - general index	Index (1913)	STATI	✓	1					
Consumer prices (in Reval) - general index	Index (1913)	STATI	✓	1					
Consumer prices (in Reval) - foodstuff	Index (1913)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Crowns	STATI		0					-0.01
Central bank - foreign exchange holdings	m Crowns	STATI		0					0.05
Central bank - bills of exchange and advances	m Crowns	STATI		0					-0.00
Central bank - currency in circulation	m Crowns	STATI		0					0.04
Clearings	m Crowns	STATI	✓	2		0.14	0.14	0.09	0.07
Central bank - bank rate	%	STATI		0					0.03
Commercial banks - bills of exchange and advances	m Crowns	STATI	✓	0					0.07
Commercial banks - deposits	m Crowns	STATI	✓	0					0.07
Protested bills of exchange	1000 Crowns	STATI	✓	4		0.00	0.00	0.00	0.01
Number of Variables					4	8	8	13	20
Variance explained					66	60	60	47	39

Comments

- *Flax exports*: Values for July 1928 and October 1930 were missing and linearly interpolated.
- *Employment (mining and industry)*: Values for June - December 1926 have been linearly interpolated.
- In the case of Estonia, it was impossible to find a ninth series for the more restrictive Economic Activity indicators. In this case, the two more restrictive indicators rely only on 8 series.

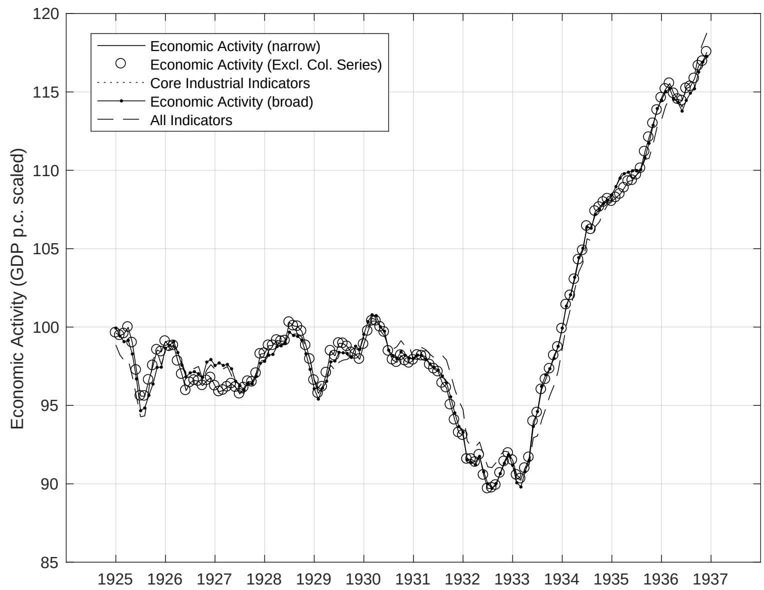


FIGURE A2.26: Economic Activity Index (GDP p.c. scale) - Estonia (Level)

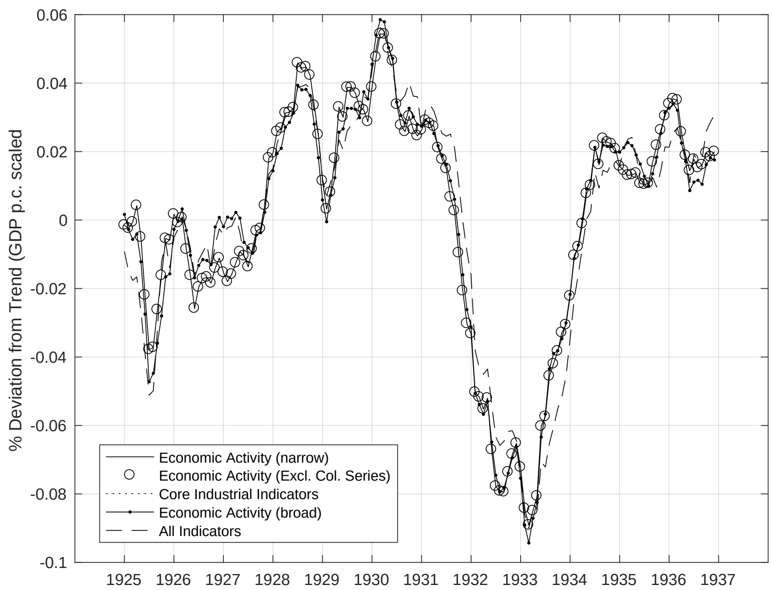


FIGURE A2.27: Economic Activity Index (GDP p.c. scale) - Estonia (Cycle)

Finland

TABLE A2.19: DATA FINLAND

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Unemployment	Index (1932)	STATI	✓	2		-0.09	-0.11	-0.07	-0.05
Wholesale - turnover	m Markkas	STATI	✓	5		0.09	0.11	0.07	0.05
Railways - transported goods	1000 tons	STATI	✓	4		0.09	0.11	0.07	0.05
Shipping - transported goods	1000 NRT	STATI	✓	5		0.07	0.10	0.06	0.05
Bankruptcies - total	Cases	STATI	✓	4		-0.08	-0.09	-0.06	-0.04
Bankruptcies - agriculture	Cases	STATI	✓	6		-0.09		-0.07	-0.05
Trade									
Imports - total	m Markkas	STATI	✓	4		0.09	0.12	0.07	0.06
Exports - total	m Markkas	STATI	✓	5		0.06	0.08	0.05	0.04
Imports - coal and coke	1000 tons	STATI	✓	6				0.04	0.03
Imports - cotton	Tons	STATI	✓	6				0.04	0.03
Exports - butter	Tons	STATI	✓	6				-0.02	-0.01
Exports - wood	1000 cubic meters	STATI	✓	6				0.03	0.02
Exports - cellulose	1000 tons	STATI	✓	6				-0.01	-0.01
Exports - wood pulp	1000 tons	STATI	✓	6				0.03	0.02
Exports - paper	1000 tons	STATI	✓	6				0.03	0.02
Prices									
Wholesale prices - general index	Index (1926)	STATI	✓	1					
Consumer prices - general index	Index (1914)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Markkas	STATI		0					0.01
Central bank - foreign exchange holdings	m Markkas	STATI		0					0.02
Central bank - bills of exchange and advances	m Markkas	STATI		0					0.01
Central bank - currency in circulation	m Markkas	STATI		0					0.05
Central bank - deposits	m Markkas	STATI		0					0.04
Clearings - foreign and domestic stocks	m Markkas	STATI	✓	2		0.08		0.07	0.06
Central bank - bank rate	%	STATI		0					-0.04
Commercial banks - bills of exchange and advances	m Markkas	STATI	✓	0					0.01
Commercial banks - deposits	m Markkas	STATI	✓	1					0.02
Saving banks - deposits	m Markkas	STATI	✓	0					0.02
New life insurance contracts	m Markkas	STATI	✓	3		0.07	0.09	0.05	0.05
Stocks	Index	STATI	✓	1		0.09	0.11	0.07	0.06
Stock turnover	m Markkas	STATI	✓	3		0.04		0.03	0.03
Protested bills of exchange	m Markkas	STATI	✓	4		-0.07	-0.08	-0.05	-0.04
Number of Variables					5	13	10	20	29
Variance explained					68	55	57	39	32

Comments

- *Gold holdings*: First twelve values converted to the 1926 parity.
- *Unemployment*: I link two unemployment series by rebasing them to a common year. Last two values for the later series are assumed to take the value of October 1936.

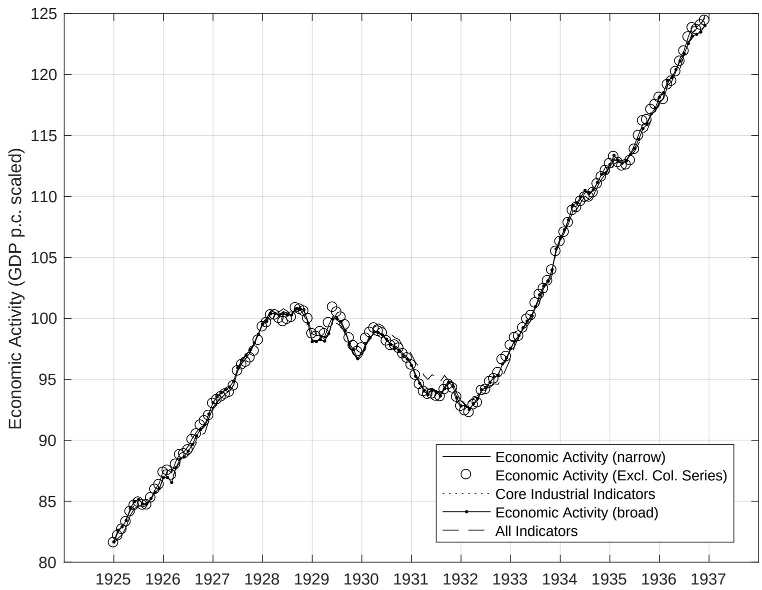


FIGURE A2.28: Economic Activity Index (GDP p.c. scale) - Finland (Level)

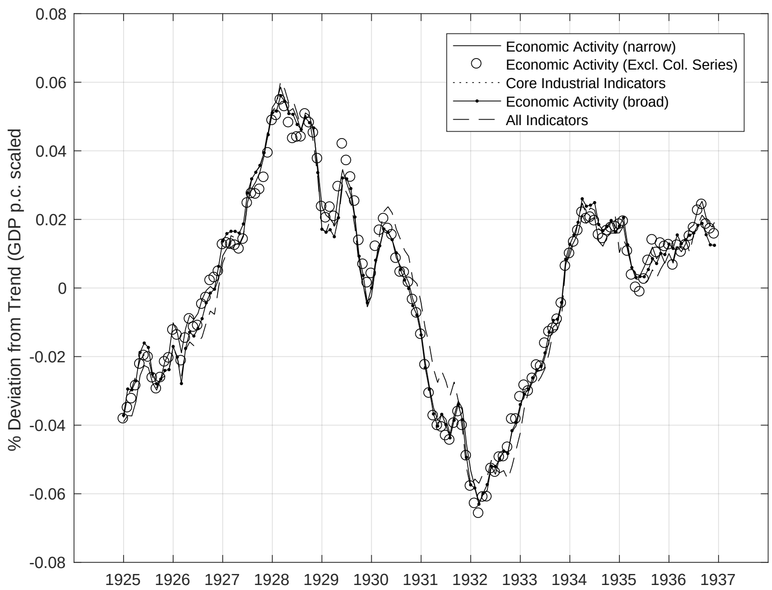


FIGURE A2.29: Economic Activity Index (GDP p.c. scale) - Finland (Cycle)

France

TABLE A2.20: DATA FRANCE

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1913)	STATI	✓	0	0.04	0.03	0.07	0.02	0.02
Mining - production	Index (1913)	STATI	✓	2	0.03	0.03	0.06	0.02	0.02
Iron and steel - production	Index (1913)	STATI	✓	1	0.04	0.03		0.03	0.02
Metal processing - production	Index (1913)	STATI	✓	0	0.04	0.03		0.02	0.02
Cars - production	Index (1913)	STATI	✓	0	0.04	0.03	0.06	0.02	0.02
Rubber - production	Index (1913)	STATI	✓	0	0.03	0.03	0.06	0.02	0.02
Paper - production	Index (1913)	STATI	✓	0	0.03	0.02	0.05	0.02	0.02
Leather - production	Index (1913)	STATI	✓	0	0.02	0.02	0.04	0.01	0.01
Textiles (all) - production	Index (1913)	STATI	✓	0	0.03	0.03	0.05	0.02	0.02
Cotton - production	Index (1913)	STATI	✓	2	0.03	0.03		0.02	0.02
Wool - production	Index (1913)	STATI	✓	1	0.03	0.02		0.02	0.01
Silk - production	Index (1913)	STATI	✓	0	0.03	0.02		0.02	0.02
Construction sector	Index (1913)	STATI	✓	0	0.02	0.02	0.04	0.01	0.01
Coal and lignite - production	1000 tons	STATI	✓	6	0.03	0.03		0.02	0.02
Iron ore - production	1000 tons	STATI	✓	2	0.03	0.03		0.02	0.02
Potassium - production	1000 tons	STATI	✓	4	0.03	0.03		0.02	0.02
Pig iron - production	1000 tons	STATI	✓	1	0.04	0.03		0.02	0.02
Raw steel - production	1000 tons	STATI	✓	2	0.04	0.03		0.02	0.02
Cotton mills - spindles employed	1000s	STATI	✓	3	0.03	0.03	0.06	0.02	0.02
Cotton mills - production per spindle	kg	STATI	✓	3	0.03	0.03	0.05	0.02	0.02
Cotton Mills - stocks per spindle	kg	STATI	✓	1	-0.02	-0.02		-0.01	-0.01
Cotton mills - orders per spindle	kg	STATI	✓	2	0.03	0.03		0.02	0.02
Weaving mills - looms employed	1000s	STATI	✓	2	0.03	0.02	0.05	0.01	0.01
Weaving mills - production per loom	piece of 100m per loom	STATI	✓	2	0.03	0.03	0.05	0.02	0.01
Weaving mills - stocks per loom	piece of 100m per loom	STATI	✓	0	-0.02	-0.02		-0.01	-0.01
Weaving mills - orders per loom	piece of 100m per loom	STATI	✓	1	0.03	0.02		0.01	0.01
Wool conditioning	1000 tons	STATI	✓	4	0.02	0.01		0.01	0.01
Silk conditioning	tons	STATI	✓	2	0.02	0.02		0.02	0.01
Railways - transported goods	1000s	STATI	✓	3	0.04	0.03	0.06	0.02	0.02
Shipping - shipped goods	1000 tons	STATI	✓	5	0.03	0.02	0.05	0.02	0.02
Unmatched job requests	1000s	STATI	✓	0	-0.04	-0.03	-0.06	-0.02	-0.02
Unemployed on benefits	1000 Individuals	STATI	✓	0	-0.03	-0.03		-0.02	-0.02
Trade									
Imports - total	m Franc	STATI	✓	2		0.02	0.05	0.02	0.02
Exports - total	m Franc	STATI	✓	2		0.02	0.04	0.02	0.02
Imports - foodstuff	m Franc	STATI	✓	2				-0.01	-0.01
Imports - raw materials	m Franc	STATI	✓	2				0.02	0.02
Imports - fully-manufactured goods	m Franc	STATI	✓	2				0.02	0.02
Exports - foodstuff	m Franc	STATI	✓	3				0.01	0.01
Exports - raw materials	m Franc	STATI	✓	3				0.01	0.01
Exports - fully -manufactured goods	m Franc	STATI	✓	2				0.02	0.02
Imports - raw cotton	1000 tons	STATI	✓	4				0.01	0.01
Imports - raw wool	1000 tons	STATI	✓	5				0.00	0.00
Imports - coal & coke	1000 tons	STATI	✓	3				0.02	0.02
Imports - copper	1000 tons	STATI	✓	6				0.02	0.02
Imports - machines	m Franc	STATI	✓	2				0.02	0.02
Exports - iron goods	1000 tons	STATI	✓	4				0.01	0.00
Exports - machines, vessels and electronics	m Franc	STATI	✓	3				0.02	0.02
Exports - cars (including partial manufactures)	m Franc	STATI	✓	4				0.01	0.01
Exports - non-precious metals	m Franc	STATI	✓	2				0.01	0.01
Exports - cotton fabrics	tons	STATI	✓	6				0.01	0.01
Exports - woolen fabrics	tons	STATI	✓	4				0.02	0.02
Exports - silk fabrics	tons	STATI	✓	6				0.01	0.01
Exports - clothing	m Franc	STATI	✓	3				0.02	0.02
Exports - goods from the chemical industry	m Franc	STATI	✓	3				0.02	0.01
Prices									
Wholesale prices - general index	Index (1926/1928)	STATI	✓	0					
Retail prices (Paris) - general index	Index	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - currency in circulation	m Franc	STATI		0					-0.00
Central bank - private deposits	m Franc	STATI		0					-0.02
Central bank - bank rate	%	STATI		0					0.00
Central bank - market rate	%	STATI	✓	1					0.01
Clearings	m Franc	STATI	✓	2		0.02	0.04	0.01	0.01
Real interest rate on bonds	%	STATI	✓	1		-0.01		-0.01	-0.01
Real dividends on shares	%	STATI	✓	2		-0.02		-0.02	-0.01
4 large credit banks - cash position	m Franc	STATI	✓	1					-0.02
4 large credit banks - Balance	m Franc	STATI	✓	2					0.02
4 large credit banks - bills of exchange	m Franc	STATI	✓	1					0.00
4 large credit banks - advances	m Franc	STATI	✓	2					0.01
4 large credit banks - deposits	m Franc	STATI	✓	1					-0.01
4 large credit banks - acceptances	m Franc	STATI	✓	1					0.01
Emissions - shares	m Franc	STATI	✓	6		0.02		0.01	0.01
Emissions - bonds	m Franc	STATI	✓	6		0.01		0.01	0.01
Stock market - general index	Index (1913)	STATI	✓	1		0.02	0.03	0.01	0.01
Bond market - general index	Index (1913)	STATI	✓	1		-0.01	-0.03	-0.01	-0.01
Number of Variables					32	41	20	61	71
Variance explained					53	46	48	41	39

Comments

- From March 1935 onwards many series exclude the Saarland territory.
- *Transportation - shipped goods*: Excluding coal and traffic within France.
- *Wholesale prices*: Two series were linked.

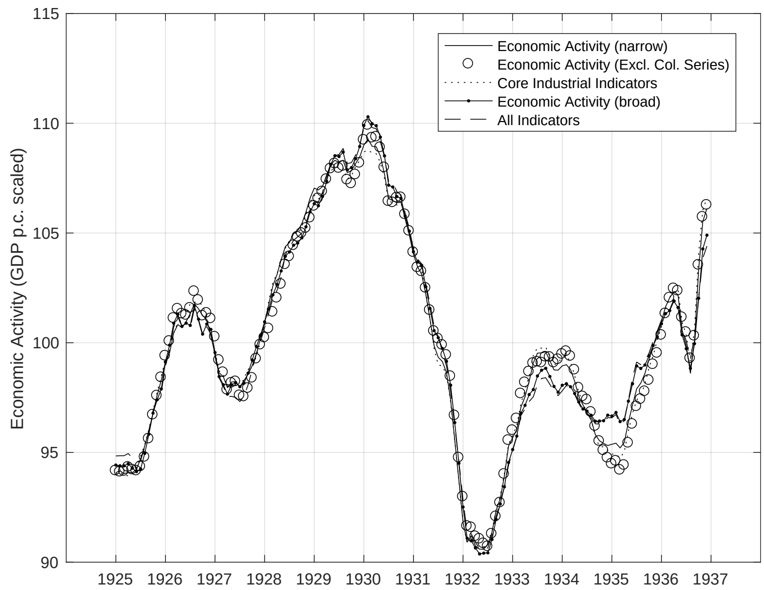


FIGURE A2.30: Economic Activity Index (GDP p.c. scale) - France (Level)

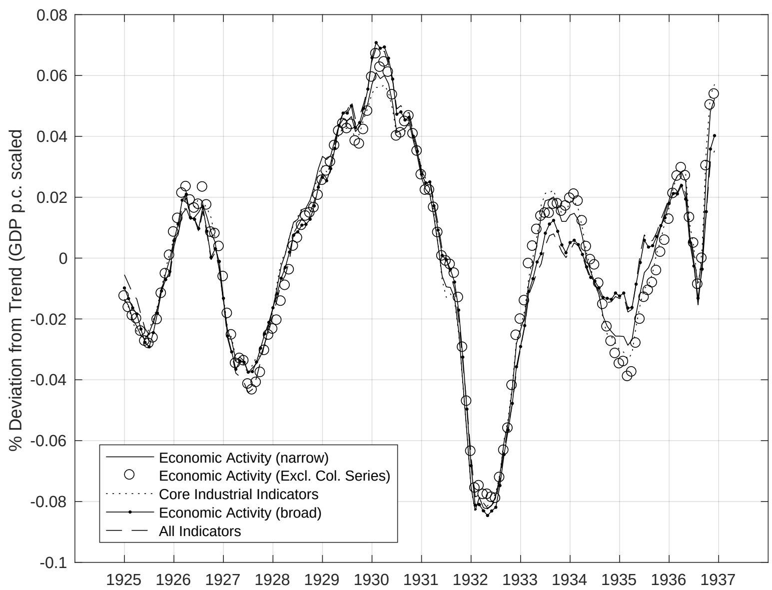


FIGURE A2.31: Economic Activity Index (GDP p.c. scale) - France (Cycle)

Germany

TABLE A2.21: DATA GERMANY

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1928)	STATI	✓	1	0.09	0.07	0.08	0.03	0.03
Capital goods - production	Index (1928)	STATI	✓	1	0.08	0.06	0.08	0.03	0.03
Consumption goods - production	Index (1928)	STATI	✓	1	0.07	0.05	0.07	0.02	0.02
Paper - production	Index (1928)	STATI	✓	2	0.08	0.06	0.08	0.03	0.03
Textiles - production	Index (1928)	STATI	✓	0	0.06	0.04	0.06	0.02	0.01
Shoes - production	Index (1928)	STATI	✓	3	0.07	0.05	0.07	0.02	0.02
Electricity - production	Index (1932/1934)	STATI	✓	1	0.07	0.06	0.07	0.03	0.03
Retail sales - total	Index (1928)	STATI	✓	3	0.08	0.06	0.07	0.04	0.03
Retail sales - foodstuff	Index (1928)	STATI	✓	3	0.07	0.06		0.03	0.03
Retail Sales - clothes	Index (1928)	STATI	✓	4	0.08	0.06		0.03	0.03
Retail sales - household inventories	Index (1928)	STATI	✓	3	0.07	0.06		0.03	0.03
Railways - car loadings for goods	1000s per day	STATI	✓	1	0.08	0.06	0.08	0.03	0.03
Unemployed - recipients of unemployment insurance	1000s	STATI	✓	0	-0.03	-0.02	-0.03	-0.00	-0.00
Bankruptcies	Number	STATI	✓	1	-0.04	-0.02	-0.04	-0.00	-0.00
Liquidations	Number	STATI	✓	1	-0.04	-0.02	-0.05	-0.00	-0.00
Trade									
Imports - total	m Reichsmark	STATI	✓	1		0.06	0.08	0.03	0.03
Exports - total	m Reichsmark	STATI	✓	2		0.03	0.02	0.03	0.02
Imports - foodstuffs	m Reichsmark	STATI	✓	4				0.02	0.02
Imports - raw materials & semi-manufactured goods	m Reichsmark	STATI	✓	2				0.03	0.03
Imports - manufactured goods	m Reichsmark	STATI	✓	1				0.02	0.02
Exports - foodstuffs	m Reichsmark	STATI	✓	3				0.01	0.01
Exports - - raw materials & semi-manufactured goods	m Reichsmark	STATI	✓	2				0.02	0.02
Exports - manufactured goods	m Reichsmark	STATI	✓	3				0.03	0.02
Exports - capital goods	m Reichsmark	STATI	✓	3				0.02	0.02
Exports - consumption goods	m Reichsmark	STATI	✓	3				0.03	0.02
Imports - oleiferous fruits	1000 tons	STATI	✓	4				0.00	0.00
Imports - cotton	1000 tons	STATI	✓	3				0.00	0.00
Imports - wool	1000 tons	STATI	✓	5				-0.00	-0.00
Imports - timber	1000 tons	STATI	✓	2				0.02	0.02
Imports - petroleum	1000 tons	STATI	✓	6				0.03	0.03
Imports - iron ore	1000 tons	STATI	✓	3				0.03	0.03
Imports - copper	1000 tons	STATI	✓	2				0.01	0.01
Exports - coal	1000 tons	STATI	✓	3				0.01	0.01
Exports - machines	m Reichsmark	STATI	✓	3				0.02	0.02
Exports - electric manufactures	m Reichsmark	STATI	✓	4				0.02	0.02
Exports - paint and lacquer	m Reichsmark	STATI	✓	4				0.01	0.01
Exports - cotton fabrics	tons	STATI	✓	3				0.03	0.03
Exports - woolen fabrics	tons	STATI	✓	3				0.02	0.02
Exports - silk fabrics	tons	STATI	✓	3				0.03	0.02
Exports - clothes	m Reichsmark	STATI	✓	4				0.01	0.01
Exports - glass manufactures	1000 tons	STATI	✓	3				0.02	0.02
Exports - paper and paper goods	1000 tons	STATI	✓	3				0.02	0.02
Prices									
Maritime freight rates	Index (1913)	STATI	✓	1					
Prices - goods of elastic demand	Index (1913)	STATI	✓	0					
Wholesale prices - general	Index (1913)	STATI	✓	0					
Wholesale prices - agriculture	Index (1913)	STATI	✓	1					
Wholesale prices - industrial raw materials and semi-processed goods	Index (1913)	STATI	✓	0					
Wholesale prices - fully-manufactured Goods	Index (1913)	STATI	✓	0					
Wholesale prices - fully-manufactured goods (capital goods only)	Index (1913)	STATI	✓	0					
Wholesale prices - fully-manufactured goods consumption goods only)	Index (1913)	STATI	✓	0					
Consumer prices - general index	Index (1913/1914)	STATI	✓	0					
Consumer prices - foodstuffs	Index (1913/1914)	STATI	✓	0					
Consumer prices - housing	Index (1913/1914)	STATI	✓	0					
Consumer prices - heating & light	Index (1913/1914)	STATI	✓	1					
Consumer prices - clothes	Index (1913/1914)	STATI	✓	0					
Consumer prices - miscellaneous	Index (1913/1914)	STATI	✓	0					
Prices - construction costs	Index (1932/1934)	STATI	✓	0					
Hourly wages in 17 sectors	Index (1928)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - Currency in circulation	m Reichsmark	STATI		0					0.02
Central bank - giro turnover	m Reichsmark	STATI		0					0.03
Clearings	m Reichsmark	STATI	✓	2		0.05	0.06	0.03	0.03
Giro cheque clearings	m Reichsmark	STATI	✓	2		0.06		0.03	0.03
Central bank - bank rate	%	STATI		0					0.00
Market rate	%	STATI	✓	0					-0.00
Interest rate - daily money (demand deposits)	%	STATI	✓	2					-0.01
Interest rate - one month maturities	%	STATI	✓	1					-0.01
Interest rate - trade bills	%	STATI	✓	0					-0.00
Commercial banks - interest rate on debit	%	STATI	✓	0					-0.01
Commercial banks - interest rate on credit	%	STATI	✓	1					0.01
Stock market - emissions	m Reichsmark	STATI	✓	6		0.04	0.05	0.02	0.02
Bond market - emissions	m Reichsmark	STATI	✓	3		0.01	0.02	0.01	0.01
Number of Variables					15	21	17	46	55
Variance explained					62	56	53	41	36

Comments

- Many series include the Saarland from March 1935 onwards.
- *Shoes - production*: New composition of the index from 1935 onwards, but series are broadly consistent.

- *Prices - construction cost* : Two series were linked.
- *Unemployment - recipients of unemployment insurance)*: From October 1936 on, recipients of the *Krisenfürsorge* are included in the original series. I deduct their number (454,000) from the values in the last quarter of this series.
- *Hourly Wages*: No variation from June 1933 onwards.
- *Central Bank - currency in circulation*: From 1932 onwards, there is a slight change in the composition of the series.
- *Interest rate - one month maturities*: Little variation from 1934 on.
- *Interest rate - trade bills*: Little variation from 1933 onwards.
- *Stock market - emissions*: Values for 1925 were recorded as quarterly sums and were simply split into monthly data.
- *Liquidation*: Last three values for 1925 were recorded as quarterly sums and were simply split into monthly data.

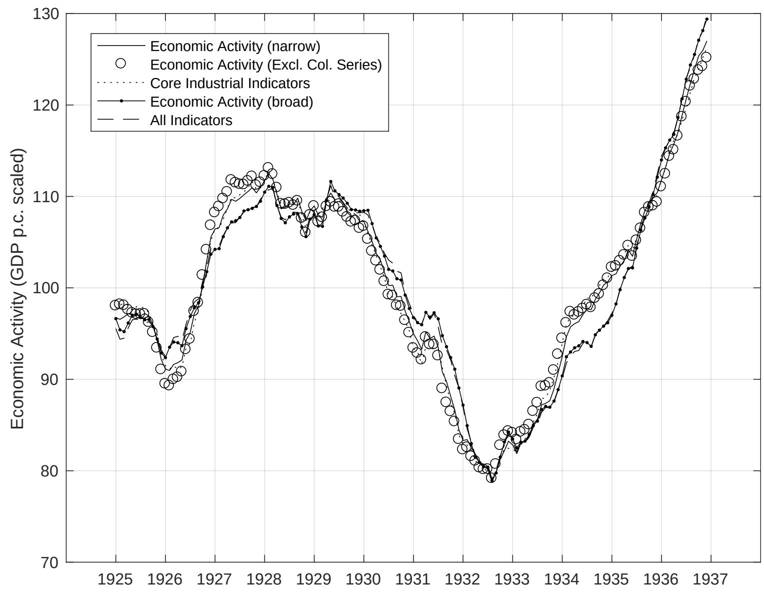


FIGURE A2.32: Economic Activity Index (GDP p.c. scale) - Germany (Level)

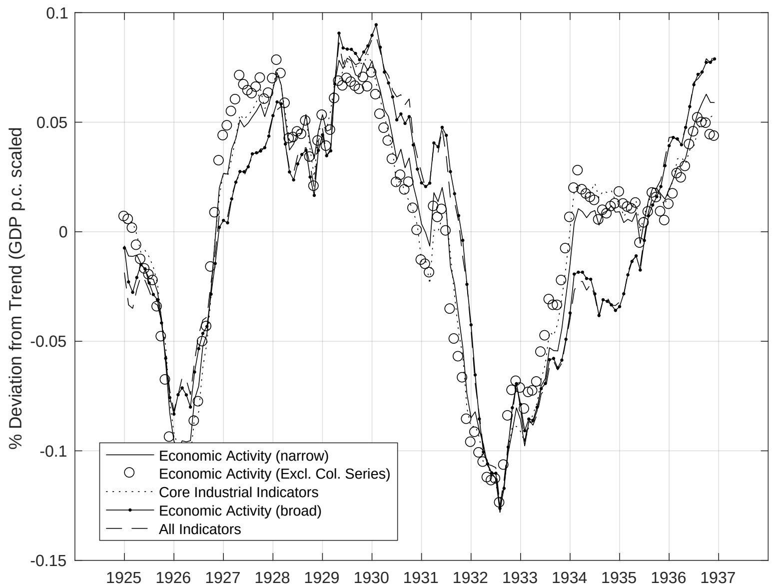


FIGURE A2.33: Economic Activity Index (GDP p.c. scale) - Germany (Cycle)

Great Britain

TABLE A2.22: DATA GREAT BRITAIN

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Business activity - general index	Index (1935)	Economist	✓	1	0.07	0.05	0.08	0.03	0.02
Insured unemployed (males) - total	1000s	IAES	✓	1	-0.07	-0.05		-0.03	-0.03
Insured unemployed (males) - coal	1000s	IAES	✓	2	0.02	0.01		0.00	-0.00
Insured unemployed (males) - iron and steel	1000s	IAES	✓	1	-0.07	-0.06		-0.03	-0.03
Insured unemployed (males) - engineering	1000s	IAES	✓	0	-0.07	-0.05	-0.08	-0.03	-0.03
Insured unemployed (males) - shipbuilding	1000s	IAES	✓	0	-0.06	-0.05	-0.08	-0.03	-0.03
Insured unemployed (males) - building and construction	1000s	IAES	✓	1	-0.06	-0.05	-0.07	-0.03	-0.02
Insured unemployed (males) - textiles	1000s	IAES	✓	1	-0.06	-0.05	-0.07	-0.02	-0.02
Insured unemployed (males) - other industries	1000s	IAES	✓	0	-0.07	-0.06	-0.09	-0.03	-0.03
Insured unemployed (females) - total	1000s	IAES	✓	0	-0.06	-0.04	-0.07	-0.02	-0.02
Insured unemployed (females) - textiles	1000s	IAES	✓	1	-0.06	-0.04		-0.02	-0.02
Coal - production	1000 tons	STATI	✓	4	0.06	0.04	0.07	0.02	0.02
Pig iron - production	1000 tons	STATI	✓	0	0.06	0.05	0.08	0.03	0.02
Raw steel - production	1000 tons	STATI	✓	2	0.07	0.05	0.08	0.03	0.02
Railways - transported goods (mining others)	m tons	IAES	✓	4	0.06	0.05		0.03	0.03
Railways - transported goods (miscellaneous)	m tons	IAES	✓	3	0.06	0.04		0.02	0.02
Railways - receipts	m tons	IAES	✓	3		0.05	0.07	0.03	0.02
Incoming ships - goods	1000 NRT	STATI	✓	4	-0.01	-0.01	-0.02	-0.00	-0.00
Trade									
Imports - total	m Pounds	STATI	✓	4		0.02	0.03	0.01	0.01
Exports - total	m Pounds	STATI	✓	3		0.05	0.08	0.03	0.03
Imports - foodstuffs	m Pounds	STATI	✓	6				0.01	0.01
Imports - raw materials and semi-processed goods	m Pounds	STATI	✓	3				0.01	0.01
Imports - fully-manufactured goods	m Pounds	STATI	✓	5				0.01	0.01
Exports - foodstuffs	m Pounds	STATI	✓	5				0.02	0.02
Exports - raw materials and semi-processed goods	m Pounds	STATI	✓	2				0.03	0.02
Exports - fully-manufactured goods	m Pounds	STATI	✓	4				0.03	0.02
Exports - consumption goods	m Pounds	STATI	✓	4				0.03	0.02
Exports - capital goods	m Pounds	STATI	✓	4				0.03	0.02
Imports - wheat	1000 tons	STATI	✓	6				-0.00	-0.00
Imports - cotton	1000 tons	STATI	✓	3				-0.00	-0.00
Imports - iron ore	1000 tons	STATI	✓	1				0.03	0.02
Imports - iron and iron Goods	1000 tons	STATI	✓	3				0.00	0.00
Imports - machines	1000 tons	STATI	✓	4				0.02	0.02
Exports - coal	1000 tons	STATI	✓	6				0.02	0.02
Exports - bunker coal	1000 tons	STATI	✓	1				0.02	0.02
Exports - iron and iron goods	1001 tons	STATI	✓	2				0.03	0.03
Exports - cotton yarn	tons	STATI	✓	4				0.02	0.02
Exports - woolen yarn	tons	STATI	✓	4				0.02	0.01
Exports - machines	1000 Pounds	STATI	✓	4				0.02	0.02
Exports - electric manufactures	1000 Pounds	STATI	✓	6				0.02	0.01
Exports - ships	1000 Pounds	STATI	✓	6				0.01	0.01
Exports - cotton weavings	m m^2	STATI	✓	3				0.02	0.02
Exports - woolen weavings	1000 m^2	STATI	✓	4				0.03	0.02
Prices									
Shipping - Maritime freight rates	Index (1898/1913)	STATI	✓	1					
Wholesale prices - general index	Index (1932/1934)	STATI	✓	0					
Consumer prices - general index	Index (July 1914)	STATI	✓	1					
Consumer prices - foodstuffs	Index (July 1914)	STATI	✓	1					
Consumer prices - textiles	Index (July 1914)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - reserve holdings	m Pounds	Howson (1980)		0					-0.00
Central bank - bills of exchange	m Pounds	STATI		0					-0.01
Central bank - other securities	m Pounds	STATI		0					-0.01
Central bank - cash reserve	m Pounds	STATI		0					0.00
Central bank - currency in circulation	m Pounds	STATI		0					0.01
Central bank - public deposits	m Pounds	STATI		0					-0.00
Central bank - deposits by banks	m Pounds	STATI		0					-0.01
Central bank - private deposits	m Pounds	STATI		0					0.00
Clearings - London Clearing House (town)	m Pounds	STATI	✓	3		0.01	0.02	0.01	0.01
Clearings - London Clearing House (country)	m Pounds	STATI	✓	2		0.01		0.01	0.00
Central bank - bank rate	%	STATI		0					0.01
Interest on call money	%	STATI	✓	0					0.01
Market rate	%	STATI	✓	1					0.01
Interest on treasury bills	%	STATI	✓	1					0.01
Real interest on obligations	%	STATI	✓	2					0.00
Clearing banks - cash reserve	m Pounds	STATI	✓	3					-0.02
Clearing banks - short term loans	m Pounds	STATI	✓	2					0.01
Clearing banks - bills of exchange	m Pounds	STATI	✓	2					-0.02
Clearing banks - securities	m Pounds	STATI	✓	0					-0.01
Clearing banks - advances	m Pounds	STATI	✓	0					-0.01
Clearing banks - deposits	m Pounds	STATI	✓	0					-0.02
Clearing banks - acceptances	m Pounds	STATI	✓	0					0.02
Emissions - total	m Pounds	STATI	✓	6		0.02	0.02	0.01	0.01
Emissions - domestic companies	m Pounds	STATI	✓	6		0.02		0.01	0.01
Stocks - general index	Index (1924)	STATI	✓	2		0.04		0.02	0.02
Bonds - general index	Index (1924)	STATI	✓	2		-0.03		-0.02	-0.02
Outstanding treasury bills	m Pounds	STATI	✓	1					-0.01
Number of Variables					17	26	16	49	70
Variance explained					64	50	55	43	33

Comments

- *Business activity - general index*: The index is taken from The Economist (1933b), and is a weighted average based on 18 series (4 employment, coal consumption, consumption of electricity, merchandise on railways, postal receipts, motor vehicle registrations, building activity, consumption of iron and steel, imports of non-ferrous metals, exports of British manufactures, movements of shippings, provincial bank clearings, and London bank clearings).

- *Wholesale prices*: Two Indices have been linked.
- *Railways series*: Values for 1932: Thirteen 4-week values were given. Hence the 7th value was taken, divided by 12 and added to the other months.
- *Central bank - reserve holdings*: Data after September 1931 was transcribed from Howson (1980, p. 80) and includes the holdings of the Exchange Equalisation Fund.

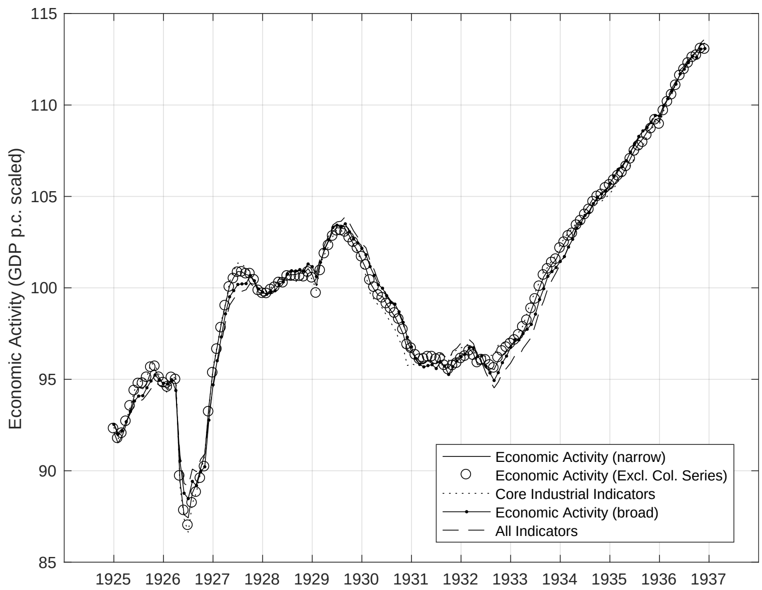


FIGURE A2.34: Economic Activity Index (GDP p.c. scale) - Great Britain (Level)

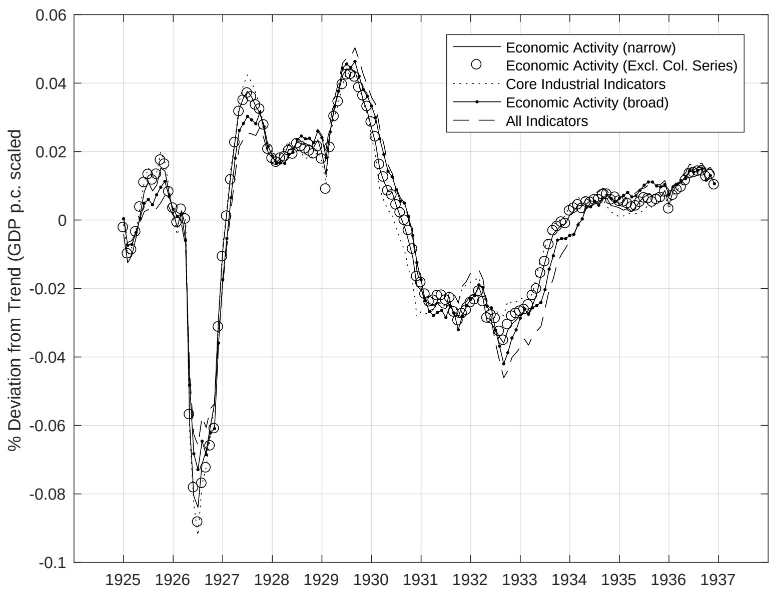


FIGURE A2.35: Economic Activity Index (GDP p.c. scale) - Great Britain (Cycle)

Hungary

TABLE A2.23: DATA HUNGARY

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Mining - lignite	1000 tons	STATI	✓	4	0.09	0.07	0.11	0.05	0.03
Mining - iron ore	1000 tons	STATI	✓	2	0.09	0.08	0.12	0.05	0.04
Mining - coal	1000 tons	IAES	✓	5	-0.02	-0.02	-0.04	-0.02	-0.01
Sugar - production	1000 tons	IAES	✓	6	0.04	0.03	0.05	0.02	0.02
Alcohol - production	1000 tons	IAES	✓	6	0.09	0.07	0.12	0.05	0.04
Number of applications per 100 job advertisements	number per 100 vacancies	STATI	✓	3	-0.09	-0.08		-0.05	-0.04
Unemployed union members	1000s	STATI	✓	1	-0.10	-0.08	-0.13	-0.05	-0.04
Railways - transported goods	1000 tons	STATI	✓	3	0.10	0.09	0.14	0.06	0.05
Railways - transported goods	m ton-km	IAES	✓	3	0.10	0.09	0.14	0.06	0.05
Railways - passengers carried	m person-km	IAES	✓	6	0.10	0.09		0.06	0.05
Railways - car loadings	1000s	IAES	✓	3	0.11	0.09		0.06	0.05
Bankruptcies	Cases	IAES	✓	6	-0.05	-0.04	-0.06	-0.02	-0.02
Liquidations	Cases	IAES	✓	3	-0.01	-0.00	-0.01	0.01	0.00
Trade									
Imports - total	m Pengö	STATI	✓	3		0.09	0.14	0.06	0.05
Exports - total	m Pengö	STATI	✓	3		0.06	0.09	0.04	0.03
Imports - raw cotton	t	STATI	✓	6				0.02	0.01
Imports - wood	1000 tons	STATI	✓	4				0.05	0.04
Imports - coal and coke	1000 tons	STATI	✓	3				0.05	0.04
Imports - machines	1000 Pengö	STATI	✓	5				0.06	0.05
Imports - cotton materials	t	STATI	✓	5				0.05	0.04
Exports - wheat	1000 tons	STATI	✓	4				0.03	0.03
Exports - flower	1000 tons	STATI	✓	6				0.04	0.03
Exports - cattle	1000s	STATI	✓	3				0.02	0.01
Exports - pigs	1000s	STATI	✓	6				0.02	0.02
Prices									
Wholesale prices - price-elastic goods	Index (1925/27)	STATI	✓	3					
Wholesale prices - general index	Index (1913)	STATI	✓	1					
Wholesale prices- agricultural goods	Index (1913)	STATI	✓	1					
Wholesale prices - industry	Index (1913)	STATI	✓	0					
Wholesale prices - wheat	Pengö per 100 kg	STATI	✓	4					
Consumer prices - general index	Index (1913)	STATI	✓	1					
Consumer prices - foodstuffs	Index (1913)	STATI	✓	1					
Consumer prices - textiles	Index (1913)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Pengö	STATI		0					0.03
Central bank - foreign exchange holdings	m Pengö	STATI		0					0.01
Central bank - bills of exchange and advances	m Pengö	STATI		0					0.00
Central bank - advances to the government	m Pengö	STATI		0					0.03
Central bank - currency in circulation	m Pengö	STATI		0					0.03
Central bank - deposits by the government	m Pengö	STATI		0					0.02
Central bank - deposits others	m Pengö	STATI		0					-0.02
Central bank - bank rate	%	STATI		0					-0.01
Market rate	%	STATI	✓	1					-0.02
Private banks - current account	m Pengö	STATI	✓	1					0.03
Private banks - savings	m Pengö	STATI	✓	0					0.03
Number of Variables					13	15	11	24	35
Variance explained					52	51	42	46	38

Comments

- *Wholesale prices*: Prices of "all goods," "agriculture goods," and "industry" are based on a new series from 1929 on. However, the Reichsamt already matched the indices. They exhibit no structural breaks.
- *Central bank - gold holdings*: Shows little variation from 1932 on, which might be due to new regulation.

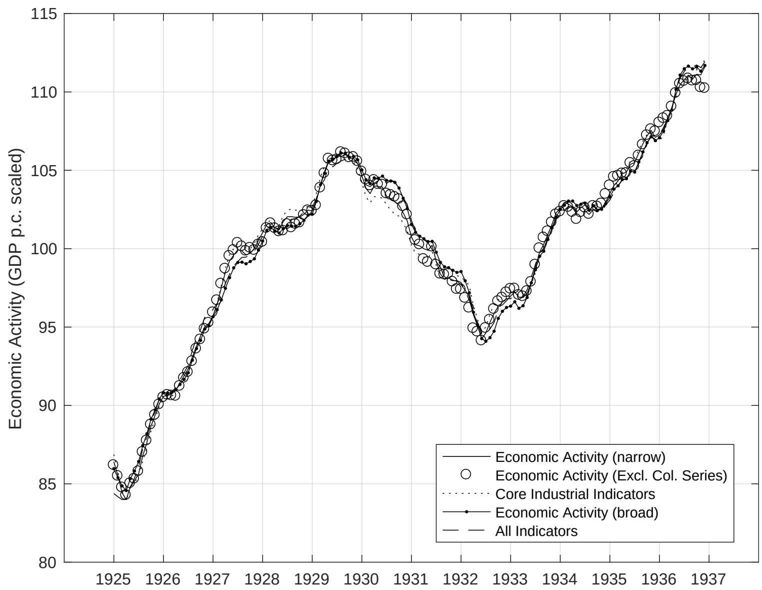


FIGURE A2.36: Economic Activity Index (GDP p.c. scale) - Hungary (Level)

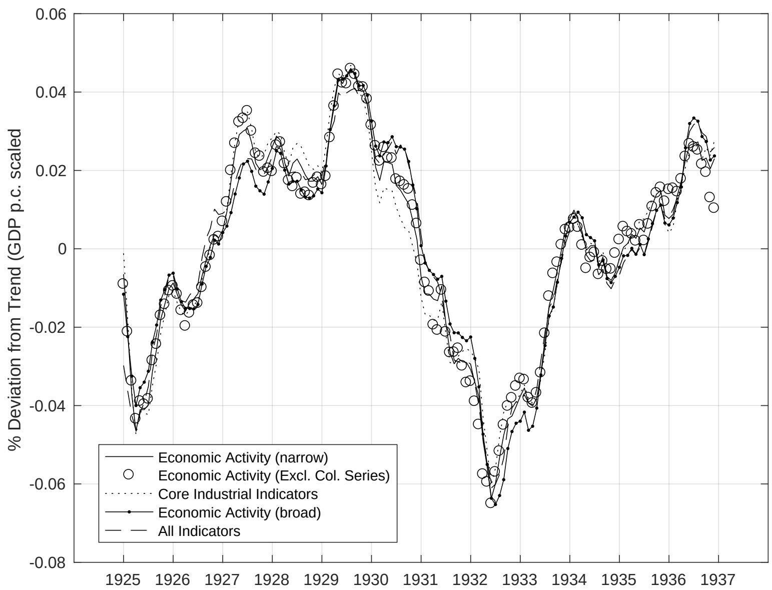


FIGURE A2.37: Economic Activity Index (GDP p.c. scale) - Hungary (Cycle)

Italy

TABLE A2.24: DATA ITALY

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Raw steel - production	1000 tons	STATI	✓	2		0.11	0.15	0.07	0.06
Railways - transported goods	1000 tons	STATI	✓	3		0.11	0.17	0.07	0.06
Ships incoming - transported goods	1000 tons	STATI	✓	6		0.09	0.15	0.06	0.05
Ships leaving - transported goods	1000 tons	STATI	✓	6		0.10		0.06	0.06
Unemployed	1000s	STATI	✓	0		-0.11	-0.15	-0.06	-0.06
Unemployed - agriculture	1000s	STATI	✓	4		-0.09		-0.05	-0.04
Unemployed - industry	1000s	STATI	✓	0		-0.11		-0.07	-0.06
Trade									
Imports - total	m Lira	STATI	✓	2		0.10	0.16	0.06	0.05
Exports - total	m Lira	STATI	✓	3		0.04	0.08	0.03	0.03
Imports - wheat	1000 tons	STATI	✓	2				0.00	0.00
Imports - raw cotton	1000 tons	STATI	✓	6				0.02	0.01
Imports - wool	1000 tons	STATI	✓	4				-0.01	-0.01
Imports - wood	1000 tons	STATI	✓	6				0.06	0.05
Imports - coal	1000 tons	STATI	✓	4				0.06	0.05
Imports - scrap metal	1000 tons	STATI	✓	3				0.06	0.05
Imports - machines	m Lira	STATI	✓	3				0.07	0.06
Exports - mandarines, oranges and lemons	tons	STATI	✓	4				-0.01	-0.01
Exports - olive oil	tons	STATI	✓	4				0.03	0.02
Exports - cheese	tons	STATI	✓	6				0.01	0.01
Exports - raw silk	tons	STATI	✓	3				0.01	0.01
Exports - cars	Number	STATI	✓	3				0.05	0.05
Prices									
Wholesale prices - general index	Index (1934	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Lira	STATI		0					-0.01
Central bank - foreign exchange holdings	m Lira	STATI		0					-0.00
Central bank - bills of exchange and advances	m Lira	STATI		0					-0.00
Central bank - currency in circulation	m Lira	STATI		0					0.04
Central bank - deposits	m Lira	STATI		0					-0.05
Clearings	Index (1932/1934)	STATI	✓	4		0.01	0.03	0.01	0.00
Clearings - giro cheques	m Lira	STATI	✓	1		-0.03		-0.02	-0.01
Central bank - bank rate	%	STATI		0					0.00
Market rate	%	STATI	✓	0					-0.02
Stock market - IPOs and capital increases for listed companies	m Lira	STATI	✓	6		0.07	0.10	0.04	0.03
Stock market - capital decreases and liquidations of listed companies	m Lira	STATI	✓	6		-0.03		-0.01	-0.01
Number of Variables					7	13	8	25	32
Variance explained					67	43	48	34	29

Comments

- *Gold and foreign exchange holdings*: Values for the first three years of the series have been converted to the 1928 parity. I follow the procedure for Article 3 of the decree law No. 253 given in the Federal Reserve Bulletin (Federal Reserve Board, 1928, p. 493).
- *Wholesale Prices*: Two series were linked via re-basing.
- *Clearings*: Two series were linked via re-basing.

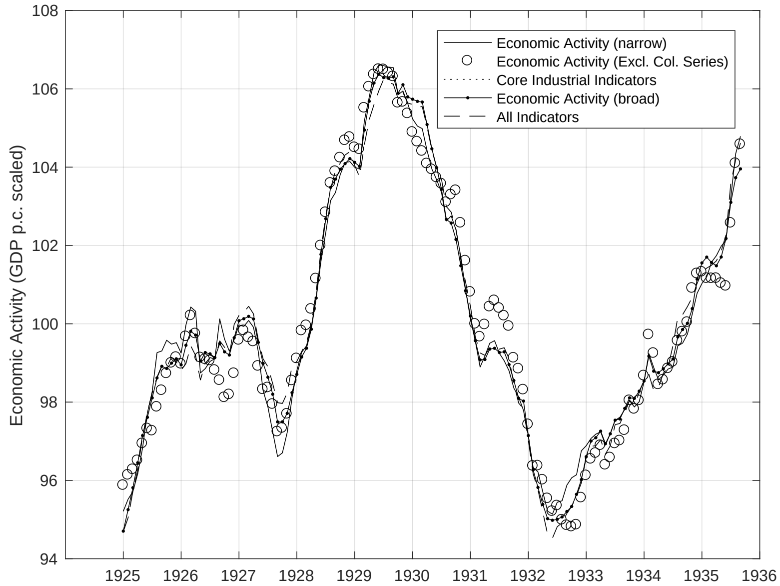


FIGURE A2.38: Economic Activity Index (GDP p.c. scale) - Italy (Level)

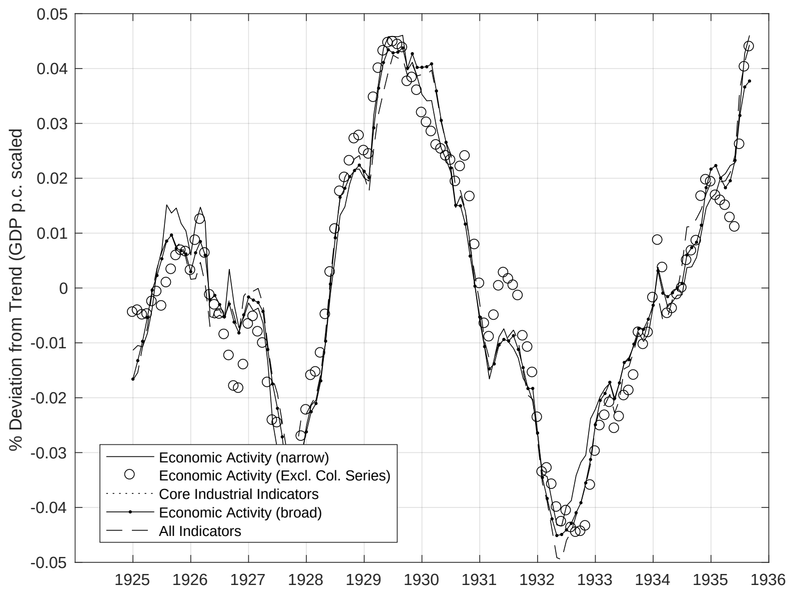


FIGURE A2.39: Economic Activity Index (GDP p.c. scale) - Italy (Cycle)

Netherlands

TABLE A2.25: DATA NETHERLANDS

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Coal - production	1000 tons	STATI	✓	4	0.03	0.02	0.04	0.02	0.01
Construction sector - constructions completed	m Guilders	STATI	✓	6		0.02		0.02	0.01
Incoming Ships - goods	1000 NRT	STATI	✓	6	0.08	0.05	0.08	0.03	0.03
Shipping (ocean vessels) - incoming	m tons	IAES	✓	5	0.08	0.05		0.04	0.03
Shipping (ocean vessels) - cleared goods	m tons	IAES	✓	3	0.03	0.02		0.02	0.01
Shipping (rivers/canals) - cleared goods	m tons	IAES	✓	6	0.07	0.05		0.03	0.02
Railways - transported goods	1000 tons	STATI	✓	4	0.03	0.02	0.03	0.01	0.01
Unemployment - total (Insured workers)	%	STATI	✓	2	-0.08	-0.06		-0.04	-0.03
Unemployment - lost working days (all industries)	%	STATI	✓	2	-0.08	-0.06		-0.04	-0.03
Unemployment - lost working days (coal mining)	%	STATI	✓	6	-0.06	-0.05	-0.08	-0.03	-0.03
Unemployment - lost working days (metallurgic industries)	%	STATI	✓	0	-0.08	-0.06	-0.09	-0.03	-0.03
Unemployment - lost working days (foodstuffs industries)	%	STATI	✓	1	-0.08	-0.05	-0.09	-0.04	-0.03
Unemployment - lost working days (textile Industries)	%	STATI	✓	1	-0.07	-0.05	-0.07	-0.03	-0.02
Unemployment - lost working days (construction industries)	%	STATI	✓	3	-0.08	-0.05	-0.08	-0.03	-0.03
Unemployment - vacancies per 100 Applicants	Number	IAES	✓	1	0.09	0.06		0.04	0.03
Bankruptcies	Real Number	STATI	✓	6	-0.08	-0.06	-0.09	-0.04	-0.03
Trade									
Imports - total	m Guilders	STATI	✓	3		0.03	0.06	0.02	0.02
Exports - total	m Guilders	STATI	✓	4		0.04	0.08	0.03	0.03
Imports - Foodstuffs	m Guilders	STATI	✓	4				-0.00	-0.00
Imports - raw materials & semi-manufactured goods	m Guilders	STATI	✓	4				0.04	0.03
Imports - manufactured goods	m Guilders	STATI	✓	3				0.02	0.01
Exports - foodstuffs	m Guilders	STATI	✓	3				0.02	0.02
Exports - raw materials & semi-manufactured goods	m Guilders	STATI	✓	4				0.03	0.02
Exports - manufactured goods	m Guilders	STATI	✓	4				0.03	0.03
Imports - coal & coke	1000 tons	STATI	✓	5				0.03	0.03
Exports - butter	tons	STATI	✓	3				0.03	0.03
Exports - cheese	tons	STATI	✓	6				0.02	0.02
Exports - eggs	tons	STATI	✓	6				0.02	0.01
Exports - margarine	tons	STATI	✓	4				0.03	0.03
Exports - coal & coke	1000 tons	STATI	✓	3				0.02	0.01
Exports - artificial silk	tons	STATI	✓	4				0.02	0.01
Exports - cotton fabrics	tons	STATI	✓	3				0.03	0.02
Exports - light bulbs	1000s	STATI	✓	2				0.02	0.01
Prices									
Wholesale prices - general index	Index (1913)	STATI	✓	0					
Food prices	Index (1913	STATI	✓	6					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Guilders	STATI		0					-0.03
Central bank - foreign exchange holdings	m Guilders	STATI		0					0.00
Central bank - bills of exchange	m Guilders	STATI		0					0.00
Central bank - currency in circulation	m Guilders	STATI		0					-0.02
Central bank - deposits (total)	m Guilders	STATI		0					-0.02
Central bank - private Deposits	m Guilders	STATI		0					-0.02
Central bank - clearings	m Guilders	STATI	✓	3		0.04	0.07	0.03	0.03
Giro cheque turnover	m Guilders	STATI	✓	3		-0.03		-0.02	-0.02
Central bank - bank rate	%	STATI		0					0.01
Interest rates - market rate	%	STATI	✓	2					0.02
Interest rates - carryover rate	%	STATI	✓	2					0.01
Saving banks - deposits	m Guilders	STATI	✓	0					-0.03
Stock market - total issuances of obligations and stocks	m Guilders	STATI	✓	6		-0.00		-0.00	-0.00
Stock market - general index	Index (21/25)	STATI	✓	1		0.05		0.03	0.03
Stock market - Index for dutch stocks	Index (21/25)	STATI	✓	1		0.05	0.08	0.03	0.03
Stock market - revenues from stock turnover tax	1000 Guilders	STATI	✓	6		0.03	0.05	0.02	0.01
Number of Variables					15	24	14	39	49
Variance explained					59	48	49	41	38

Comments

- *Stock market - revenues from stock turnover tax*: values for 10/1925 11/1925 were given as a sum, which I divide up into the two month into equal proportions.
- *Exports - Light Bulbs*: Tenfold increase from 1928 on.
- *Transport variables*: The drop in February and March 1929 is due to severe frost (The Economist, 1929b).

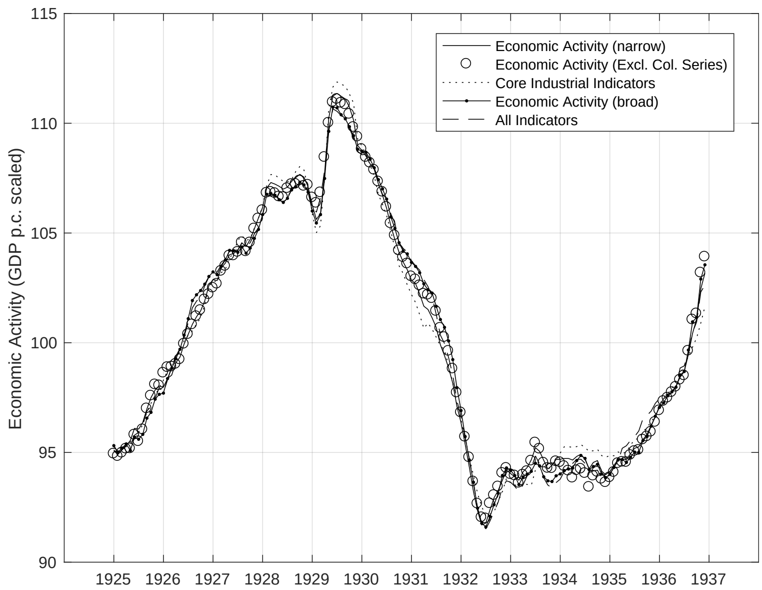


FIGURE A2.40: Economic Activity Index (GDP p.c. scale) - Netherlands (Level)

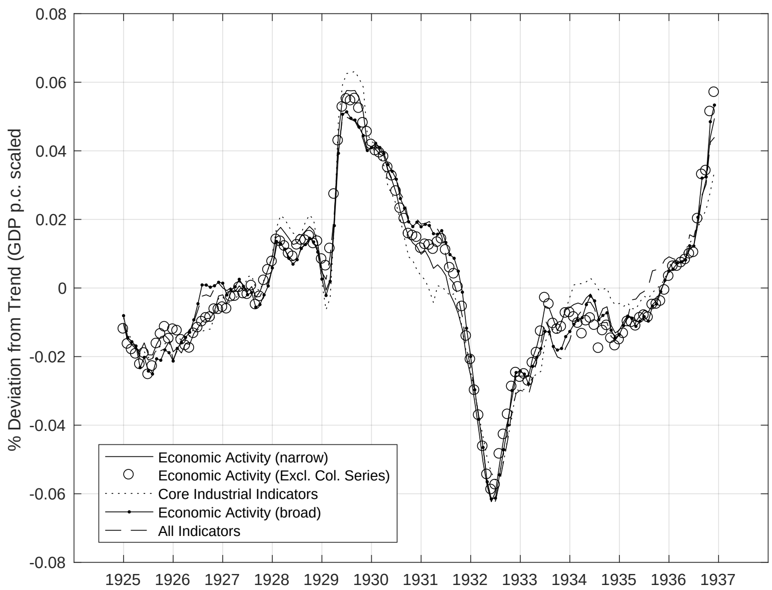


FIGURE A2.41: Economic Activity Index (GDP p.c. scale) - Netherlands (Cycle)

Norway

TABLE A2.26: DATA NORWAY

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial Production	Index	Klovland (1998)	✓	1	0.11	0.08	0.11	0.06	0.05
Paper and cartons - production	1000 tons	STATI	✓	0	0.06	0.05	0.08	0.04	0.03
Construction sector - new dwellings	Number	STATI	✓	0	0.08	0.06	0.07	0.04	0.03
Ship construction - started	1000 BRT	STATI	✓	6	0.10	0.07	0.09	0.05	0.04
Ship construction - completed	1000 BRT	STATI	✓	6	0.11	0.08		0.05	0.04
Railways - transported goods	1000 tons	STATI	✓	4	0.10	0.08	0.11	0.06	0.04
Shipping - ships incoming	1000 NRT	STATI	✓	6	0.10	0.07	0.09	0.05	0.04
Unemployment - number	1000s	STATI	✓	1	-0.12	-0.09	-0.10	-0.06	-0.05
Unemployment - unemployed union members	%	STATI	✓	0	-0.11	-0.08		-0.05	-0.04
Bankruptcies	Number	STATI	✓	6	-0.09	-0.06	-0.07	-0.04	-0.03
Trade									
Imports - total	m Crowns	STATI	✓	5		0.06	0.08	0.04	0.03
Exports - total	m Crowns	STATI	✓	3		0.07	0.09	0.05	0.04
Imports - coal	1000 tons	STATI	✓	6				0.05	0.03
Imports - machines	m Crowns	STATI	✓	4				0.05	0.04
Imports - textiles	m Crowns	STATI	✓	2				0.02	0.02
Exports - fish	1000 tons	STATI	✓	6				0.03	0.02
Exports - canned fish	tons	STATI	✓	6				0.01	0.00
Exports - cellulose	1000 tons	STATI	✓	6				0.05	0.03
Exports - wood pulp	1000 tons	STATI	✓	6				0.03	0.03
Exports - paper	1000 tons	STATI	✓	6				0.05	0.03
Prices									
Shipping - maritime freight rates	Index (1923)	STATI	✓	1					
Wholesale prices - general	Index (1913)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - bills of exchange	m Crowns	STATI		0					-0.00
Central bank - currency in circulation	m Crowns	STATI		0					0.02
Central bank - deposits	m Crowns	STATI		0					-0.02
Clearings (15 banks in Oslo)	m Crowns	STATI	✓	3					-0.03
Bank Rate (Central Bank)	%	STATI		0					0.02
Commercial Banks - Bills of Exchange	m Crowns	STATI	✓	1					-0.03
Commercial Banks - Advances	m Crowns	STATI	✓	0					-0.04
Commercial Banks - Deposits	m Crowns	STATI	✓	0					-0.04
Saving Banks - Deposits	m Crowns	STATI	✓	0					-0.04
Bonds Return	% of face value	STATI	✓	1		-0.08		-0.05	-0.04
Stocks - Turnover	1000 Crowns	STATI	✓	3		0.03	0.05	0.02	0.02
Bonds - Turnover	1000 Crowns	STATI	✓	4		-0.06	-0.07	-0.04	-0.03
Number of Variables					10	15	12	23	32
Variance explained					58	51	48	44	39

Comments

- *Paper and cartons - production, Construction sector - new dwellings, Ship construction - started, Ship construction - completed*: First I convert the quarterly sums into quarterly averages. I then employ a cubic hermite spline interpolation to convert them into monthly data.
- *Wholesale prices - general index*: New composition from 1932 on, but no apparent change in the series.
- *Bonds returns*: From 1934 on, new calculation method, but no apparent break in the series.

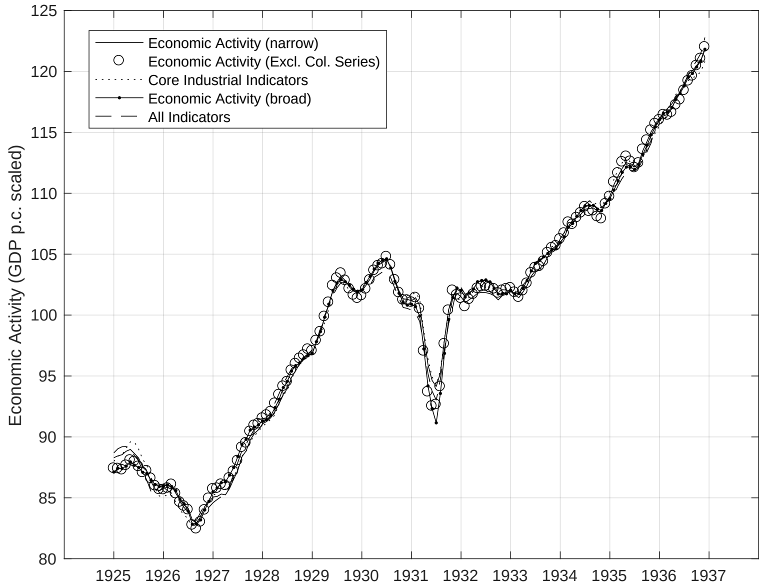


FIGURE A2.42: Economic Activity Index (GDP p.c. scale) - Norway (Level)

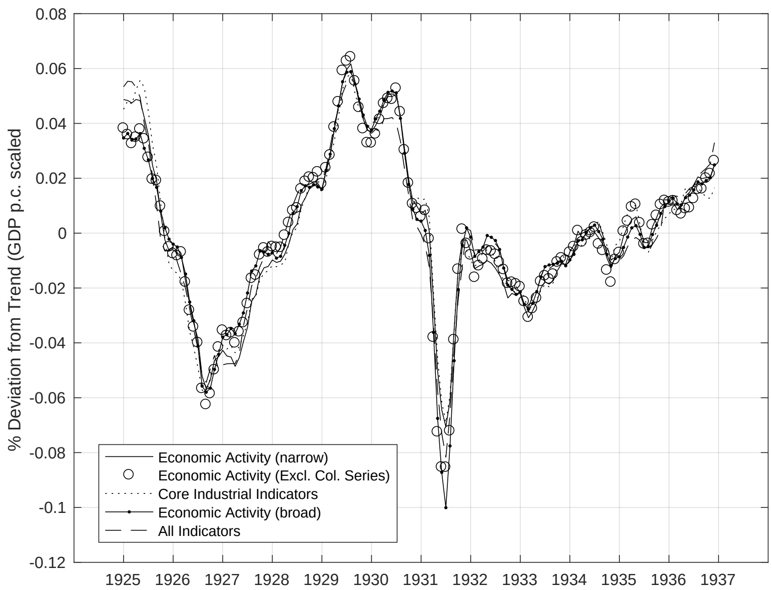


FIGURE A2.43: Economic Activity Index (GDP p.c. scale) - Norway (Cycle)

Poland

TABLE A2.27: DATA POLAND

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1928)	STATI	✓	1	0.08	0.06	0.09	0.04	0.03
Employment in mining and manufacturing	1000s	STATI	✓	1	0.07	0.06		0.04	0.03
Capital goods - production	Index (1928)	STATI	✓	0	0.08	0.06	0.09	0.04	0.03
Consumption goods - production	Index (1928)	STATI	✓	2	0.07	0.05	0.08	0.04	0.03
Zinc - production	Index (1928)	STATI	✓	1	0.06	0.05		0.03	0.02
Metal and machinery industries - production	Index (1928)	STATI	✓	1	0.07	0.06	0.08	0.04	0.03
Chemicals - production	Index (1928)	STATI	✓	3	0.07	0.05	0.08	0.04	0.03
Textiles - production	Index (1928)	STATI	✓	1	0.06	0.04	0.07	0.03	0.02
Construction	Index (1928)	STATI	✓	2	0.07	0.05	0.08	0.03	0.03
Coal - production	1000 tons	STATI	✓	2	0.06	0.04		0.03	0.02
Pig iron - production	1000 tons	STATI	✓	2	0.07	0.05		0.03	0.03
Crude steel - production	1000 tons	STATI	✓	2	0.06	0.05		0.03	0.03
Railways - wagons	Index (1928)	STATI	✓	3	0.07	0.05	0.07	0.04	0.03
Railways - wagons above 15 tons	number per day	STATI	✓	3	0.07	0.05		0.04	0.03
Unemployment - registered unemployed	1000s	STATI	✓	0	-0.04	-0.03	-0.05	-0.02	-0.02
Bankruptcies	Number	STATI	✓	5	-0.02	-0.01	-0.01	-0.01	-0.01
Trade									
Imports - total	m Zloty	STATI	✓	2		0.05	0.08	0.04	0.03
Exports - total	m Zloty	STATI	✓	3		0.03	0.03	0.02	0.01
Imports - foodstuffs	m Zloty	STATI	✓	4				0.03	0.02
Imports - raw materials and semi-manufactured goods	m Zloty	STATI	✓	2				0.04	0.03
Imports - fully-manufactured goods	m Zloty	STATI	✓	3				0.03	0.03
Exports - animals	m Zloty	STATI	✓	3				0.03	0.02
Exports - foodstuffs	m Zloty	STATI	✓	5				0.00	-0.00
Exports - raw materials and semi-manufactured goods	m Zloty	STATI	✓	2				0.02	0.01
Exports - fully-manufactured goods	m Zloty	STATI	✓	4				0.02	0.01
Imports - cotton	1000 tons	STATI	✓	3				0.01	0.01
Imports - wool	1000 tons	STATI	✓	6				0.02	0.01
Imports - machines	m Zloty	STATI	✓	4				0.04	0.03
Exports - pigs	1000s	STATI	✓	3				0.03	0.02
Exports - wheat	1000 tons	STATI	✓	6				-0.02	-0.02
Exports - rye	1000 tons	STATI	✓	6				-0.01	-0.01
Exports - coal	1000 tons	STATI	✓	3				0.01	0.01
Exports - timber	1000 tons	STATI	✓	3				0.02	0.01
Prices									
Nominal wages	Index (1931)	STATI	✓	0					
Wholesale prices - general index	Index (1928)	STATI	✓	0					
Consumer prices - general index	Index (1928)	STATI	✓	1					
Consumer prices - food	Index (1928)	STATI	✓	2					
Money, Banking, Stock Markets									
Central bank - bills of exchange and advances	m Zloty	STATI		0					0.01
Central bank - currency	m Zloty	STATI		0					0.03
Central bank - government deposits	m Zloty	STATI		0					0.02
Central bank - private deposits	m Zloty	STATI		0					0.02
Clearings	m Zloty	STATI	✓	2		0.03	0.05	0.02	0.02
Giro clearings	m Zloty	STATI	✓	1		0.04		0.03	0.02
Drawn bills of exchange	Number	STATI	✓	3		0.04	0.06	0.03	0.02
Central bank - bank rate	%	STATI		0					-0.01
Interest rate - bills of exchange	%	STATI		0					-0.02
Interest rates - real interest rate on government bonds	%	STATI	✓	1					-0.03
Joint-stock banks - bills of exchange	m Zloty	STATI	✓	0					0.03
Joint-stock banks - advances	m Zloty	STATI	✓	1					0.01
Joint-stock banks - deposits	m Zloty	STATI	✓	1					0.02
Saving banks - deposits	m Zloty	STATI	✓	0					0.02
Stock market - general index	Index (1928)	STATI	✓	2		0.05	0.07	0.03	0.03
Number of Variables					16	22	15	37	48
Variance explained					69	62	61	50	47

Comments

- *Employment in mining and manufacturing*: Two series have been merged. One is seasonally adjusted, whereas the other is not. The algorithm, in principle, should adapt to varying patterns of seasonality and thus no further adjustment of the raw data is made.
- *Nominal wages*: Two indices have been linked via re-basing. The value for December 1936 was assumed to equal the one of November 1936.
- *Import and export series related to foodstuff, raw materials and semi-manufactured goods, fully-manufactured goods, and animals*: Values for July-September 1936 were given as the sum. They were hence divided by 3 and allocated proportionally.
- *Interest rates - real interest rate on government bonds*: Values for November and December 1936 were missing and assumed to take those of October 1936.

- *Series related to the joint-stock banks*: Values for January 1925 were missing and assumed to take those of February 1925.

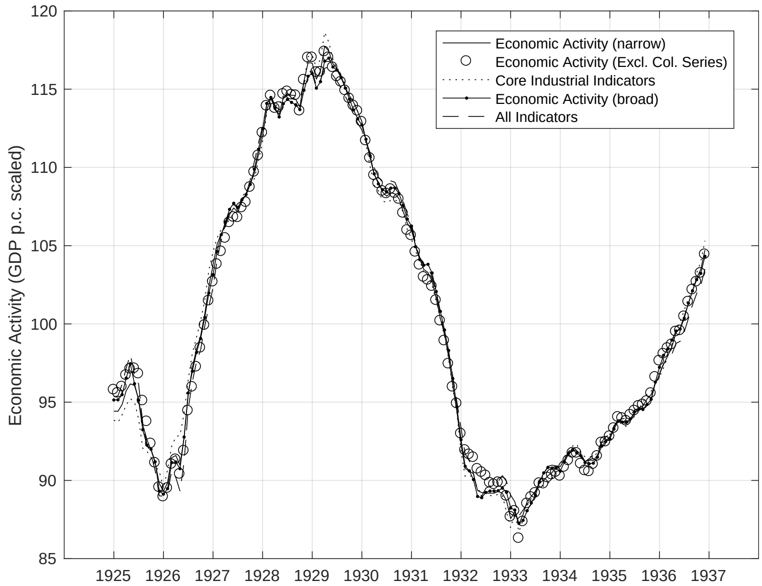


FIGURE A2.44: Economic Activity Index (GDP p.c. scale) - Poland (Level)

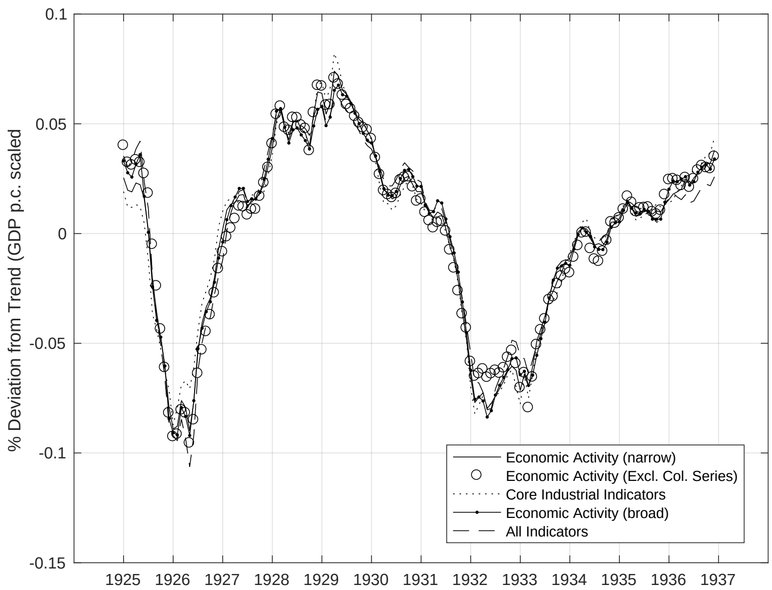


FIGURE A2.45: Economic Activity Index (GDP p.c. scale) - Poland (Cycle)

Romania

TABLE A2.28: DATA ROMANIA

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Oil -production	1000 tons	STATI	✓	1		0.00	0.01	-0.00	0.00
Railways - transported goods	1000 tons	STATI	✓	6		0.12	0.15	0.09	0.08
Lignite - production	1000 tons	STATI	✓	4		0.10	0.14	0.09	0.07
Gasoline - production	1000 tons	STATI	✓	4		-0.03	-0.04	-0.03	-0.02
Unemployment - unemployed total	1000s	STATI	✓	1		-0.08	-0.10	-0.06	-0.04
Unemployment - seasonal workers	1000s	STATI	✓	2		-0.08		-0.06	-0.05
Moratoria	Number	STATI	✓	6		-0.06	-0.08	-0.05	-0.04
Trade									
Imports - total	m Lei	STATI	✓	4		0.08	0.10	0.05	0.05
Exports - total	m Lei	STATI	✓	3		0.08	0.08	0.06	0.05
Exports - cattle	1000s	STATI	✓	2				0.10	0.08
Exports - corn	1000 tons	STATI	✓	6				-0.02	-0.02
Exports - wood	1000 tons	STATI	✓	4				0.09	0.08
Prices									
Wholesale prices - general index	Index (1935=100)	STATI	✓	1					
Retail prices - general index	Index (1932/1934)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Lei	STATI		0					0.00
Central bank - currency in circulation	m Lei	STATI		0					-0.04
Clearings (in Bucharest)	m Lei	STATI	✓	3		0.09	0.11	0.08	0.07
Central bank - Bank Rate	%	STATI		0					0.04
Interest rates - real interest on bonds	%	STATI	✓	2					-0.08
Stock market - new issuances	m Lei	STATI	✓	6		0.11		0.09	0.08
Bond market - general index	Index (1926)	STATI	✓	2		0.08	0.10	0.07	0.06
Stock market - stocks turnover	m Lei	STATI	✓	5		-0.02	-0.01	-0.02	-0.02
Protested bills of exchange	m Lei	STATI	✓	6		-0.07	-0.08	-0.05	-0.05
Number of Variables					7	14	12	17	21
Variance explained					41	33	31	35	33

Comments

- *Retail prices - general index*: two series were linked.
- *Wholesale prices - general index*: Three series were linked. The first two refer two wholesale prices for petroleum, wheat, and wood, whereas the third is more general, but was only available for 1935 and 1936.
- *Clearings*: From May 1931 onwards, clearings declined rapidly. However, there are no comments on the series that indicate that it is not valid anymore.
- *Interest rates - real interest on bonds*: From 1934 on, the series does not take foreign treasury bills into account, which lowers its value by around 2 %.
- *Central bank - gold holdings*: Values for November and December 1936 have been converted to the old parity: 0.009 vs the new one: 0.00625174 (Statistisches Reichsamt, 1937, p. 98).
- *Additional Data*: There is also bankruptcy data for Ilfov county, which was not included as it does not seem to comove with the rest of the economy and relates only to one county (not including the capital).

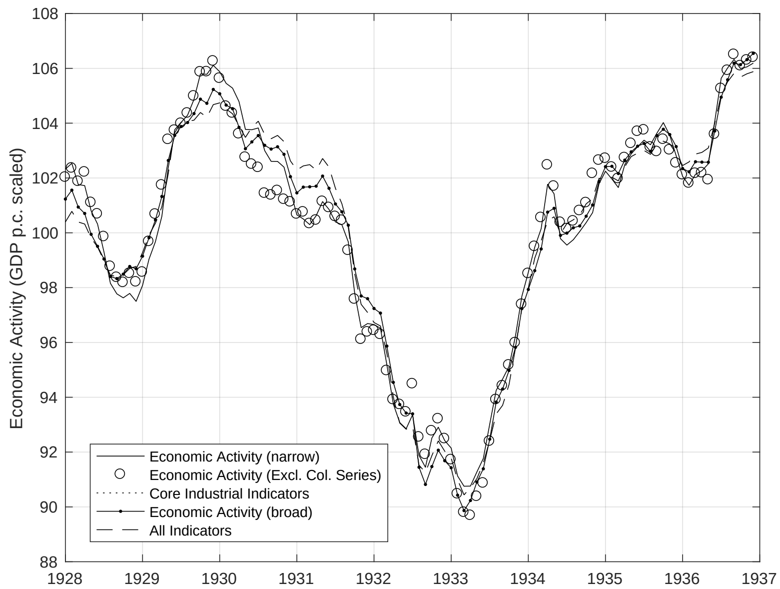


FIGURE A2.46: Economic Activity Index (GDP p.c. scale) - Romania (Level)

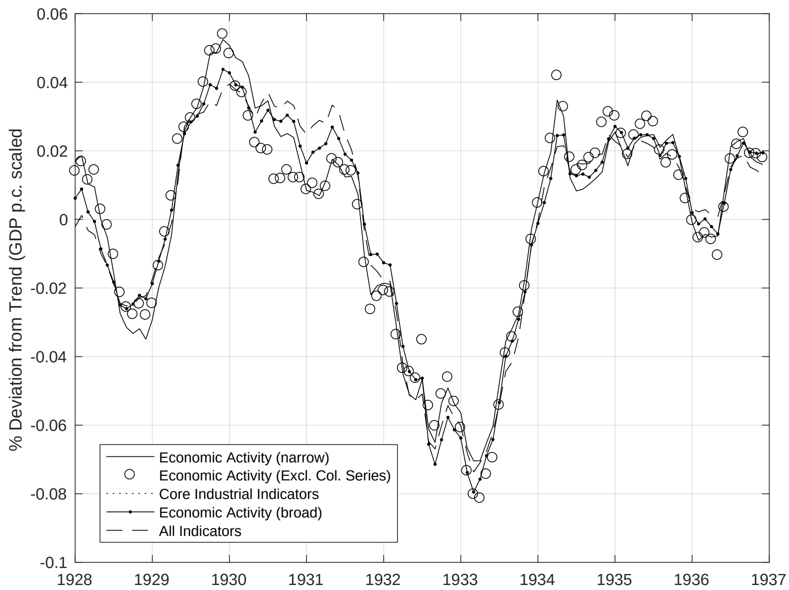


FIGURE A2.47: Economic Activity Index (GDP p.c. scale) - Romania (Cycle)

Spain

TABLE A2.29: DATA SPAIN

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Coal and lignite - production	1000 tons	IAES	✓	6		0.02	0.02	0.02	0.01
Iron ore - production	1000 tons	IAES	✓	2		0.11	0.13	0.11	0.10
Copper - production	1000 tons	IAES	✓	6		-0.01	-0.01	-0.01	-0.00
Lead - production	1000 tons	IAES	✓	6		0.03	0.04	0.03	0.03
Pig iron - production	1000 tons	IAES	✓	4		0.10	0.12	0.10	0.09
Steel - production	1000 tons	IAES	✓	4		0.10	0.13	0.10	0.10
Woolen yarn - production	tons	IAES	✓	3		-0.04		-0.04	-0.04
Cotton yarn - production	tons	IAES	✓	6		0.01	0.01	0.01	0.01
Trade									
Imports (total)	m Gold Pesetas	STATI	✓	4		0.11	0.13	0.11	0.10
Exports (total)	m Gold Pesetas	STATI	✓	3		0.10	0.13	0.10	0.10
Prices									
Wholesale prices - general index	Index (1913)	STATI	✓	2					
Money, Banking, Stock Markets									
Central bank - currency in circulation	m Pesetas	IAES		0					-0.05
Protested bills of exchange	Number	IAES	✓	4		-0.05	-0.07	-0.05	-0.05
Clearings (Madrid)	m Pesetas	IAES	✓	3		0.06	0.07	0.06	0.06
Clearings (Barcelona)	m Pesetas	IAES	✓	4		0.07		0.07	0.06
Barcelona Stock Exchange - security prices (18 Securities)	Index(1925)	IAES	✓	1		0.10		0.10	0.10
Barcelona Stock Exchange - 22 Stocks	Index(1925)	IAES	✓	0		0.11	0.13	0.11	0.10
Number of Variables					8	15	12	15	16
Variance explained					38	44	45	44	42

Comments

- *Mining series (except for coal and lignite)*: first value of 1925 was a quarterly sums and thus simply divided by 3 and allocated proportionally to the first three months.
- *Prices of industrial inputs* and *food prices*: Value for December of 1935 was assumed to take the one of November 1935.
- *Clearings (Madrid)*: series exhibits stark (positive) break in the first quarter of 1927. This is most likely due to speculation in favor of the Peseta (see IAES - events).
- *Trade series*: Values until the first quarter 1928 are given in quarterly sums and were simply divided by 3; the series are monthly thereafter. The values for May 1935 are assumed to be those of April 1935.

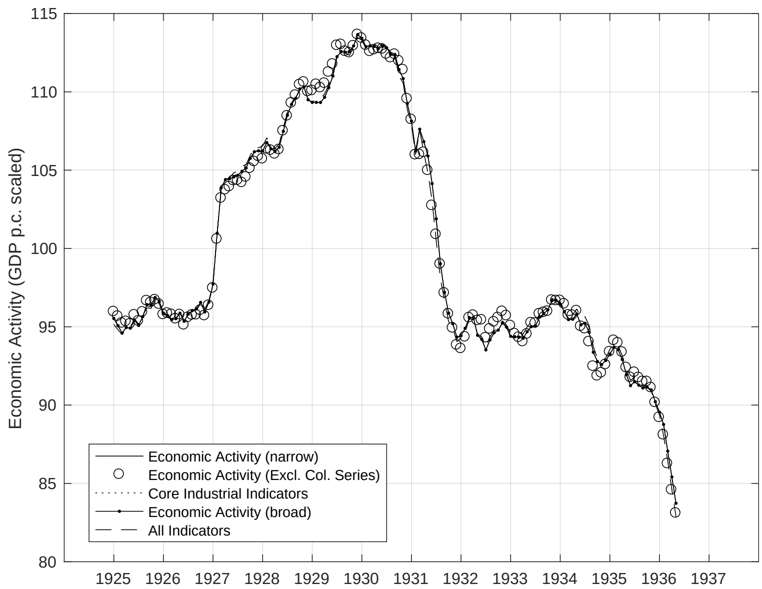


FIGURE A2.48: Economic Activity Index (GDP p.c. scale) - Spain (Level)

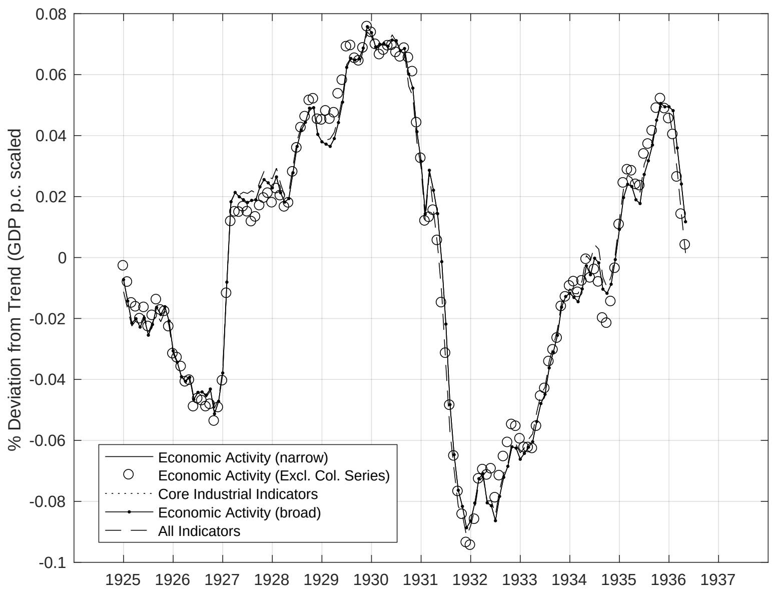


FIGURE A2.49: Economic Activity Index (GDP p.c. scale) - Spain (Cycle)

Sweden

TABLE A2.30: DATA SWEDEN

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index	Klovland (1998)	✓	2	0.12	0.08	0.09	0.06	0.05
Pig iron - production	1000 tons	STATI	✓	2	0.11	0.08	0.09	0.06	0.05
Raw steel - production	1000 tons	STATI	✓	5	0.11	0.07		0.06	0.05
Finished rolling mill products - production	1000 tons	STATI	✓	5	0.10	0.07	0.07	0.06	0.04
Railways - transported goods	1000 tons	STATI	✓	2	0.11	0.08	0.10	0.07	0.05
Incoming ships	1000 NRT	STATI	✓	5	0.09	0.07	0.08	0.05	0.04
Unemployment - individuals on benefits	Number	STATI	✓	0	-0.12	-0.08	-0.10	-0.06	-0.05
Unemployed Union Members	%	STATI	✓	1	-0.13	-0.09		-0.07	-0.05
Stock market - bankruptcies	number	STATI	✓	6	-0.11	-0.08	-0.10	-0.06	-0.05
Trade									
Imports - total	m Crowns	STATI	✓	4		0.08	0.09	0.06	0.04
Exports - total	m Crowns	STATI	✓	3		0.08	0.09	0.07	0.05
Imports - coal and coke	1000 tons	STATI	✓	3				0.03	0.02
Exports - iron ore	1000 tons	STATI	✓	1				0.06	0.04
Exports - timber	1000 cbm	STATI	✓	6				0.04	0.03
Exports - cellulose	1000 tons	STATI	✓	6				0.05	0.03
Exports - paper	1000 tons	STATI	✓	6				0.03	0.02
Prices									
Wholesale prices - general index	1913=100	STATI	✓	0					
Wholesale prices - raw materials	1913=100	STATI	✓	1					
Wholesale prices - semi-processed goods	1913=100	STATI	✓	1					
Wholesale prices - fully-manufactured goods	1913=100	STATI	✓	0					
Wholesale Prices - capital goods	1913=100	STATI	✓	1					
Wholesale prices - consumption goods	1913=100	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Crowns	STATI		0					0.04
Central bank - foreign exchange holdings	m Crowns	STATI		0					0.03
Central bank - bills of exchange	m Crowns	STATI		0					-0.02
Central bank - deposits	m Crowns	STATI		0					0.01
Central bank - currency in Circulation	m Crowns	STATI		0					0.02
Clearings	m Crowns	STATI		0					0.02
Central bank - bank rate	%	STATI		0					-0.01
Interest rates - real interest rate for government bonds	%	STATI		0					-0.03
Commercial banking - bills of exchange	m Crowns	STATI	✓	1					-0.03
Commercial banking - private debt	m Crowns	STATI	✓	1					-0.03
Commercial banks - domestic deposits	m Crowns	STATI	✓	2					-0.03
Stock market - emissions	m Crowns	STATI	✓	6		0.03	0.04	0.02	0.02
Stock market - turnover	m Crowns	STATI	✓	3		0.05	0.07	0.04	0.03
Protested bills of exchange	1000 Crowns	STATI	✓	4		-0.06	-0.07	-0.04	-0.04
Number of Variables					9	14	12	19	30
Variance explained					69	58	56	50	39

Comments

- *Central bank - gold holdings*: From March 1933, the series includes earmarked gold.
- *Central bank - deposits*: There is a strong increase in 1933, possibly due to change in accounting.
- *Protested bills of exchange*: There is a large outlier in May 1932.

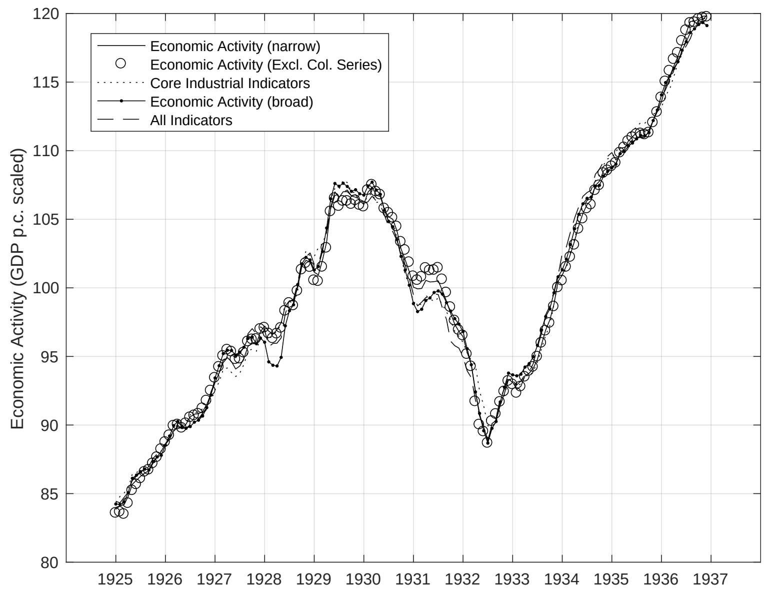


FIGURE A2.50: Economic Activity Index (GDP p.c. scale) - Sweden (Level)

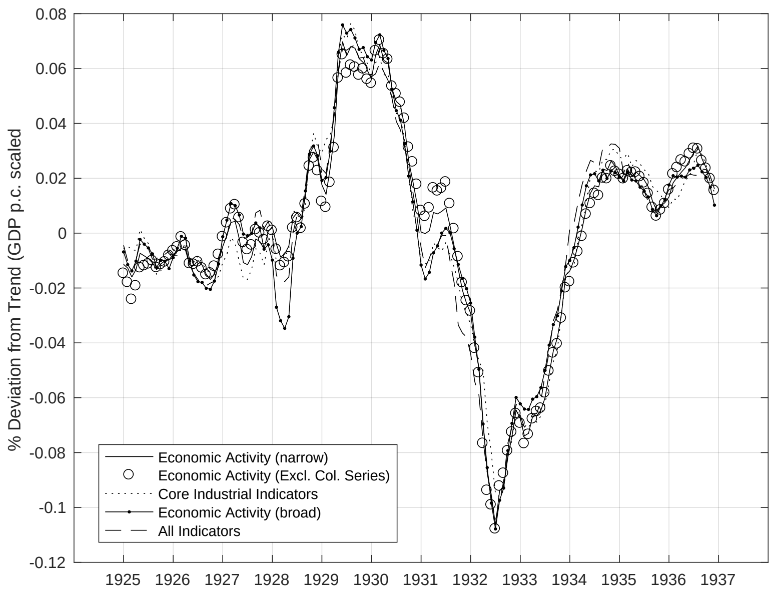


FIGURE A2.51: Economic Activity Index (GDP p.c. scale) - Sweden (Cycle)

Switzerland

TABLE A2.31: DATA SWITZERLAND

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Watches - production	1000s	STATI	✓	3		0.12	0.14	0.08	0.06
Railways - transported individuals	1000s	STATI	✓	6		0.12		0.08	0.06
Railways - transported goods	1000 tons	STATI	✓	4		0.12	0.13	0.08	0.06
Unemployment - number of job seekers	Number	STATI	✓	1		-0.13	-0.14	-0.09	-0.07
Bankruptcies	Number	STATI	✓	6		-0.10	-0.11	-0.06	-0.05
Trade									
Imports - total	m Franks	STATI	✓	2		0.07	0.08	0.06	0.03
Exports - total	m Franks	STATI	✓	2		0.13	0.15	0.09	0.07
Imports - raw and semi-manufactured goods	m Franks	STATI	✓	4				0.07	0.05
Imports- manufactured goods	m Franks	STATI	✓	3				0.06	0.03
Exports - raw material	m Franks	STATI	✓	6				0.05	0.04
Exports - manufactured goods	m Franks	STATI	✓	2				0.09	0.07
Imports - coal	1000 tons	STATI	✓	6				0.04	0.02
Prices									
Wholesale prices - general index	Index (July 1932/1934 = 100)	STATI	✓	0					
Consumer prices - general index	Index (1914)	STATI	✓	0					
Consumer prices - food	Index (1914)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Franks	STATI		0					-0.06
Central bank - currency in circulation	m Franks	STATI		0					-0.06
Central bank - deposits	m Franks	STATI		0					-0.06
Central bank - giro transfers	m Franks	STATI		0					0.05
Clearings	m Franks	STATI	✓	2		0.11	0.13	0.08	0.06
Central bank - turnover of giro and postal checks	m Franks	STATI		0					0.02
Central bank - bank rate	%	STATI		0					0.02
Market rate	m Franks	STATI	✓	0					-0.00
Stock market - returns	%	STATI	✓	1		0.10	0.12	0.07	0.06
Number of Variables					5	9	8	14	21
Variance explained					68	57	56	49	43

Comments

- *Gold holdings and deposits*: Values for October–December 1936 have been converted to the new parity.
- *Stock market - returns*: Change of the composition of the series is reported for 1934. However, no structural break is apparent. No further adjustment is made.

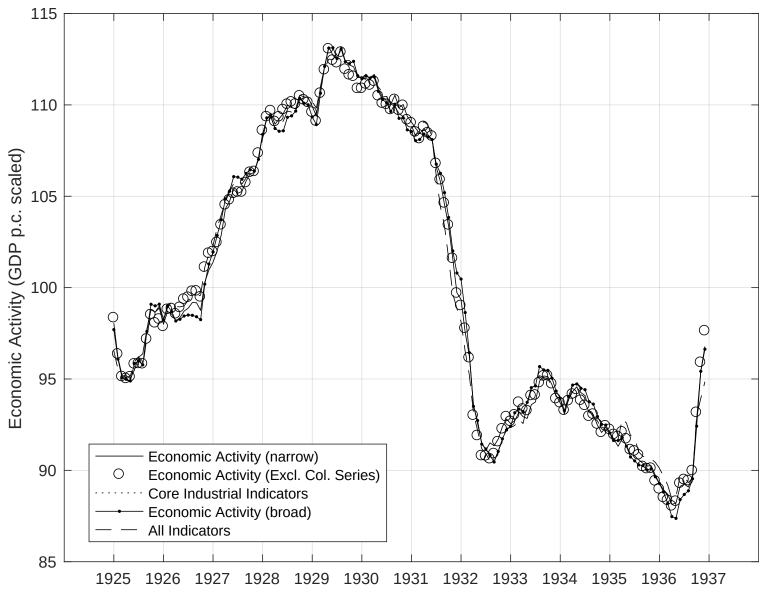


FIGURE A2.52: Economic Activity Index (GDP p.c. scale) - Switzerland (Level)

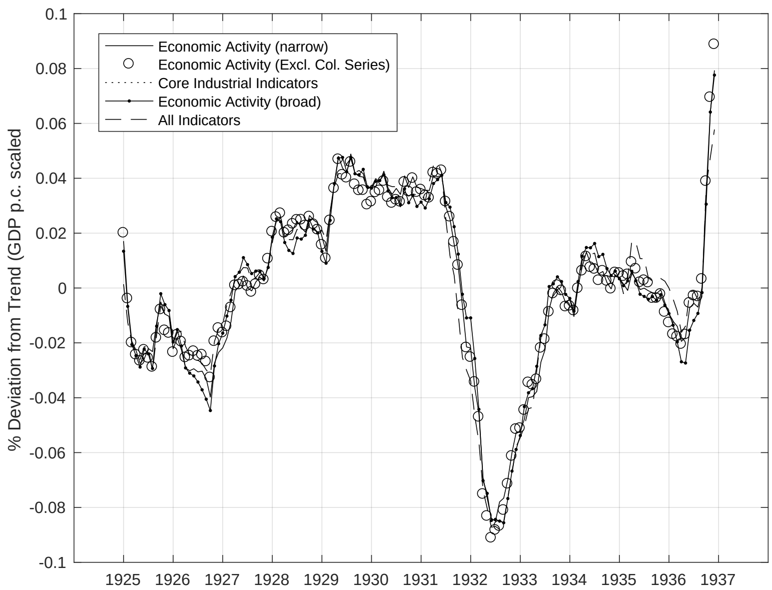


FIGURE A2.53: Economic Activity Index (GDP p.c. scale) - Switzerland (Cycle)

Yugoslavia

TABLE A2.32: DATA YUGOSLAVIA

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Coal - production	1000 tons	STATI	✓	5		0.10	0.10	0.10	0.07
Railways - transported goods	1000s	STATI	✓	4		0.11	0.11	0.11	0.07
Unemployment - jobseekers	Number	STATI	✓	2		-0.09	-0.09	-0.09	-0.07
Bankruptcies	Number	STATI	✓	4		-0.05	-0.05	-0.05	-0.05
Industrial employment	1000s	STATI	✓	1		0.14	0.14	0.14	0.10
Trade									
Imports - total	m Dinar	STATI	✓	4		0.15	0.15	0.15	0.11
Exports - total	m Dinar	STATI	✓	4		0.14	0.14	0.14	0.10
Prices									
Wholesale prices - general index	Index (1926)	STATI	✓	1					
Wholesale prices - imports	Index (1926)	STATI	✓	0					
Wholesale prices - exports	Index (1926)	STATI	✓	1					
Wholesale prices - crops	Index (1926)	STATI	✓	1					
Wholesale prices - beef	Index (1926)	STATI	✓	2					
Wholesale Prices - minerals	Index (1926)	STATI	✓	1					
Wholesale prices - industry	Index (1926)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - bills of exchange and advances	m Dinar	STATI		0					-0.11
Central bank - currency in circulation	m Dinar	STATI		0					0.02
Central bank - private deposits	m Dinar	STATI		0					0.07
Clearings - giro and postal cheques	m Dinar	STATI	✓	4		0.09	0.09	0.09	0.06
Central bank - bank rate	%	STATI		0					-0.09
Bond market - value of the 7 % Government Bond from 1921	Index (1926)	STATI	✓	1		0.13	0.13	0.13	0.09
Number of Variables					5	9	9	9	13
Variance explained					49	52	52	52	49

Comments

- *Industrial employment*: Value for December 1936 was assumed to be the same as in November 1936.

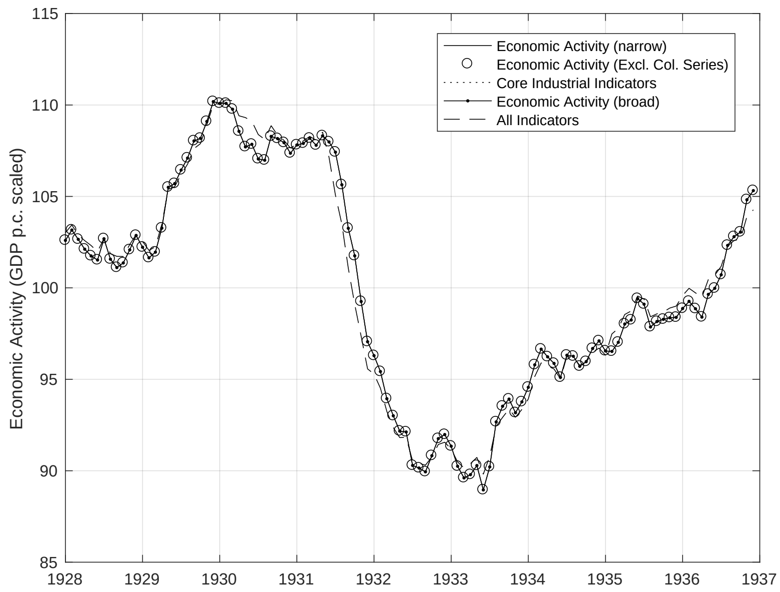


FIGURE A2.54: Economic Activity Index (GDP p.c. scale) - Yugoslavia (Level)

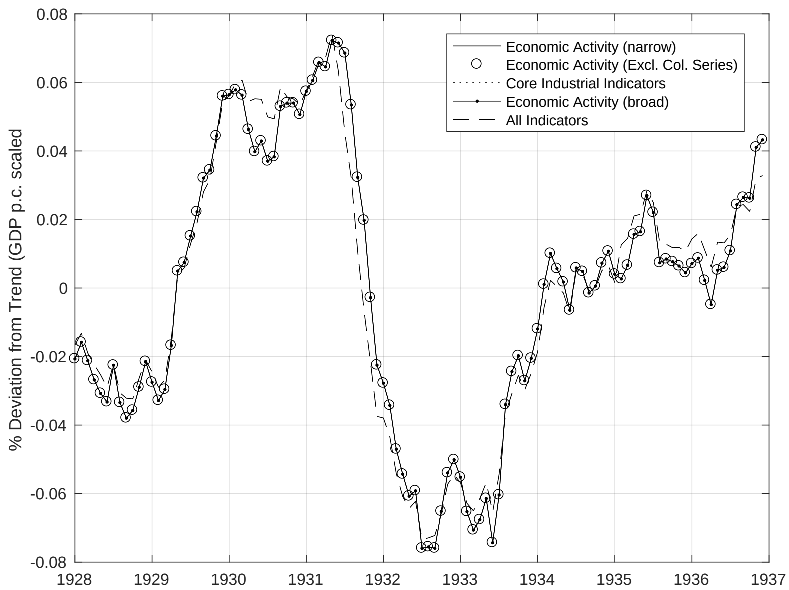


FIGURE A2.55: Economic Activity Index (GDP p.c. scale) - Yugoslavia (Cycle)

Americas

Canada

TABLE A2.33: DATA CANADA

Variable Name	Unit	Source	Seasonal Adjustment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1926)	STATI	✓	2	0.05	0.03	0.06	0.03	0.03
Cereal - sales	Index (1926)	STATI	✓	6	-0.01	-0.00	-0.01	-0.00	-0.00
Cattle - sales	Index (1926)	STATI	✓	6	0.00	0.00	0.00	0.00	0.00
Forestry - production	Index (1926)	STATI	✓	3	0.05	0.03	0.06	0.03	0.02
Mining - production	Index (1926)	STATI	✓	5	0.04	0.03	0.06	0.02	0.02
Other Industries - production	Index (1926)	STATI	✓	2	0.05	0.03	0.06	0.03	0.02
Construction - activity	Index (1926)	STATI	✓	4	0.04	0.03	0.05	0.02	0.02
Employment - total	Index (1926)	STATI	✓	0	0.05	0.03	0.06	0.03	0.02
Industrial Employment (total)	Index (1926)	STATI	✓	0	0.05	0.03		0.03	0.02
Industrial employment - steel and iron industries	Index (1926)	STATI	✓	1	0.05	0.03		0.03	0.02
Industrial employment - car manufacturing	Index (1926)	STATI	✓	3	0.04	0.03		0.02	0.02
Industrial employment - timber Industries	Index (1926)	STATI	✓	1	0.05	0.03		0.03	0.02
Industrial employment - cellulose industries	Index (1926)	STATI	✓	1	0.05	0.03		0.03	0.02
Industrial employment - textile industries	Index (1926)	STATI	✓	1	0.04	0.03		0.02	0.02
Industrial employment - leather Industries	Index (1926)	STATI	✓	1	0.02	0.01		0.01	0.01
Coal - production	1000 tons	STATI	✓	3	0.04	0.03		0.02	0.02
Pig iron - production	1000 tons	STATI	✓	6	0.05	0.03		0.03	0.02
Crude steel - production	1000 tons	STATI	✓	5	0.05	0.03		0.03	0.02
Cars manufactured	Number	STATI	✓	4	0.04	0.03	0.05	0.02	0.02
Lorries manufactured	Number	STATI	✓	4	0.04	0.03		0.02	0.02
Paper for newspaper - production	1000 tons per day	STATI	✓	2	0.05	0.03	0.06	0.03	0.02
Electricity - production	m kWh	STATI	✓	2	0.05	0.03	0.06	0.03	0.02
Construction sector - finished buildings	m $	STATI	✓	6	0.04	0.03	0.05	0.02	0.02
Railways - transported goods (wagons)	Index (1926)	STATI	✓	3	0.05	0.03	0.06	0.03	0.02
Bankruptcies (cases)	Number	STATI	✓	4	-0.03	-0.02		-0.02	-0.02
Bankruptcies (volume)	m $	STATI	✓	6		-0.03	-0.05	-0.02	-0.02
Trade									
Imports - total	m $	STATI	✓	2		0.03	0.06	0.03	0.02
Exports - total	m $	STATI	✓	4		0.03	0.06	0.03	0.02
Imports - foodstuffs and beverages	m $	STATI	✓	5				0.02	0.02
Imports - raw materials and semi-processed goods	m $	STATI	✓	3				0.03	0.02
Imports - fully-manufactured Goods	m $	STATI	✓	2				0.03	0.02
Exports - foodstuffs and beverages	m $	STATI	✓	5				0.01	0.01
Exports - raw materials and semi-processed goods	m $	STATI	✓	3				0.02	0.02
Exports - fully-manufactured goods	m $	STATI	✓	3				0.03	0.02
Exports - agricultural goods	m $	STATI	✓	5				0.02	0.01
Exports - non-Agricultural goods	m $	STATI	✓	2				0.02	0.02
Exports - wheat	1000 tons	STATI	✓	4				0.00	0.00
Exports - wheat flour	1000 tons	STATI	✓	6				0.01	0.01
Exports - paper for newspaper	1000 tons	STATI	✓	4				0.03	0.02
Prices									
Wholesale prices - general	Index (1926)	STATI	✓	0					
Wholesale prices - raw materials	Index (1926)	STATI	✓	1					
Wholesale prices - fully-manufactured goods	Index (1926)	STATI	✓	0					
Wholesale prices - foodstuffs (excluding meat)	Index (1926)	STATI	✓	1					
Wholesale prices - meat and related products	Index (1926)	STATI	✓	1					
Wholesale prices - non-ferrous metals	Index (1926)	STATI	✓	0					
Wholesale prices - Non-ferrous Minerals	Index (1926)	STATI	✓	2					
Wholesale prices - iron and iron products	Index (1926)	STATI	✓	0					
Wholesale prices - timber and paper	Index (1926)	STATI	✓	0					
Wholesale prices - textiles	Index (1926)	STATI	✓	0					
Wholesale prices - wheat	cts per bush	STATI	✓	2					
Consumer prices - general index	Index (1926)	STATI	✓	0					
Money, Banking, Stock Markets									
Chartered banks - Holdings of stocks	m $	STATI	✓	0					-0.02
Chartered banks - business loans outstanding	m $	STATI	✓	0		-0.01	-0.02	-0.01	-0.01
Chartered banks - short-term deposits	m $	STATI	✓	2					0.01
Chartered banks - long-term deposits	m $	STATI	✓	0					-0.02
Central bank - currency in circulation	m $	STATI		0					0.02
Cheques drawn	m $	STATI	✓	4		0.03	0.05	0.02	0.02
Clearings	m $	STATI	✓	4		0.03	0.05	0.02	0.02
Interest rates - real interest on bond of the province of Ontario	%	STATI	✓	1					-0.01
Stock market - general index	Index (1926)	STATI	✓	1		0.03	0.06	0.03	0.02
Stock market - industrial shares	Index (1926)	STATI	✓	1		0.03		0.03	0.02
Stock market - insurance shares	Index (1926)	STATI	✓	1		0.03		0.02	0.02
Stock market - bank shares	Index (1926)	STATI	✓	2		0.02		0.02	0.02
Stock market - turnover	Index (1926)	STATI	✓	3		0.02		0.01	0.01
Number of Variables					25	36	20	47	52
Variance explained					69	65	65	63	60

Comments

- *Industrial production - general index, Cereal - sales, Cattle - sales, Forestry, Mining, Other Industries, Construction, Railways*: Seasonal adjustment methodology changed in 1936.
- *Pig iron - production*: Values for March - May 1933 were missing and assumed to be 0.
- *Clearings*: Series comprises 32 cities from 1931 onwards, but only 29–31 before.

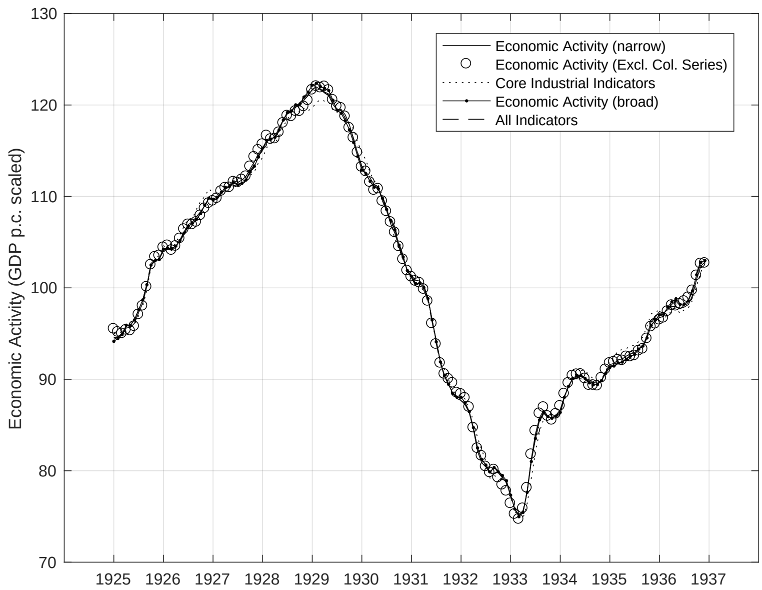


FIGURE A2.56: Economic Activity Index (GDP p.c. scale) - Canada (Level)

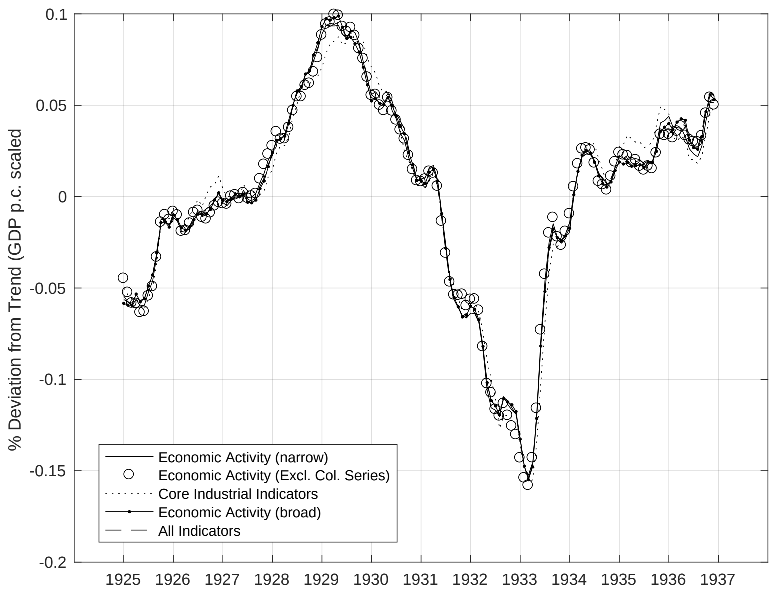


FIGURE A2.57: Economic Activity Index (GDP p.c. scale) - Canada (Cycle)

Chile

TABLE A2.34: DATA CHILE

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Mining - production index	Index (1927/29)	STATI	✓	1	0.11	0.08	0.08	0.08	0.06
Mining - employed workers in saltpeter industry	1000s	STATI	✓	0	0.12	0.09		0.08	0.07
Mining - employed workers in copper Industry	1000s	STATI	✓	0	0.11	0.08		0.08	0.06
Copper - production	1000 tons	STATI	✓	1	0.09	0.06		0.06	0.05
Coal - production	1000 tons	STATI	✓	5	0.11	0.07		0.07	0.06
Electric energy - production	Index (1927/1929)	STATI	✓	3	0.13	0.09	0.11	0.08	0.07
Tissues - production	Index (1927/1929)	STATI	✓	3	0.10	0.07	0.11	0.06	0.05
Shoes - production	Index (1927/1929)	STATI	✓	5	0.12	0.08	0.12	0.08	0.06
Glass Manufactures - production	Index (1927/1929)	STATI	✓	3	0.09	0.06	0.09	0.06	0.05
Paper - production	Index (1927/1929)	STATI	✓	6	0.01	0.01	0.05	0.00	0.00
Retail sales (Santiago)	Index (1932/1934)	STATI	✓	2		0.06	0.09	0.05	0.05
Trade									
Imports - total	m Gold Peso	STATI	✓	3		0.07	0.08	0.07	0.06
Exports - total	m Gold Peso	STATI	✓	3		0.07	0.07	0.07	0.06
Exports - wool (washed)	tons	STATI	✓	6				-0.00	-0.00
Exports - copper	1000 tons	STATI	✓	5				0.05	0.04
Prices									
Wholesale prices - general index	Index (1913)	STATI	✓	1					
Money, Banking, Stock Markets									
Clearings	m Pesos	STATI	✓	2		0.08	0.12	0.07	0.07
Central bank - bank rate	%	STATI		0					-0.01
Commercial banks - bills of exchanges and advances	m Pesos	STATI	✓	0					0.04
Commercial banks - deposits	m Pesos	STATI	✓	1					0.03
Saving banks - deposits	m Pesos	STATI	✓	0					0.07
Stock market - general index	Index (1927)	STATI	✓	0		0.04	0.08	0.03	0.03
Number of Variables					10	15	11	17	21
Variance explained					55	51	51	46	42

Comments

- *Production series*: Values for 1927-29 were previously indexed to January 1927. They had to be re-based to 1927-29 to make them comparable with later values.
- *Workers in saltpeter industry*: Value for February 1934 was missing and linearly interpolated-
- *Retail sales (Santiago)*: Two indices were linked via re-basing. One is based on 20 companies and their branches, the other on 18.
- *Commercial banks series* : Series from the two editions of the STATI differ marginally for 1932–1934. The ones taken from 1937 edition adjust for the value of foreign deposits.
- *Wholesale prices - general index*: 1927 based on consumer prices from the STATI, which are based on 1913. This is an imperfect solution, but no wholesale prices have been calculated for the period prior to 1928 at any frequency. From 1932, a conversion is necessary to reflect prices in gold pesos rather than paper pesos (the conversion rate is 2:1).

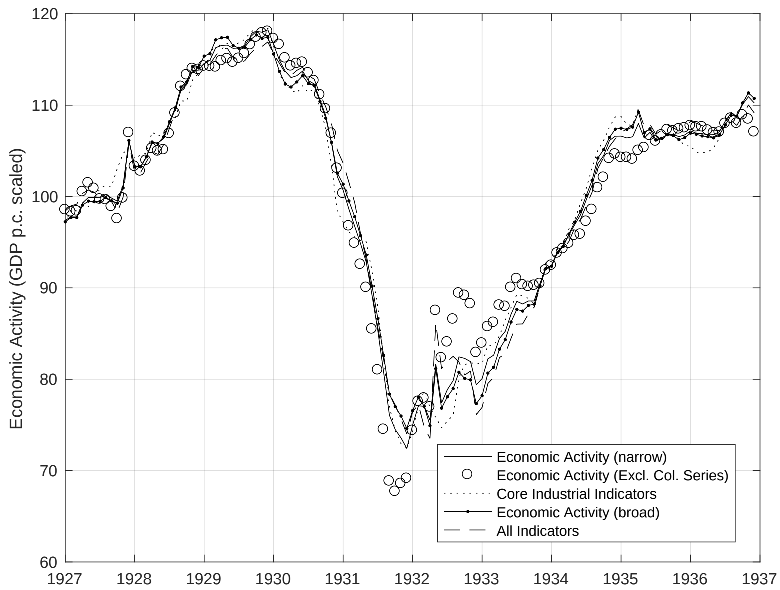


FIGURE A2.58: Economic Activity Index (GDP p.c. scale) - Chile (Level)

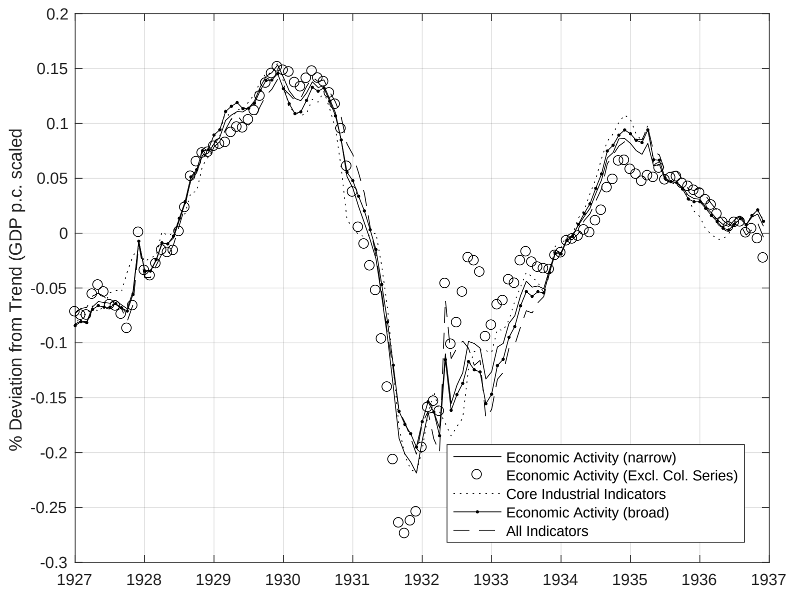


FIGURE A2.59: Economic Activity Index (GDP p.c. scale) - Chile (Cycle)

Mexico

TABLE A2.35: DATA MEXICO

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Oil - production	1000 hectoliter	STATI	✓	2		0.07	0.07	0.06	0.04
Copper - production	tons	STATI	✓	6		0.12	0.12	0.11	0.08
Lead - production	tons	STATI	✓	6		0.12	0.12	0.11	0.08
Zinc - production	tons	STATI	✓	6		0.13	0.13	0.11	0.08
Gold - production	kg	STATI	✓	6		0.09	0.09	0.08	0.06
Silver - production	tons	STATI	✓	6		0.13	0.13	0.12	0.08
Trade									
Imports - total	m Pesos	STATI	✓	5		0.12	0.12	0.11	0.08
Exports - total	m Pesos	STATI	✓	5		0.10	0.10	0.10	0.06
Exports - vegetables	m Pesos	STATI	✓	6				0.01	0.01
Exports - minerals	m Pesos	STATI	✓	6				0.08	0.05
Prices									
Wholesale prices - general index	Index (1929=100)	STATI	✓	2					
Money, Banking, Stock Markets									
Central bank - currency in circulation	m Pesos	STATI		0					-0.01
All banks - liquid assets	m Pesos	STATI	✓	1					0.05
All banks - short-term loans	m Pesos	STATI	✓	0		0.12	0.12	0.11	0.09
All banks - long-term loans	m Pesos	STATI	✓	1					0.02
All banks - other loans	m Pesos	STATI	✓	2					-0.06
All banks - sight liabilities	m Pesos	STATI	✓	1					0.00
All banks - future liabilities	m Pesos	STATI	✓	1					0.08
All banks - other liabilities	m Pesos	STATI	✓	1					0.06
Number of Variables					6	9	9	11	18
Variance explained					62	59	59	51	39

Comments

- *All banks series*: Those include the central bank.
- *Wholesale prices - general index*: The values for 1927–1929 are based on retail prices from the League of Nations (1929, p. 277), which have been based on 1929. Values for 1927 are linearly interpolated from quarterly data. From 1930 on, they are simply wholesale prices.

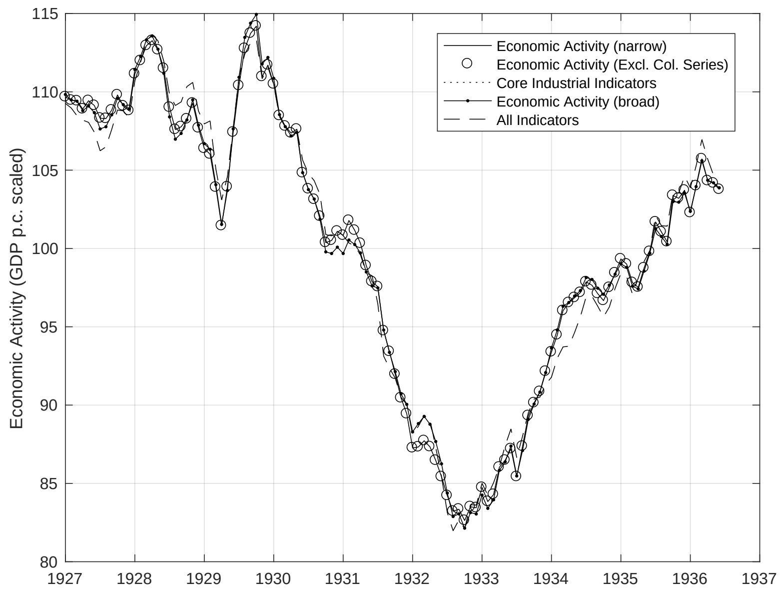


FIGURE A2.60: Economic Activity Index (GDP p.c. scale) - Mexico (Level)

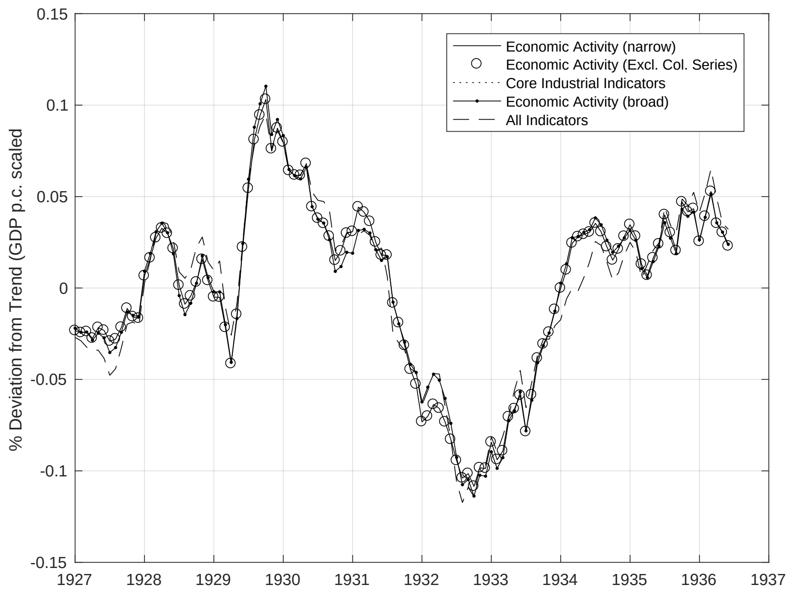


FIGURE A2.61: Economic Activity Index (GDP p.c. scale) - Mexico (Cycle)

United States

TABLE A2.36: DATA UNITED STATES

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Industrial production - general index	Index (1932/1934)	STATI	✓	0	0.05	0.03	0.03	0.02	0.02
Employment - machinery manufacturing	Index (1932/1934)	STATI	✓	0	0.04	0.03	0.03	0.02	0.02
Employment - textile industries	Index (1932/1934)	STATI	✓	0	0.04	0.02	0.03	0.02	0.01
Production - mining	Index (1932/1934)	STATI	✓	3	0.04	0.03	0.03	0.02	0.01
Production - capital goods	Index (1932/1934)	STATI	✓	0	0.05	0.03	0.03	0.02	0.02
Production - consumption goods	Index (1932/1934)	STATI	✓	3	0.04	0.02	0.02	0.01	0.01
Production - foodstuffs	Index (1932/1934)	STATI	✓	3	0.01	0.01	0.01	0.01	0.00
Production - petroleum refineries	Index (1932/1934)	STATI	✓	1	0.04	0.03	0.03	0.02	0.01
Production - flat glass	Index (1932/1933)	STATI	✓	3	0.04	0.02	0.03	0.02	0.01
Production - caoutchouc industries	Index (1932/1934)	STATI	✓	2	0.04	0.02	0.02	0.01	0.01
Production - tires	Index (1932/1934)	STATI	✓	2	0.03	0.02	0.02	0.01	0.01
Production - textiles	Index (1932/1934)	STATI	✓	2	0.03	0.02	0.02	0.01	0.01
Production - shoes	Index (1932/1934)	STATI	✓	3	0.03	0.01	0.02	0.01	0.01
Production - electricity	m kWh	STATI	✓	1	0.04	0.03	0.03	0.02	0.02
Construction - contracts	m Dollars	STATI	✓	2		0.02	0.02	0.01	0.01
Warehouses - turnover	Index (1932/1934)	STATI	✓	4		0.01	0.01	0.01	0.01
Warehouses - stocks	Index (1932/1934)	STATI	✓	1		0.00	0.00	0.00	0.00
Raw materials - stocks (total)	Index (1923/1925)	STATI	✓	1	-0.01	-0.01		-0.01	-0.00
Raw materials - stocks (foodstuffs)	Index (1923/1925)	STATI	✓	1	0.01	0.01	0.01	0.00	0.00
Raw materials - stocks (metals)	Index (1923/1925)	STATI	✓	3	-0.01	-0.00	-0.00	-0.00	-0.00
Raw materials - stocks (textiles)	Index (1923/1925)	STATI	✓	1	-0.03	-0.02	-0.02	-0.01	-0.01
Fully-manufactured goods - stocks (all)	Index (1923/1925)	STATI	✓	1	0.03	0.02		0.02	0.01
Fully-manufactured goods - stocks (foodstuffs)	Index (1923/1925)	STATI	✓	0	0.03	0.01	0.02	0.01	0.01
Fully-manufactured goods - stocks (iron and steel products)	Index (1923/1925)	STATI	✓	2	0.04	0.02	0.03	0.02	0.01
Fully-manufactured goods - stocks (textiles)	Index (1923/1925)	STATI	✓	1	0.03	0.01	0.01	0.01	0.01
Fully-manufactured goods - stocks (caoutchouc-based products)	Index (1923/1925)	STATI	✓	1	0.03	0.02	0.02	0.02	0.01
Wheat - stocks	1000 tons	STATI	✓	2	0.00	0.00	0.00	-0.00	-0.00
Wheat flower - stocks	1000 tons	STATI	✓	3	0.03	0.02	0.02	0.01	0.01
Cotton - stocks	1000 Bags	STATI	✓	1	-0.03	-0.02	-0.02	-0.01	-0.01
Silk - stocks	1000 Bags	STATI	✓	2	-0.00	-0.00	-0.00	-0.00	-0.00
Crude oil - stocks	1000 tons	STATI	✓	0	0.02	0.01	0.02	0.01	0.01
Railways - transported goods (mean number of cars per week)	1000s	STATI	✓	1	0.05	0.03	0.03	0.02	0.02
Railways - cargo	Index (1932/1934)	STATI	✓	4	0.04	0.03		0.02	0.02
Working hours (9000 Firms)	Index (1932/1933)	STATI	✓	3	0.04	0.02	0.02	0.01	0.01
Industrial workers - average weekly salary	Dollars	STATI	✓	1		0.02	0.02	0.01	0.01
Wage bill - all industries (excluding mining)	Index (1923/1925)	STATI	✓	0		0.03	0.03	0.02	0.02
Bankruptcies (number)	Number	STATI	✓	2	-0.03	-0.02	-0.02	-0.01	-0.01
Bankruptcies (volume)	m Dollars	STATI	✓	4		-0.02		-0.02	-0.01
Trade									
Imports - total	m Dollars	STATI	✓	2		0.03	0.03	0.02	0.02
Exports - total	m Dollars	STATI	✓	2		0.03	0.03	0.02	0.02
Imports - food and beverages	m Dollars	STATI	✓	5				0.02	0.01
Imports - raw and semi-manufactured goods	m Dollars	STATI	✓	2				0.02	0.01
Imports - fully-manufactured goods	m Dollars	STATI	✓	2				0.02	0.01
Exports - food and beverages	m Dollars	STATI	✓	3				0.01	0.01
Exports - raw and semi-manufactured goods	m Dollars	STATI	✓	3				0.01	0.01
Exports - manufactured goods	m Dollars	STATI	✓	2				0.02	0.02
Exports - capital goods	m Dollars	STATI	✓	2				0.02	0.02
Exports - consumption goods	m Dollars	STATI	✓	2				0.02	0.02
Imports - caoutchouc	1000 tons	STATI	✓	6				0.01	0.01
Imports - wool & animal hair	tons	STATI	✓	3				0.02	0.01
Imports - raw silk	1000 tons	STATI	✓	3				0.02	0.01
Imports - copper	tons	STATI	✓	6				0.01	0.01
Imports - paper (newspaper)	1000 tons	STATI	✓	4				0.02	0.02
Exports - wheat and flour	1000 tons	STATI	✓	3				0.00	0.00
Exports - raw cotton	1000 bags	STATI	✓	6				-0.01	-0.01
Exports - timber	1000 cbm	STATI	✓	5				0.02	0.01
Exports - refined copper	1000 tons	STATI	✓	3				0.01	0.01
Exports - cars	1000s	STATI	✓	3				0.02	0.01

Table continues on the following page.

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Prices									
Wholesale prices - general index (Fisher's index)	Index (1926)	STATI	✓	0					
Wholesale prices - agricultural products	Index (1926)	STATI	✓	0					
Wholesale prices - foodstuffs	Index (1926)	STATI	✓	1					
Wholesale prices - industrial goods	Index (1926)	STATI	✓	0					
Wholesale prices - raw materials	Index (1926)	STATI	✓	0					
Wholesale Prices - semi-manufactured goods	Index (1926)	STATI	✓	0					
Wholesale prices - fully-manufactured goods	Index (1926)	STATI	✓	0					
Wholesale prices - wheat	$ bushel	STATI	✓	2					
Wholesale prices - cacao	Cents per lb.	STATI	✓	1					
Wholesale prices -Sugar	Cents per lb.	STATI	✓	2					
Wholesale prices - lard	Dollars per 100 lb.	STATI	✓	2					
Wholesale prices - cotton	Cents per lb.	STATI	✓	2					
Wholesale prices - oxen skins	Cents per lb.	STATI	✓	1					
Wholesale prices - petroleum	Dollars per 42 gallons	STATI	✓	1					
Wholesale prices - petroleum (for lamps)	Cents per gallons	STATI	✓	1					
Wholesale prices - steel	Cents per lb.	STATI	✓	1					
Wholesale prices - copper	Cents per lb.	STATI	✓	1					
Agricultural prices - general	Index (1909(8)/1914(7))	STATI	✓	1					
Agricultural prices - grain	Index (1909(8)/1914(7))	STATI	✓	1					
Agricultural prices - dairy products	Index (1909(8)/1914(7))	STATI	✓	1					
Agricultural prices - meat	Index (1909(8)/1914(7))	STATI	✓	1					
Agricultural prices - cotton & cotton seeds	Index (1909(8)/1914(7))	STATI	✓	2					
Agricultural prices - prices for farm supplies	Index (1909(8)/1914(7))	STATI	✓	0					
Agricultural prices - purchasing power of agricultural products	Index (1923)	STATI	✓	2					
Consumer prices - general index	Index (1923)	STATI	✓	0					
Consumer prices - foodstuffs	Index (1923)	STATI	✓	0					
Consumer prices - property	Index (1923)	STATI	✓	0					
Consumer prices - clothes	Index (1923)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - lending (total)	Index (1932/1934)	STATI		0					-0.01
Central bank - discounted Bills of Exchange	Index (1932/1934)	STATI		0					-0.01
Central bank - acquired bills of exchange	m Dollars	STATI		0					-0.00
Central bank - government bonds	m Dollars	STATI		0					-0.01
Central bank - currency in circulation	m Dollars	STATI		0					-0.01
Central bank - total deposits	m Dollars	STATI		0					0.01
Central bank - cash in circulation	m Dollars	STATI		0					-0.01
Clearings - direct debit (New York)	m Dollars	STATI	✓	3		0.02	0.03	0.02	0.01
Clearings - direct debit (outside of New York)	m Dollars	STATI	✓	2		0.02	0.03	0.02	0.01
Central bank - bank rate	%	STATI		0					-0.00
Interest rates - bankers' acceptances	%	STATI	✓	1					-0.00
Interest rates - commercial bills	%	STATI	✓	1					-0.00
Interest rates - call money (daily)	%	STATI	✓	1					0.00
Interest rates - time deposits	%	STATI	✓	1					0.00
Interest rates - debit (New York)	%	STATI	✓	1					-0.01
Interest rates - debit (27 cities)	%	STATI	✓	0					-0.01
Interest rates - real interest rate of 60 bonds (industrial, railways, public utilities, municipal)	%	STATI	✓	1					-0.01
Interest rates - real interest rate of 15 industrial bonds	%	STATI	✓	1					-0.01
Interest rates - real interest rate of 15 railway bonds	%	STATI	✓	2					-0.01
Interest rates - real interest rate of 15 public utilities bonds	%	STATI	✓	2					-0.01
Interest rates - real interest rate of 15 municipal bonds	%	STATI	✓	1					-0.01
Commercial banks (members of the Federal Reserve System) - Cash	Index (1932/1933)	STATI	✓	2					-0.00
Commercial banks (members of the Federal Reserve System) - credits with the federal reserve	m Dollars	STATI	✓	1					0.00
Commercial banks (members of the Federal Reserve System) - advances and securities	b Dollars	STATI	✓	1					0.00
Commercial banks (members of the Federal Reserve System) - securities (incl. Government Bonds)	m Dollars	STATI	✓	0					-0.01
Commercial banks (members of the Federal Reserve System) - net sight deposits	b Dollars	STATI	✓	1					-0.00
Commercial banks (members of the Federal Reserve System) - time deposits	b Dollars	STATI	✓	0					0.00
Commercial banks (members of the Federal Reserve System) - debt with reserve banks	m Dollars	STATI	✓	6					-0.01
Emissions - new capital (total, excluding convertible issuances)	m Dollars	STATI	✓	6		0.02		0.02	0.02
Stock market - emissions	m Dollars	STATI	✓	6		0.02	0.03	0.02	0.01
Bond market - emissions (all bonds)	m Dollars	STATI	✓	6		0.02	0.02	0.01	0.01
Bond market - emissions (companies)	m Dollars	STATI	✓	6		0.00	0.00	0.00	0.00
Stock market - general index	Index (1926)	STATI	✓	1		0.03		0.02	0.02
Stock market - 347 industrial stocks	Index (1926)	STATI	✓	0		0.03	0.03	0.02	0.02
Stock market - railways stocks	Index (1932/1934)	STATI	✓	1		0.02	0.03	0.02	0.01
Stock market - 40 Public utility stocks	Index (1932/1934)	STATI	✓	1		0.02	0.02	0.01	0.01
Bond market - government bonds	Index (1932/1934)	STATI	✓	1		-0.02	-0.03	-0.02	-0.01
Bond market - 40 prime bonds	Index (1932/1935)	STATI	✓	2		0.01	0.01	0.01	0.01
Bond market - 10 industrial bonds	Index (Face Value = 100)	STATI	✓	1		0.02	0.02	0.01	0.01
Stock market - transactions (number)	m	STATI	✓	3		0.01	0.02	0.01	0.01
Bond market - transactions (volume)	m Dollars (Face Value)	STATI	✓	5		-0.00	-0.00	-0.00	-0.00
Number of Variables					32	55	49	73	99
Variance explained					47	48	47	49	42

Comments

- For the following indicators, two series have been linked: *Industrial production - general* *index, Employment - machinery manufacturing, Production - mining, Production - foodstuffs, Production - petroleum refineries , Production - flat glass, Production - caoutchouc industries, Production - tires, Production - textiles, Warehouses - turnover, Warehouses - stocks, Railways - cargo, Central bank - lending (total), Central bank - discounted Bills of Exchange, Central bank - acquired bills of exchange, Central bank - government bonds, Central bank - total deposits, Stock market - railways stocks, Stock market - 40 Public utility stocks, Bond market - government bonds, Bond market - 40 prime bonds*.

- *Fully-manufactured goods - stocks (iron and steel products) & Fully-manufactured goods - stocks (Textiles)*: Values for November & December 1936 are assumed to take those of October 1936.
- *Stocks - wheat flower*: Values for October, November & December 1936 are assumed to take those of September 1936.
- *Wholesale prices - petroleum (for lamps)*: Value for December 1935 was assumed to take the one of November 1935.
- *Consumer prices - general, Consumer prices -foodstuffs, Consumer prices - property & Consumer prices - clothes* : Slightly different numbers in the two publications, the latter were assumed to be correct.
- Indicators of *Commercial banks (members of the Federal Reserve System)*: The series comprise 101 Cities until December 1931, 90 thereafter. Series have been linked via re-basing the series to a common base year.
- *Bond market - transactions (volume)*: There is a strong increase in 1936, but it does not seem to be a mis-recording of data.

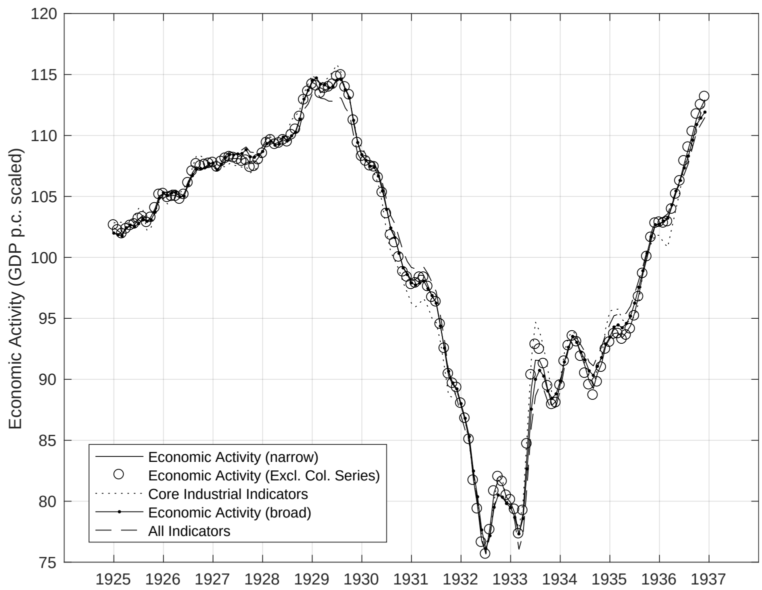


FIGURE A2.62: Economic Activity Index (GDP p.c. scale) - United States (Level)

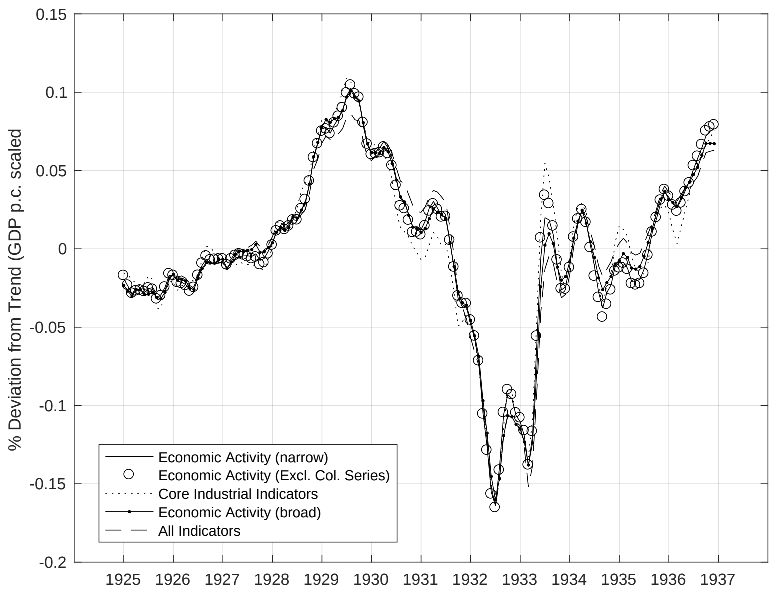


FIGURE A2.63: Economic Activity Index (GDP p.c. scale) - United States (Cycle)

Oceania

Australia

TABLE A2.37: DATA AUSTRALIA

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Wheat stocks	1000 tons	STATI	✓	4		0.02	0.03	0.01	0.01
Unemployed union members - total	1000s	STATI	✓	0		-0.17		-0.09	-0.09
Unemployed union members - mining	%	STATI	✓	0		-0.11	-0.14	-0.07	-0.07
Unemployed union members - metal industries	%	STATI	✓	0		-0.15	-0.18	-0.08	-0.07
Unemployed union members - textile industries	%	STATI	✓	0		-0.13	-0.16	-0.07	-0.06
Unemployed union members - foodstuffs	%	STATI	✓	0		-0.12	-0.14	-0.07	-0.07
Unemployed union members - construction sector	%	STATI	✓	0		-0.15	-0.18	-0.08	-0.08
Trade									
Imports - total	1000 Pounds	STATI	✓	3		0.14	0.18	0.09	0.09
Exports - total	1000 Pounds	STATI	✓	3		0.01	0.01	-0.01	-0.00
Imports - food and beverages	1000 Pounds	STATI	✓	4				0.09	0.08
Imports - raw and semi-manufactured goods	1000 Pounds	STATI	✓	3				0.08	0.08
Imports - fully-manufactured goods	1000 Pounds	STATI	✓	3				0.09	0.09
Exports - food and beverages	1000 Pounds	STATI	✓	3				-0.03	-0.03
Exports- raw and Semi-manufactured goods	1000 Pounds	STATI	✓	3				0.02	0.02
Exports - wheat	1000 tons	STATI	✓	5				-0.04	-0.04
Exports - butter	1000 tons	STATI	✓	4				-0.06	-0.06
Exports - wool (non-washed)	1000 tons	STATI	✓	5				-0.01	-0.01
Exports - wool (washed)	1000 tons	STATI	✓	5				-0.01	-0.01
Exports - gold and silver	1000 Pounds	STATI	✓	6				0.02	0.01
Prices									
Wholesale prices - general index	Index (1911)	STATI	✓	0					
Consumer prices - food prices	Index (1923/27)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	mPounds	STATI		0					-0.02
Central bank - currency in circulation	m Pounds	STATI		0					0.02
Central bank - bank rate	%	STATI		0					0.00
Number of Variables					7	9	8	19	22
Variance explained					56	51	46	38	33

Comments

- All *Unemployed union members* series: I employ a cubic spline interpolation to convert mid-of-quarter data into monthly data. All other series are monthly.
- The results for the Economic Activity Index excluding collinear series are shown despite being based only on 8 series.

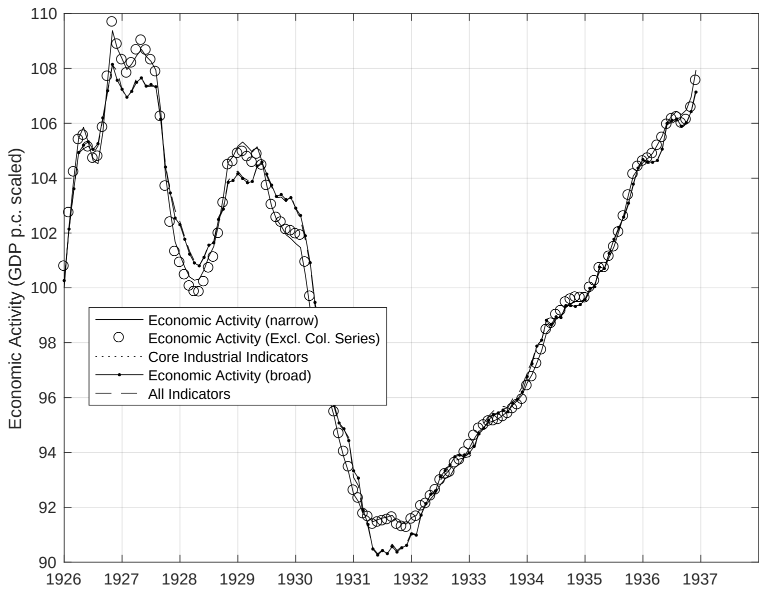


FIGURE A2.64: Economic Activity Index (GDP p.c. scale) - Australia (Level)

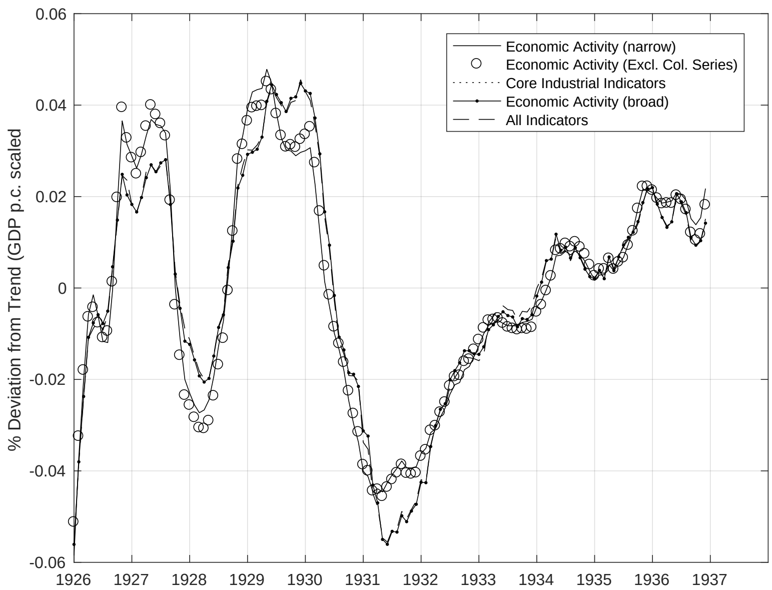


FIGURE A2.65: Economic Activity Index (GDP p.c. scale) - Australia (Cycle)

New Zealand

TABLE A2.38: DATA NEW ZEALAND

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Construction permits	1000 Pounds	STATI	✓	4		0.09	0.12	0.08	0.08
Incoming ships	1000 NRT	STATI	✓	6		0.03	0.05	0.03	0.03
Unemployed	Index(1932/1934)	STATI	✓	1		-0.09	-0.11	-0.08	-0.08
Trade									
Imports - total	m Pounds	IAES	✓	6		0.10	0.12	0.09	0.09
Exports - total	m Pounds	IAES	✓	6		0.04	0.05	0.03	0.03
Exports - butter	tons	STATI	✓	6				-0.02	-0.02
Exports - cheese	tons	STATI	✓	6				0.01	0.01
Exports - meat	tons	STATI	✓	6				-0.04	-0.04
Exports - wool	tons	STATI	✓	6				-0.02	-0.02
Prices									
Wholesale prices - general index	Index (1909/13)	STATI	✓	1					
Consumer prices - food prices	Index (1926/30)	STATI	✓	0					
Money, Banking, Stock Markets									
Stock market - general index	Index (1926)	STATI	✓	0		0.06	0.08	0.05	0.05
Mortgages - registered (cases)	1000s	IAES	✓	2		0.10		0.09	0.09
Mortgages - registered (volume)	m Pounds	IAES	✓	3		0.10	0.12	0.09	0.09
Mortgages - discharged (cases)	1000s	IAES	✓	2		0.10	0.12	0.09	0.09
Mortgages - discharged (volume)	m Pounds	IAES	✓	4		0.10	0.12	0.09	0.09
Land transfers - registered (cases)	1000s	IAES	✓	3		0.10		0.09	0.09
Land transfers - registered (volume)	m Pounds	IAES	✓	4		0.09	0.12	0.09	0.09
Number of Variables					3	12	10	16	16
Variance explained					69	68	64	53	53

Comments

- *Unemployed*: extrapolated with male unemployed from 1935 onwards.
- *Stocks*: Values for December 1926, 1927, 1928, 1930 were missing and therefore linearly interpolated.

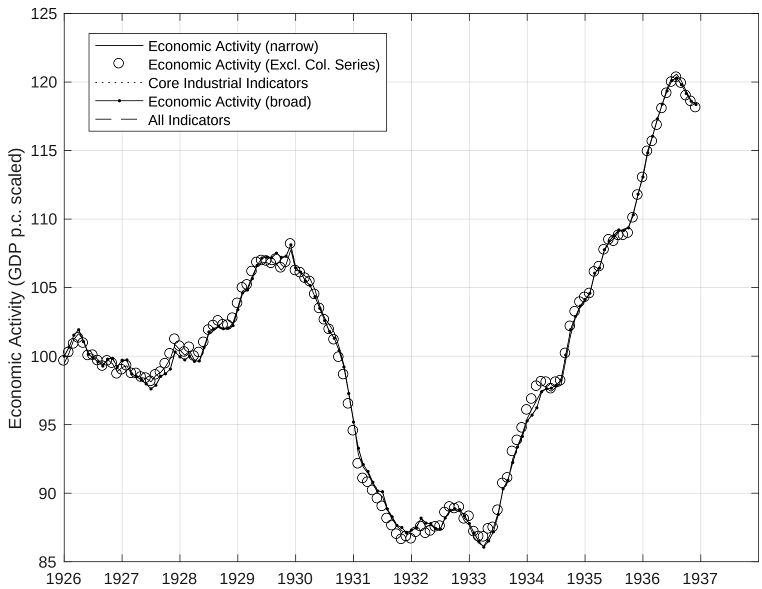


FIGURE A2.66: Economic Activity Index (GDP p.c. scale) - New Zealand (Level)

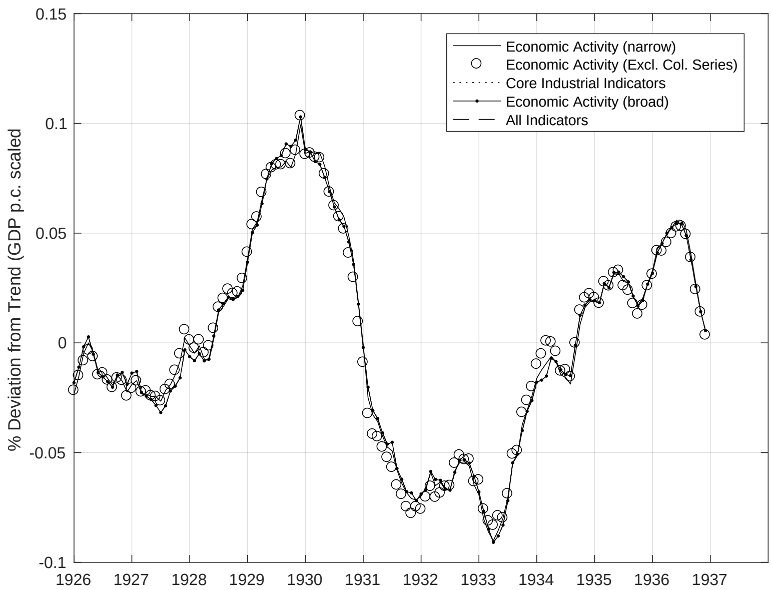


FIGURE A2.67: Economic Activity Index (GDP p.c. scale) - New Zealand (Cycle)

Asia

Japan

TABLE A2.39: DATA JAPAN

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients				
					Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
General Index of Production	Index (1930)	IAES	✓	2		0.09	0.12	0.07	0.05
Warehouses - turnover	m Yen	STATI	✓	3		0.05	0.06	0.04	0.02
Warehouses - stocks (value)	m Yen	STATI	✓	1		0.02		0.01	-0.00
Warehouses - stocks (quantity)	m pieces	IAES	✓	1		0.04		0.03	0.02
Employment (industry)	Index (1926)	STATI	✓	0		0.09	0.12	0.07	0.05
Coal - production	1000 tons	STATI	✓	2		0.08	0.11	0.06	0.05
Textiles - production	Index (1930)	STATI	✓	3		0.09	0.11	0.06	0.04
Silk - production	tons	STATI	✓	6		0.03	0.04	0.02	0.01
Railways - transported goods	1000 tons	STATI	✓	2		0.09	0.12	0.07	0.05
Trade									
Imports - total	m Yen	STATI	✓	3		0.09	0.11	0.07	0.04
Exports - total	m Yen	STATI	✓	2		0.08	0.11	0.06	0.04
Imports - raw cotton	1000 tons	STATI	✓	6				0.02	0.01
Imports - wool	tons	STATI	✓	6				-0.03	-0.02
Imports - coal	1000 tons	STATI	✓	4				0.07	0.04
Imports - pig iron	1000 tons	STATI	✓	5				0.05	0.03
Imports - machines	1000 Yen	STATI	✓	5				0.06	0.04
Exports - raw silk	tons	STATI	✓	4				0.01	0.01
Exports - cotton threads	tons	STATI	✓	2				-0.01	-0.01
Prices									
Wholesale prices - general index	Index (Juli 1914)	STATI	✓	0					
Consumer prices - general index(Tokyo)	Index (Juli 1914)	STATI	✓	0					
Wages	Index (1926)	STATI	✓	0					
Money, Banking, Stock Markets									
Central bank - gold holdings	m Yen	STATI		0					0.02
Central bank - bills of exchange and advances	m Yen	STATI		0					0.01
Central bank - currency in circulation	m Yen	STATI		0					0.02
Central bank - deposits by the government	m Yen	STATI		0					0.00
Central bank - deposits by banks	m Yen	STATI		0					0.03
Clearings	m Yen	STATI	✓	2		0.01	0.02	0.01	-0.00
Central bank - bank rate	%	STATI		0					-0.04
Market rate	%	STATI	✓	0					-0.05
Interest rates - demand deposits	%	STATI	✓	3					-0.04
Clearing banks - cash position	m Yen	STATI	✓	6					0.01
Clearing banks - stocks	m Yen	STATI	✓	1					-0.01
Clearing banks - bills of exchange and advances	m Yen	STATI	✓	1					-0.05
Clearing banks - deposits	m Yen	STATI	✓	0					-0.04
Saving banks - savings	m Yen	STATI	✓	0					-0.05
Stock market - emissions	m Yen	STATI	✓	6		0.05		0.04	0.03
Stock companies - new investments	m Yen	STATI	✓	6		0.06		0.05	0.03
Stock companies - capital losses	m Yen	STATI	✓	6		-0.04		-0.04	-0.02
Stock market - Index (50 Industrial Shares)	Index	IAES	✓	1		0.07	0.09	0.05	0.03
Number of Variables					7	16	11	23	36
Variance explained					54	38	48	34	31

Comments

- *Clearings*: Statistisches Reichsamt (1937, p. 134) and Statistisches Reichsamt (1936, p. 385) report slightly different values for the years 1933 and 1934, which might be due to a revision of the former statistics.
- *Railways - transported goods*: The value for December 1936 was missing and assumed to take the same value as in November.
- *Central bank - gold holdings*: There is little variation until 1930.
- *Central bank - bills of exchange and advances*: The series reported in Statistisches Reichsamt (1937, p. 134) and Statistisches Reichsamt (1936, p. 385) differ slightly in their definition and were hence linked via re-basing them to a common base year.
- *Stock companies - capital losses*: Values for November/December 1935 are assumed to equal those of October.

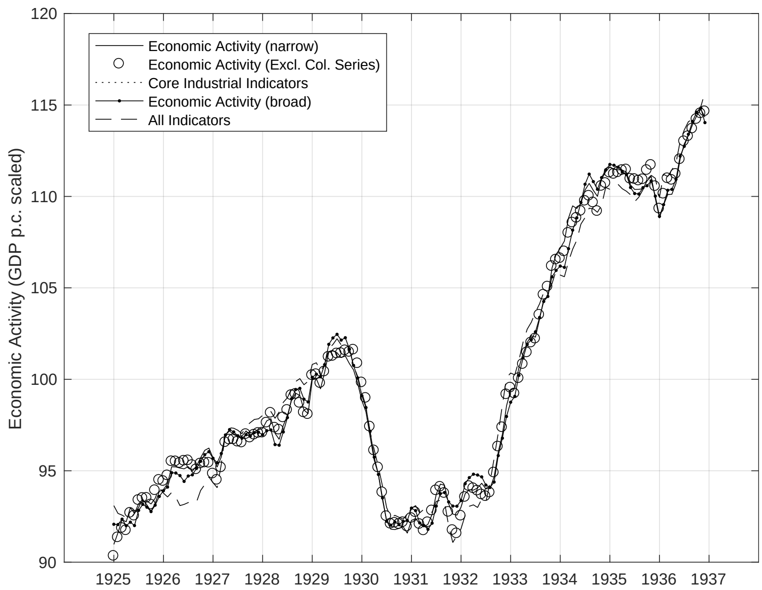


FIGURE A2.68: Economic Activity Index (GDP p.c. scale) - Japan (Level)

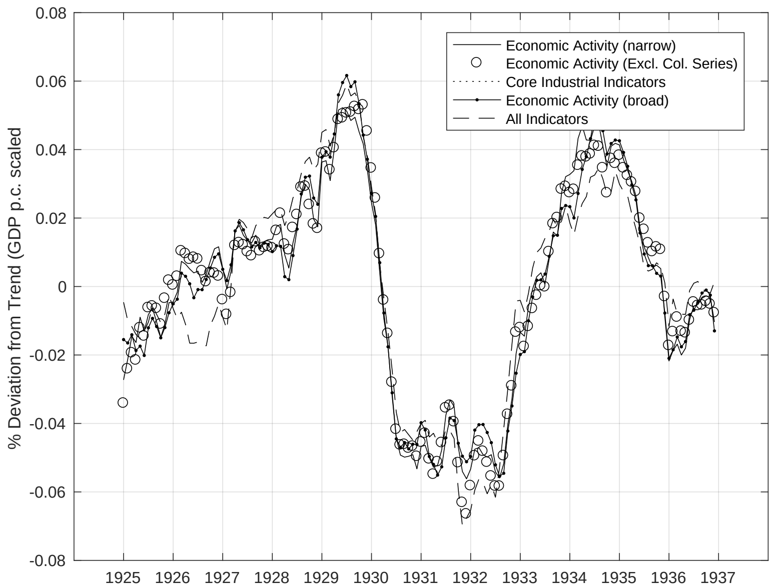


FIGURE A2.69: Economic Activity Index (GDP p.c. scale) - Japan (Cycle)

Africa

South Africa

TABLE A2.40: DATA SOUTH AFRICA

Variable Name	Unit	Source	Seasonal Adjust-ment	MCD Parameter	Principal Component Coefficients: Core Indicators	Economic Activity	Economic Activity (excl. col. series)	Econ Activity & Trade	All
Production, Transport and Employment									
Coal - production	1000 tons	STATI	✓	4		0.12	0.13	0.11	0.06
Employment - employed Europeans in mining	1000s	STATI	✓	2		0.10	0.11	0.09	0.05
Employment - employed non-Europeans in mining	1000s	STATI	✓	1		0.11	0.12	0.10	0.06
Employment - employed Europeans in gold mining	1000s	STATI	✓	0		0.11		0.10	0.06
Unemployment - employed non-Europeans in gold mining	1000s	STATI	✓	0		0.07	0.08	0.07	0.04
Ships incoming - transported goods	1000 NRT	STATI	✓	6		0.07	0.08	0.07	0.03
Unemployment - unemployed Europeans (job seekers)	number	STATI	✓	2		-0.09	-0.10	-0.08	-0.04
Trade									
Imports - total	1000 Pounds	STATI	✓	2		0.11	0.13	0.11	0.07
Exports - total (excluding bullion and coins)	1000 Pounds	STATI	✓	6		0.09	0.10	0.08	0.05
Exports - wool	tons	STATI	✓	4				-0.05	-0.03
Prices									
Wholesale prices - general index	Index (1910=100)	STATI	✓	0					
Consumer prices - general index	Index (1910)	STATI	✓	1					
Consumer prices - foodstuffs	Index (1910)	STATI	✓	1					
Money, Banking, Stock Markets									
Central bank - gold holdings	1000 Pounds	STATI		0					0.05
Central bank - foreign exchange holdings	1000 Pounds	STATI		0					0.05
Central bank - bills of exchange and advances	1000 Pounds	STATI		0					-0.03
Central bank - currency in circulation	1000 Pounds	STATI		0					0.05
Clearings	m Pounds	STATI	✓	3		0.04	0.05	0.04	0.04
Central bank - bank rate	%	STATI		0					-0.04
Private banking - bills of exchange and advances	m Pounds	STATI	✓	0		0.03	0.04	0.03	-0.00
Private banking - demand deposits	m Pounds	STATI	✓	1					0.06
Private banking - long-term deposits	m Pounds	STATI	✓	2					-0.02
Land and agricultural bank - advances	1000 Pounds	STATI	✓	1					-0.07
Saving banks - deposits	1000 Pounds	STATI	✓	0					0.05
Stock market - 6 gold mining stocks in London	Index (1 Jan. 1923)	STATI	✓	0		0.07	0.08	0.07	0.06
Number of Variables					7	12	11	13	22
Variance explained					61	48	46	46	40

Comments

- *Unemployed Europeans*: the value for November 1931 was missing and linearly interpolated. From July 1934 onwards, women are included. There is, however, no structural break in the series at that point.
- *Stock market*: the value for December 1936 was missing and assumed to take the same value as the one for November 1936.
- *Wholesale prices - index*: Quarterly series was converted into monthly frequency by employing a cubic hermite spline.
- *Additional series*: An additional series about gold production is excluded as it would contribute the index negatively. This is absolutely reasonable as the demand for gold (and thus the incentive to produce more) was growing as the world went into the crisis (and South Africa, too).

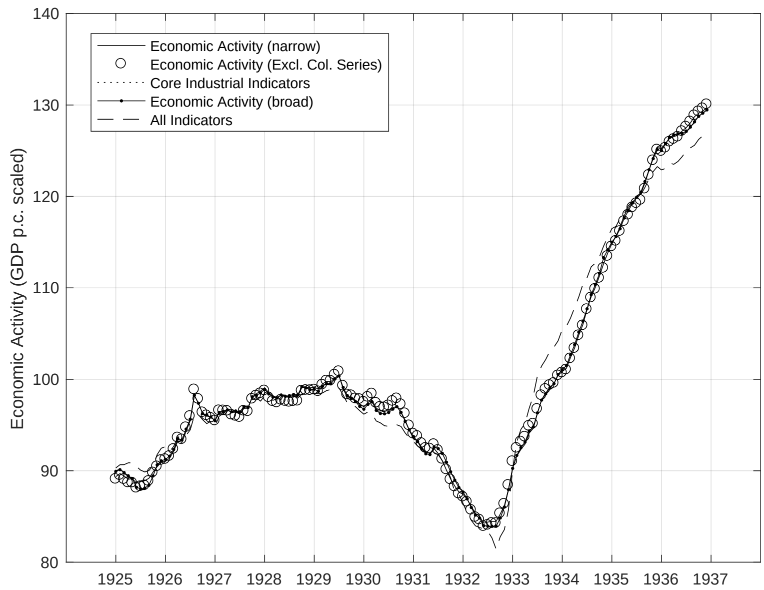


FIGURE A2.70: Economic Activity Index (GDP p.c. scale) - South Africa (Level)

FIGURE A2.71: Economic Activity Index (GDP p.c. scale) - South Africa (Cycle)

2A.16 Robustness - Choice of the Filter

The following appendix documents the robustness of the results with regards to the choice of the filter. For each country, a graph compares the final index based on data filtered by the method proposed by Hodrick and Prescott (1997) with its counterpart filtered with the approach suggested by Christiano and Fitzgerald (2003). The parameter choices for the Hodrick-Prescott filter follow Ravn and Uhlig (2002). For the Christiano-Fitzgerald filter, I choose cutoff frequencies of 6 and 96 months. The comparison shows that the differences for the application of this article are indeed negligible.

The Hodrick-Prescott filter has been subject to critique as it is argued that it introduces spurious correlations. How important is this concern for the results shown in this study? Ultimately, the results for the coefficients in the principal component analysis depend on the strength of the correlation between variables. These in turn form the basis of the weighting for the indices. In order to show that the weighting of the individual series for the final index does not unduly depend on the choice of the filter, two further graphs compare the weights based on the monthly data filtered by the (i) HP-filter, (ii) CF-Filter, and Hamilton's linear projection approach (Hamilton, 2017). A 45° degree line illustrates what the perfect match would be. The deviations are very small for the CF- and HP-filter throughout. The weights also vary little in virtually all cases when the HP- and Hamilton-filter are compared (please notice the scale).[52]

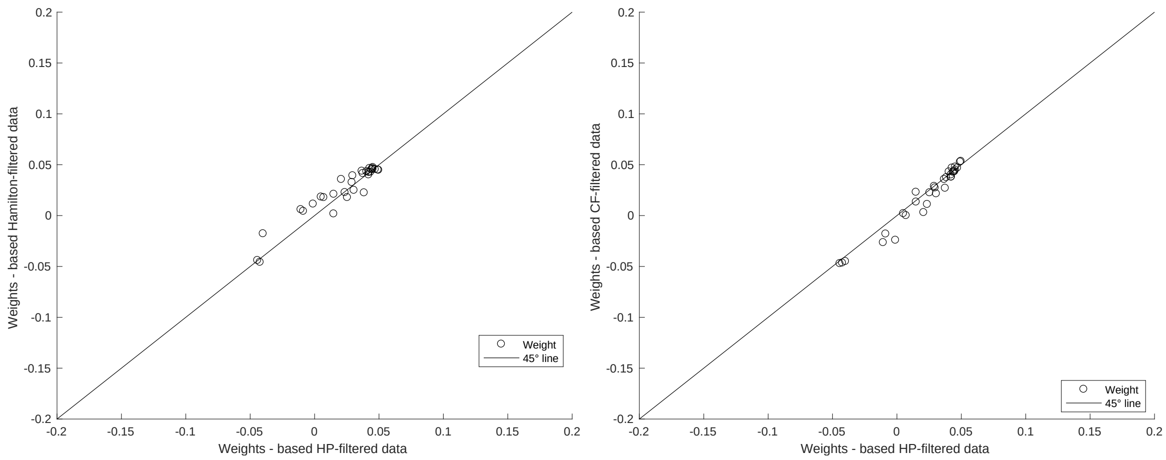
Unfortunately, it is not possible to create the level indices based on the approach by Hamilton (2017) in the particular case of this study (combining different frequencies of data). Given that many GDP series during this period only become available after 1923 (the end of wartime inflations) and only extend until 1938 (the year before the beginning of WW II), the regression would rest on 16 observations only with four parameters and a constant to estimate. Even where more data is available, it is not clear that it is valid to include the war years and or pre-WW I and post-WW II data as those were structurally different from each other. Given so few observations, the regression coefficients for the filter are very imprecisely estimated (small t-values for all lags). This leads to large standard deviations of the cyclical component of the annual data in some cases. More generally, it makes the cycle estimated from the monthly (disaggregated) and annual (GDP) data very incomparable. This is further aggravated by the fact that the way the Hamilton filter is set up, it draws on different information sets depending on the frequency. When filtering quarterly data, Hamilton suggested a forecast horizon of $h_q = 8$ (2 years) and a lag structure of $p = 4$ (1 year). Correspondingly, for annual data $h_a = 2$ and for monthly data $h_m = 24$. However, the information that is used when using the filter with $p = 4$ lags stems from the last four years, whereas for the monthly data it stems from the last 4 months. One could use a different lag structure for monthly data using the lags $t-3,\ t-6,\ t-9,\ t-12$ to mimic the suggestions by Hamilton for quarterly data. This, however, would not change the fact that the annual prediction is based on four years versus one year (or in the "normal case" four months).

[52] This does not necessarily imply that the estimate for the stationary index is exactly the same in all three cases as the three filters focus on slightly different frequency bands. As I re-combine the cyclical (high-frequency) with (low-frequency) trend data, however, this is of little relevance in this context.

Europe

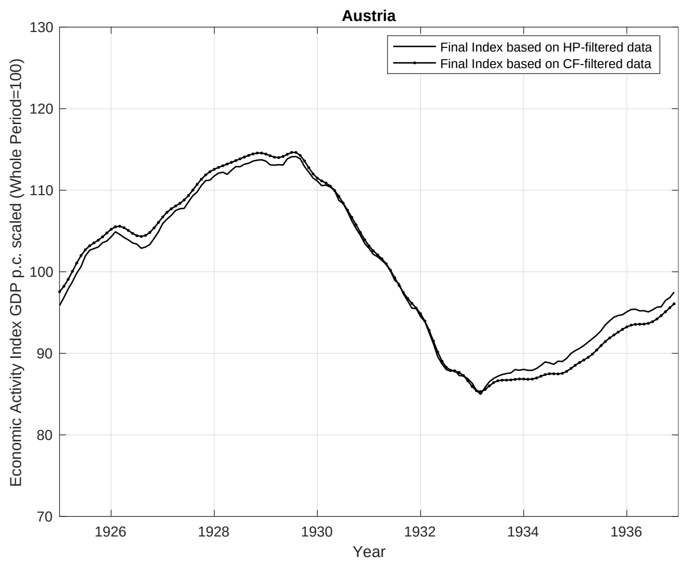
Austria

FIGURE A2.72: Estimated Weights & Choice of Filter



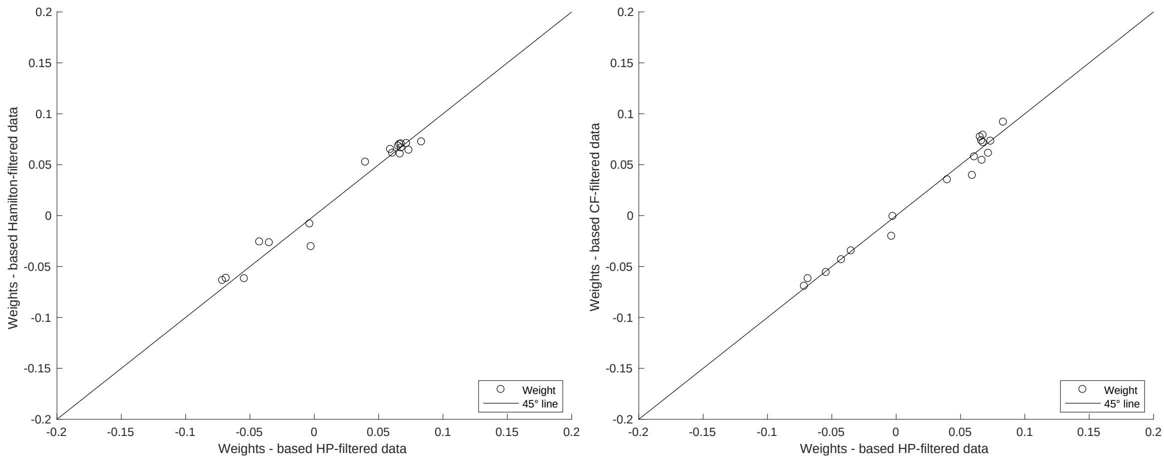
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.73: Final Index in Levels (HP vs. CF Filter)



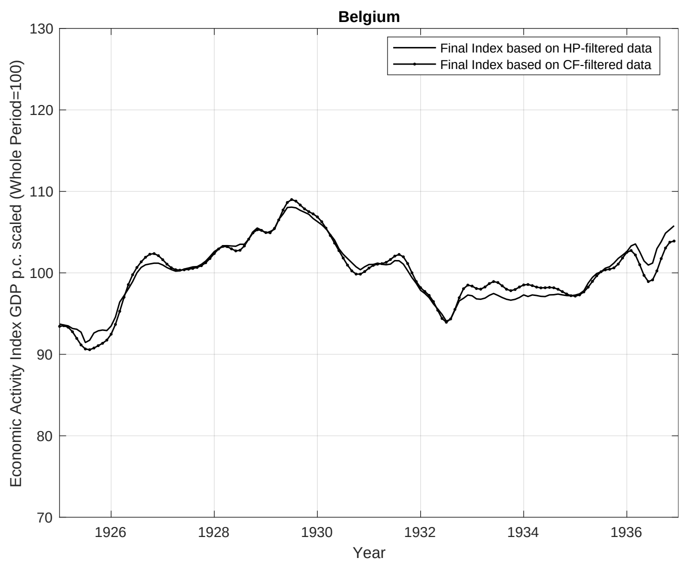
Belgium

FIGURE A2.74: Estimated Weights & Choice of Filter



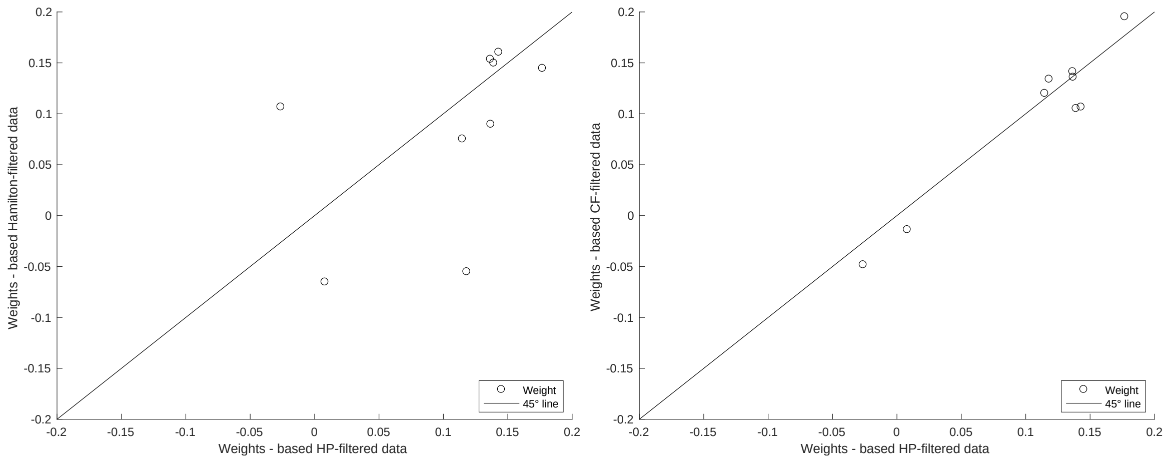
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.75: Final Index in Levels (HP vs. CF Filter)



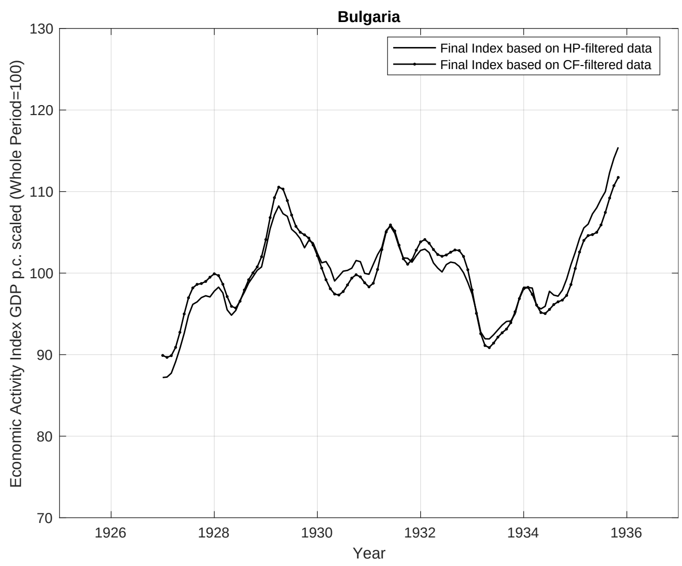
Bulgaria

FIGURE A2.76: Estimated Weights & Choice of Filter



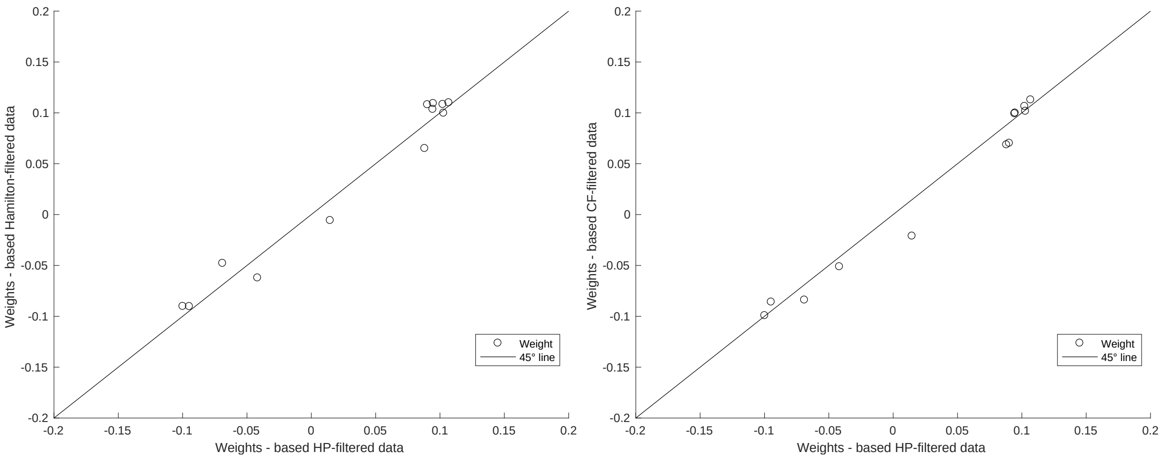
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.77: Final Index in Levels (HP vs. CF Filter)



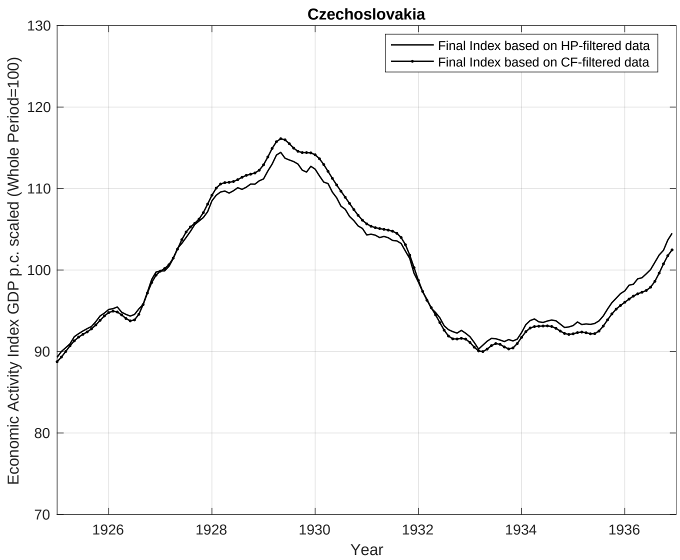
Czechoslovakia

FIGURE A2.78: Estimated Weights & Choice of Filter



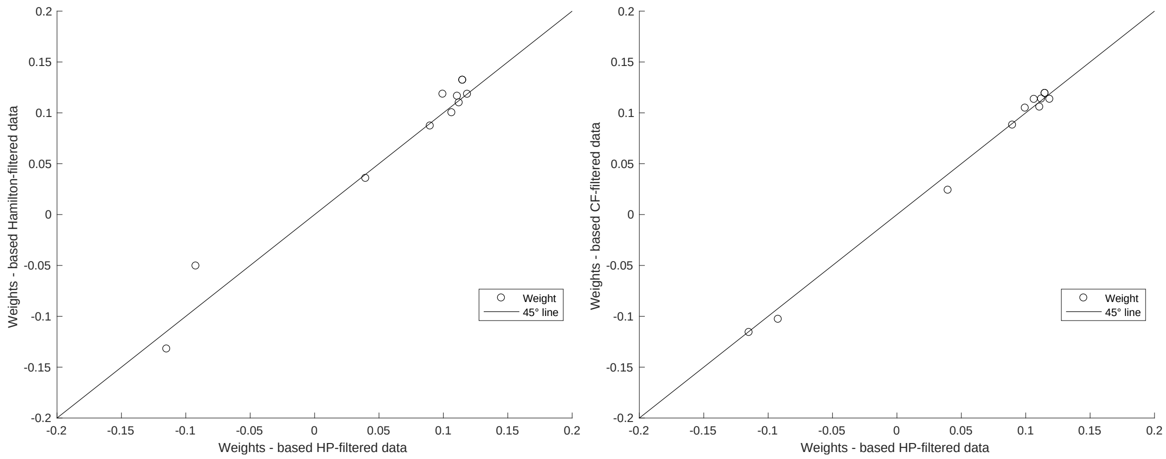
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.79: Final Index in Levels (HP vs. CF Filter)



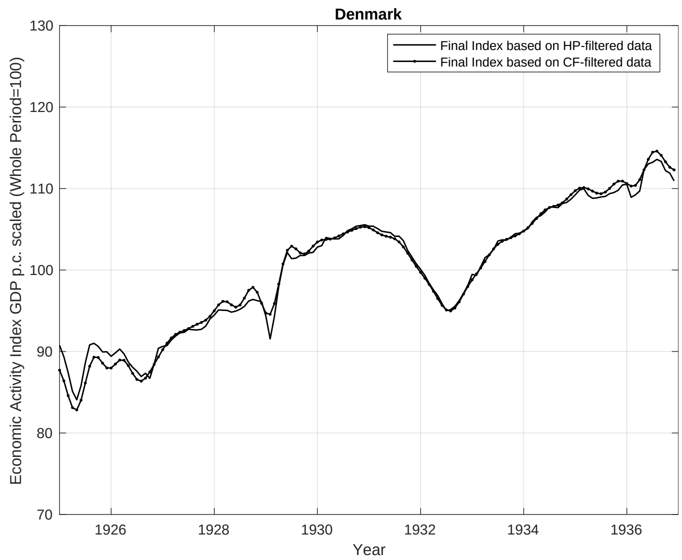
Denmark

FIGURE A2.80: Estimated Weights & Choice of Filter



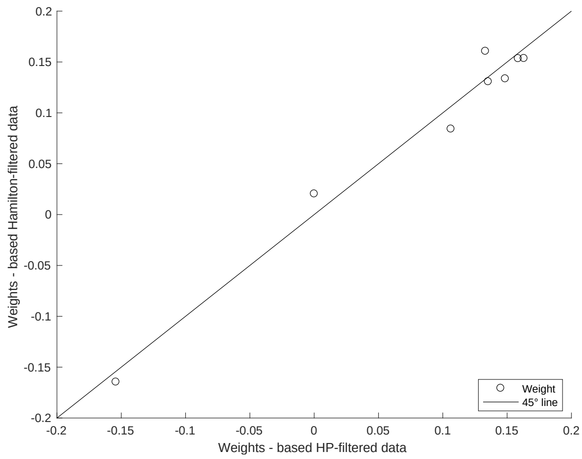
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.81: Final Index in Levels (HP vs. CF Filter)

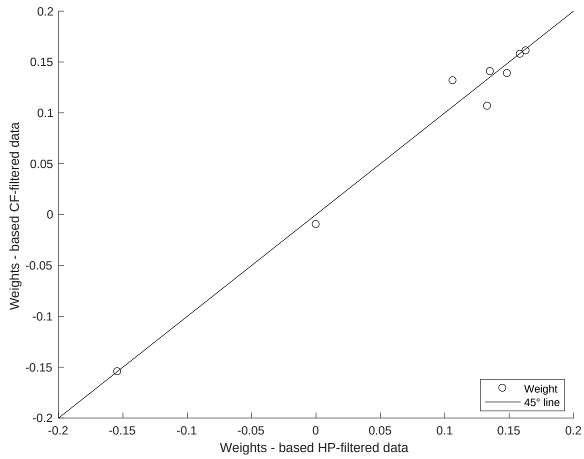


Estonia

FIGURE A2.82: Estimated Weights & Choice of Filter

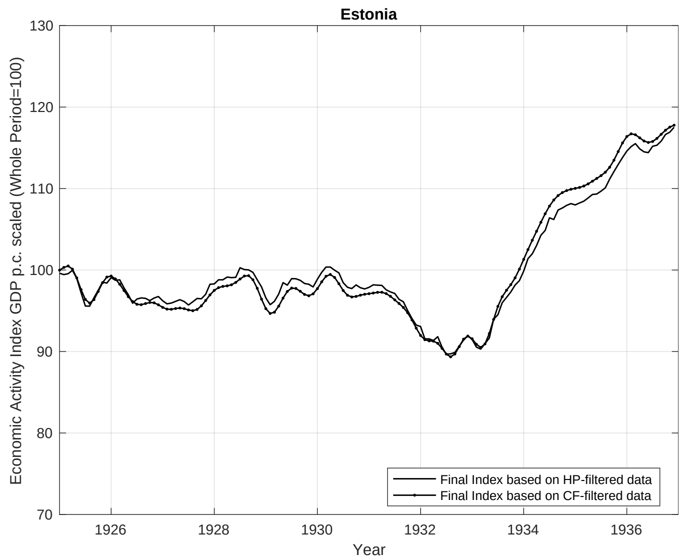


a) Weights with Hamilton Filter vs HP Filter



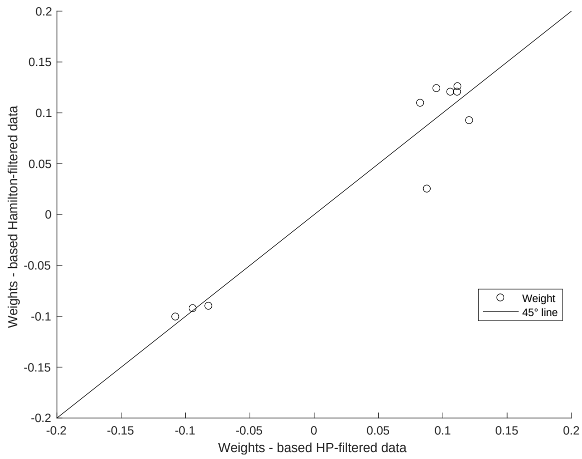
b) Weights with CF Filter vs HP Filter

FIGURE A2.83: Final Index in Levels (HP vs. CF Filter)

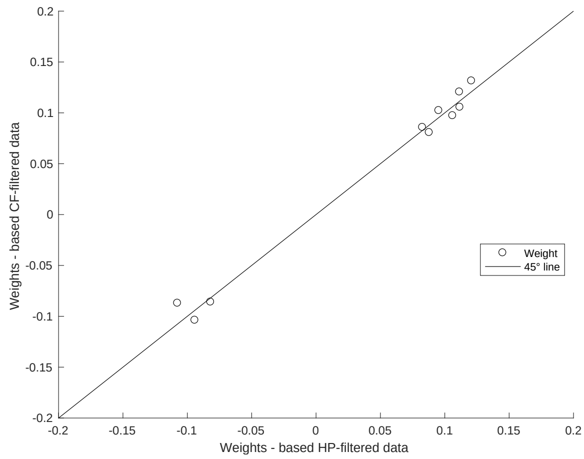


Finland

FIGURE A2.84: Estimated Weights & Choice of Filter

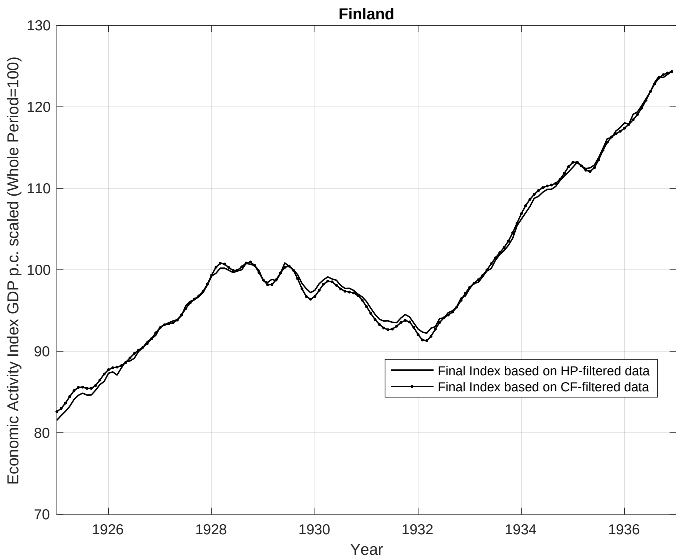


a) Weights with Hamilton Filter vs HP Filter



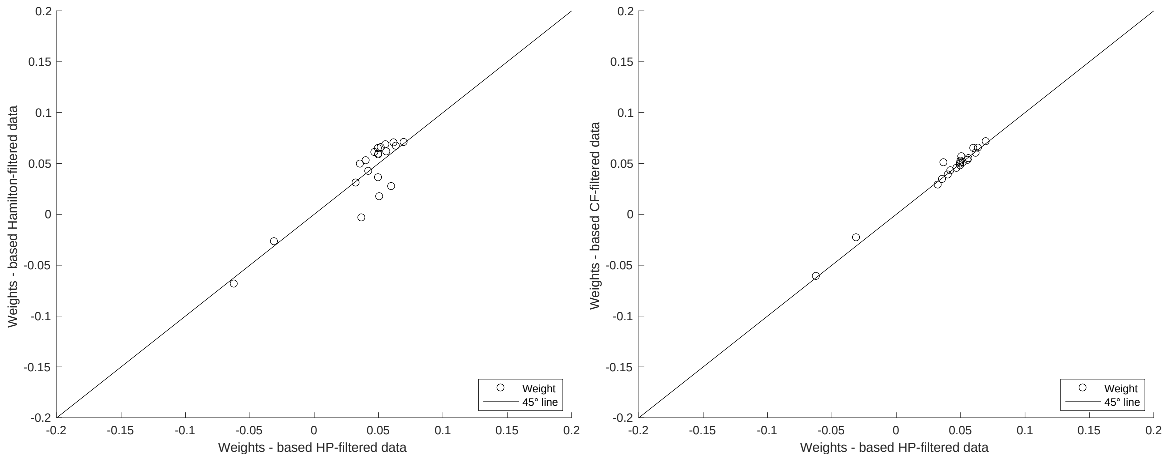
b) Weights with CF Filter vs HP Filter

FIGURE A2.85: Final Index in Levels (HP vs. CF Filter)



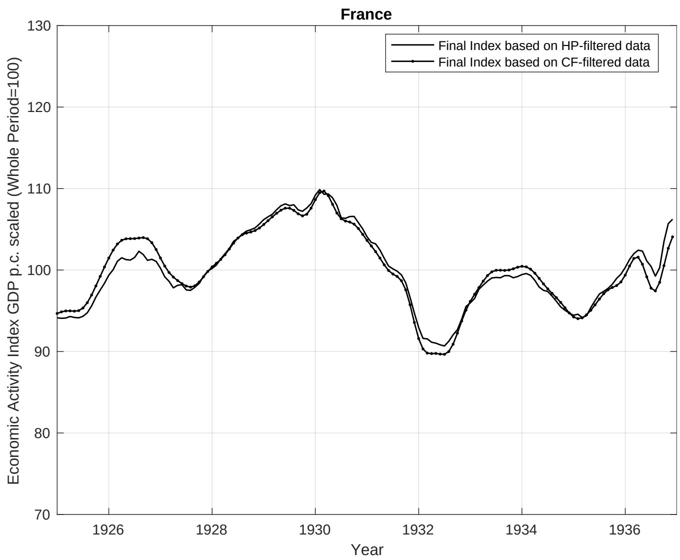
France

FIGURE A2.86: Estimated Weights & Choice of Filter



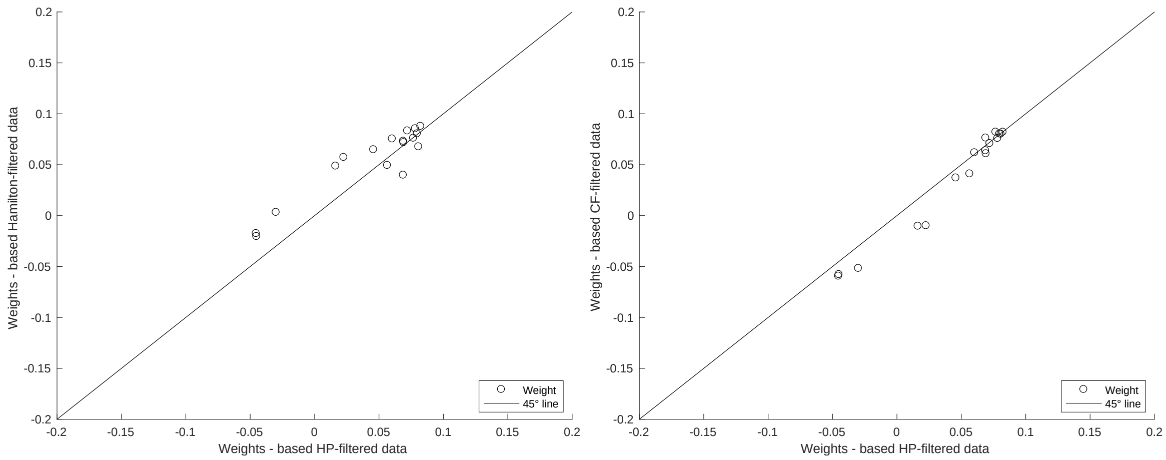
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.87: Final Index in Levels (HP vs. CF Filter)



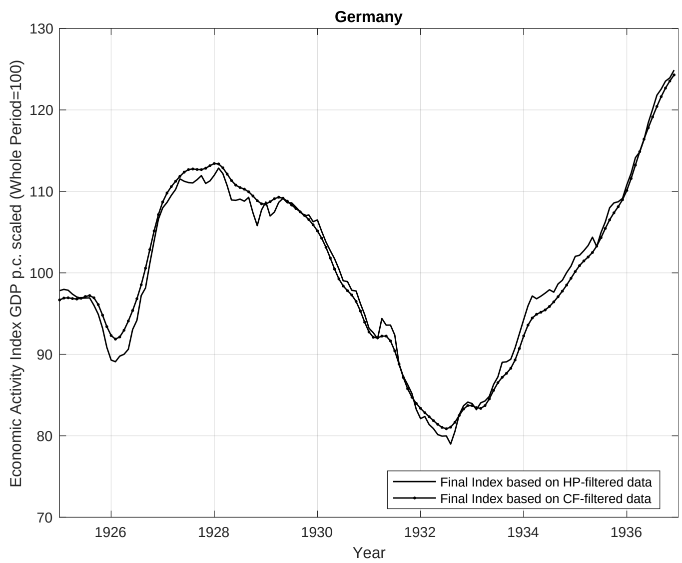
Germany

FIGURE A2.88: Estimated Weights & Choice of Filter



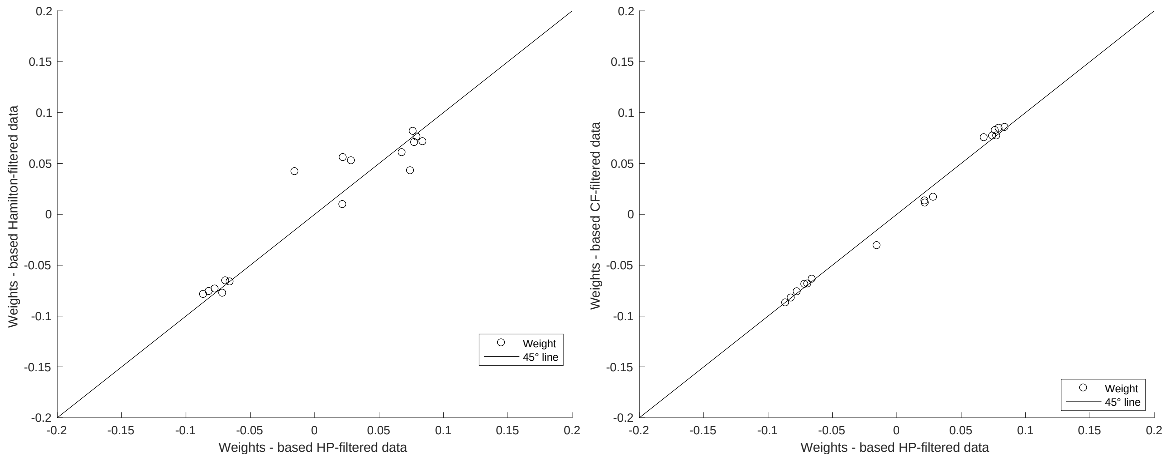
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.89: Final Index in Levels (HP vs. CF Filter)



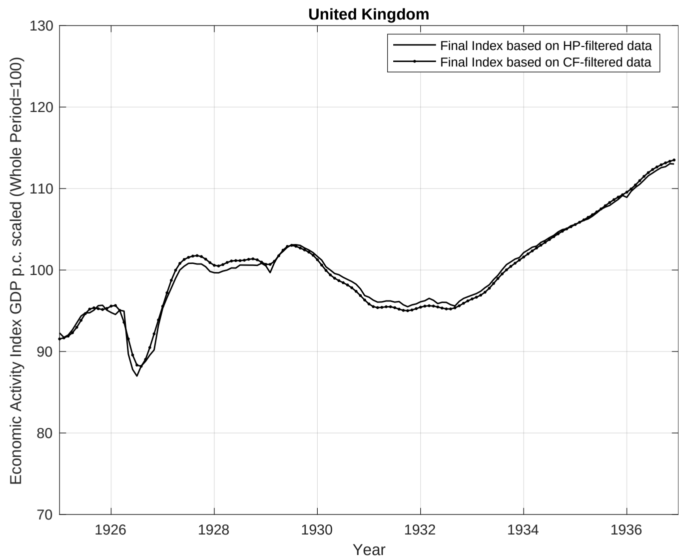
Great Britain

FIGURE A2.90: Estimated Weights & Choice of Filter



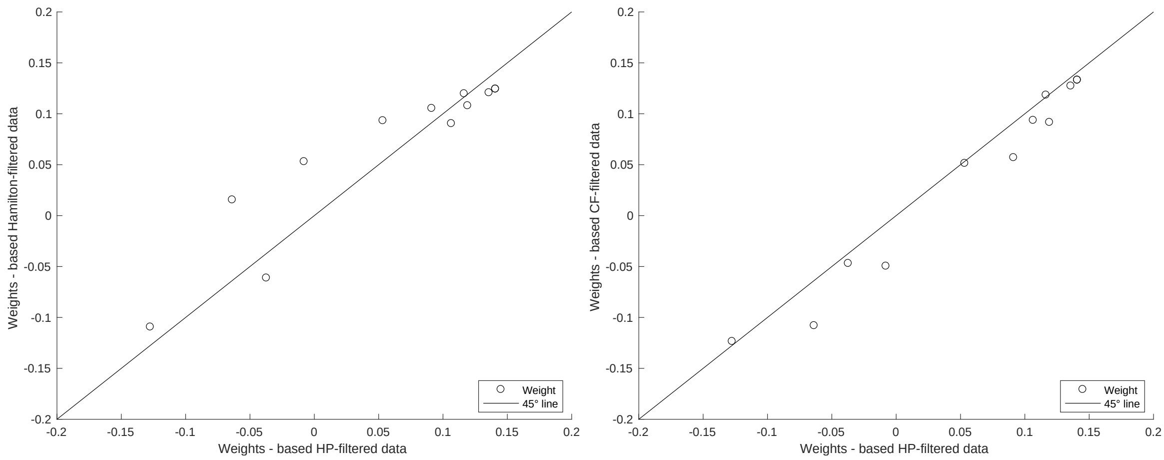
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.91: Final Index in Levels (HP vs. CF Filter)



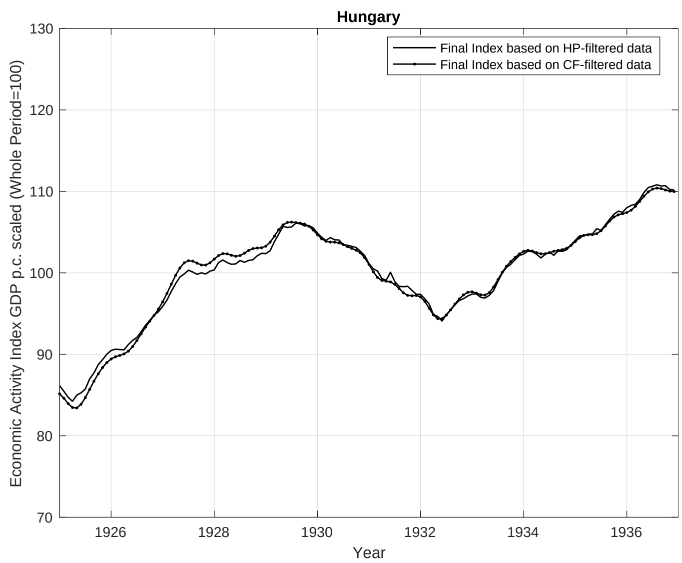
Hungary

FIGURE A2.92: Estimated Weights & Choice of Filter



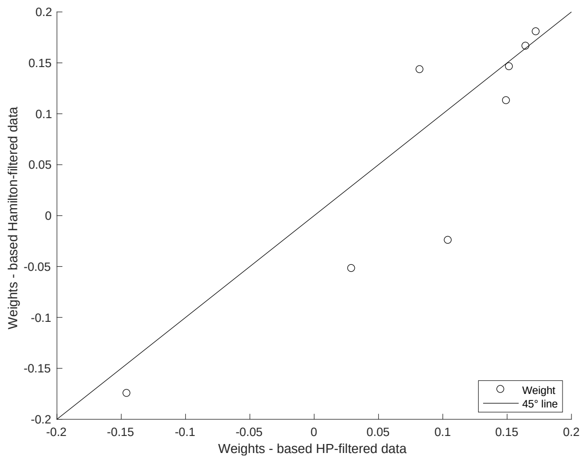
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.93: Final Index in Levels (HP vs. CF Filter)

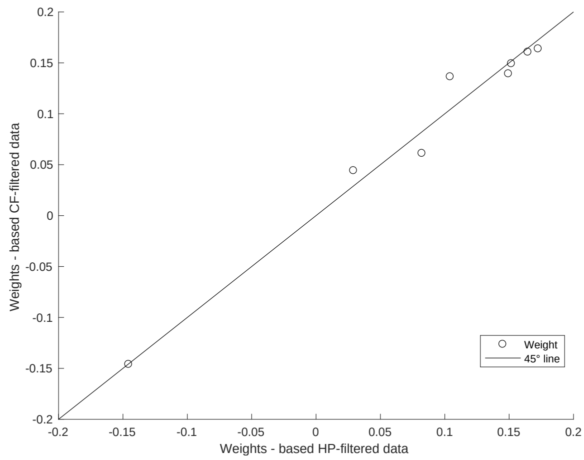


Italy

FIGURE A2.94: Estimated Weights & Choice of Filter

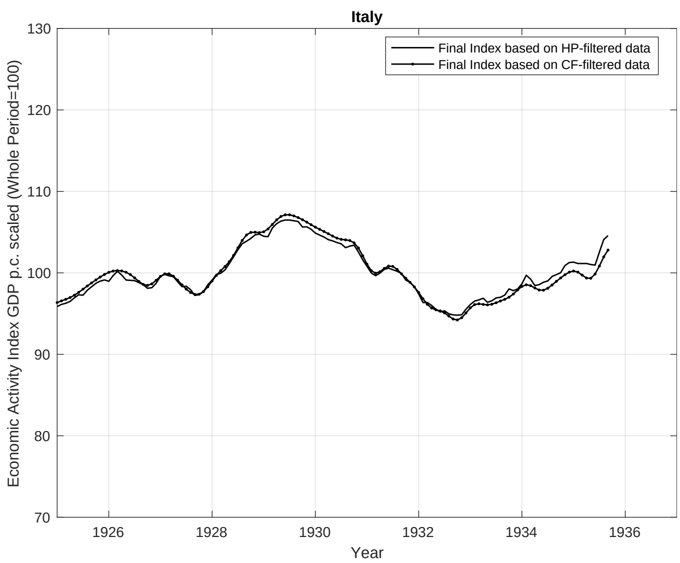


a) Weights with Hamilton Filter vs HP Filter



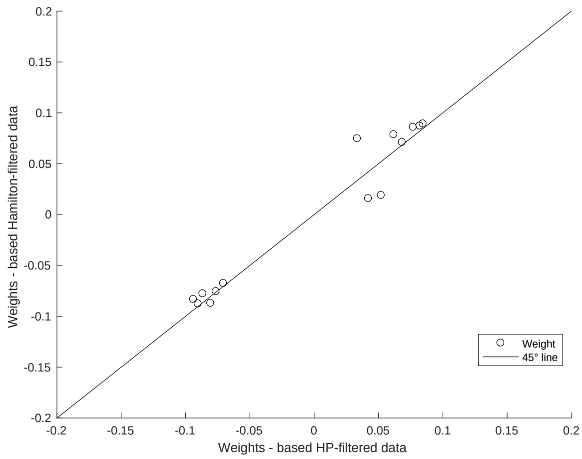
b) Weights with CF Filter vs HP Filter

FIGURE A2.95: Final Index in Levels (HP vs. CF Filter)

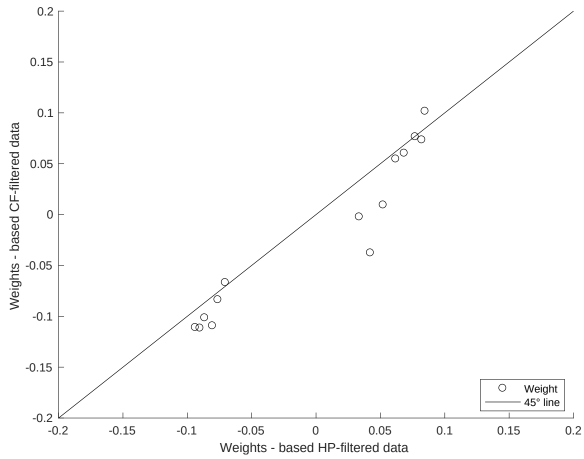


Netherlands

FIGURE A2.96: Estimated Weights & Choice of Filter

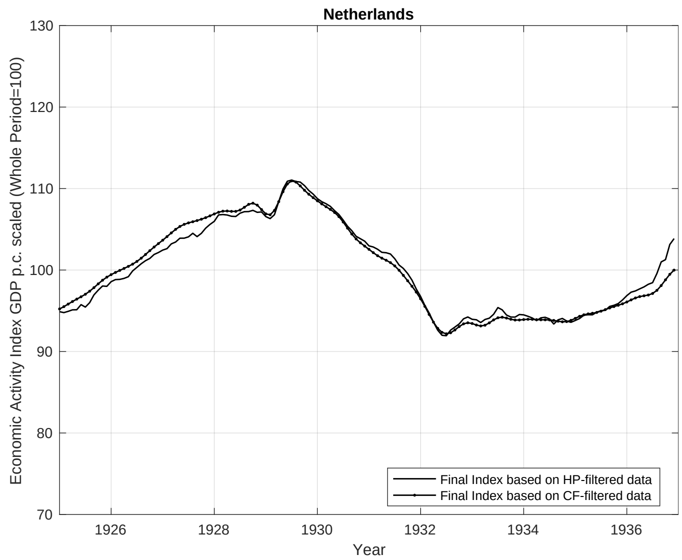


a) Weights with Hamilton Filter vs HP Filter



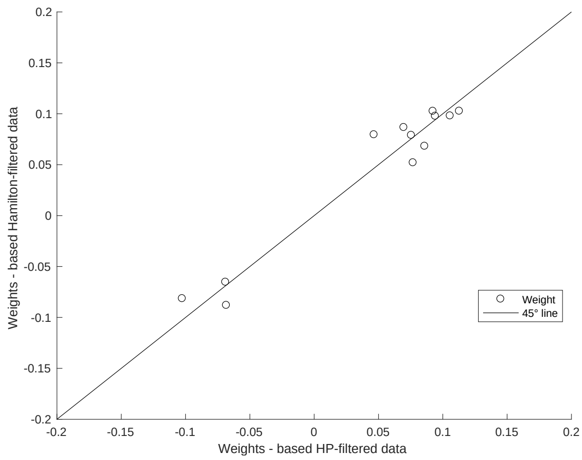
b) Weights with CF Filter vs HP Filter

FIGURE A2.97: Final Index in Levels (HP vs. CF Filter)

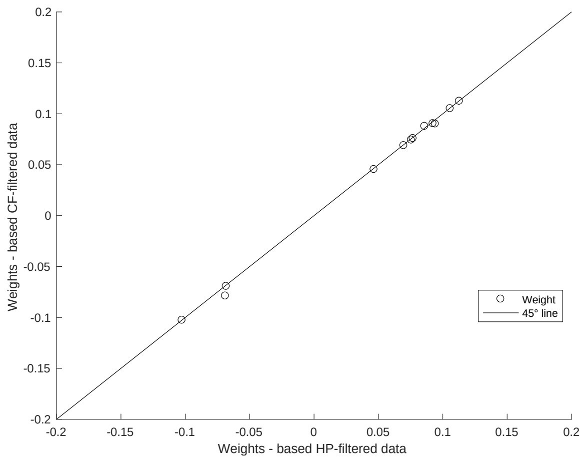


Norway

FIGURE A2.98: Estimated Weights & Choice of Filter

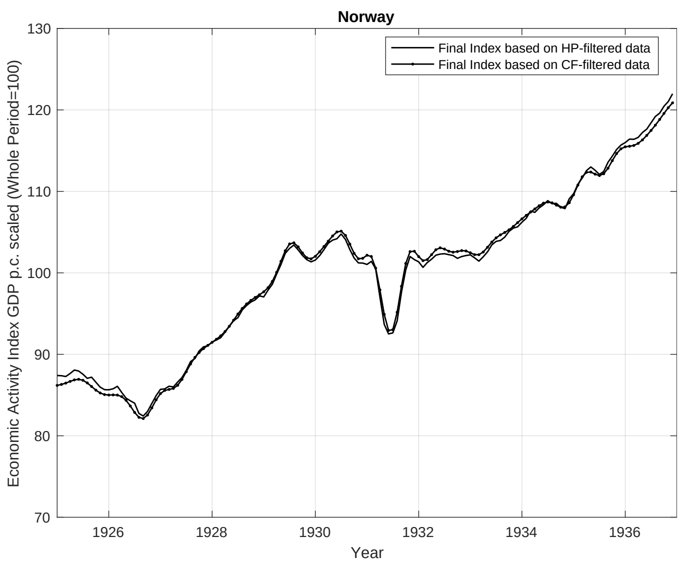


a) Weights with Hamilton Filter vs HP Filter



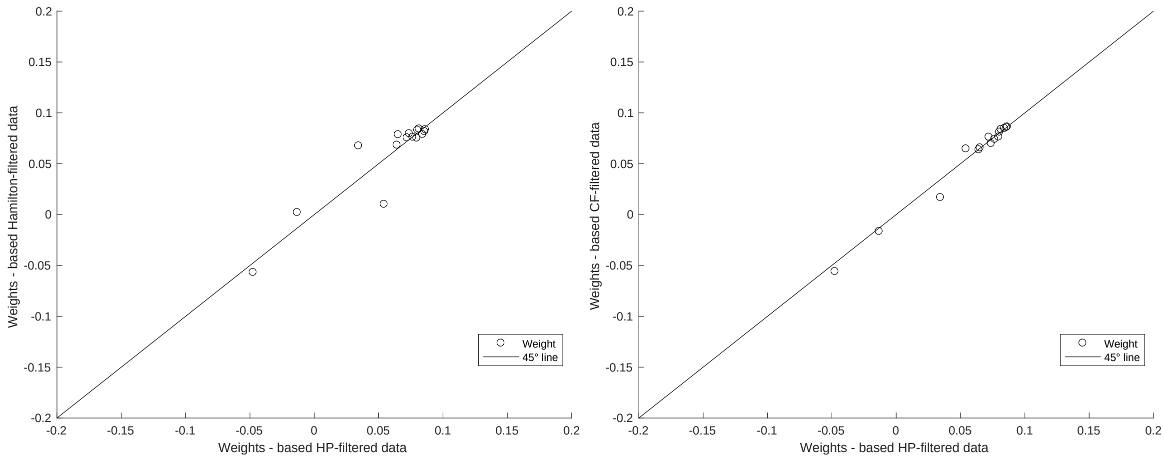
b) Weights with CF Filter vs HP Filter

FIGURE A2.99: Final Index in Levels (HP vs. CF Filter)



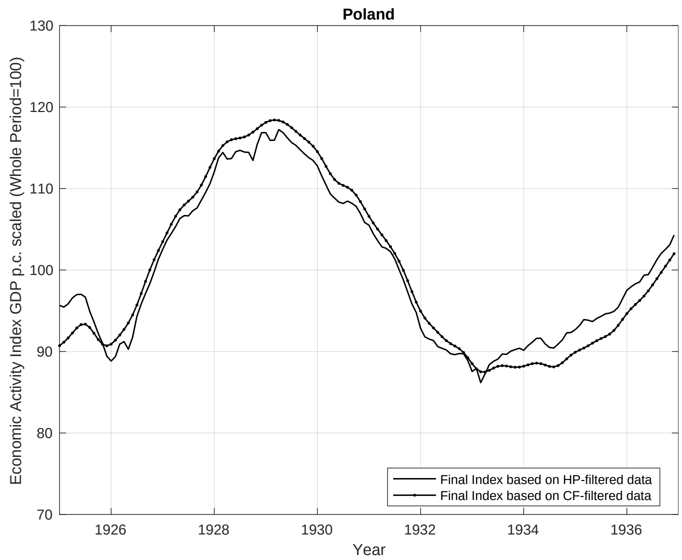
Poland

FIGURE A2.100: Estimated Weights & Choice of Filter



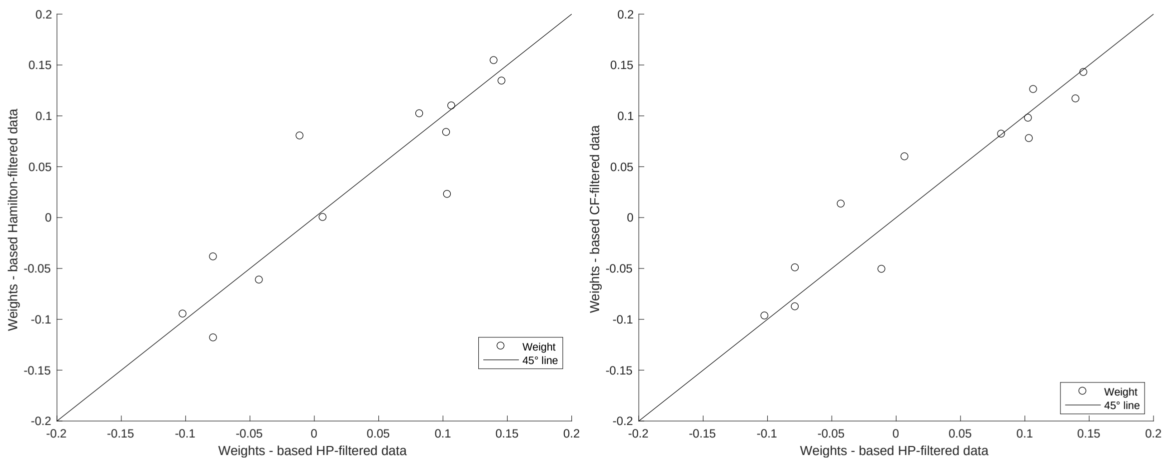
a) Weights with Hamilton Filter vs HP Filter   b) Weights with CF Filter vs HP Filter

FIGURE A2.101: Final Index in Levels (HP vs. CF Filter)



Romania

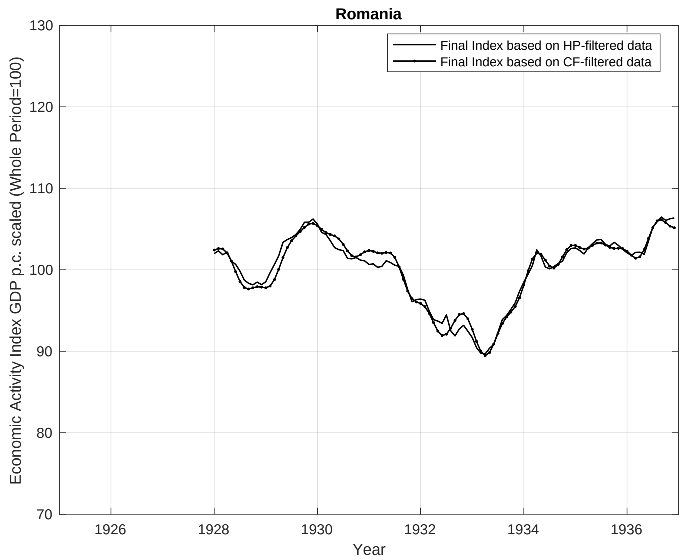
FIGURE A2.102: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter

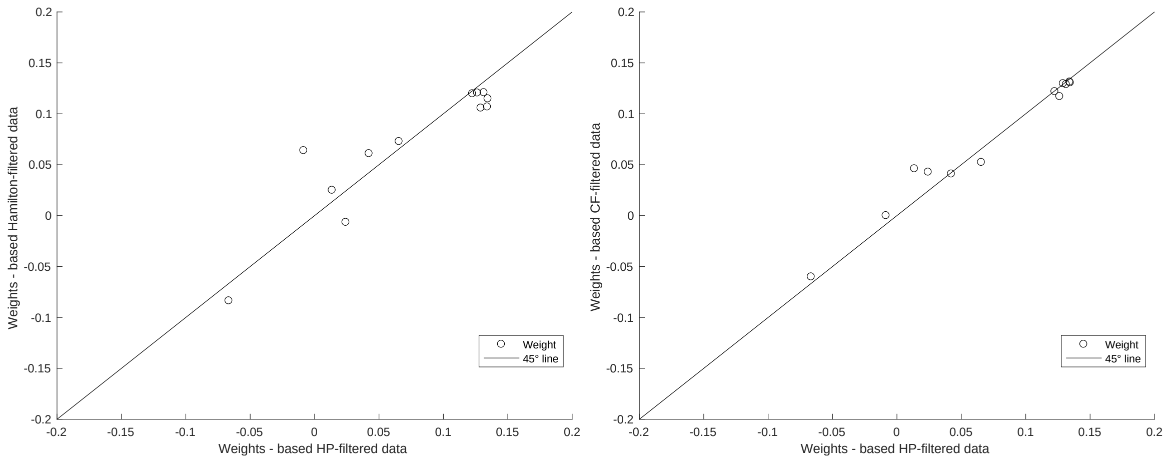
b) Weights with CF Filter vs HP Filter

FIGURE A2.103: Final Index in Levels (HP vs. CF Filter)



Spain

FIGURE A2.104: Estimated Weights & Choice of Filter

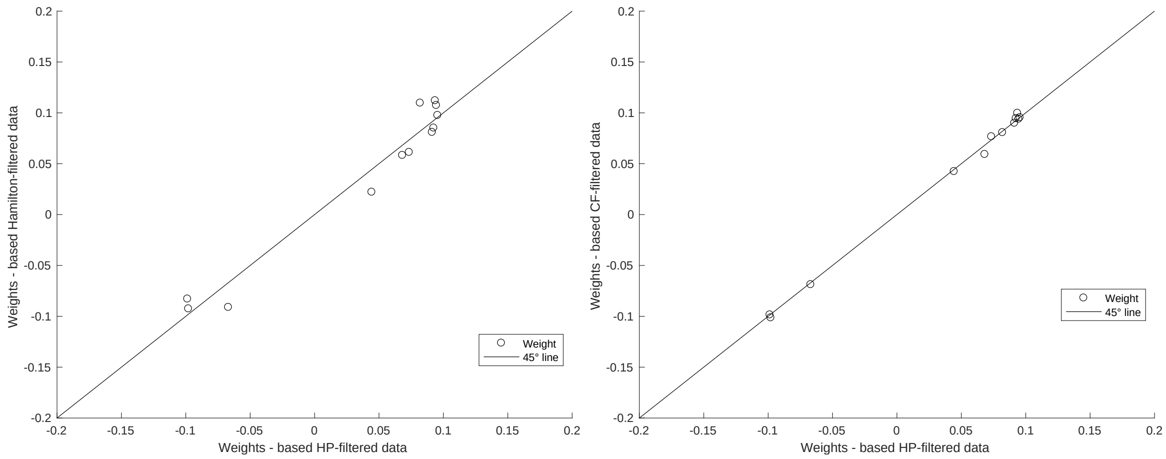


a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.105: Final Index in Levels (HP vs. CF Filter)

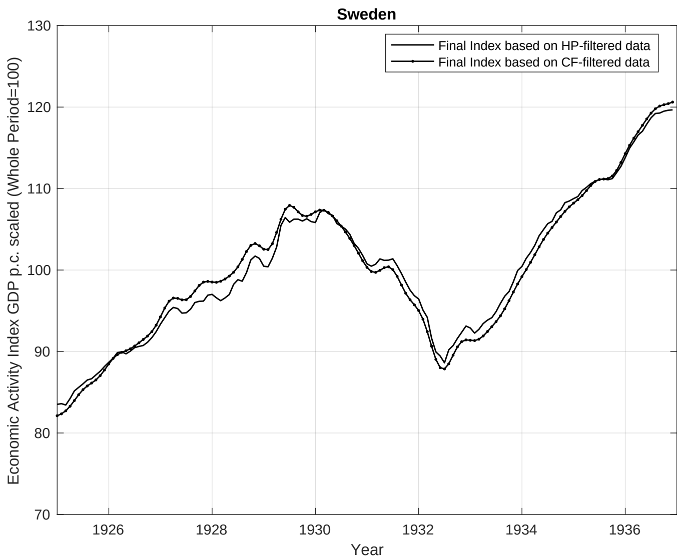
Sweden

FIGURE A2.106: Estimated Weights & Choice of Filter



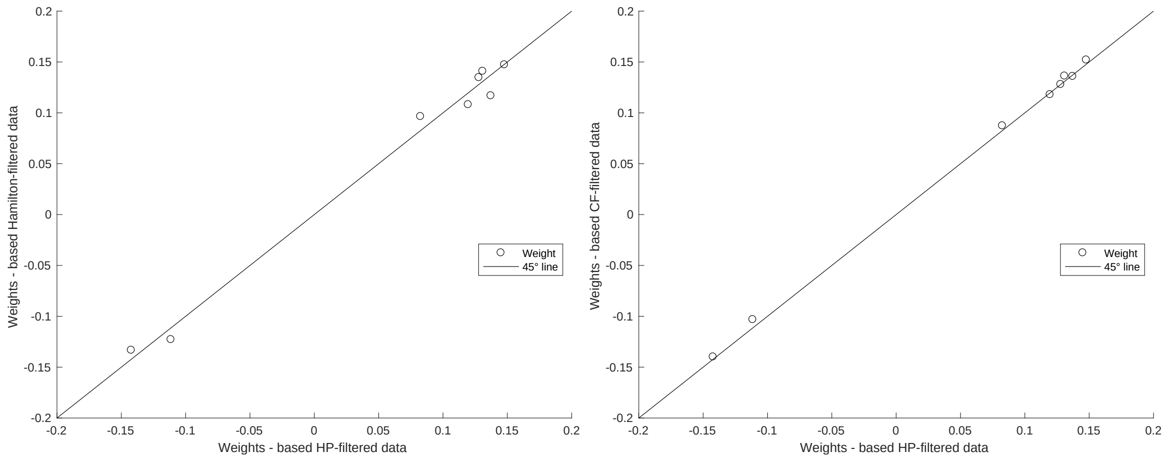
a) Weights with Hamilton Filter vs HP Filter   b) Weights with CF Filter vs HP Filter

FIGURE A2.107: Final Index in Levels (HP vs. CF Filter)



Switzerland

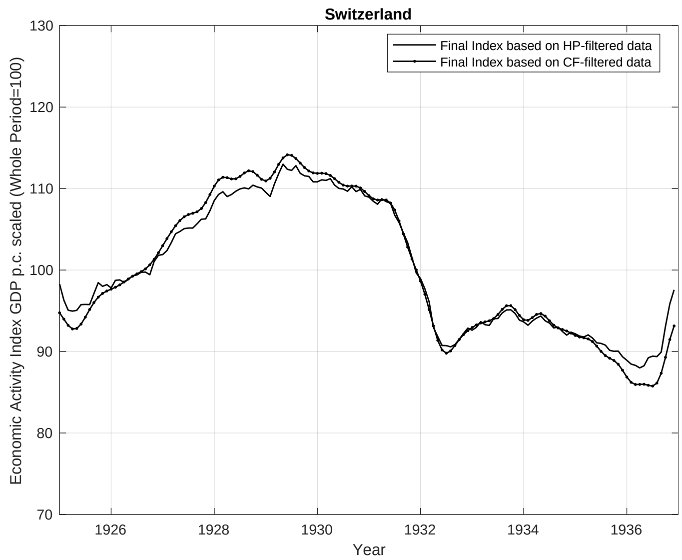
FIGURE A2.108: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter

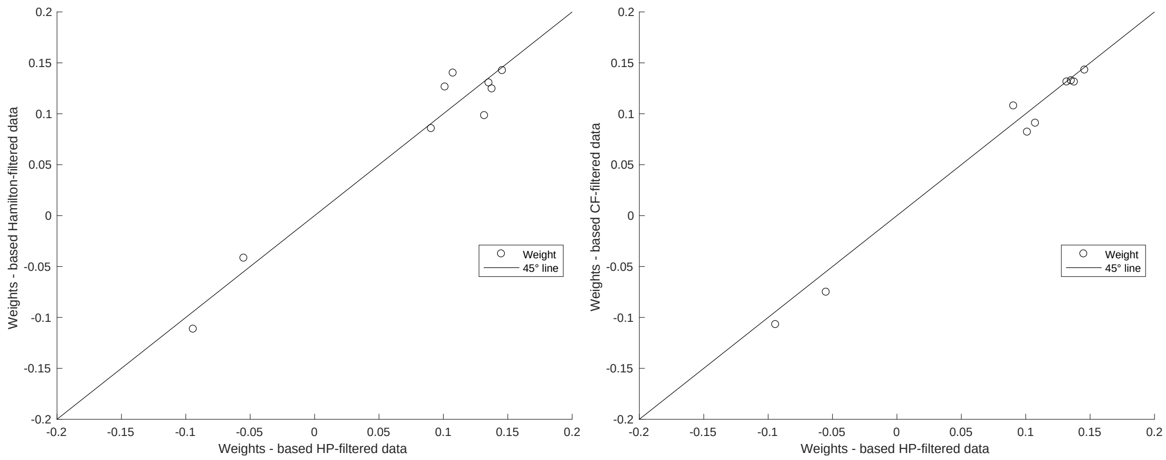
b) Weights with CF Filter vs HP Filter

FIGURE A2.109: Final Index in Levels (HP vs. CF Filter)



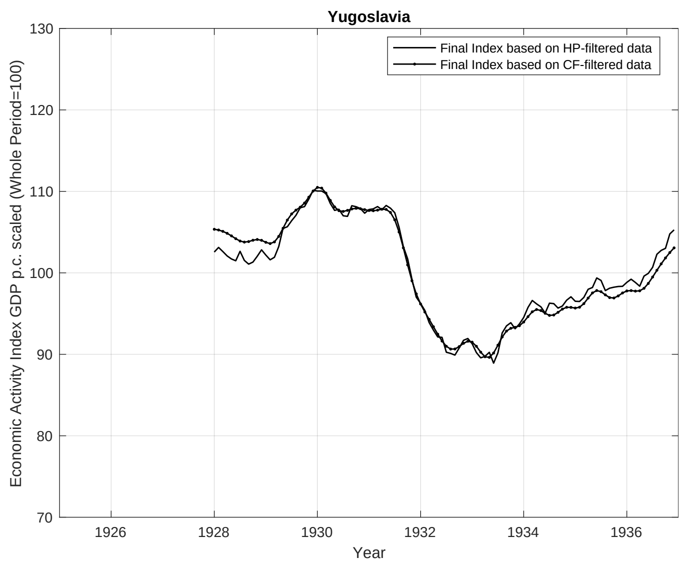
Yugoslavia

FIGURE A2.110: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

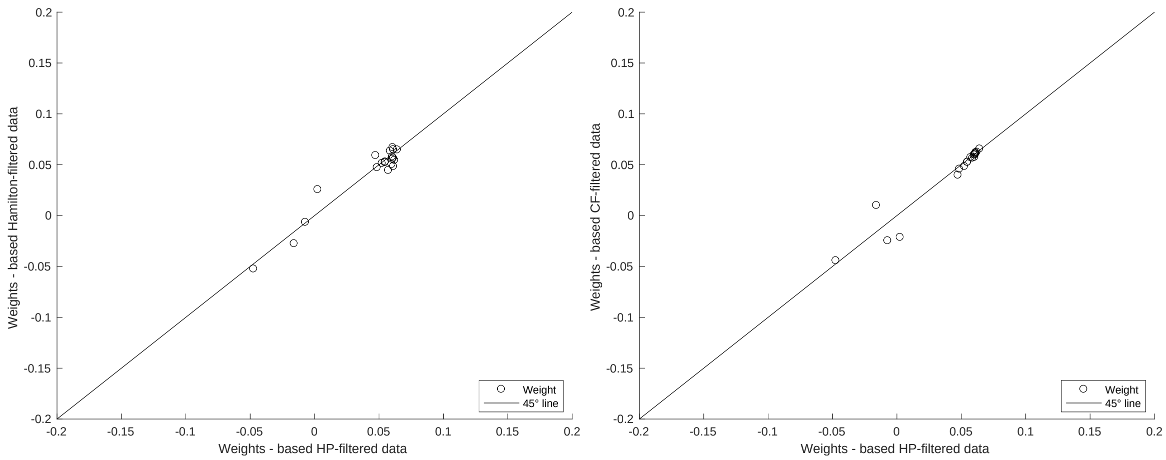
FIGURE A2.111: Final Index in Levels (HP vs. CF Filter)



Americas

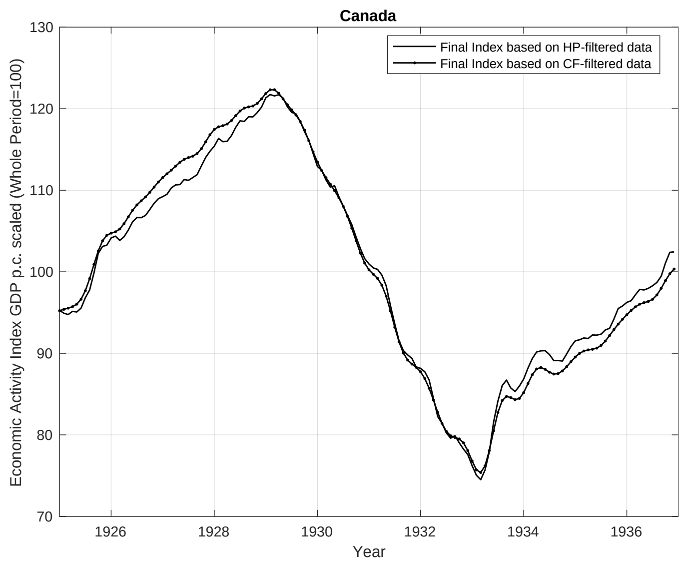
Canada

FIGURE A2.112: Estimated Weights & Choice of Filter



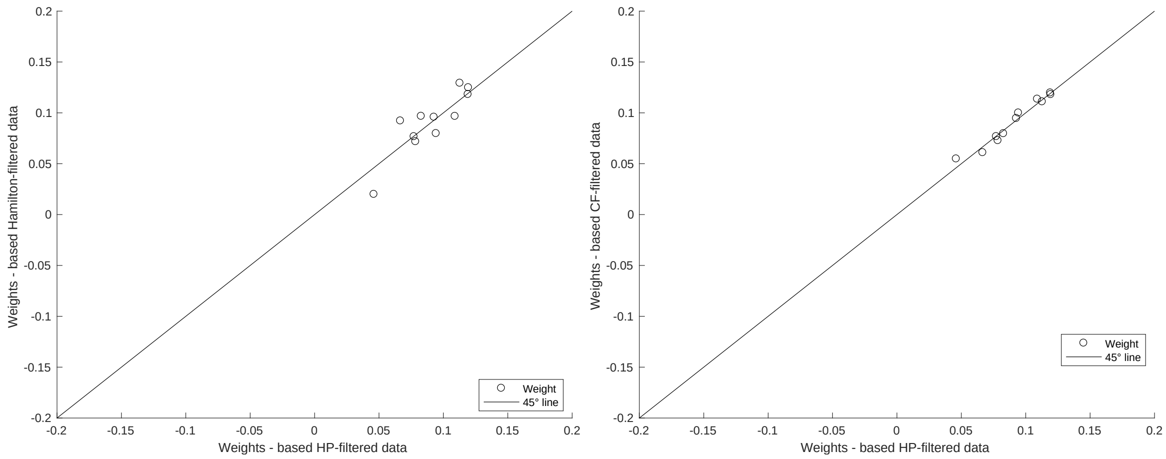
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.113: Final Index in Levels (HP vs. CF Filter)



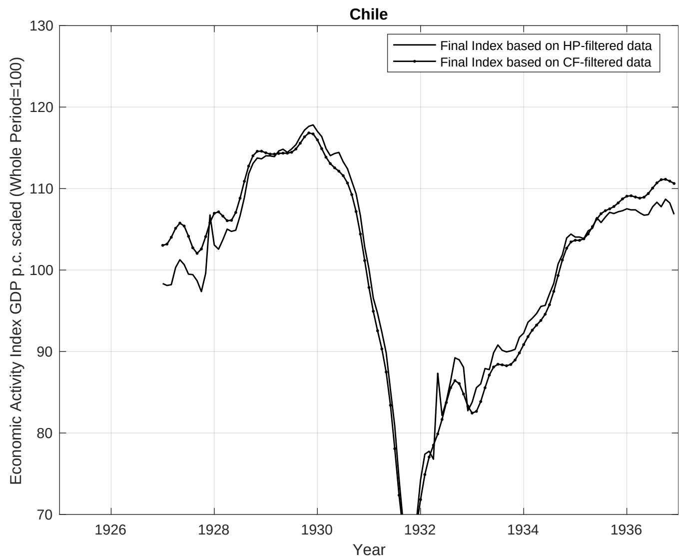
Chile

FIGURE A2.114: Estimated Weights & Choice of Filter



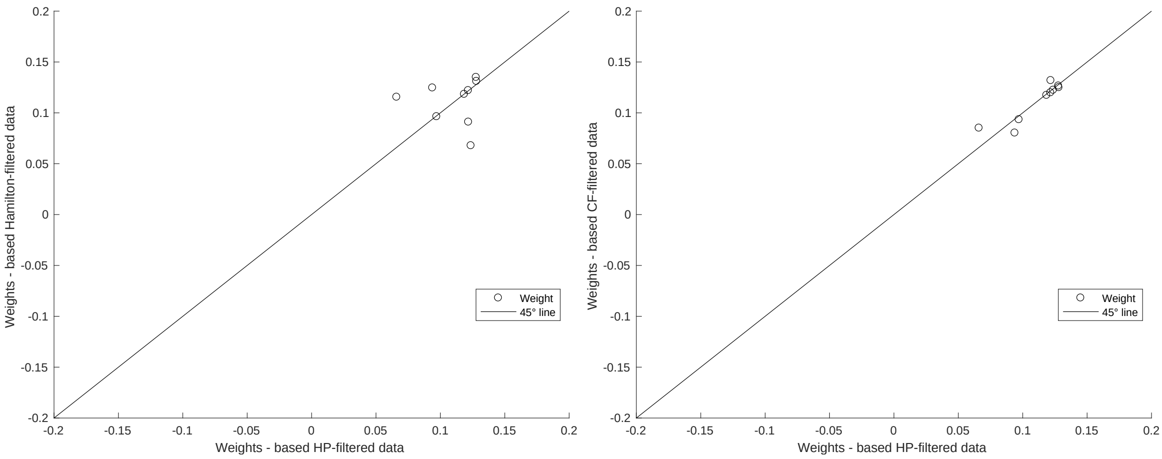
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.115: Final Index in Levels (HP vs. CF Filter)



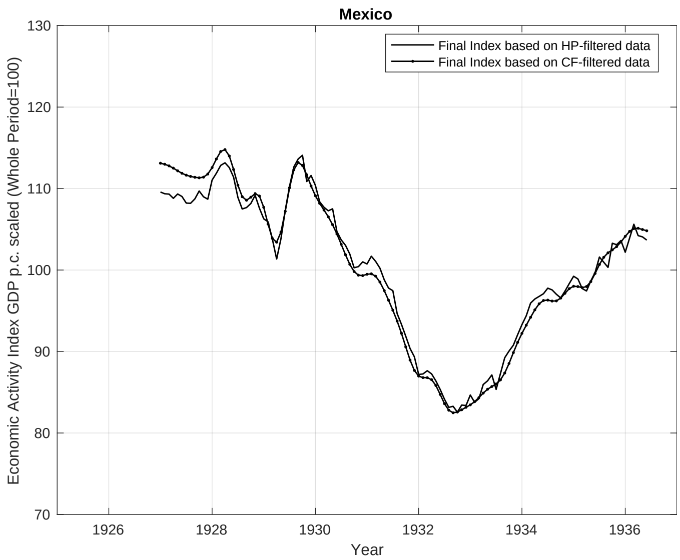
Mexico

FIGURE A2.116: Estimated Weights & Choice of Filter



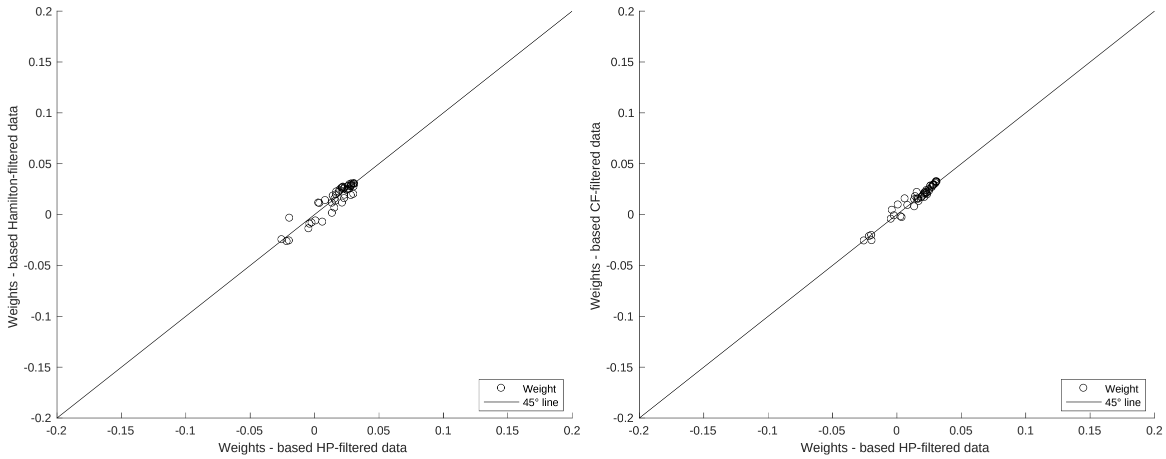
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.117: Final Index in Levels (HP vs. CF Filter)



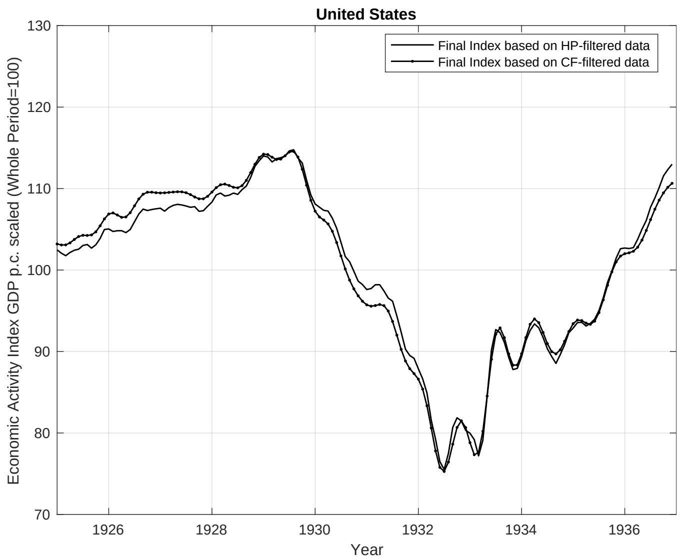
United States

FIGURE A2.118: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

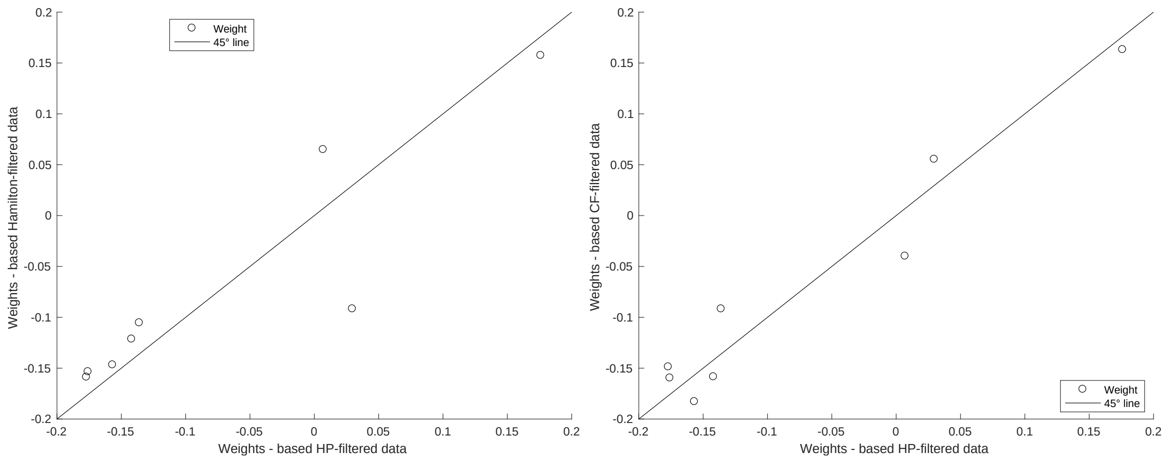
FIGURE A2.119: Final Index in Levels (HP vs. CF Filter)



Oceania

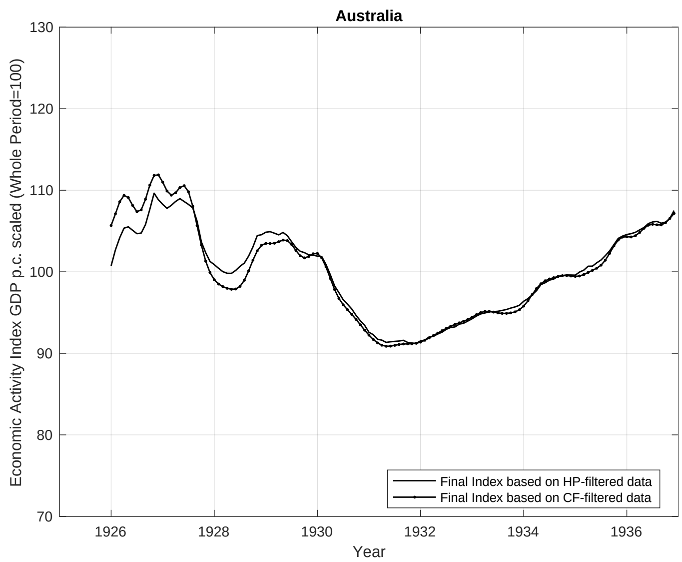
Australia

FIGURE A2.120: Estimated Weights & Choice of Filter



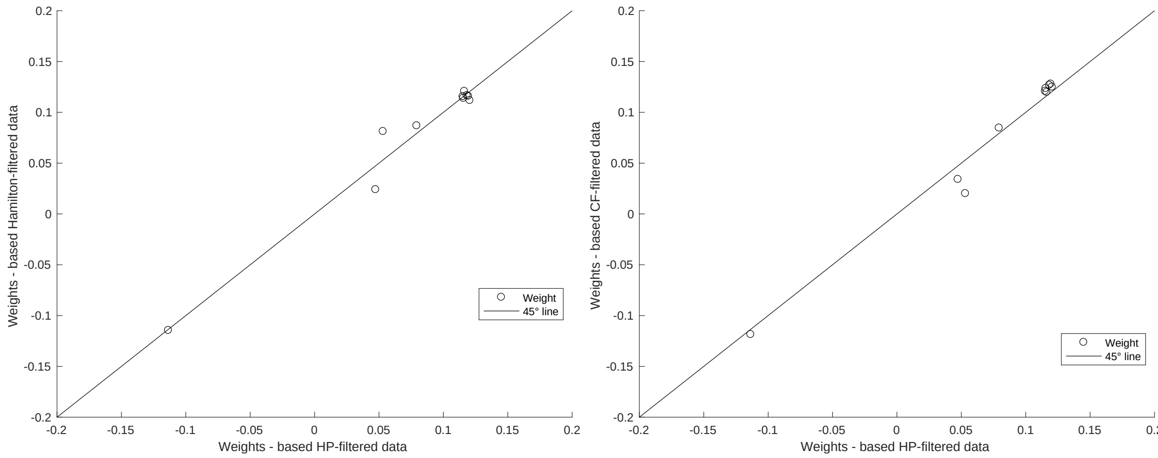
a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.121: Final Index in Levels (HP vs. CF Filter)



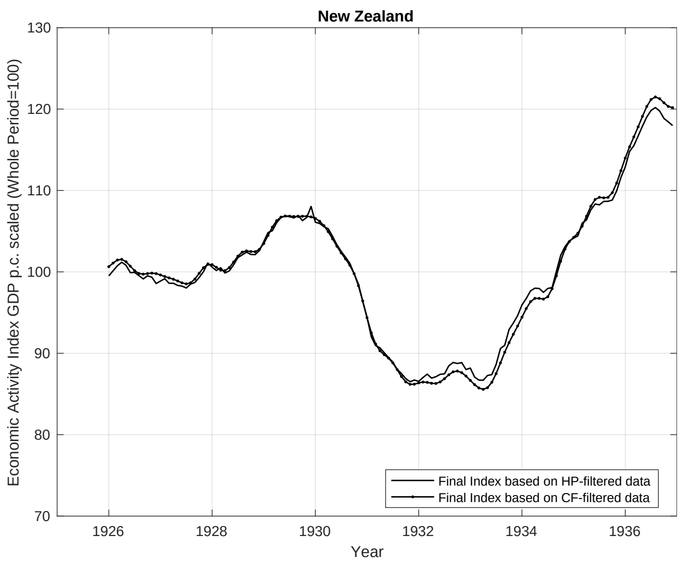
2A.17 New Zealand

FIGURE A2.122: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

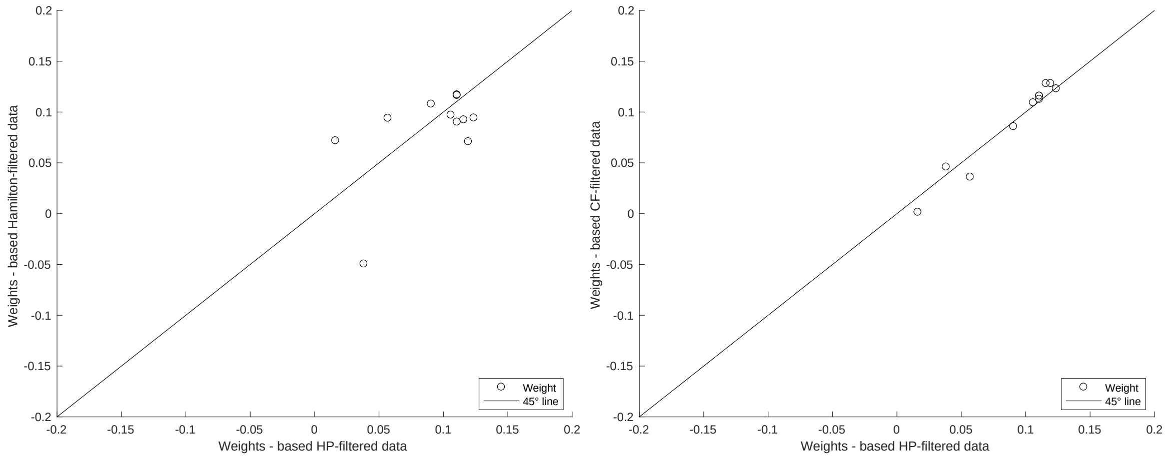
FIGURE A2.123: Final Index in Levels (HP vs. CF Filter)



Asia

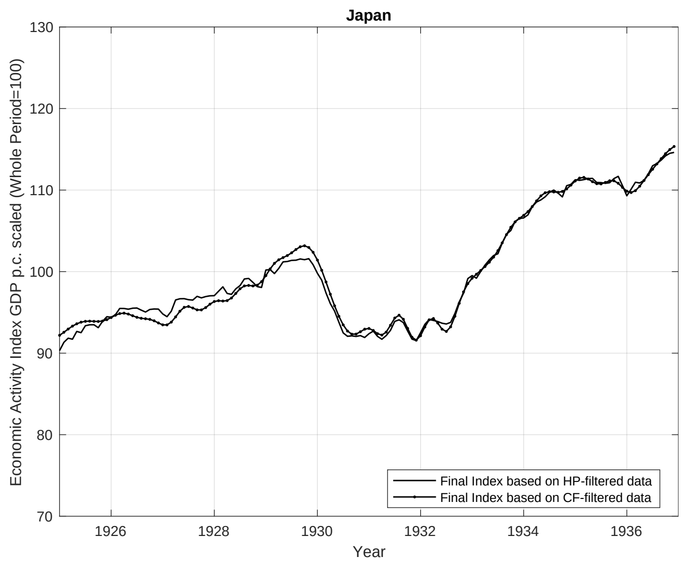
Japan

FIGURE A2.124: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

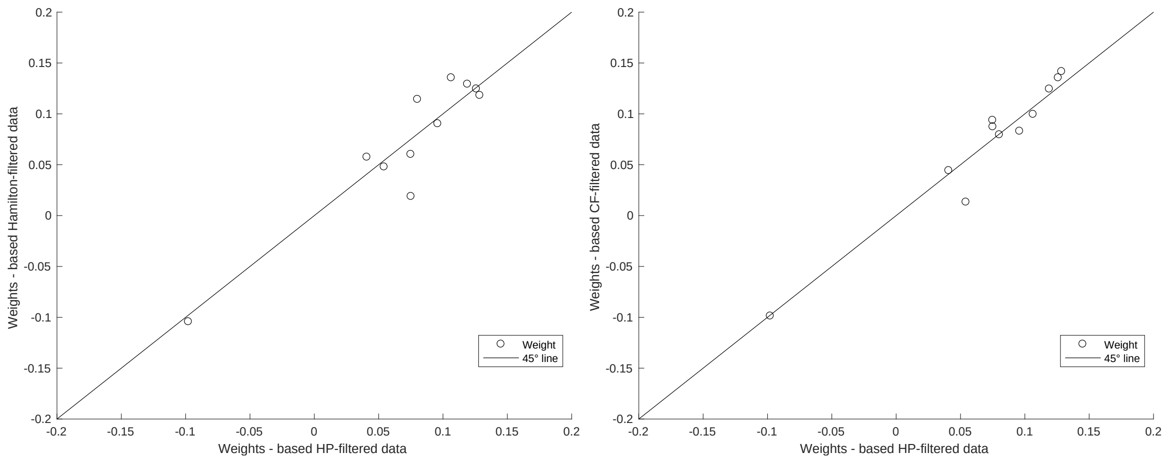
FIGURE A2.125: Final Index in Levels (HP vs. CF Filter)



Africa

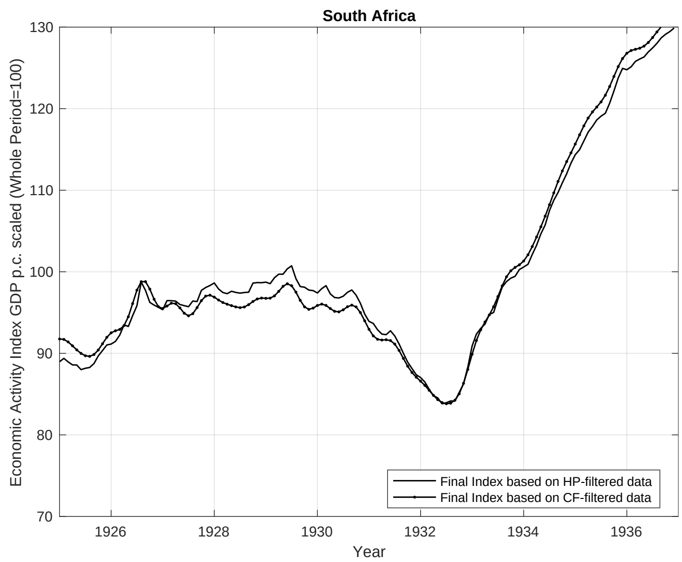
South Africa

FIGURE A2.126: Estimated Weights & Choice of Filter



a) Weights with Hamilton Filter vs HP Filter b) Weights with CF Filter vs HP Filter

FIGURE A2.127: Final Index in Levels (HP vs. CF Filter)



Chapter 3

The Trade Channel of the Great Depression

"It is a well-known fact that nearly every country is, in its economic position, highly dependent on these two factors: economic conditions in all other countries and the relative height of its currency in terms of other currencies"

Polak (1939, p. 79)

Abstract

How do macroeconomic crises spread from developed economies to the rest of the world? To what extent does the fate of small open economies depend on the economic powerhouses of the world? Drawing on evidence from the mother of all modern economic crises, the Great Depression, this study sets out to shed light on these questions. Making use of cross-sectional and time-series variation deeply rooted in the history and geography of trade, a causal estimate of the foreign trade multiplier allows me to assess the role of trade destruction in the fall of incomes during the 1930s. Indeed, the trade channel can explain large parts of the downturn in small open economies. If there had not been a fall in export demand, some countries would not have suffered a downturn in the initial phase of the Depression at all.

3.1 Introduction

The Great Depression spread through three channels: the gold standard,[1] financial linkages,[2] and trade.[3] While the first two channels have been the focus of much attention in the empirical literature, much less is known about the relative significance of the trade channel. Resurrecting the concept of the foreign trade multiplier, this study sets out to test its predictive power in a causal manner. The insights (i) that three economic powerhouses (Germany, Great Britain, the United States) absorbed a third of world imports,[4] (ii) that the extent of the crisis varied substantially across them, and (iii) that small open economies traded to varying degrees with them, allow me to isolate the importance of the trade channel. Indeed, much of the fate of the small open economies in terms of the initial depth of the crisis can be explained by the loss of export markets. No domestic policy change could have made these countries immune to the global economic crisis emanating from the large economies.

Research on the international extent of the Great Depression in recent decades has focused on the gold standard channel. Not only did the gold standard transmit the crisis through monetary policy shocks, but the gold orthodoxy across the world was itself causal to the severity of the Depression (Eichengreen and Sachs, 1985; Bernanke, 1995). In an effort to defend their gold parities, central banks around the world had kept interest rates at high levels and caused deflation (Eichengreen, 1992). Typically, the gold standard literature has highlighted two mechanisms through which deflation depressed the respective countries' economies. Firstly, wages were particularly sticky during this period. Falling prices translated relatively constant nominal wages into increasing real wages, which depressed output (Bernanke and Carey, 1996). Secondly, debt deflation translated into financial crises (Fisher, 1933). Not only had the gold standard ultimately caused the crisis, but its architecture also prevented the appropriate policy response. Because of the widespread prohibition of open market operations due to the hyperinflation experience in the early 1920s, central banks around the globe

[1] See, for example, Eichengreen (1992) and Bernanke (1995).

[2] See, for example, Temin (1993) and Accominotti (2012b, forthcoming).

[3] For the potential relevance of the trade channel, see the back-of-the envelope calculations by Irwin (2012, p. 110f) and Grossman and Meissner (2010). The "lost" gains from trade during this period in the long-run study by Federico and Tena-Junguito (2017) can be interpreted in a similar manner.

[4] Own calculation based on League of Nations (1937, p. 214f).

were unable to act as a lender of last resort. The resulting unfettered banking crises deepened the Depression in many countries (Bernanke and James, 1991). Like the sticky wage mechanism, the financial crisis mechanism does not take into account the international contagion of the crisis *per se*. The crisis impulse, while rooted in the constrains of the international monetary system, originates in domestic monetary policy.

Yet, international financial linkages mattered for the spread of the Depression. Temin (1993) speculates about the importance of global financial linkages, especially with regards to the European financial crisis of 1931. Indeed, Accominotti (2012b, forthcoming) provides balance sheet evidence that international financial contagion mattered a great deal.[5] There is little question about the relevance of the financial contagion channel and the gold standard channel for propelling the Great Depression around the globe. However, these explanations do not include another important link for the internationalisation of the crisis.

Beyond the gold standard channel, contemporaries such as Polak (1939) pointed to a non-monetary and non-financial channel of the Depression. Based on the insights from Harrod's (1933) foreign trade multiplier, they attributed the severity of the Depression in small countries in part to the loss of export markets.[6] Both the fall in income in the trading partners' economies and the increasing prevalence of protectionism led to decreasing export opportunities. Given its relevance to contemporary scholars, it is surprising that the trade multiplier

[5]For more empirical evidence on the importance of international capital flows at the macro level, see also Accominotti and Eichengreen (2016). By focusing on the transmission rather than the causes of the Depression, the financial contagion view accommodates a host of other explanations for the crisis in the advanced countries beyond the gold standard. For example, Romer (1990, 1993) on the stock market crash, Ritschl (2002) on the German transfer problem, and recent work on banking in the United States (Mitchener and Richardson, forthcoming).

[6]See in particular the more general outline of the argument by Harrod (1933, p. 143f). The historiographical journey of the foreign trade multiplier from its inception by Harrod until today is an intellectual curiosity. Harrod had postulated it in the early 1930s based on the short-run macroeconomic fluctuations surrounding him. It was fiercely debated in the 1950s by eminent economists such as Stolper (1947) and Polak (1956). Thirlwall and Hussain (1982) linked the export multiplier to the development economics debate and focused on long-run effects. At the same time, a negligence of the short-term dynamics, the initial explicandum, started to prevail and carries on until today. This is even more surprising given the importance typically attached to trade in the business cycle comovement literature (see e.g. Baxter and Kouparitsas, 2005).

features relatively little in the historiography of the Great Depression.[7] The back-of-the-envelope calculations by Irwin (2012, p. 110f) and Grossman and Meissner (2010) provide notable exceptions highlighting the potential relevance of the trade channel. However, the very nature of such calculations warrants closer examination.

Most likely, the lack of a thorough empirical assessment emanates from three factors. Firstly, the view that the fall in world trade and rise of trade barriers were ultimately a consequence of the Depression, and not its cause, might have tamed the appetite to deal with this question.[8] However, even if we were to accept this view generally, it does not follow that trade destruction had no impact on incomes. More generally, analysing contributing causes of the Great Depression has led to valuable insights in the past.[9] Secondly, the lack of high-frequency macroeconomic data has so far provided little variation to exploit. Thirdly, severe endogeneity problems loom large when dealing with the question of the effect of trade on income.[10] This study provides a remedy for the last two factors. Relying on additional data collection and the dataset presented in Chapter 2, it provides the necessary macroeconomic data for the empirical analysis. Furthermore, I propose a novel identification strategy to estimate the causal effect of the loss of export markets on income.

Figure 3.1 provides a first informative correlation regarding the importance of foreign markets for the severity of the Depression. The x-axis shows the foreign demand that the small country faces. It is defined as the cumulative GDP loss in the *big three* importing nations (Germany, Great Britain, and the United States), weighted by their respective pre-crisis shares in the export market of the small

[7] This is not to say that there is little research on trade in the 1920s and 1930s. Researchers have investigated the role of trade blocs in great depth (Eichengreen and Irwin, 1995; Wolf and Ritschl, 2011; Gowa and Hicks, 2013), accounted for the role of income, tariffs, and non-tariff barriers in the fall of world trade (Madsen, 2001), analysed determinants of tariff setting (Eichengreen and Irwin, 2010), and highlighted the economic policy dimension of the "trade policy disaster" (Irwin, 2012). Put simply, the effects of the Depression on trade are well-researched. However, we know much less, in particular empirically, on the opposite direction of causation.

[8] This view is best-reflected in Eichengreen and Irwin (2010) and Irwin (2012), who link the rise of trade barriers and fall of trade to the gold standard. It is important to point out that the work by these authors does not preclude the possibility that trade was a contributing factor. Irwin (2012) even provides a back-of-the-envelope calculation for the potential role of trade destruction on income.

[9] Romer's (1990) treatise on the effects of the stock market crash serves as a case in point. For the transmission of the crisis, see, for example, the analysis of business cycle comovement by Mathy and Meissner (2011).

[10] In this context, the conflicting results in the tariff-growth paradox debate may serve as a reminder (Clemens and Williamson, 2004; Schularick and Solomou, 2011).

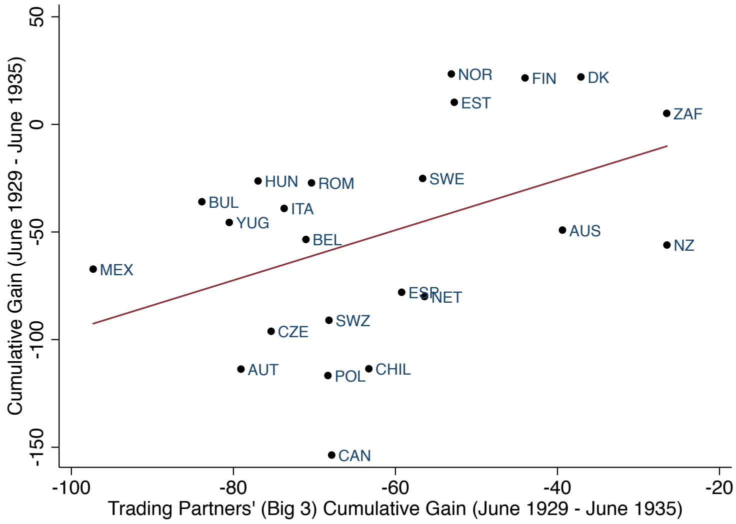


FIGURE 3.1: The loss of foreign demand and the severity of the Great Depression in small open economies

Note: The axes are scaled in percentages of the corresponding June 1929 GDP. The trading partners' GDP is the weighted average of the GDP of the United States, Great Britain, and Germany according to the corresponding trade shares in 1927.

country.[11] The y-axis displays the cumulative GDP loss for the small country. The regression line provides a first indication that the varying exposure to the global crisis was an important predictor for the severity of the Depression in the small countries. This correlation is informative and yet unsatisfactory. It neither provides causal evidence nor does it highlight the precise mechanism. To do so, high frequency data and a precise empirical modelling of the export channel is needed.

Using a panel of quarterly data for 23 small economies from Chapter 2, I estimate the effect of exports on GDP. History and geography allow me to deal with the looming endogeneity concerns, in particular omitted variable bias. A quarterly measure of foreign demand based on the same principle as in the figure above serves as an excellent instrument for a country's total exports. It is safe to assume that economic fluctuations in a small country do not affect the business cycle of either of the three large countries.[12] At the same time, variations in foreign demand exerted strong influence on a country's export opportunities. Like in the figure above, the variation in foreign demand originates in pre-crisis

[11] Note that all variation on this axis thus originates in the export weights.

[12] This assumption is a staple in the literature on small open economies (see e.g. Gali and Monacelli, 2005).

trade patterns. These patterns are themselves a function of history and geography and thus reasonably exogenous in the short-run. The panel setup also allows me to control for the world demand itself at any given point in time and thus identify the causal effect from the variations around it. Satisfying the exclusion and relevance criteria, foreign demand from the large countries thus serves as an instrumental variable for the ability to export.

In a framework akin to the fiscal multiplier literature (Barro and Redlick, 2011), I then estimate the trade multiplier. The estimated impact (contemporaneous) multiplier is around 1.2, signalling that for every 1 % decrease in exports (in terms of GDP), 1.2 % of GDP are lost. Most conservatively, assuming full future balancing of trade beyond the contemporaneous adjustment and neglecting any potential dynamic effects caused by the multiplier, the estimate reduces to 0.7. This is still a very sizeable multiplier effect solely based on the (lost) gains from trade. The logic of the instrument provides a straightforward way to verify the results through a placebo study. Using a miniature version of the gravity model, I predict trade shares in 1927 in the absence of (colonial) history and rotating the geography of the main trading partners. Shutting down history and reversing geography, the results of the model become insignificant, as they should be.

What are the implications of the causal estimate of the multiplier for the course and spread of the Great Depression? How much of the Depression was due to the loss in foreign demand? Combining the multiplier estimates with data on the loss of exports and the initial depth of the Depression allows me to account for the share of income destruction due to the loss of foreign markets. For most countries, the trade channel explains more than 50 % of the initial downturn. For a small number of countries, it over-explains the initial crisis. Put differently, in the absence of the loss of export markets and all other things equal, some countries might not have suffered a downturn in the initial phase of the Depression at all.

The remainder of this chapter is organised as follows. Section 3.2 reviews the literature on trade and the Depression through the lenses of the research question put forward in this study. Section 3.3 outlines the empirical framework and data sources, including newly collected price indices for exports and trade patterns. Section 3.4 discusses the results. Section 3.5 concludes and highlights potential avenues for future research.

3.2 International Trade and the Great Depression

What was the relative importance of income, trade policy, geography, and history for the breakdown in world trade? How did they influence each other? The brief review of the literature in light of these questions suggests that loss of foreign demand and tariffs were of similar importance for the breakdown of trade. Tariffs, however, changed the geographic trade patterns only to a limited degree. Furthermore, the review highlights an important void in our understanding of the Great Depression. With few exceptions, studies on the course of interwar trade focus on trade as an outcome, not a contributing factor to the Great Depression. Evidence on the reverse direction of causation remains very limited and constitutes a major gap in the research on the Great Depression.[13]

The focus of the literature on the Great Depression has long been on its ultimate causes in the United States and abroad (Friedman and Schwartz, 1963; Eichengreen, 1992; Bernanke, 1995). Because the breakdown in trade is not considered to be part of this set of causes, it is mostly analysed as a consequence of the Depression rather than a contributing factor. Given its link to the monetary system, the dominant explanation for interwar protectionism falls at least partially into this category. According to Eichengreen and Irwin (2010) and Irwin (2012), policymakers found themselves in a trilemma. They could only choose two of the following three options: independent monetary policy, sustaining the gold standard parity, and open trade.[14] As the Depression deepened those policymakers who were bound by the infamous gold orthodoxy (Eichengreen, 1992) resorted to protectionist measures. In contrast, those who had left the gold standard were relatively less inclined to increase trade barriers.[15] What, however, was the effect of these trade restrictions on the volume and geography of trade in the interwar period? How does their effect compare to the losses in trade induced by changes in national income?

The 1930s saw a massive fall in world trade. From its peak in 1929 until its trough in 1932, real world trade fell by about 25 % (Irwin, 2012, p. 102). Tariff

[13]Irwin (2012, p. 110), too, makes this point. The application of closed economy DSGE models to obviously open economies such as Belgium provides another example (e.g. Pensieroso, 2011).

[14]As such, it is related to the macroeconomic policy trilemma (Obstfeld and Taylor, 1997).

[15] Given the many parallels drawn between the Great Recession and Great Depression, it is worthwhile to point out that this constitutes a unique feature of the crisis of the 1930s (Irwin, 2012). One reason making Eichengreen's and Irwin's argument so compelling is that it can explain both, the emergence of the protectionism in the 1930s and the absence of it in the current crisis. As today's international macroeconomic environment is governed by flexible exchange rates, there was simply less need to resort to 1930s style protectionism.

and non-tariff barriers can explain around 14 % of this drop, whereas the other 11 % are accounted for by income losses. Trade barriers continued to grow in the recovery period of 1932–1935. In the absence of a further increase of trade restrictions compared to 1932, trade would have grown by 8 % due to the recovery of incomes around the globe. However, the recovery of world trade only reached 6 % due to ever growing trade restrictions.[16] It is clear that restrictions and income changes alike mattered for the fall and tame rebound of world trade. The effect of trade barriers on the geography of trade, however, is less clear-cut.

Recently, Bromhead et al. (2017) and, to a limited extent, Gowa and Hicks (2013) have resurrected the role of policy for the reorientation of world trade. Both contributions point out that British imperial trade policies redirected trade to within the empire. Likewise, Chapter 4 of this thesis emphasises the role of policy. Indeed, French policymakers were able to change the direction of trade. Yet, these findings do not call into question the general finding of the gravity literature that geographical and historical links between countries are strong predictors of trade flows at any point in time (Head et al., 2010; Head and Mayer, 2014).[17] This was no different for the interwar period as Eichengreen and Irwin (1995) demonstrate. Wolf and Ritschl (2011) argue that this persistence is so strong that taking it into account can nullify the effects found for common currency areas. The gravity literature thus provides little evidence that the oft-cited regionalisation of trade actually took place in the 1930s. These "gravity-based" conclusions are almost certainly too strong as recent evidence presented in this thesis and elsewhere (Bromhead et al., 2017) suggest. What remains undisputed though, is that the geography of trade flows is relatively persistent, at least in the short run. This insight will be important for the empirical specification in this study.

While the effect of policy on trade volumes and its geography is well-studied, the effect of trade destruction on incomes remains a relatively blind spot in the literature on the Great Depression. Income usually features in accounting exercises to explain the fall in world trade, not vice versa. In the analysis of protectionism, the magnitude of the effect of protectionism on income through falling demand is almost never explicitly tested (Irwin, 2012, p. 110). This is all the more surprising

[16]These are the calculations by Irwin (2012, p. 104), which are based on the decomposition by Madsen (2001).

[17] Indeed, Frankel and Romer (1999) use this insight to investigate the impact of trade on income. They separate the "geography component" of trade and use it to instrument for actual trade. This allows them to provide an estimate of the long-run relationship between income and trade. See also Irwin (2012) for a discussion. See Head et al. (2010) on the persistence of the effect of colonial ties in the post-war period.

as we know that trade links influenced the transmission of the Great Depression. In the vein of the post-war analysis by Baxter and Kouparitsas (2005), Mathy and Meissner (2011) establish that bilateral trade was an important determinant for business cycle comovement during this period. Unfortunately, this tells us little about the magnitude of the effects the trade channel ought to explain. The same holds true for many country case studies based on descriptive data, some of which will be discussed in Section 3.4.2.

While no comprehensive empirical cross-country study for the interwar period exists, a few country-specific studies quantify the effect of trade destruction on income. Crucini and Kahn (1996) and Eichengreen (1986) find small effects of the Smooth-Hawley tariff on the American GDP (though with opposite signs). Irwin's (1998) study supports this notion by showing that the impact of the tariff on trade itself was not as large as one might expect. However, the focus of these studies on the closed and large economy of the United States precludes any extrapolation to the world as a whole. In contrast, two case studies on the Italian Great Depression, using a VAR analysis (Mattesini and Quintieri, 1997) and general equilibrium model (Perri and Quadrini, 2002), indicate the importance of the loss in foreign demand for amplifying the Depression.

Beyond these studies, we have to rely on back-of-the-envelope calculations. Using an estimate of the elasticity of income with respect to trade based on modern data, Irwin (2012, p. 112) presents such a calculation for the world as a whole. Abstracting from changes in income, he conjectures that trade barriers could explain about a tenth in the fall of global income during the Depression. Grossman and Meissner (2010) take income into account and use the trade multiplier. Assuming a trade multiplier of 3, they argue that the fall in trade could have explained a large part of the Depression experience in a small open economy such as Canada (25 % of the 30 % fall in GDP). While illuminating the potential magnitude of the effect of trade destruction on income, such back-of-the-envelope calculations necessarily remain speculative as long as no causal empirical estimate of the foreign trade multiplier is available.[18] This study closes this gap and thus allows us to account for the impact of trade destruction on incomes.

The paucity of evidence on the importance of the fall of foreign demand for

[18] The only ones available are those by Friedman (1978) for 12 European countries. They suggest a much lower value for the multiplier than Grossman and Meissner (2010) assume. They are based on estimates of the marginal propensity to consume (see Section 3.3.1 for a short discussion of such an approach). Given the lack of sufficient data on which these estimates are based upon and the use of the marginal propensity to consume for their calculation, however, the literature seems to have largely ignored these estimates.

the severity of the Depression motivates this study. The existing research on trade and the Great Depression informs the empirical strategy in at least three respects. Firstly, the strong persistence of regional trade patterns as suggested by the gravity literature paves the way for a clean identification of the effect of trade shocks on income. Secondly, the heterogenous tariff responses to the Great Depression have to be accounted for. Finally, with an estimate of the foreign trade multiplier at hand, the relative importance of the trade channel in explaining the Great Depression in small open economies can be measured directly.

3.3 Framework, Data & Empirical Strategy

Before delving into the data description and presenting the precise estimation framework, it is worthwhile to fix the ideas that will guide the empirical analysis. The framework presented in the first part of this section links the domestic economy with foreign demand through the general level of exports, export shares with other countries, and the respective GDPs of these countries. The following discussion of the data sources quantifies these trade linkages and highlights the importance of trade for small countries during the interwar period. It also highlights the significant variation in trade shares across the three most significant economies during this period. In turn, this variation motivates the construction of the foreign demand measure, which is used as an instrumental variable in the 2SLS regression framework. After discussing the role of tariff rates, a placebo approach is presented to demonstrate the robustness of the estimation results. Finally, a simple accounting framework is presented to assess the magnitude of the effect of trade destruction on national incomes.

3.3.1 Fixing Ideas

As for fiscal multipliers, we could, in principle, calculate the multiplier based on the marginal propensity to consume and import.[19] However, estimates for the marginal propensity differ so greatly even for modern data that they hardly present a satisfying basis for the calculation of multipliers.[20] Alternatively, we

[19] Specifically, $m_x = \frac{1}{(1-mpc)+mpm}$.

[20] For example, Sahm et al. (2010) estimate it to be .3 based on survey data for the United States, whereas a clean quasi-natural experiment in Singapore suggests .8 (Agarwal and Qian, 2014). However, the variation in the estimates is not limited to methodologies or countries. As Shapiro and Slemrod (2003, p. 394) point out, it is very likely that the marginal propensity to consume is "contingent on aggregate conditions in ways that are difficult to anticipate."

can think of the trade multiplier and foreign demand in terms of the framework outlined by Abeysinghe and Forbes (2005) in connection with the Asian crisis.[21] In their setup, country i in an n-country world has the following output:

$$Y = X + A \tag{3.1}$$

in which the subscript i is omitted, Y is the output, X denotes export component of output, and A the non-export component of output. We can rewrite X as the sum of i's exports X_j to j countries (with $j \neq i$ throughout the following equations):

$$Y = \sum_{j=1}^{n} X_j + A \tag{3.2}$$

expressing the above equation in growth rates yields:

$$\frac{dY}{Y} = \frac{1}{Y}\left[\sum_{j=1}^{n} dX_j + dA\right] \tag{3.3}$$

From this equation, we could, in principle, estimate the elasticity of income with respect to changes in aggregate exports ($\sum_{j=1}^{n} dX_j$). However, Abeysinghe and Forbes (2005) further link the exports to each trading partner's economy in the following way. i's ability to export goods in the value of X_j to j depends on j's income such that:

$$X_j = X_j(Y_j) \tag{3.4}$$

with the derivative:

$$dX_j = \frac{\partial X_j}{\partial Y_j} dY_j \tag{3.5}$$

summing over all trading partners and expressing changes in terms of GDP as in 3.3:

$$\frac{dX}{Y} = \frac{1}{Y}\sum_{j=1}^{n} \frac{\partial X_j}{\partial Y_j} dY_j \tag{3.6}$$

[21]The equations presented follow their study closely but constitute only a small part of their whole argument.

and this can be rewritten as:

$$\frac{dX}{Y} = \frac{1}{Y}\sum_{j=1}^{n} \frac{\partial X_j}{\partial Y_j} dY_j \frac{X_j}{X_j}\frac{Y_j}{Y_j}\frac{X}{X} \tag{3.7}$$

denoting the elasticity of i's exports to j with respect to j's income with $\eta_j = \frac{\partial X_j}{\partial Y_j}\frac{Y_j}{X_j}$ and inserting the above term into equation 3.3 yields:

$$\frac{dY}{Y} = \frac{X}{Y}\Big[\sum_{j=1}^{n} \eta_j \frac{X_j}{X}\frac{dY_j}{Y_j}\Big] + d\frac{A}{Y} \tag{3.8}$$

and then assuming that the elasticity η does not vary by trading partner, the equation becomes:

$$\frac{dY}{Y} = \frac{X}{Y}\eta\Big[\sum_{j=1}^{n} \frac{X_j}{X}\frac{dY_j}{Y_j}\Big] + d\frac{A}{Y} \tag{3.9}$$

This final equation provides the link between country i's economy with the rest of the world. While obviously an abstraction,[22] three insights stem from this equation. These motivate the empirical setup and hence guide the data collection. First, the term $\frac{X}{Y}$, the overall export to GDP ratio, is an important determinant of how much the export sector can influence the domestic economy. The second important insight is that the income elasticity η links exports with the domestic economy. Third, the term $\frac{X_j}{X}\frac{dY_j}{Y_j}$ illuminates that the influence of a certain export market j for i's GDP depends on its weight relative to i's other export markets ($\frac{X_j}{X}$) and the GDP growth in j. With this wish list of variables at hand, we can now turn to the data collection.

3.3.2 GDP, Exports, Prices, and Trade data

The estimation of an export multiplier requires data on GDP, exports, and prices for the sample of 23 small economies.[23] Furthermore, data on trade flows are essential for the construction of the measure of foreign demand. This section briefly discusses the sources for and construction of the corresponding variables.

[22] While the above equations ignore many relevant relationships and implicitly make theoretically indefensible exogeneity assumptions, they are still useful to organise the thoughts.

[23] The database is limited to the 28 countries for which data has been gathered in Chapter 2. The United States, Germany and United Kingdom are excluded as they are considered large economies. Furthermore, I exclude Japan and France being neither small enough countries nor large enough importers.

While quarterly GDP data are mostly unavailable for this period, the economic activity indices estimated in Chapter 2 provide a close-enough proxy. This is particularly true as they are scaled on the volatility and trend of the annual per capita GDP data.[24] For the purpose of this study, employing these indices might be even preferable over actual national accounts. The new database presented in Chapter 2 contains a version of the economic activity index that, unlike actual GDP data, excludes all trade data.[25] In a robustness test, this allows me to ensure that the estimates are not driven by the fact that exports, in principle, enter the model on both sides of the equation.[26]

To facilitate the interpretation as a multiplier, it is important to express the economic activity and export data in terms of GDP. I thus rebase the *real* economic activity indices to 1929 nominal GDP per capita data (see Appendix 3A for the country-specific sources) such that:[27]

$$GDP_t = \frac{EAC_t}{\left(\frac{\sum_{r=1929Q1}^{1929Q4} EAC_r}{4}\right)} GDP_{1929} \tag{3.10}$$

GDP_t thus provides a quarterly measure of real national product per capita in 1929 prices. As is common for quarterly national accounts (see e.g. OECD, 2017), the quarterly values are expressed as annualised equivalents.

Correspondingly, I rebase the quarterly nominal exports per capita on their respective per capita annual total of 1929. Finally, equation 3.11 divides the resulting term by the price index P with the base year 1929. This yields real quarterly per capita exports in 1929 prices:[28]

[24] In fact, Mitchell et al. (2012) conducting a similar study refer to such indices as high-frequency GDP estimates. Quarterly rather than monthly data is used to abstract from very short-term fluctuations.

[25] The trend on which it is scaled should not be influenced much by trade data as trade balances over the medium term.

[26] In principle, this is also true for all estimates of the fiscal multiplier known to this author. In these study, spending enters the equation as part of GDP as well as the variable of interest on the right-hand side.

[27] As the estimations in this paper will be made in per capita terms (such as in Barro and Redlick, 2011, for estimating fiscal multipliers), I convert all variables into per capita by dividing their value by the population estimates (see Chapter 2 for the relevant sources). The annual population data is converted to monthly frequency by a spline interpolation. Given the steadiness of population growth, this is a quite reasonable procedure. To simplify the notation, I omit the per capita term in the rest of the study.

[28] The quarterly nominal export data is derived from the smoothed and seasonally-adjusted monthly export data in Chapter 2. The smoothing and seasonal adjustment procedure is the same as outlined in that Chapter. The high (quarterly) and low (annual) frequency export data are typically fully consistent. However, in some countries such as Chile the introduction of a new nominal currency requires conversion. To ensure full consistency, I take the 1929 annual export

$$XP_t^{real} = \frac{\frac{XP_t^{nominal}}{\left(\frac{\sum_{r=1929Q1}^{1929Q4} XP_r^{nominal}}{4}\right)} XP_{1929}^{nominal}}{P_t} \tag{3.11}$$

Unfortunately, the choice of the deflator P is not straightforward. Contemporary export price indices have severe limitations, especially regarding the weighting (see League of Nations, 1939a, p. 67 for a discussion). This can have severe implications for the interpretation of the real series. If the export price index is based on very few agricultural commodities, the prices of which fell rapidly during this period, increasing real exports could signal a flourishing export business when in fact farmers sell their harvest in large quantities at dumping prices. As we are interested in the impact of the foreign demand shock on the domestic economy, a GDP deflator provides an alternative. It expresses the income gained from exports in terms of the average price basket of the economy. Finally, wholesale price indices provide a compromise between the export and GDP deflators as they typically contain a number of export and domestic goods (League of Nations, 1939a, p. 67). Because of this feature and their availability at a quarterly frequency (see Chapter 2), they constitute the preferred deflator for this study. To ensure that the choice of the deflator does not have an undue influence on the results, the robustness of the results against using either of these deflators is tested (and confirmed).[29]

Having gathered real export and GDP data, we can assess the importance of exports relative to GDP. However, as we will identify the export multiplier from the variations in foreign demand based on trade flows, bilateral export data is needed. I derive these from the *Statistisches Handbuch der Weltwirtschaft* (Statistisches Reichsamt, 1936).[30] As all data were given in millions of national currencies, the flows were converted by the dollar exchange rate from the Board of Governors of the Federal Reserve System (1943).[31] This provides me with cross sections

values from the sources described in Appendix 3A rather than deriving them by summing the quarterly data.

[29]Unlike for wholesale prices, neither export price indices (with one for Belgium being the exception) nor GDP deflators exist at a monthly or quarterly frequency for the countries in the sample. An alternative is to employ annual export price indices and convert them to quarterly frequency. Using a spline interpolation, I create quarterly price indices from the annual indices, base them to $1929 = 1$, and convert the nominal to real per capita exports in 1929 prices. Appendix 3A reports all sources.

[30]For Bulgaria, there was no trade flow to the United States given in the source. I assume this flow to have been half of the export flow to the United Kingdom.

[31]For Estonia, a cross calculation with Germany was necessary based on the exchange rate given in Statistisches Reichsamt (1936). For Australia, New Zealand, and South Africa, the rate for the British Pound was used as these were pegged $1 : 1$. The dollar conversion is only important for the estimation of the gravity model.

for 1927 and 1933 with $23 * 3 = 69$ exports flows each. These data will be used for the creation of the foreign demand variable and the miniature gravity model to create the placebo study.

3.3.3 The Importance of Trade for Small Economies

While the Great War had taken its toll on the achievements of the first era of globalisation, the global degree of trade openness as measured by the trade (exports+imports) to income ratio during the 1920s was comparable to that of the Bretton-Woods period (Klasing and Milionis, 2014). However, when looking at the construction of the weights for such global measure, the large and relatively closed economy of the United States dominates. In contrast, the focus of this study is the export sector of small countries. Table 3.1 thus provides country-specific export and GDP data for them.

Indeed, for many smaller economies the exports to GDP ratio in 1927 alone surpassed 20 % as the column $\frac{X}{GDP}$ of Table 3.1 demonstrates. New Zealand, Denmark, Belgium, and the Netherlands even exported more than 30 % of their GDP. Prima facie, this provides us with an idea of how much of a role the loss of foreign demand could have played during the Depression. It also raises the question to which countries most of the goods were exported.

For the world as a whole, the top three importers, the United States, Germany, and the United Kingdom, absorbed around a third of the exports.[32] Because of the centre-periphery relationships, their share in the exports of the small economies in the sample was much larger for most countries (see column $\frac{X_{Top3}}{X_{Total}}$).[33] For example, the share of Chilean exports, typically mining and agricultural commodities, that went to the three economic powerhouses of the world amounted to 78 %. Combining this share with the data from the previous column means that around 16 % of Chile's GDP was exported to the three largest importers of the interwar period. Hence, many small countries were relatively open and their exports concentrated, making the conditions in the three large markets an important factor in a small country's GDP.

[32]Specifically, the world import value in 1929 was 35,595 m US-Dollars (1929 value), of which m $4,339 were consumed by the United States, m $5,407 by the United Kingdom, and m $3,203 by Germany. The fourth largest importer was France with m $ 2,282 (League of Nations, 1937, p. 214f).

[33]The division of Austria and Hungary obviously led to a reclassification of internal to foreign trade in the two countries. Yugoslavia traded mostly with Austria and Italy due to its geographic (and historical) proximity.

TABLE 3.1: EXPORT SHARES OF SMALL COUNTRIES

Country	$\frac{X}{GDP}$	$\frac{X_{Top3}}{X_{Total}}$	$\frac{X_{Germany}}{X_{Top3}}$		$\frac{X_{United\ Kingdom}}{X_{Top3}}$		$\frac{X_{United\ States}}{X_{Top3}}$	
			1927	1933	1927	1933	1927	1933
Australia	13	52	17	15	73	81	10	4
Austria	23	25	73	68	15	21	12	11
Belgium	43	37	45	37	30	44	24	19
Bulgaria	11	25	94	95	4	5	2	0
Canada	19	76	5	2	44	53	51	45
Chile	21	78	14	14	47	50	39	36
Czechoslovakia	28	37	66	61	21	14	14	25
Denmark	32	83	26	16	73	83	1	1
Estonia	23	62	48	34	50	59	2	7
Finland	24	62	26	15	66	71	9	14
Hungary	16	16	82	54	15	39	3	7
Italy	11	35	41	37	28	35	30	27
Mexico	13	84	12	10	9	28	79	62
Netherlands	31	52	47	50	46	40	7	11
New Zealand	32	85	3	1	91	91	6	8
Norway	17	53	24	29	56	47	20	24
Poland	11	45	71	46	27	50	2	4
Romania	10	25	76	40	24	59	1	1
South Africa	15	61	8	3	90	95	3	1
Spain	7	40	23	22	49	58	28	20
Sweden	18	56	30	37	50	22	20	42
Switzerland	20	45	43	48	34	31	23	20
Yugoslavia	13	13	84	75	10	14	6	10

Sources: Own calculations based on sources documented in Appendix 3A.
Note: All values are given in percentages. Column 1 is based on data for 1929. Column 2 on data for 1927.

However, even across these three markets, exports were all but diversified. The following six columns show the relative share of each of the three main economic powers in the small country's export markets for 1927 and 1933.[34] Combining these shares with the data in the first two columns also allows us to get an idea of the relative importance of large countries for the smaller ones. For example, around 9 % of the South African GDP were exports to the United Kingdom. Denmark exported 26 % of its GDP to Germany and Great Britain. Mexico's economy, in turn, heavily depended on exports to the United States, which made up around 8.5 % of her GDP. In short, economic conditions in a larger economy absorbing a significant share of a small economy's exports could have severe effects

[34]These shares are normalised by the X_{Top3} to improve the readability across rows.

on these countries.

Why was there such little diversification in terms of export markets? At first glance, history seems to have mattered for trade patterns as the cases of Canada, Australia, New Zealand, and South Africa suggest. They traded relatively intensively with their colonial metropole Great Britain. Likewise, the table suggests that geography mattered. For example, the American share in Mexico's export market is relatively large. The same holds true for the German share in Czechoslovakian exports. Estimating a gravity model in the later part of this section confirms these casual observations. History and geography determined the locus of the main export market during this period. Consistent with the gravity literature, export portfolios between 1927 and 1933 changed relatively little.

Chapter 2 demonstrated that the course and depth of the Depression varied substantially across the United States, Great Britain, and Germany. Combining this insight with the patterns of export markets shown in this section suggests that the small open economies could have been affected to different degrees by the global Depression through the trade channel. This is in line with what the League of Nations (1931, p. 236) reported as early as 1931. The first summary on the "course and phases of the World Depression" suggested that the depth of the Depression for each individual country did, amongst other factors, heavily depend on the situation of its "chief customers." Moreover, the League's report stated that "countries selling largely to others which have been seriously affected have tended to suffer, while those whose customers have enjoyed favourable conditions have in general been able better to maintain their economic activity." It is worthwhile to formalise these observations by constructing the appropriate measure.

3.3.4 Constructing the Measure of Foreign Demand

Based on the trade share data in Table 3.1 and the economic activity estimates in Chapter 2, I build the following measure of foreign demand.

$$Y_{i,t}^{F} = \sum_{j=1}^{n=3} w_{i,1927}^{j} * Y_{t}^{j} \tag{3.12}$$

where Y_i^F is the foreign demand for the small open economy i in quarter t. Y_t^j is the quarterly GDP per capita index of j in quarter t. $j = 1, 2, 3$ are the United States, United Kingdom, and Germany. Finally, w is the export share of i in 1927 with trading partner j. The shares are normalised such that $\sum w_{i,1927}^{j} = 1$.

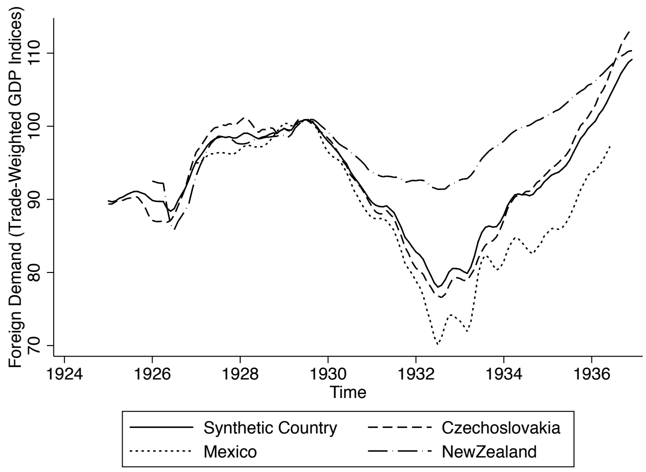


FIGURE 3.2: Varying exposure to foreign demand shocks due to composition of export markets

Source: Own calculations based on trade shares from Statistisches Reichsamt (1936) and the economic activity indices from Chapter 2.

Figure 3.2 highlights the variation of this measure over time across countries. The solid line emulates a synthetic country that exports to each of the large countries to the same degree ($w^1_{i,1927} = w^2_{i,1927} = w^3_{i,1927} = \frac{1}{3}$). The other indices are based on the actual trade data in Table 3.1. It becomes apparent that the exposure to the Depression varied substantially across countries. Mexico traded mostly with the United States. As the Great Depression was the deepest in the United States among the three economic powerhouses, the drop in foreign demand for Mexico was very large. In contrast, New Zealand benefitted from the fact that Great Britain was its chief customer, absorbing exports worth about 24 % of her GDP. Foreign demand dropped relatively little because the Depression was least severe in Great Britain among the three main global importers. Finally, Czechoslovakia exported foremost to Germany. The German Depression was neither as deep as the one in the United States nor as mild as the one in Great Britain. This meant that the intensity of the foreign demand shock was milder than in Mexico, but more pronounced than in New Zealand. Figure 3.2 suggests that the variation in foreign demand for each of the small countries was indeed large. It stems solely from the historical and geographic trade patterns as the GDP data used for all three large countries is the same for every small economy. How did this variation in foreign demand affect export opportunities?

Figure 3.3 shows the conditional correlation between the growth of foreign

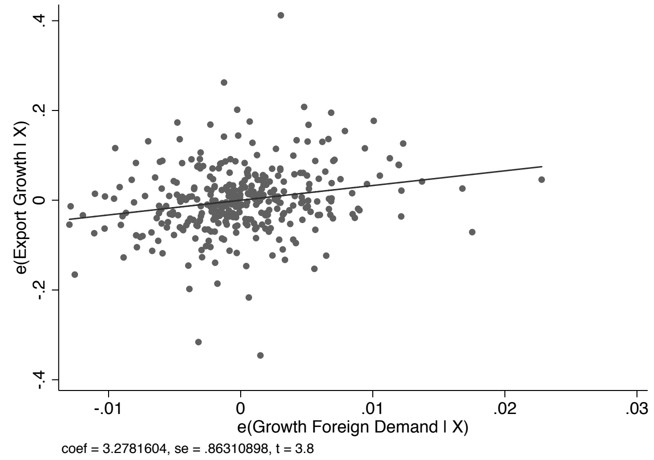


FIGURE 3.3: Relationship between exports and the foreign demand measure

Note: Conditional correlation of the growth of real exports with foreign demand as defined above. Controls include: inflation, gold adherence, foreign exchange controls, country fixed effects and year fixed effects. This graph is based on the balanced sample (1928Q3-1932Q1). Number of observations: 345.

demand and real exports.[35] The relationship is significant in statistical and economic terms. A 1 % percent change in the growth of the foreign demand index increased the growth of real exports by around 3.3 %. It is fair to assume that this variation is exogenous for the small country. First, it is unlikely that the small country influences the large country's economy to a significant degree. Second, the time fixed effect in the conditional correlation shown above controls for global economic conditions. The identifying variation comes from the combination of the course of the Depression in the three large countries and the trade patterns in 1927. These patterns themselves were deeply rooted in history and geography. They changed relatively little in response to the Depression. Given these desirable features, the relationship displayed here will thus constitute the first stage of the instrumental variable strategy chosen in this study.

3.3.5 Estimating the Trade Multiplier

For the estimation of fiscal multipliers, the literature has moved towards the analysis of time series data covering either one or multiple countries. Yet, the latter panel data approach cannot deal with the inherent identification problems either.

[35] The set of control variables includes (wholesale price) inflation, dummy variables for gold adherence and foreign exchange controls, and country and time fixed effects. The time fixed effect ensures that the identifying variation only comes from the variation in foreign demand at a given point in time.

Thus, the causal identification of the multiplier is either achieved by restrictions in a vector autoregression analysis or by instrumental variable approaches (see Ramey, 2011, for a concise and excellent review). In the following paragraphs, I present two specifications common in the fiscal multiplier literature but repurposed for the analysis of the trade multiplier. To the best of my knowledge, no other recent study adapts the instrumental variable approaches from the fiscal multiplier literature in this way.

The first specification follows the panel regressions by Almunia et al. (2010):

$$\frac{y_{i,t} - y_{i,t-1}}{y_{i,t-1}} = \beta_1 \frac{XP_{i,t} - XP_{i,t-1}}{XP_{i,t-1}} + \beta_x X' + c_i + t_t + \epsilon \tag{3.13}$$

in which $\frac{y_{i,t}-y_{i,t-1}}{y_{i,t-1}}$ denotes the GDP growth rate in country i, X' is a vector of controls, including inflation, a dummy capturing gold adherence and the imposition of foreign exchange controls.[36] c_i denotes a country fixed effects country i. As the equation is estimated in growth rates, the country fixed effects account for structural reasons that might affect growth rates. One such factor could, for example, be industrial development (see Chapter 2). Finally, t_t is a time fixed effect for quarter t. This fixed effect captures global economic conditions.

The term $\frac{XP_{i,t}-XP_{i,t-1}}{XP_{i,t-1}}$ captures real export growth. Note, that in this setting the coefficient β_1 is not interpretable as a multiplier. Instead it is the elasticity of income with respect to changes in exports. In order to facilitate the interpretation as a multiplier, we have to divide the coefficient by the median ratio of exports to GDP in the sample ($m_x = \frac{\beta_1}{\widetilde{(\frac{X}{GDP})}}$).[37] Because various dimension of endogeneity such as reverse causation and omitted variable bias loom large, estimating the above equation with the one stage OLS estimator is unlikely to produce reasonable estimates for the coefficient of interest.[38] This calls for an instrumental variable approach. As argued above, satisfying the exclusion restriction and relevance conditions, we can isolate exogenous changes in a small country's exports in this panel setting by the following first-stage regression:

[36] The gold standard adherence and foreign exchange control indicators are from a variety of sources (League of Nations, 1941; Wolf and Yousef, 2007; Bernanke and James, 1991; Crafts and Fearon, 2013a). The wholesale price inflation is calculated from the data in Chapter 2. In robustness tests, I also add the lagged dependent variable $\frac{y_{i,t-1}-y_{i,t-2}}{y_{i,t-2}}$ to mitigate serial correlation concerns.

[37] This procedure is equivalent to the fiscal multiplier literature, where one divides the coefficient by the public spending to GDP ratio. Almunia et al. (2010) use the median, whereas Riera-Crichton et al. (2015, p. 19) use the mean. Using either does not make a large difference in the case of this study.

[38] One of such confounding factors could be the well-documented capital flow reversals during this period, which might affect exports and GDP (Accominotti and Eichengreen, 2016).

$$\frac{XP_{i,t} - XP_{i,t-1}}{XP_{i,t-1}} = \beta_1 \frac{y^F_{i,t} - y^F_{i,t-1}}{y^F_{i,t-1}} + \beta_x X' + c_i + t_t + \epsilon_{i,t} \tag{3.14}$$

where $\frac{y^F_{i,t} - y^F_{i,t-1}}{y^F_{i,t-1}}$ captures the growth rate in foreign demand. This setup provides us with a causal estimate of the foreign trade multiplier. Note that the time fixed effect ensures that the identifying variation of the instrument comes from deviations in foreign demand based on the pre-crisis trade patterns, not the world demand itself.

In an alternative specification, I apply the approach put forward by Barro and Redlick (2011), estimating fiscal and tax multipliers for the United States. The advantage of this approach is that the coefficient can be interpreted as a multiplier without any further conversions. This is achieved by basing the changes in real exports on the GDP in $t-1$ such that the variable of interest becomes $\frac{XP_{i,t} - XP_{i,t-1}}{y_{i,t-1}}$:

$$\frac{y_{i,t} - y_{i,t-1}}{y_{i,t-1}} = \beta_1 \frac{XP_{i,t} - XP_{i,t-1}}{y_{i,t-1}} + \beta_x X' + c_i + t_t + \epsilon \tag{3.15}$$

where the calculation of export growth in terms of GDP $\frac{XP_{i,t} - XP_{i,t-1}}{y_{i,t-1}}$ facilitates a straightforward interpretation of β_1 as a multiplier. Corresponding to the Almunia et al. specification above, the first stage is estimated by the following equation:

$$\frac{XP_{i,t} - XP_{i,t-1}}{y_{i,t-1}} = \beta_1 \frac{y^F_{i,t} - y^F_{i,t-1}}{y^F_{i,t-1}} + \beta_x X' + c_i + t_t + \epsilon \tag{3.16}$$

A potential problem for this setup is that the (lagged) left-hand side variable now features in the denominator on the right-hand side, which could induce endogeneity. Reassuringly, as we shall see, both specifications yield virtually the same result.

In this study, I focus on the size of the impact (contemporaneous) multiplier. Future research should also aim to estimate a more dynamic version of this multiplier, for example by using the local projection approach proposed by Jordà (2005). This approach has recently gained prominence in the fiscal multiplier literature (Ramey and Zubairy, 2018).[39] If dynamic effects are taken into account, the multiplier would most likely increase. Yet, other problems potentially emerge

[39] Earlier estimates of the dynamic multiplier relied on VAR approaches in the vein of Ilzetzki et al. (2013).

and thus this approach is not followed here.[40]

On the other hand, we might want to correct for trade-balance effects. So far, we have abstracted from the adjustment of the trade balance entirely. This may or may not be warranted in a short-run analysis such as this one even though a full adjustment of the trade balance is not a given during this period.[41] If there was no adjustment at all, we could just interpret the multiplier as it is. In a national accounting sense, however, trade is neutral. It is useful to distinguish contemporaneous ϕ and long-term adjustment (γ=1-ϕ) such that the trade balance-adjusted impact multiplier m_x^{TB} becomes:

$$m_x^{TB} = m_x - (1 - \phi) \tag{3.17}$$

If there is full within-period trade balance adjustment ($\phi = 1$), no adjustment of the trade multiplier is necessary and thus $m_x^{TB} = m_x$. This is because the growth in imports is already fully reflected in the contemporaneous GDP growth - the dependent variable in Equation 3.15. If there is zero contemporaneous adjustment of the trade balance ($\phi = 0$), the impact multiplier would become $m_x^{TB} = m_x - 1$. Fortunately, estimating (ϕ) is very straightforward. Another way to express ϕ is the within-period elasticity of imports M with respect to a change in exports, which can be estimated by the following equation:

$$\frac{M_{i,t} - M_{i,t-1}}{y_{i,t-1}} = \phi \frac{XP_{i,t} - XP_{i,t-1}}{y_{i,t-1}} + c_i + t_t + \epsilon \tag{3.18}$$

Using the same instrument for exports as in Equation 3.16, Appendix 3B.2 provides the corresponding estimate for the within-period adjustment $\phi \approx .53$. The conservative lower bound estimate for the foreign trade multiplier would thus be $m_x^{TB} = mx - .47$, assuming full future trade balance adjustment and no impact of the multiplier other than the contemporaneous one. Another natural way to think of m_x^{TB} is the part of the multiplier that purely captures the gains from trade, many of which were lost during the period under consideration.

[40] In particular, the large number of fixed effects essential for my identification strategy could impose problems. Typically, the panel local projections are not estimated with time fixed effects (see e.g. Jordá et al., 2017).

[41] See Appendix 3A for plots of the annual trade balance in terms of GDP for each country.

3.3.6 The Omission of Tariff Rates and the Measure of Foreign Demand

Even though the instrumental variable strategy should mitigate omitted variable bias and endogeneity concerns, some caveats of the measure of foreign demand are worth mentioning. So far, we have abstracted from changes in tariff barriers. If tariff barriers rose to the same degree in all three countries throughout the period, this would not pose any difficulties for the identification per se. As we know from previous research (Eichengreen and Irwin, 2010), this was not the case as the world crisis progressed in the 1930s. Germany became more restrictive than the United Kingdom and the United States in the 1930s. If the evolution of tariff barriers across the three large countries diverged, this could weaken the instrument as the weighting of the foreign GDPs is time-invariant.

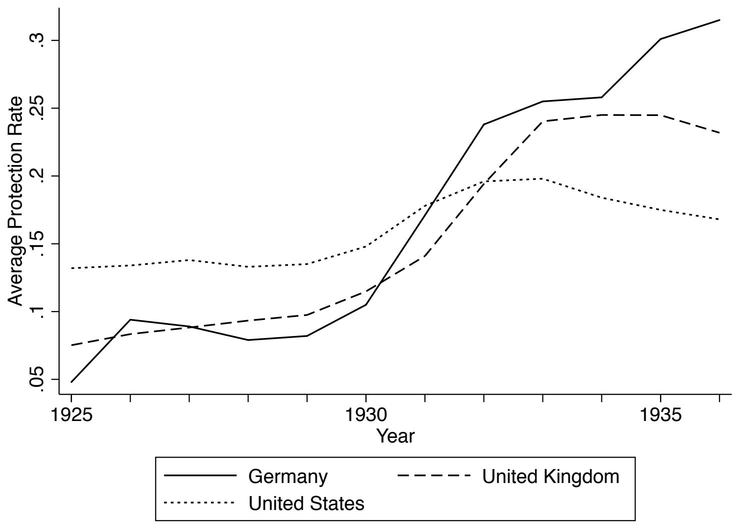


FIGURE 3.4: Average protection rates in Germany, the United Kingdom, and the United States

Source: Clemens and Williamson (2004)
Notes: The average protection rate is defined as tariff revenue over imports.

However, Figure 3.4 demonstrates that the growth in protectionism across the three large countries only started to diverge significantly after 1932. Moreover, other forms of import restrictions such as quotas and exchange controls became more common in response to the financial crisis of 1931 and the collapse of the gold standard at the end of that year (Mitchener and Wandschneider, 2015; Gordon, 1941, p. 35f). Given these observations, we should restrict the sample until

1932.[42] As for two countries of the countries in the sample, the GDP data are only available from 1928 onwards, a balanced subsample between the second quarter of 1928 and the first quarter of 1932 will thus serve as the preferred sample.[43]

3.3.7 A Placebo Test: Shutting Down History & Reversing Geography

The insight that trade flows are persistent in the short and medium term motivates the creation of the foreign demand instrumental variable. It also paves the way for a placebo test to verify the results of the analysis. As the observed pre-crisis trade shares are a function of history and geography, we can experiment with a historical and geographical counterfactual. Simulating the absence of (colonial) history and rotating the distance of countries to the main economic powers, what would the trade shares in 1927 have looked like? If we use these counterfactual trade shares to construct the foreign demand measure, do we still obtain significant results in the instrumental variable estimation? If so, this would cast doubts on the validity of the results.

To investigate this question, we start by creating a "miniature gravity model" including the exports of the 23 small countries in the sample to the three large importing nations. Specifically, I estimate the following equation:

$$XP_{i,j} = \beta_1 ln(D_{ij}) + \beta_2 C_{ij} + \gamma_i + \delta_j + \epsilon \tag{3.19}$$

$XP_{i,j}$ are the exports from the small economy i to the large economy j in US-Dollars, C_{ij} indicates if a colonial relationship exists, and γ_i and δ_j are exporter and importer fixed effects respectively. $D_{i,j}$ is the distance between small country i and large country j.[44]

Table 3.2 displays the results using the two most common estimators for this miniature gravity model. As OLS is biased when applied to trade data, the PPML estimator is preferred (Santos Silva and Tenreyro, 2006). The results are all but surprising. Countries farther apart traded less, but having a colonial tie had a positive effect on trade. The high value for the *Pseudo* R^2 indicates the power of geographical and historical forces in shaping commercial relationships.

[42] As the Import Duties Act became effective in March 1932 in the United Kingdom, the first quarter of 1932 seems a reasonable cut-off date within that year.
[43] Appendix 3C, however, demonstrates the robustness of the results for the full sample.
[44] Distances for the estimation of the gravity model were taken from Gowa and Hicks (2013).

TABLE 3.2: RESULTS FROM A MINIATURE GRAVITY MODEL

Estimator	OLS	PPML
Dep. Variable	LN(Exports)	Exports
LN(Distance)	-0.821***	-0.434***
	(0.183)	(0.115)
Colonial Tie	2.590***	2.424***
	(0.715)	(0.345)
Observations	69	69
R^2 / *Pseudo* R^2	0.856	0.908

Note: See text for data sources. A constant, importer and exporter fixed effects are included, but not shown. Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.

With these elasticities at hand, we can now build our counterfactual world. The historical part of this world will be the absence of colonial ties by setting $\beta_2 = 0$. For the geographical counterfactual, I rotate the distances between trading partners.[45] The country that was farthest away now becomes closest, the country that was second farthest now becomes the farthest away, and the closest country would now be in the middle of the two. Based on this reversed geography and the coefficients from Table 3.2, I then predict trade. This allows me to construct the relative trade shares in the three export markets akin to Table 3.1. Table A3.24 in the appendix compares the actual and counterfactual trade shares in 1927. In turn, these counterfactual trade shares allow us to construct a "placebo" measure of foreign demand for each country. The calculation of this measure strictly follows the one for the actual foreign demand measure outlined in Section 3.3.4. It only differs in that it employs the counterfactual trade shares rather than the actual ones.

3.3.8 Accounting for the Importance of the Fall of Trade

The causal estimate of the export multiplier allows us to assess the role of trade destruction for the initial phase of the Great Depression in small open economies. Rather than using a metric such as the peak-to-trough loss, it is helpful to calculate the cumulative loss in the vein of the analysis in Chapter 2. This measure has the salient feature of being comparable across countries by ensuring that the same

[45]An alternative would be to randomise the distances entirely, but for the sake of the argument and precise replicability of the results, the rule-based rotation of countries is preferred.

time horizon is used across the sample. A further advantage is that an exceptionally good (or bad) quarter in terms of exports at the end of the three-year period has less influence on the result than a good (or bad) quarter at the trough when calculating the peak-to-trough loss. The cumulative loss relative to the peak is calculated by:

$$GDP_L = \frac{\sum_{t=1}^{12} GDP_{P+t} - GDP_P}{4} \bigg/ GDP_P \tag{3.20}$$

where GDP_P is the quarterly GDP and P denotes the quarter, in which the final pre-Depression peak of the GDP occurred between 1928 and 1931. Dividing the integral between a horizontal line from the peak and the observed actual GDP for first three years (= 12 quarters) of the crisis by 4 and then by the peak-GDP allows us to express the initial loss in terms of annualised peak-GDPs. Correspondingly, the loss in real exports[46] in the first three years is calculated in the following way:

$$XP_L^{GDP} = \frac{\sum_{t=1}^{12} XP_{P+t} - XP_P}{4} \bigg/ \frac{\sum_{t=1}^{P+12} GDP_{P+t}}{12} \tag{3.21}$$

in which, like above, P refers to the quarter in which GDP peaked. The term $\frac{\sum_{t=1}^{P+12} GDP_{P+t}}{12}$ ensures that the cumulative loss in exports ($\frac{\sum_{t=1}^{12} XP_{P+t} - XP_P}{4}$) is expressed in terms of the average GDP for the three years following the last GDP peak. We can then combine our estimate of the export multiplier m_x^{TB} with the cumulative loss in exports XP_L^{GDP} to calculate GDP_{TD} - the GDP loss that is due to the fall in exports (trade destruction).

$$GDP_{TD} = m_x^{TB}\, XP_L^{GDP} \tag{3.22}$$

Finally, dividing the trade-induced income destruction GDP_{TD} by the total decline GDP_L provides us with the share of total income loss caused by trade destruction:

$$S_{TD} = \frac{GDP_{TD}}{GDP_L} \tag{3.23}$$

[46] I use the GDP deflator for this accounting exercise as the interpolation from annual to quarterly observations, unlike for the regressions, seems to be harmless here. Given the objective of the accounting exercise, the effect of the loss of exports on the domestic economy, converting nominal exports to real exports employing the GDP deflator seems the most appropriate procedure.

As long as the terms XP_L^{GDP} and GDP_L are not positive (meaning a cumulative gain in either GDP or exports), S_{TD} must be greater than zero.[47] It can also be larger than one, implying that, in the absence of the loss in exports, the country's economy would have grown ceteris paribus.

3.4 Results

3.4.1 Estimating the trade multiplier

Table 3.3 reports the results of the IV estimation for the balanced sample of 23 countries running from the third quarter of 1928 until the first quarter of 1932. All regressions include a set of controls comprising wholesale price inflation, gold standard adherence, imposition of foreign exchange controls, country and time fixed effects. For expositional clarity, their display is omitted in the below table.[48]

TABLE 3.3: IV RESULTS (BALANCED SAMPLE - 1928Q2–1932Q1)

Specification	Almunia et al.		Barro-Redlick		Placebo	
	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
	xp	y	xp^{GDP}	y	xp^{GDP}	y
xp		0.19^{***}				
		(0.05)				
xp^{GDP}				1.20^{***}		1.28
				(0.39)		(1.55)
y^F	3.36^{***}		0.52^{***}		1.45	
	(0.75)		(0.10)		(1.47)	
Observations	368	368	368	368	368	368
Countries	23	23	23	23	23	23
Partial F	20.22		26.37		0.98	

Note: Standard errors in parentheses and clustered at the country level. Controls included, but not shown: wholesale price inflation, gold standard adherence, imposition of foreign exchange controls, time and country fixed effects. The median ratio of exports to GDP for this sample is .161.
* $p < .10$, ** $p < .05$, *** $p < .01$

[47] Only in the case of Bulgaria, exports do not fall cumulatively during the first three years of the crisis. Export quantities increased heavily due to two exceptionally good harvests in 1930 and 1931 (Methorst, 1938, p. 47). Bulgaria is thus omitted from this exercise. An interpretation would naturally be that in the absence of the gain in trade, the Depression would have been even worse.

[48] The respective coefficients are shown in Appendix 3C. Given that during this period almost all countries were still on the gold standard and foreign exchange controls were the exception rather than the rule before 1932, they are of little interest.

The first two columns show the specification in the vein of Almunia et al. (2010). The instrument is very strong as signalled by the partial F-statistic well above 10. To interpret the elasticity of income with respect to changes in exports, we have to divide the estimate for the export variable xp by the median ratio of exports to GDP such that the export multiplier is $m_x = \frac{.193}{.161} \approx 1.19$. This value is virtually the same as the estimate of the specification in the vein of Barro and Redlick (2011) shown in column four (1.20). In the case of the Barro and Redlick-specification, the coefficient for changes in xp^{GDP} can be interpreted without further transformation. As for the Almunia et al.-specification, the partial F-statistic in the first stage suggests that the instrument is relevant and strong. Based on these estimates, we can conclude that the foreign trade multiplier m_x was about 1.2 in the period under consideration. This estimate is reassuringly close to another, though domestic, demand-shock based estimate of the multiplier during this period. Rather than analysing a foreign demand shock, Almunia et al. (2010, p. 247) use domestic defence spending shocks on government expenditure. Their (fiscal) multiplier takes a value of 1.6.

We can convert the estimated impact multiplier into the trade-balance adjusted multiplier by $m_x^{TB} = 1.2 - .47 \approx .73$. This provides us with the most conservative estimate for the foreign trade multiplier, assuming for full future readjustment of the trade balance and neglecting any potential dynamic effects. This effect is still large. For every percentage point of exports lost (in terms of GDP), GDP declined by .73 %. Again, m_x^{TB} corrects for all accounting-related effects and simply captures the lost gains from trade. As the next section will demonstrate, this multiplier is large enough to have severe implications for our understanding of the spread and depth of the Great Depression.

The results presented here are robust against a number of specifications. The last two columns of Table 3.3 estimate the Barro and Redlick-specification with the placebo foreign demand rather than the actual one. As expected, the first stage indicates that the counterfactual foreign demand is no predictor of the crisis. The second stage thus naturally leads, as it should do, to insignificant results. This non-result provides an important verification of the multiplier estimate. It shows that the finding is not driven by unobserved global movements.

Further robustness checks are included in Appendix 3C. The results change little when (i) errors are clustered along the country *and* time dimension and (ii) a lagged dependent variable is included to mitigate serial correlation concerns. While the instrument becomes weaker as the trend in the erection of trade barriers diverges in the mid-1930s, the results also hold (iii) for the full (unbalanced) sample throughout the period. In fact, the estimated trade multiplier grows. However, it is not clear whether this is due to a weak instrument problem or in fact driven by the nature of the recovery of the 1930s. In specification (iv), I estimate the same equation with the economic activity indices that were constructed without any trade and price data. Finally, specification (v) does employ un-smoothed data for exports and prices. Naturally, the estimate is less precise as the export data are very volatile for some countries. However, its econometric and economic significance is comparable to the other specifications and the F-statistic for the first stage remains close to the value of 10.

3.4.2 Accounting for the Importance of the Fall of Trade

How would the initial course of the Great Depression have looked like in small open economies in the absence of the breakdown of opportunities to export? Table 3.4 provides a guide to answer this question based on the GDP and export data for each country and the causal estimate of the export multiplier from the previous section. The countries are ordered by the explanatory power of the trade channel.

The column GDP_L displays the cumulative GDP loss in the first three years after each country's pre-Depression peak. Correspondingly, the column XP_L^{GDP} shows the cumulative loss in real exports over the average GDP in the first three years of crisis. For example, Belgium had lost 20 % worth of a year of its peak-GDP in the three years following the pre-Depression peak. During the same period, she had cumulatively lost 42 % of exports in terms of her average GDP during these three years. The column GDP_{TD} multiplies this latter value with the trade multiplier showing the percentage amount of GDP lost to trade destruction.[49] In the case of Belgium, this would imply a 30 % loss in terms GDP due to the loss of export markets, whereas the actual observed one was 20 % (column 1). Finally, the column $S_{TD} = \frac{GDP^{TD}}{GDP_L}$ divides the former by the latter, thus documenting the share that trade destruction can explain in the total GDP loss during the first three years of the crisis. In the Belgian case as well as for Estonia and Denmark, the trade channel over-explains the drop in GDP. Put differently and all other things equal, these economies would have grown in the absence of the

[49] A potential caveat of this method is that the estimate of the multiplier is not country-specific. On the other hand, it is not ex-ante clear why the multiplier itself should vary greatly across countries. In any case, this accounting exercise rather than being a definitive statement in the sense of a horse race on the causes of the Great Depression in small open economies shall illuminate the relative importance of the trade multiplier.

fall in trade. This accessible metric thus allows us to gauge, to a first approximation, how important the loss of export markets could have been for the course of the Great Depression in small open economies.

TABLE 3.4: THE IMPACT OF TRADE DESTRUCTION ON INCOME

Country	GDP_L	XP_L^{GDP}	GDP^{TD}	$S_{TD} = \frac{GDP^{TD}}{GDP_L}$
Explanatory Power of the Trade Channel: > 100 %				
Belgium	-20	-42	-30	154
Estonia	-6	-12	-9	152
Denmark	-12	-18	-13	105
Explanatory Power of the Trade Channel: 50-99 %				
Norway	-9	-11	-8	90
Netherlands	-25	-29	-21	85
Czechoslovakia	-23	-26	-19	84
Hungary	-16	-16	-12	73
Switzerland	-16	-15	-11	71
South Africa	-19	-16	-12	62
Austria	-34	-28	-21	60
Finland	-10	-8	-6	57
Sweden	-25	-18	-13	52
Explanatory Power of the Trade Channel: < 50 %				
Yugoslavia	-26	-17	-13	48
Canada	-42	-26	-19	46
Chile	-64	-39	-28	44
Australia	-24	-14	-10	43
Italy	-16	-9	-6	38
Mexico	-18	-8	-6	34
Spain	-27	-11	-8	29
New Zealand	-39	-15	-11	28
Romania	-21	-7	-5	26
Poland	-32	-5	-4	12

Source: Own calculations. All numbers are given in percentages.
Note: All calculations based on a trade multiplier of 0.73.

The second group contains countries for which at least half of the initial downturn can be explained by the loss of export markets. The fact that much, if not all, of the initial depth of the Depression in the Scandinavian countries is explained by the loss in export opportunities, resonates well with the large effects of international fluctuations on the Scandinavian business cycles found in Klovland (1998,

p. 335). Similarly, country-specific studies on Austria, Switzerland, Hungary, and Czechoslovakia have emphasised the lack of world demand as an important contributing, though not necessarily dominant, factor for the Depression.[50] The same holds true for the economies of the Netherlands and Belgium, which were particularly vulnerable due to their openness (see van Zanden (1998, p. 109) and Mommen (1994, p. 32).

The final group comprises countries for which the trade channel explains less than 50 % of the downturn. However, it is still a large factor for the depth of the initial crisis in countries such as Australia and Canada.[51] The results for Italy confirm the important role ascribed to the loss in foreign demand found in earlier research (Mattesini and Quintieri, 1997, p. 279). Except for Poland, a relatively closed economy (see Table 3.1), the trade channel can explain substantial parts of the initial depth of the crisis even in this last group.

In sum, a number of countries would perhaps have avoided or nearly avoided the first years of Depression altogether had there not been such a drastic fall of export opportunities. For most other countries, the trade channel still serves as an important explanation for the initial depth of the crisis. The effects presented here are large, but they are not unrealistic. They are fully consistent with the notion of contemporaries that, besides the gold standard, the exposure to the global Depression determined the fate of the small open economies during the interwar years. Furthermore, they are consistent with the importance of trade linkages for business cycle comovement during this period.[52] After all, trade propagated the Depression to a significant extent.

3.5 Conclusion

This study resurrects the concept of the foreign trade multiplier for the analysis of short-run macroeconomic fluctuations. Ironically, while nowadays the foreign

[50] See Otruba (1968, p. 20) and März (1990, p. 413) for Austria, Woitek et al. (2012, p. 145) for Switzerland, Berend and Ránki (1985, p.61–64 with a special emphasis on agriculture) for Hungary, and Pryor et al. (1971, p. 46) for Czechoslovakia. This is of course not to say that other factors were negligible or that trade is framed as the dominant driver of the Great Depression in these countries. This is particularly true for the consequences of the *Creditanstalt* crisis in Austria (Schubert, 1991) and the twin banking crisis in Hungary (Macher, forthcoming).

[51] See Valentine (1987) on the role of the fall in exports and export prices in Australia and Horn (1984) on the role of the loss of foreign markets for the Canadian Depression.

[52] See Mathy and Meissner (2011).

trade multiplier is at the centre of (mostly Keynesian) long-run development economics, explaining short-run fluctuations is precisely what Harrod's initial contribution was intended for. The trade multiplier can explain large parts of the Depression in the small countries, at least in the initial stages. Some countries would have even escaped this downturn altogether if it was not for the fall in trade. Or to morph Dennis H. Robertson's quip (Polak, 1956): If the industrial powerhouses of the world had not sneezed, the rest of the world could have avoided catching pneumonia. In reality, however, demand from the large importers for exports dropped. Given the magnitude of the crisis emanating from them, it seems unlikely that any small open economy could have escaped the Great Depression by implementing better policies.

On the empirical side, future work should aim to provide dynamic estimates of the multiplier. Furthermore, it should quantify the impact of the rise of tariffs on the destruction of income in a more formal manner. Finally, it would be interesting to investigate the relative importance of prices and demand. One could argue that for some countries the increasing real exchange rate relative to that of other exporters who had left the gold standard was the dominant force for the fall in trade during the later phase of the Depression. If so, the gold standard naturally plays a role. However, the mechanism is quite different from the ones operating through the real wage (Bernanke and Carey, 1996), domestic financial (Bernanke and James, 1991), and international financial channel (Temin, 1993; Accominotti, 2012b; Accominotti and Eichengreen, 2016). In this study, I have avoided this question by dealing only with the first phase of the Depression. Most countries in the sample were still on the gold standard during this episode.

These empirical questions aside, the economic policy implications are perhaps the most thought-provoking ones. The magnitude of the effects presented in this study calls into question the idea that policymakers in small open economies had much leverage to counter the crisis. Much of their countries' fate seems to have depended on the course of the Depression elsewhere. While these countries could rely on currency devaluation or active fiscal policies in order to boost aggregate demand, there was a limit to the efficacy of these policies in the initial stages of the Depression. A large share of the fall in demand faced by small countries in the early 1930s was just a mechanical consequence of the economic recession in the world's core economies and, thus, was beyond their control. These findings also suggest that countries with a more diversified export portfolio are less likely to be hit severely by Great Depression-type events.

3.6 Appendices

Appendix 3A Data

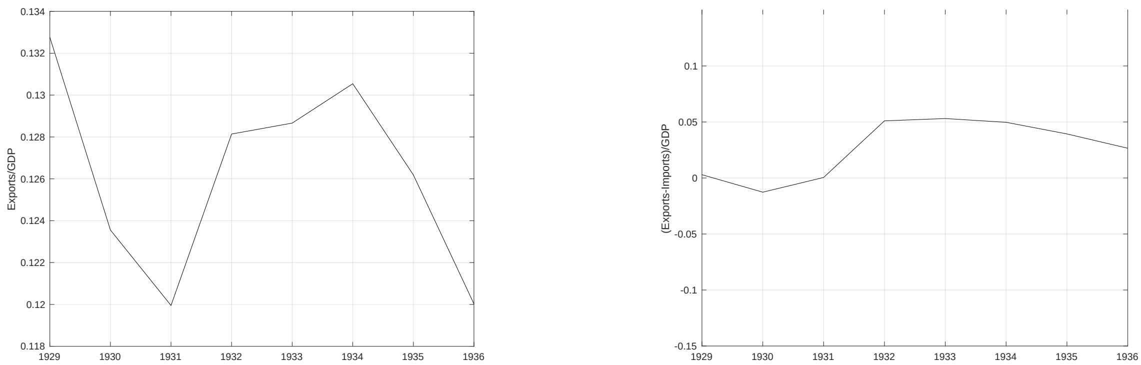
The following appendix summarises the data used in this study and sources thereof. Annual export, nominal GDP, real GDP, and export prices have been gathered from a variety of sources as detailed in the following appendix. Beyond these "source tables," it provides graphs for the exports to GDP ratios and the trade balance in terms of GDP for each country as referred to in the main text.

Furthermore, it contains figures showing the raw, seasonally-adjusted, and seasonally-adjusted and smoothed monthly export data. These data are shown to underscore the importance of seasonal adjustment and smoothing. Upon inspection of the individual country graphs, it becomes apparent that in some countries, exports exhibit very strong seasonal variations. Not correcting for those would introduce so much noise in the estimations that any attempt to estimate them would be fruitless. As in Chapter 2, the X-13-ARIMA algorithm is used to remove the seasonal components from the series. The graphs also suggest that even seasonally-adjusted data in some cases shows very large month-to-month variation due to a large irregular component. These could be, for example, due to a frozen harbour, dock strikes or measurement error. Typically, in the following month such changes are fully compensated as the export goods are stored and then simply accounted for the next month. In the case of the smoothed data, the MCD smoother is applied as in Chapter 2. In the specifications shown in this study, the smoothed data are thus used in the the preferred specification. While using the seasonally-adjusted data introduces more noise into the estimation and weakens the instrument, it does not affect the results in significant manner.

3A.1 Data Australia

TABLE A3.1: DATA SOURCES: AUSTRALIA

Variable	Unit	Source	Note
Real GDP	2010 Australian Dollars	Hutchinson and Ploeckl (2016)	GDP
Nominal GDP	Australian Dollars	Hutchinson and Ploeckl (2016)	GDP
Nominal Exports	Current Dollars	Butlin et al. (2014, p. 573)	Data was converted into calendar years.
Nominal Imports	Current Dollars	Butlin et al. (2014, p. 573)	Data was converted into calendar years.
Export Price Deflator	Index (1966 = 1)	Butlin (1977, p. 82)	Index was converted into calendar years.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.1: Trade Ratios - Australia

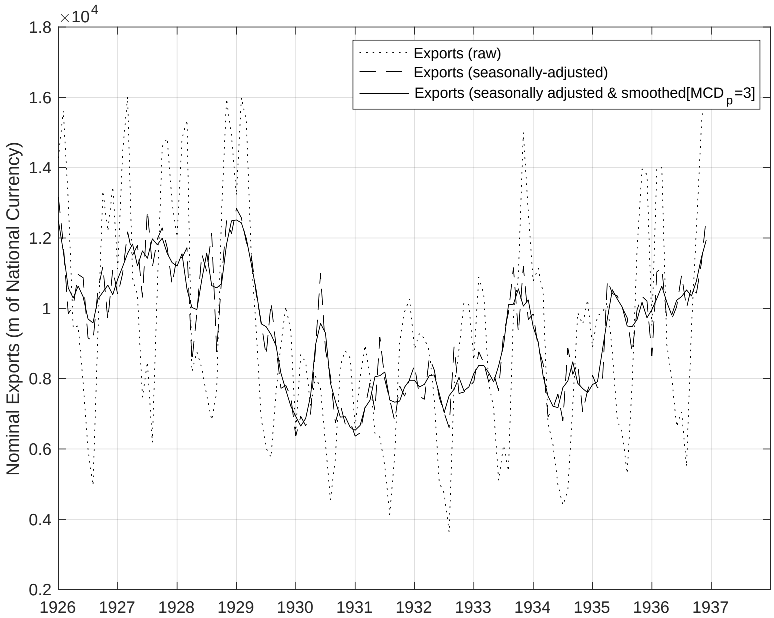


FIGURE A3.2: Monthly Export Data - Australia

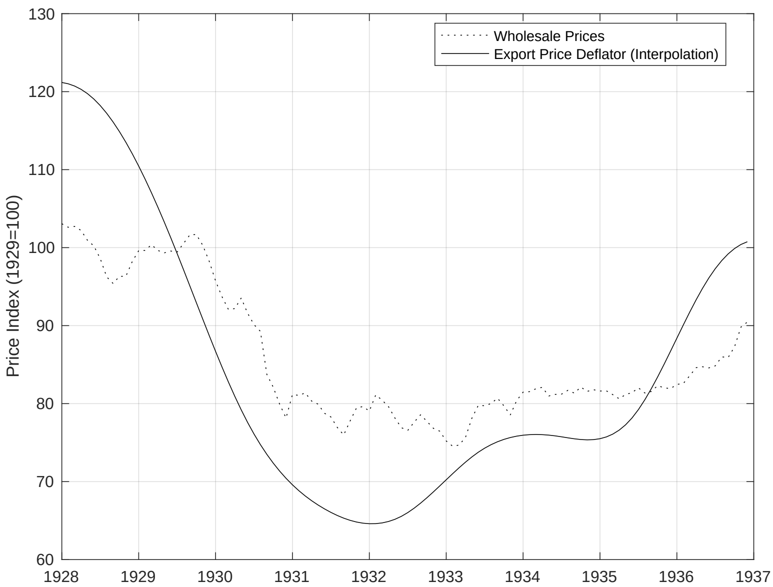
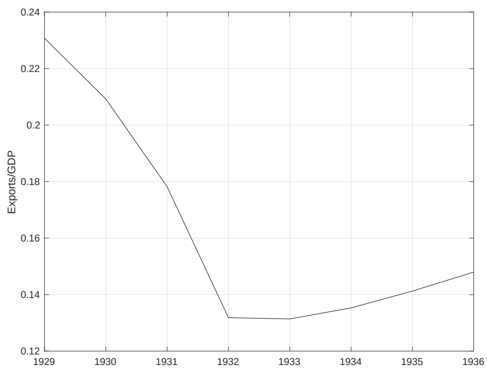


FIGURE A3.3: Price Indices Data - Australia

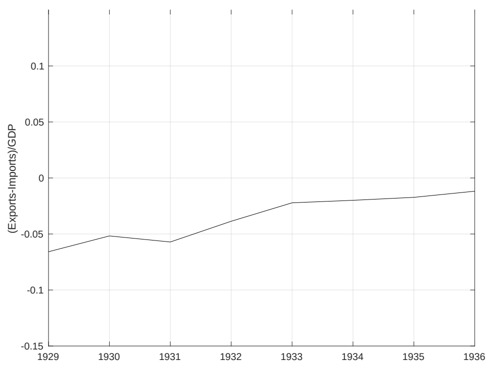
3A.2 Data Austria

TABLE A3.2: DATA SOURCES: AUSTRIA

Variable	Unit	Source	Note
Real GDP	m 1937 Schilling	Kausel et al. (1965, p. 42)	GNP
Nominal GDP	m Schilling	Kausel et al. (1965, p. 41)	GNP
Nominal Exports	m Schilling	Kausel et al. (1965, p. 41)	
Nominal Imports	m Schilling	Kausel et al. (1965, p. 41)	
Export Price Deflator	Index (1929=100)	Kausel et al. (1965, p. 40 & 41)	Implicit deflator based on nominal and real exports.



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.4: Trade Ratios - Austria

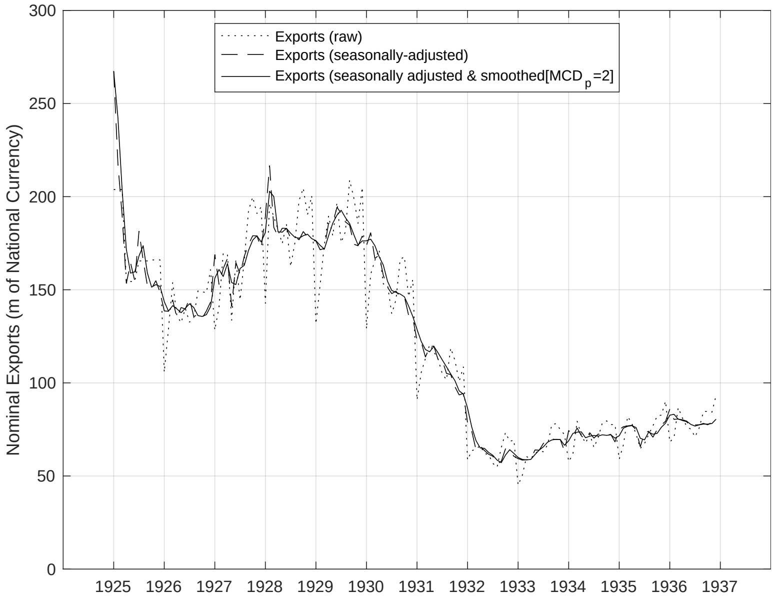


FIGURE A3.5: Monthly Export Data - Austria

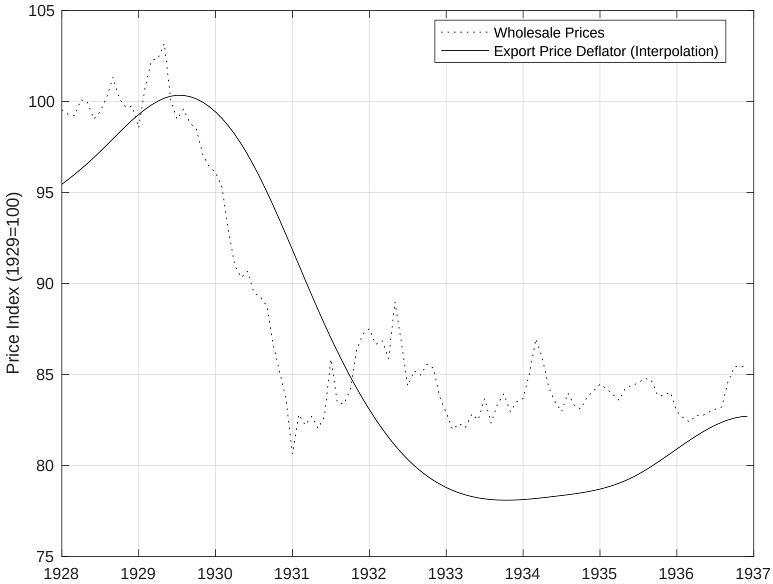
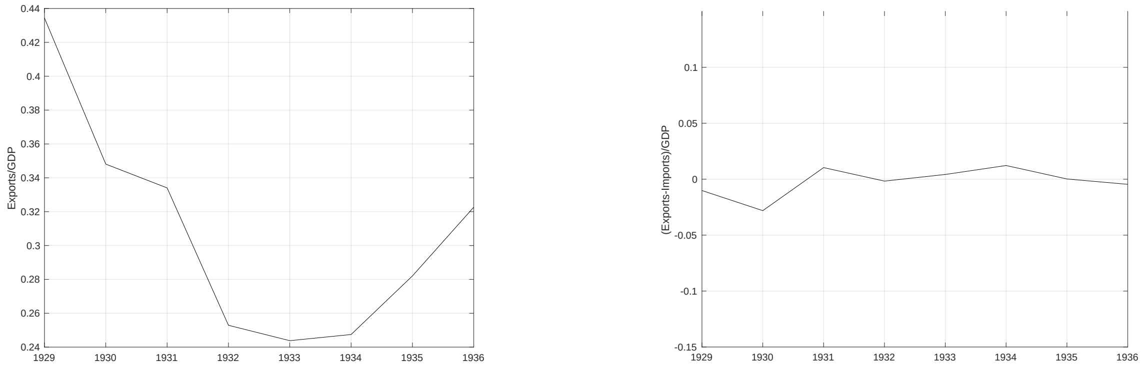


FIGURE A3.6: Price Indices Data - Austria

3A.3 Data Belgium

TABLE A3.3: DATA SOURCES: BELGIUM

Variable	Unit	Source	Note
Real GDP	1936-8 m Belgian Franc	Buyst (1997)	
Nominal GDP	Belgian Franc	Buyst (1997)	
Nominal Exports	Belgian Franc	Buyst (1997)	
Nominal Imports	Belgian Franc	Buyst (1997)	
Export Price Deflator	Index (1929 = 1)	Buyst (1997)	Implicit export deflator based on the estimates by Buyst (1997).



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.7: Trade Ratios - Belgium

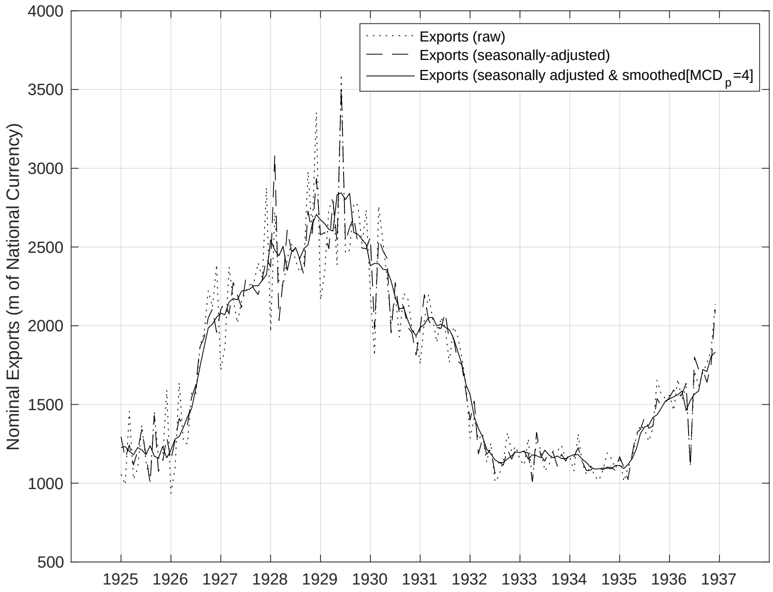


FIGURE A3.8: Monthly Export Data - Belgium

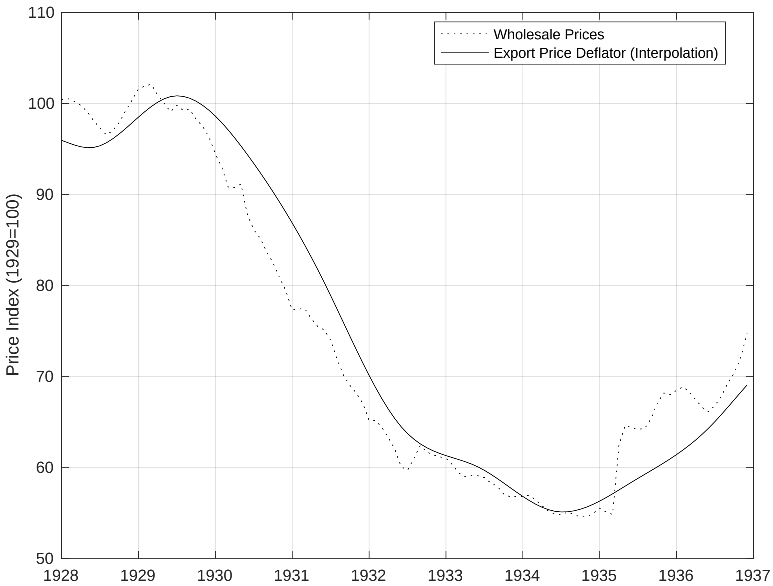
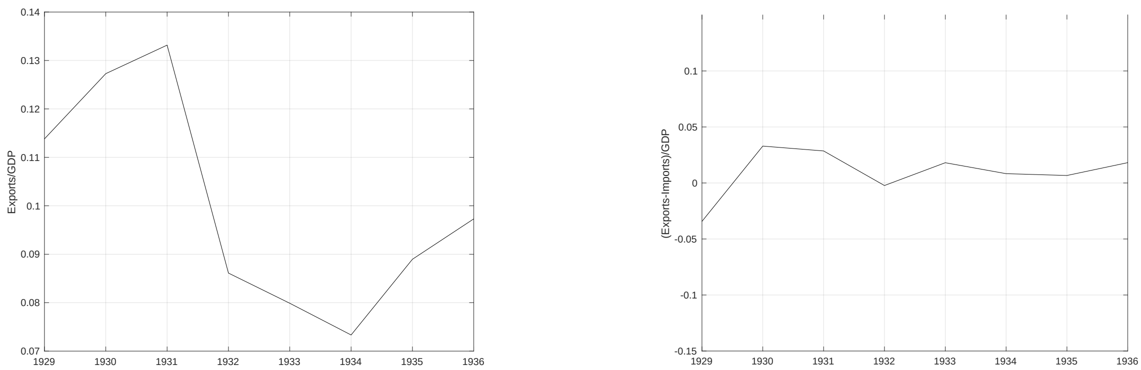


FIGURE A3.9: Price Indices Data - Belgium

3A.4 Data Bulgaria

TABLE A3.4: DATA SOURCES: BULGARIA

Variable	Unit	Source	Note
Real GDP	m 1939 Lev	Bank of Greece et al. (2014)	
Nominal GDP	Current Lev	Bank of Greece et al. (2014)	
Nominal Exports	Current Lev	Bank of Greece et al. (2014)	
Nominal Imports	Current Lev	Bank of Greece et al. (2014)	
Export Price Deflator	Index (1939 = 100)		In the absence of a better alternative, I use the GDP deflator.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.10: Trade Ratios - Bulgaria

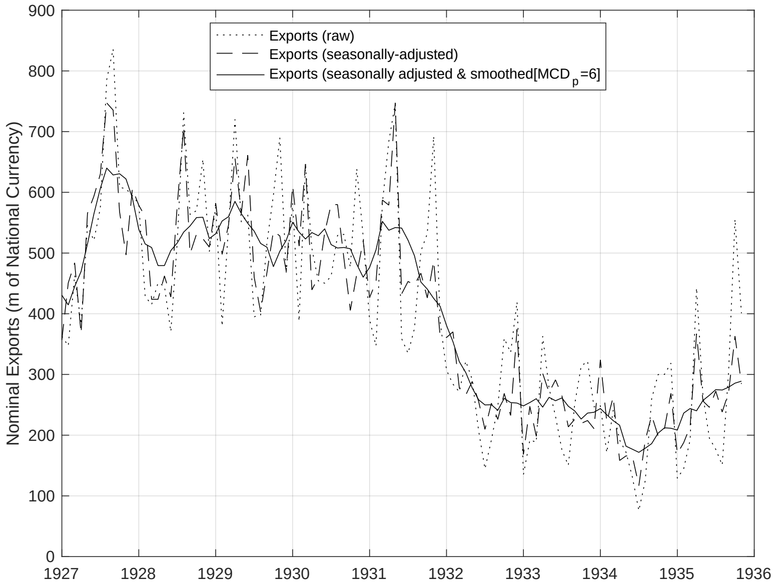


FIGURE A3.11: Monthly Export Data - Bulgaria

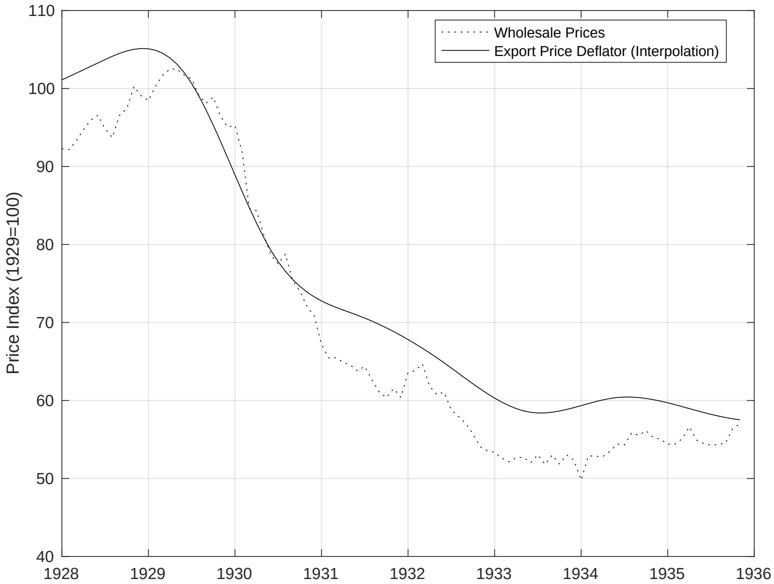
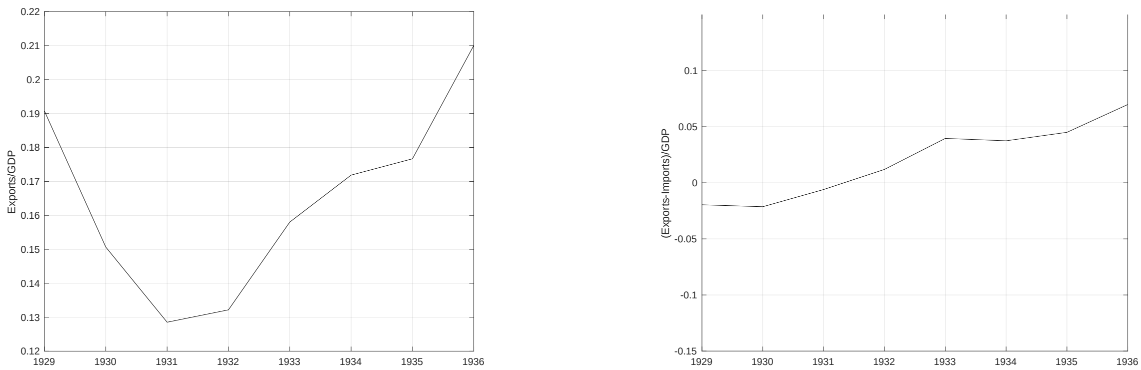


FIGURE A3.12: Price Indices Data - Bulgaria

3A.5 Data Canada

TABLE A3.5: DATA SOURCES: CANADA

Variable	Unit	Source	Note
Real GDP	1971 Dollars	Mitchell (2003b, p. 763)	GNP: I calculate the growth rate of the GNP series in 1920 prices to project the GNP of 1925 backwards.
Nominal GDP	m Dollars	Dincecco and Prado (2013)	GDP at factor cost
Nominal Exports	m Dollars	Mitchell (2014)	
Nominal Imports	m Dollars	Mitchell (2014)	
Export Price Deflator	Index (1929=100)	Statistics Canada (1983(2016, p. K31),League of Nations (1939a)	I splice the series by League of Nations (1939a) into the export deflator by Statistics Canada (1983(2016, p. K172-183) for before 1927.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.13: Trade Ratios - Canada

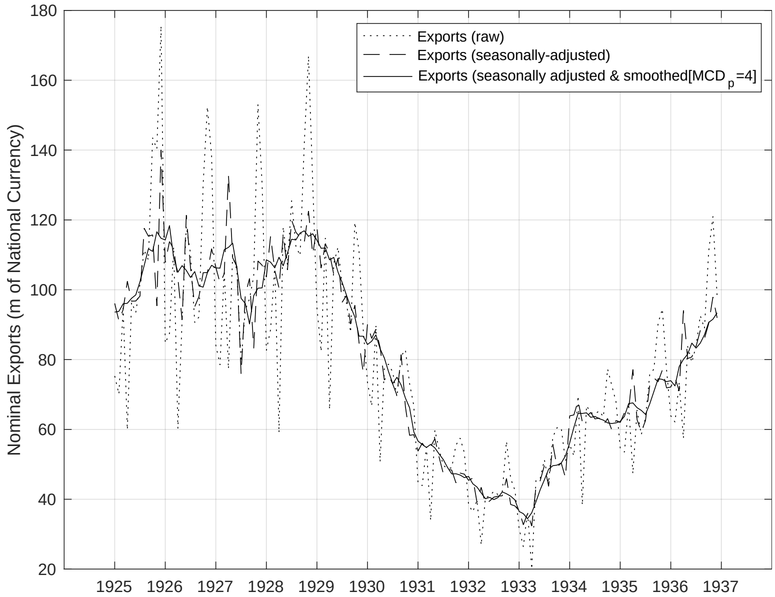


FIGURE A3.14: Monthly Export Data - Canada

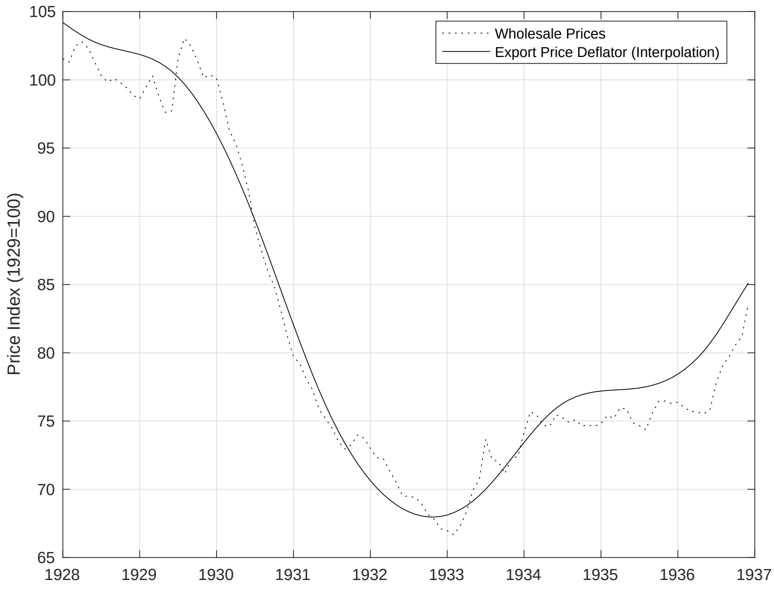
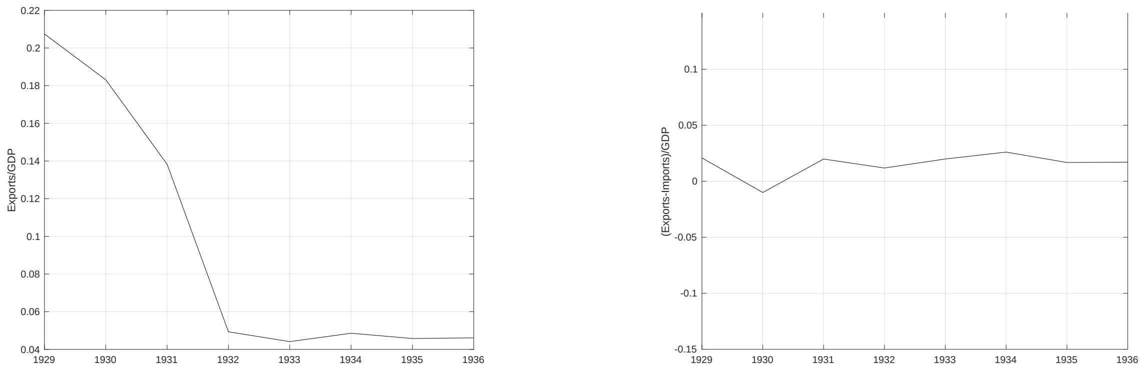


FIGURE A3.15: Price Indices Data - Canada

3A.6 Data Chile

TABLE A3.6: DATA SOURCES: CHILE

Variable	Unit	Source	Note
Real GDP	m 2003 pesos	Díaz et al. (2016)	
Nominal GDP	m new pesos	Díaz et al. (2016)	
Nominal Exports	m new pesos	Statistisches Reichsamt (1936), League of Nations (1939a)	As exports are only available from 1927 until 1933. I use the value index by the League of Nations (1939a) to calculate the nominal exports for the rest of the years. I convert the values to new pesos by dividing them 10^6 in order to be consistent with the GDP data, which is in new pesos.
Nominal Imports	m new pesos	Statistisches Reichsamt (1936), League of Nations (1939a)	As imports are only available from 1927 until 1933. I use the value index by the League of Nations (1939a) to calculate the nominal imports for the rest of the years. I convert the values to new pesos by dividing them 10^6 in order to be consistent with the GDP data, which is in new pesos.
Export Price Deflator	Index (2003 = 100)	Díaz et al. (2016)	



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.16: Trade Ratios - Chile

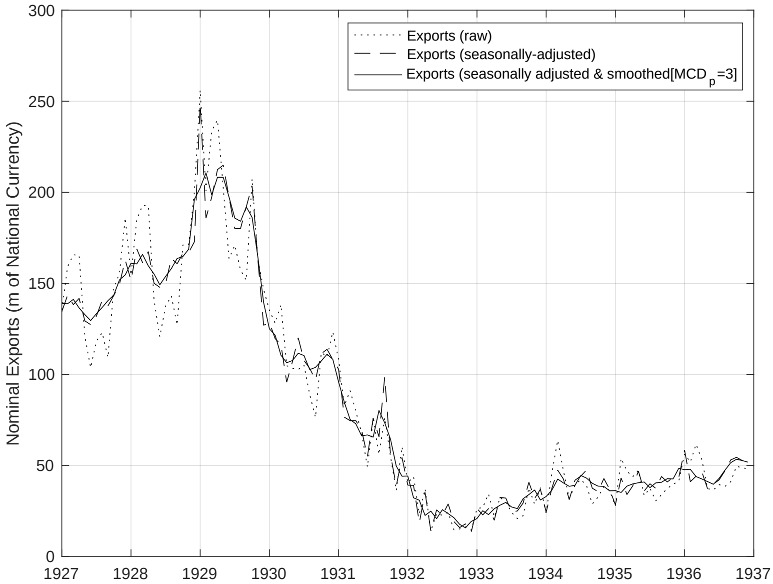


FIGURE A3.17: Monthly Export Data - Chile

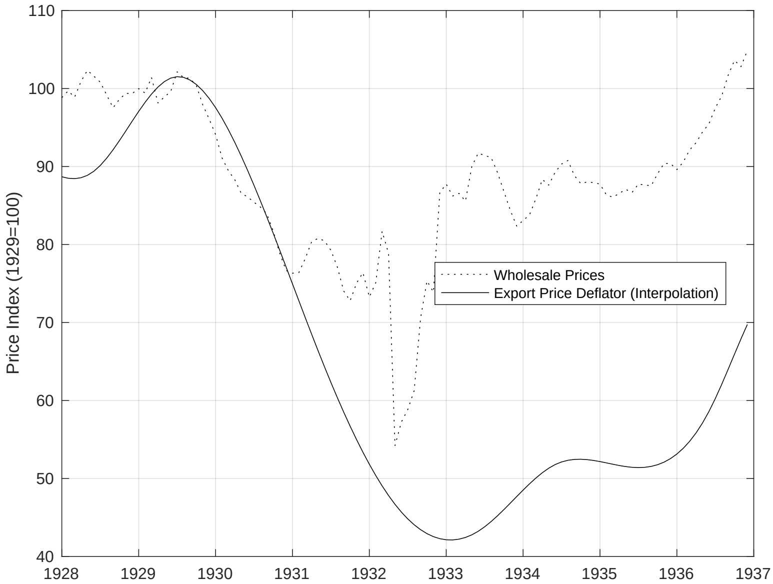
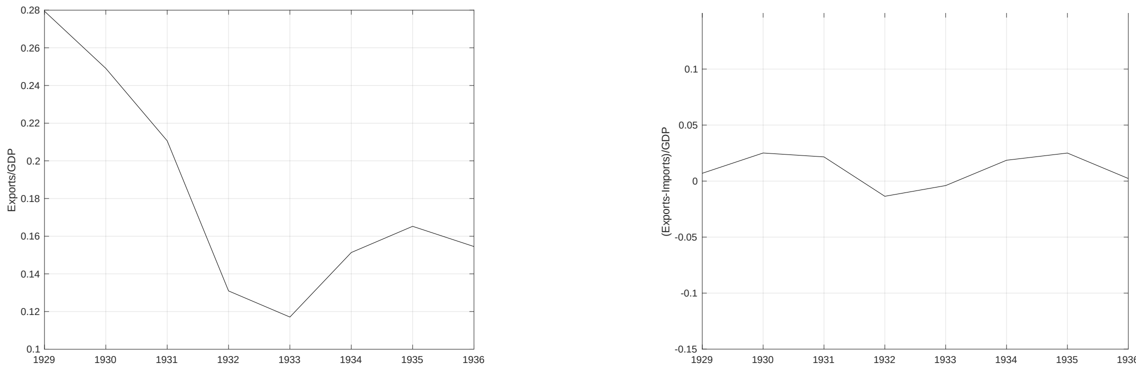


FIGURE A3.18: Price Indices Data - Chile

3A.7 Data Czechoslovakia

TABLE A3.7: DATA SOURCES: CZECHOSLOVAKIA

Variable	Unit	Source	Note
Real GDP	m 1929 Czech Crowns	Pryor et al. (1971, p. 47)	
Nominal GDP	m Crowns	Pryor et al. (1971, p. 47), Klasing and Milionis (2014)	I employ the 1929 benchmark estimate from Pryor et al. (1971) and use the growth rates from the nominal GDP estimates by Klasing and Milionis (2014).
Nominal Exports	m Crowns	Mitchell (2014)	
Nominal Imports	m Crowns	Mitchell (2014)	
Export Price Deflator	Indewx (1929 = 100)	Mitchell (2014),Pryor et al. (1971, p. 49)	I build the implicit deflator from the real and nominal export series.



a) Export-GDP Ratio b) Trade Balance-GDP Ratio

FIGURE A3.19: Trade Ratios - Czechoslovakia

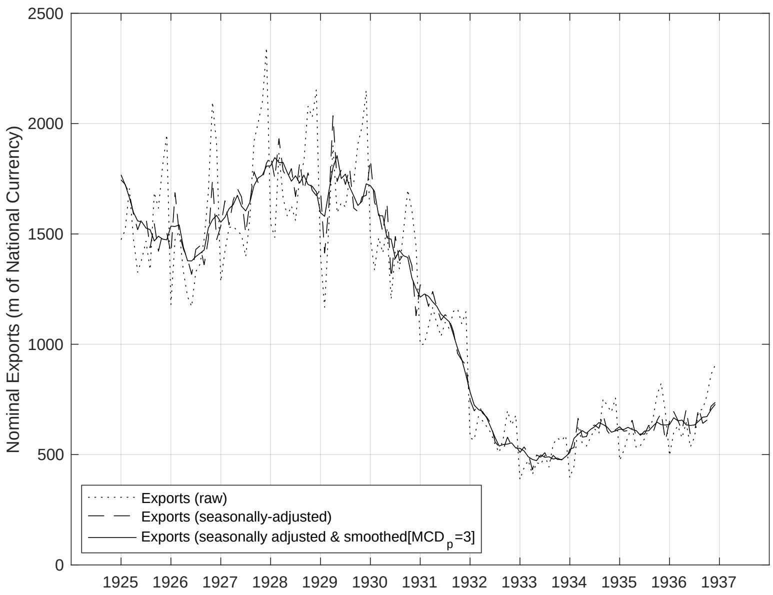


FIGURE A3.20: Monthly Export Data - Czechoslovakia

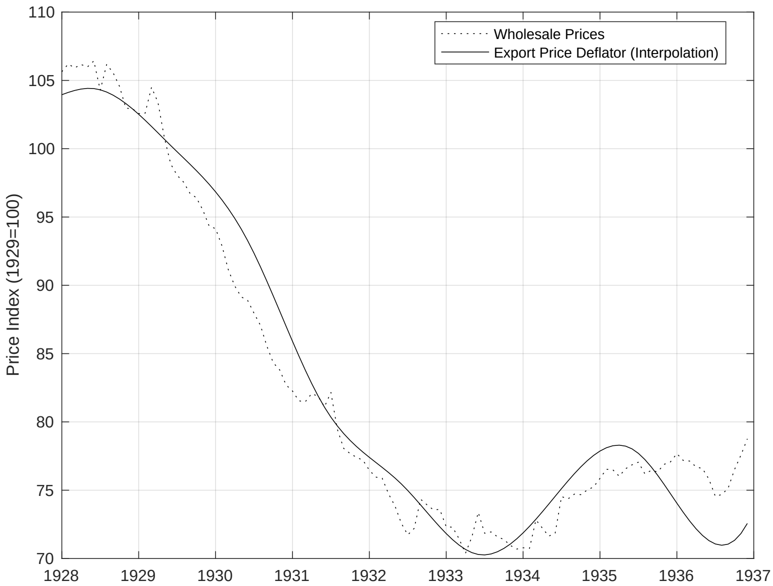
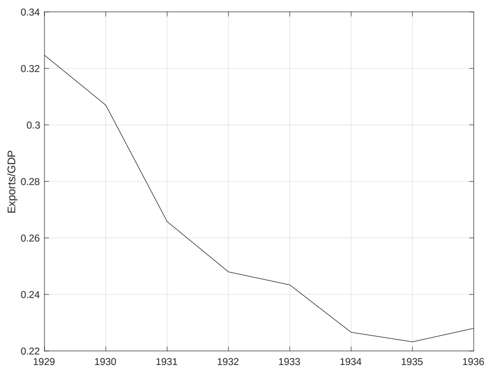


FIGURE A3.21: Price Indices Data - Czechoslovakia

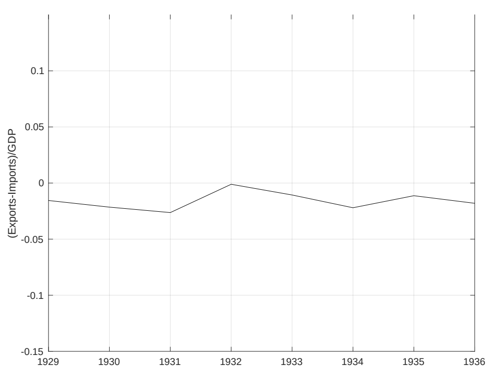
3A.8 Data Denmark

TABLE A3.8: DATA SOURCES: DENMARK

Variable	Unit	Source	Note
Real GDP	m 1929 Danish Crowns	Bjerke (1955)	From 1931 onwards, I splice in the official GDP series in constant 1935 dollars (Statistiske Departement, 1951). Bjerke noted that his deflation method would certainly underestimate the fall in output. Indeed the fall is more pronounced in the official series.
Nominal GDP	m Danish Crowns	Bjerke (1955)	
Nominal Exports	m Crowns	Bjerke (1955)	
Nominal Imports	m Crowns	Bjerke (1955)	
Export Price Deflator	Index (1929=100)	Statistiske Departement (1951)	In the absence of a better alternative, the export deflator is the GDP deflator as Bjerke (1955) did in his GDP calculations. The price index by the League of Nations (1939a) seems flawed, suggesting increases in trade during the harshest Depression years. In contrast, the volume index of exports shown in Statistisches Reichsamt (1936) suggests a drop by about 30 percent.



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.22: Trade Ratios - Denmark

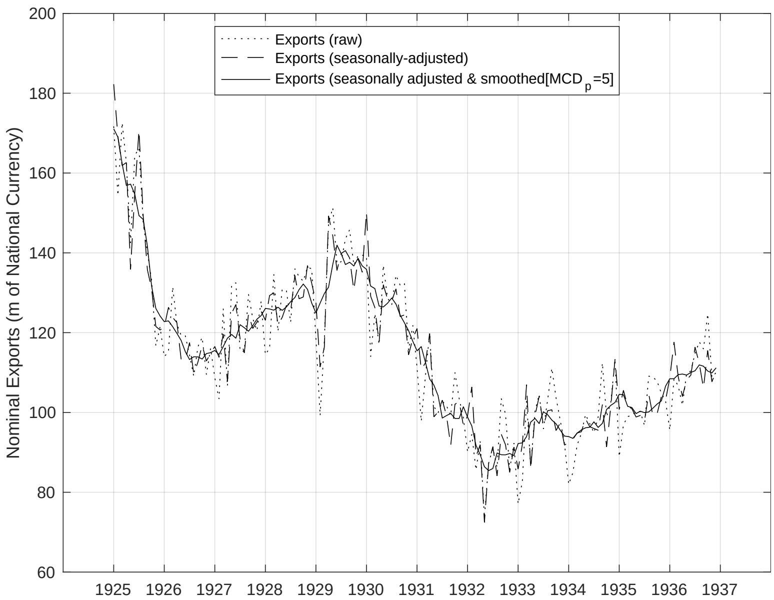


FIGURE A3.23: Monthly Export Data - Denmark

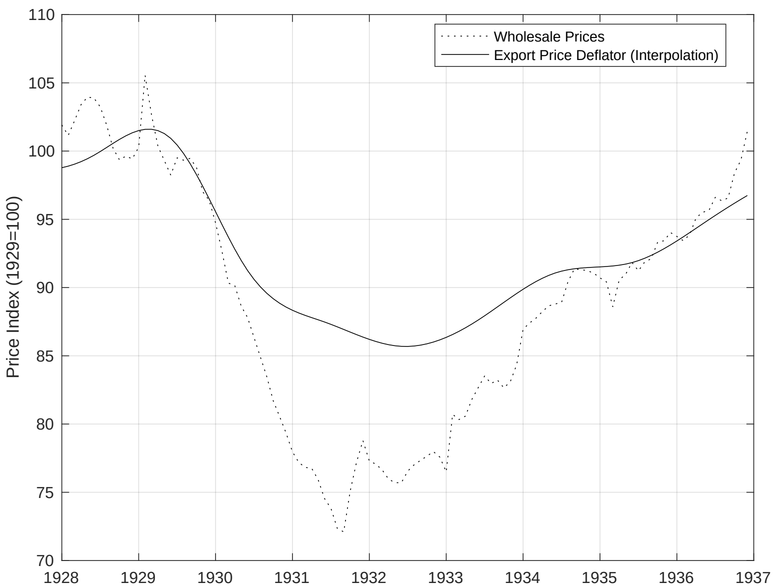
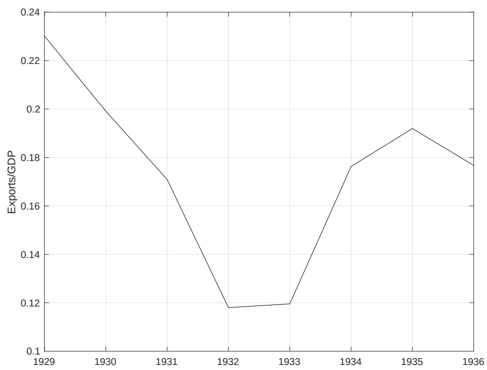


FIGURE A3.24: Price Indices Data - Denmark

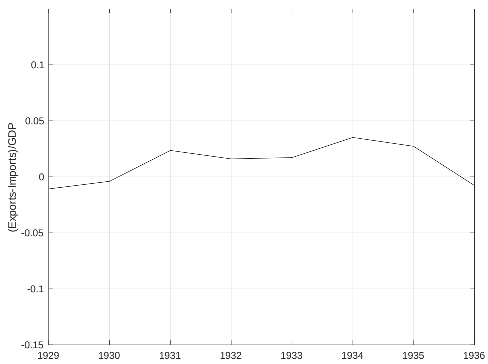
3A.9 Data Estonia

TABLE A3.9: DATA SOURCES: ESTONIA

Variable	Unit	Source	Note
Real GDP	m 1929 Estonian crowns	Valge (2003)	
Nominal GDP	m Estonian crowns	Valge (2003)	
Nominal Exports	m Crowns	Statistisches Reichsamt (1936, p. 75), League of Nations (1937, p. 218)	
Nominal Imports	m Crowns	Statistisches Reichsamt (1936, p. 75),League of Nations (1939a)	
Export Price Deflator	Index (1929 = 100)	Valge (2003)[p. 74]	The index from the League of Nations (1939a) seems flawed, which is why I use the GDP deflator.



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.25: Trade Ratios - Estonia

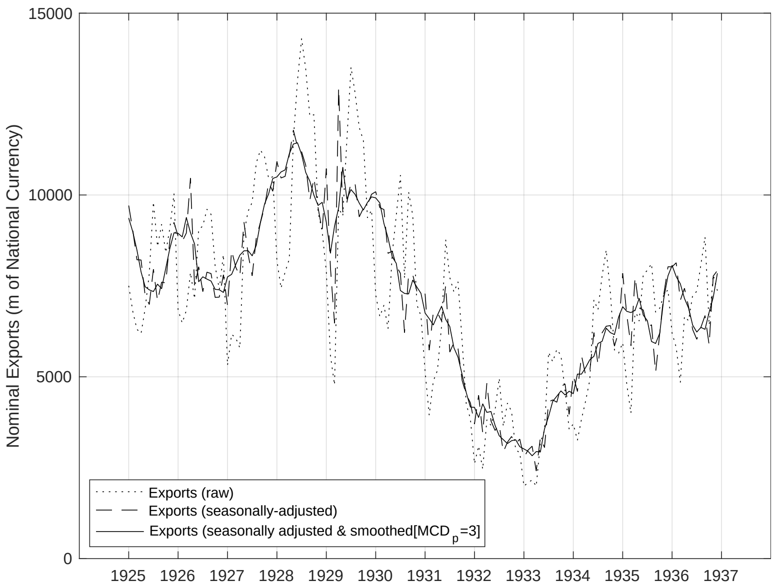


FIGURE A3.26: Monthly Export Data - Estonia

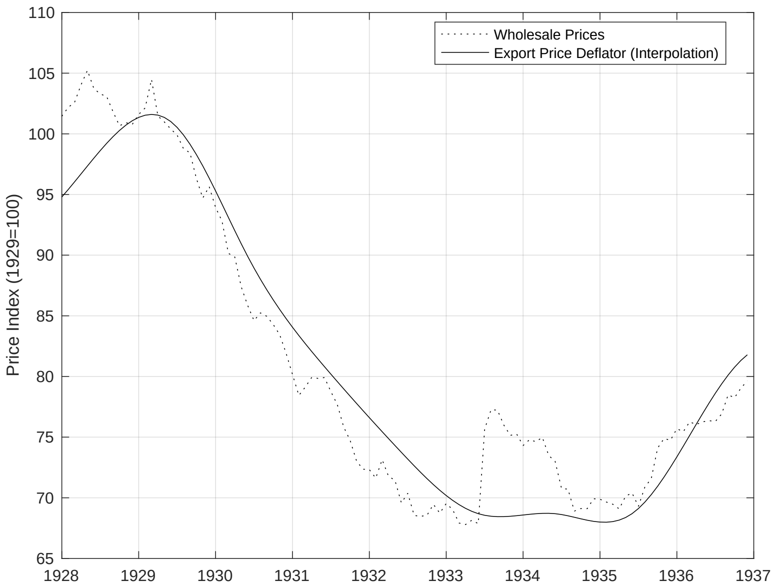
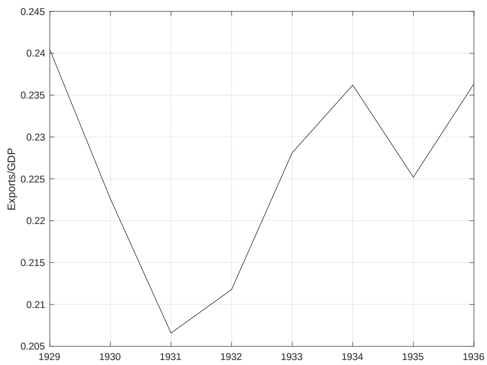


FIGURE A3.27: Price Indices Data - Estonia

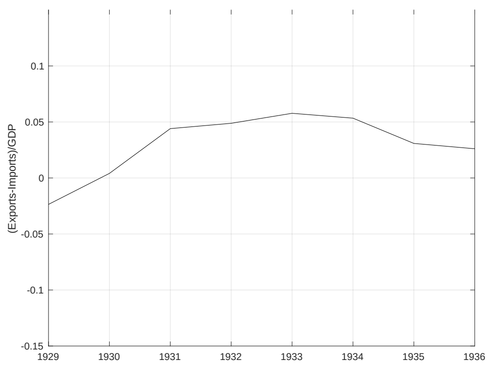
3A.10 Data Finland

TABLE A3.10: DATA SOURCES: FINLAND

Variable	Unit	Source	Note
Real GDP	1926 Prices in m Marka	Smits et al. (2009)	
Nominal GDP	m Finish Marka	Hjerppe (1989, p. 203)	
Nominal Exports	m Finish Marka	Hjerppe (1989, p. 260)	
Nominal Imports	m Finish Marka	Hjerppe (1989, p. 260)	
Export Price Deflator	Index (1927 = 100)	League of Nations (1939a)	



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.28: Trade Ratios - Finland

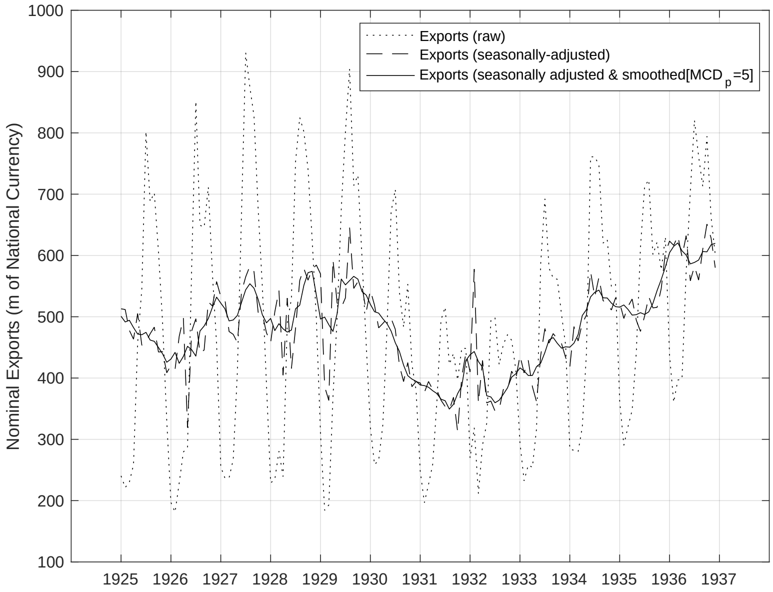


FIGURE A3.29: Monthly Export Data - Finland

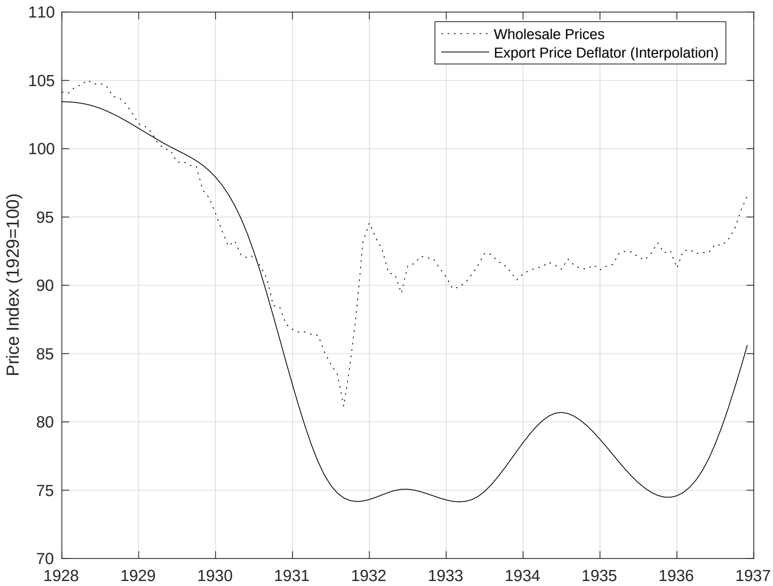
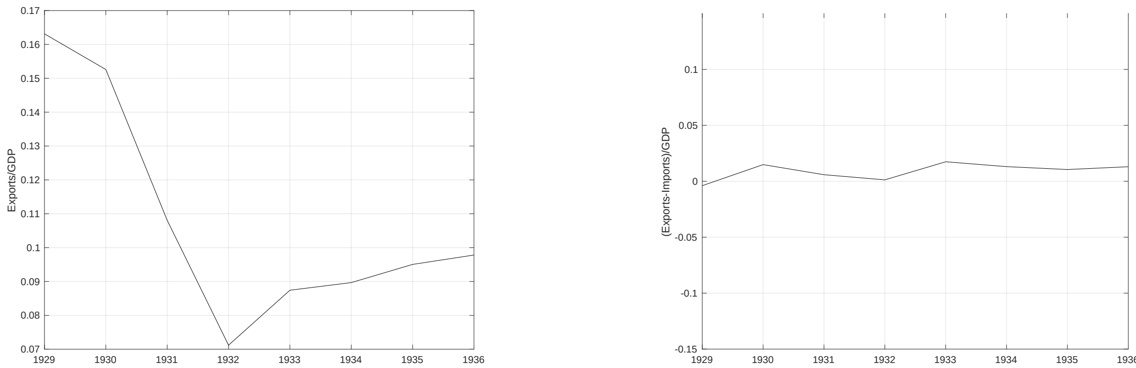


FIGURE A3.30: Price Indices Data - Finland

3A.11 Data Hungary

TABLE A3.11: DATA SOURCES: HUNGARY

Variable	Unit	Source	Note
Real GDP	1938/1939 Pengös	Eckstein (1955)	NNP: Compounding interpolation for 1921-1923. Data had to be adjusted from fiscal years to calendar years.
Nominal GDP	m Pengös	Eckstein (1955)	NNP: Compounding interpolation for 1921-1923. Data had to be adjusted from fiscal years to calendar years.
Nominal Exports	m Pengös	Mitchell (2014)	
Nominal Imports	m Pengös	Mitchell (2014)	
Export Price Deflator	Index (1927 = 100)	League of Nations (1939a)	



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.31: Trade Ratios - Hungary

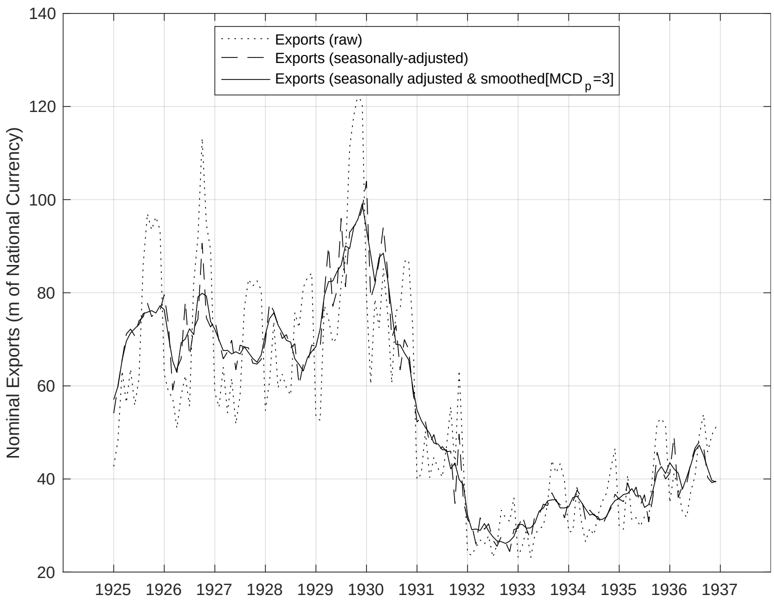


FIGURE A3.32: Monthly Export Data - Hungary

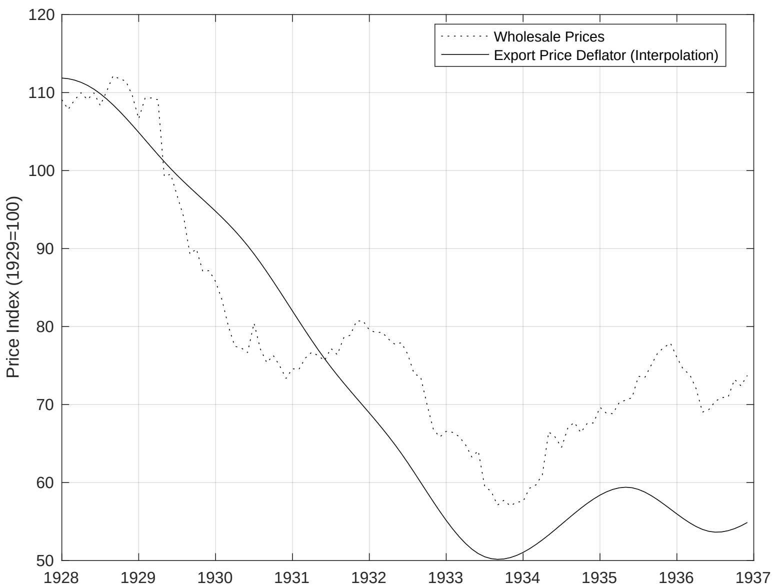
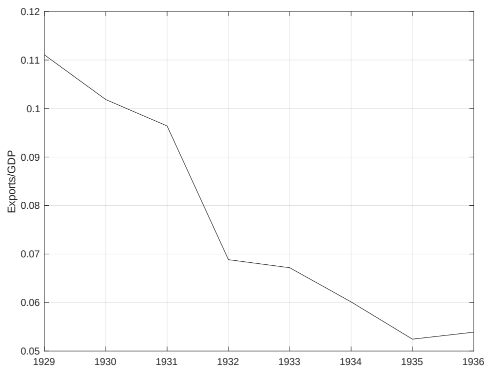


FIGURE A3.33: Price Indices Data - Hungary

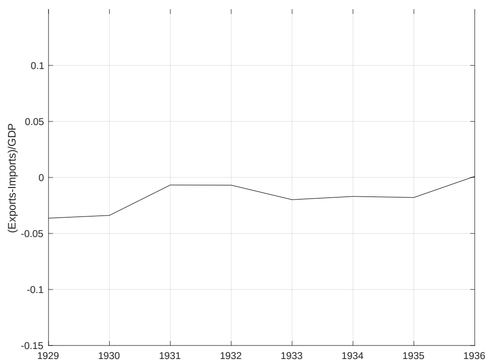
3A.12 Data Italy

TABLE A3.12: DATA SOURCES: ITALY

Variable	Unit	Source	Note
Real GDP	m 1938 Lira	Baffigi (2011)	
Nominal GDP	m Lira	Baffigi (2011)	
Nominal Exports	m Lira	Baffigi (2011)	
Nominal Imports	m Lira	Baffigi (2011)	
Export Price Deflator	Index (1938 = 1)	Baffigi (2011)	Implicit export deflator from Historical National Accounts by Baffigi (2011).



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.34: Trade Ratios - Italy

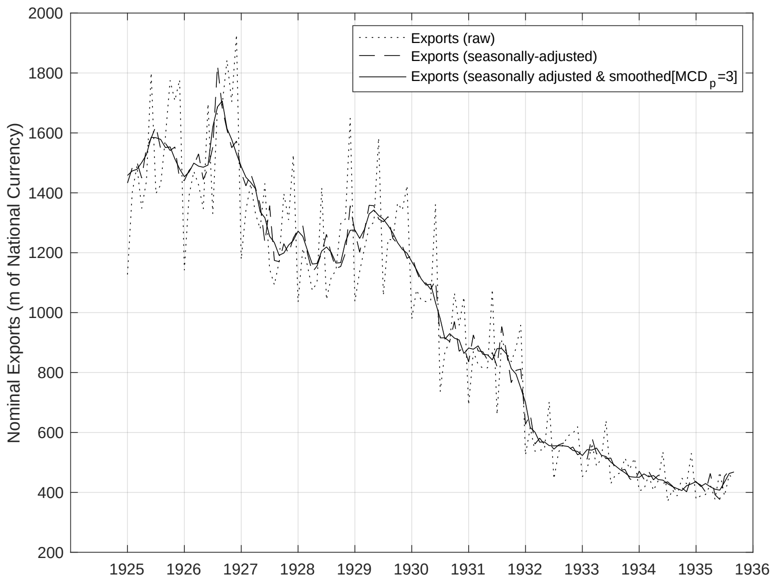


FIGURE A3.35: Monthly Export Data - Italy

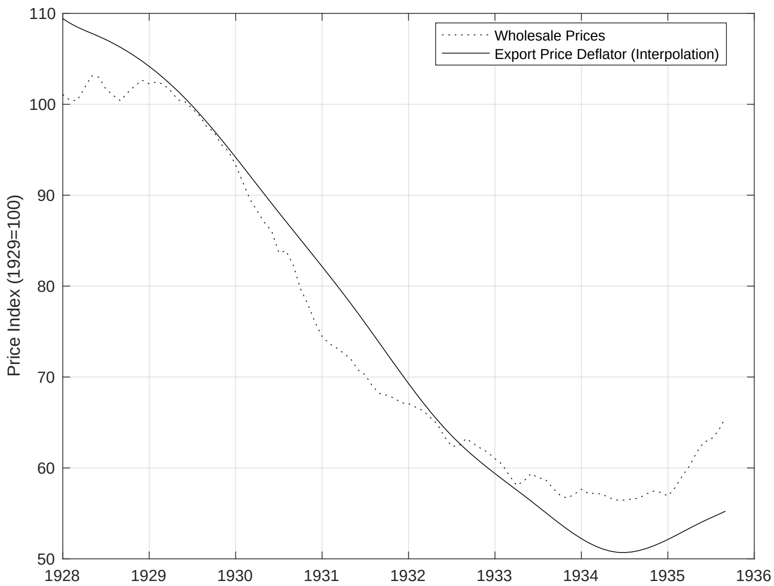
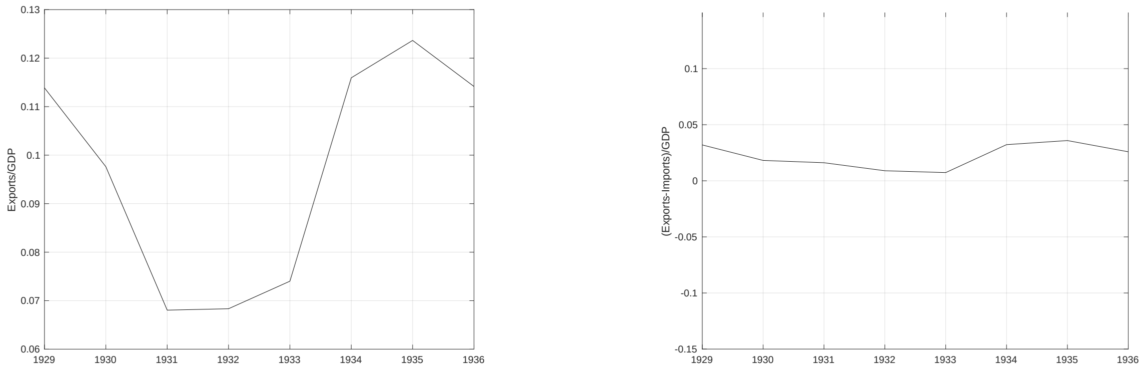


FIGURE A3.36: Price Indices Data - Italy

3A.13 Data Mexico

TABLE A3.13: DATA SOURCES: MEXICO

Variable	Unit	Source	Note
Real GDP	m 1960 Pesos	Cárdenas (1987, p. 190)	
Nominal GDP	m Pesos	Cárdenas (1987, p. 190)	
Nominal Exports	m Pesos	Cárdenas (1987, p. 230)	
Nominal Imports	m Pesos	Cárdenas (1987, p. 241)	
Export Price Deflator	Index (1929 = 100)	Cárdenas (1987, p. 190)	In absence of better alternatives, I use the GDP deflator which I derive from the real and nominal GDP estimates by Cárdenas (1987, p. 190). I rebase it to 1929.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.37: Trade Ratios - Mexico

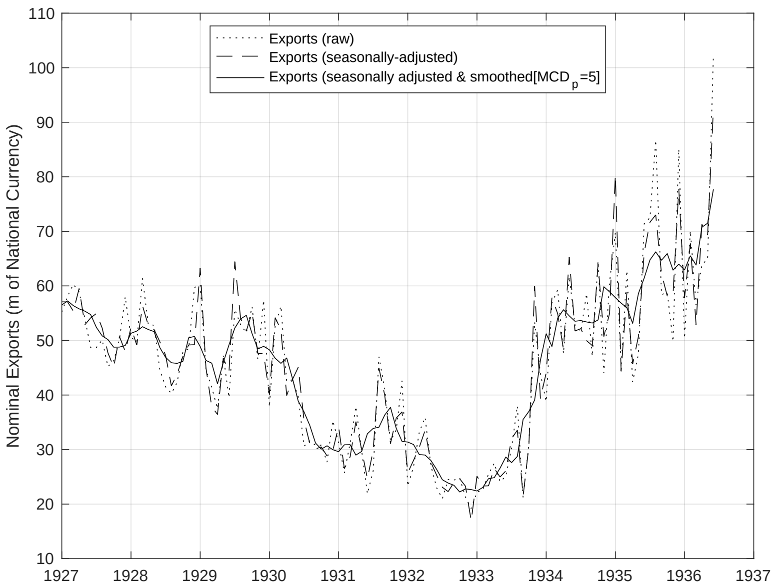


FIGURE A3.38: Monthly Export Data - Mexico

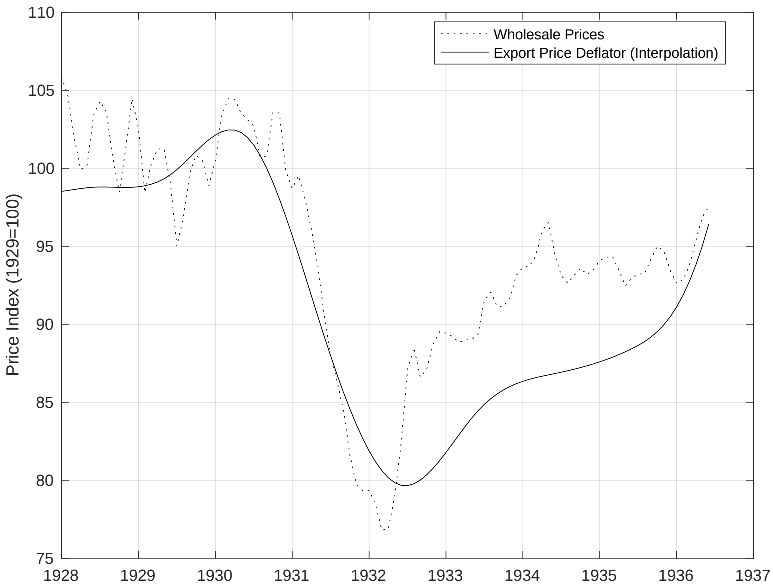
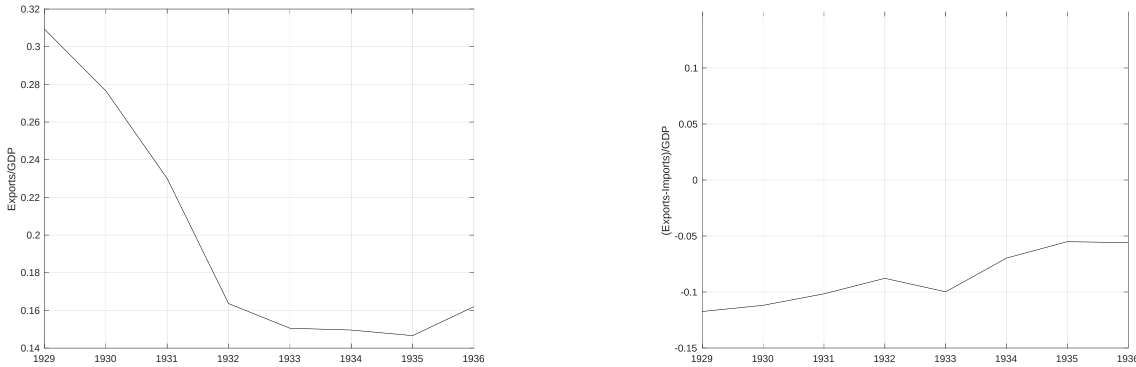


FIGURE A3.39: Price Indices Data - Mexico

3A.14 Data Netherlands

TABLE A3.14: DATA SOURCES: NETHERLANDS

Variable	Unit	Source	Note
Real GDP	m 1913 Guilders	Smits et al. (2009)	
Nominal GDP	m Guilders	Bakker et al. (1990, p. 201)	
Nominal Exports	m Guilders	Mitchell (2014)	
Nominal Imports	m Guilders	Mitchell (2014)	
Export Price Deflator	Index (1929 = 100)	Mitchell (2014),Bakker et al. (1990, p. 204)	Implicit deflator based on export volume and value index.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.40: Trade Ratios - Netherlands

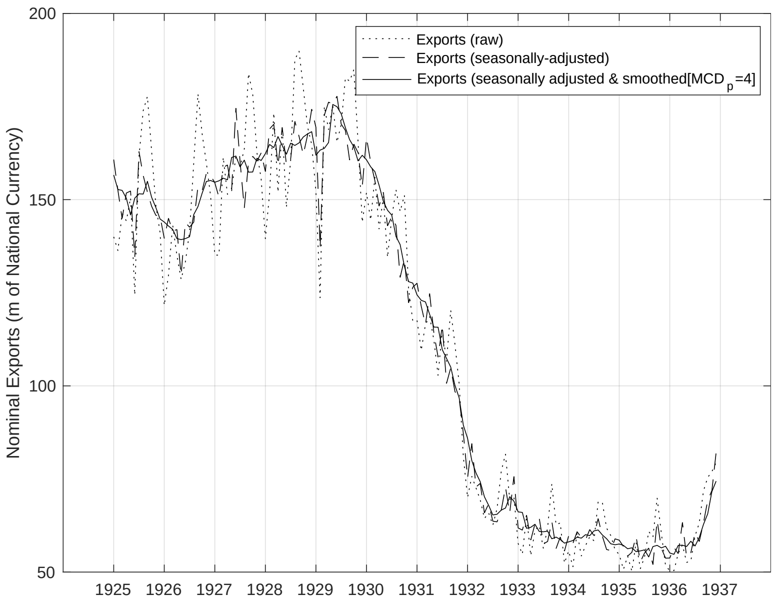


FIGURE A3.41: Monthly Export Data - Netherlands

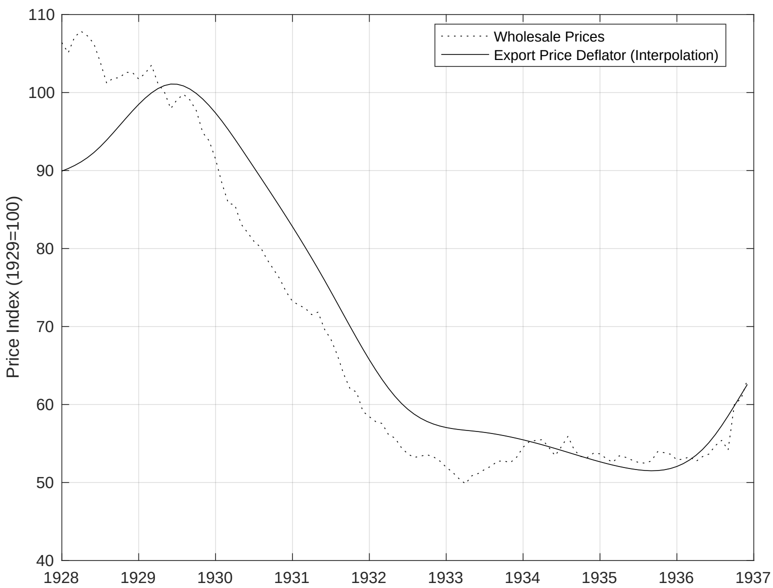
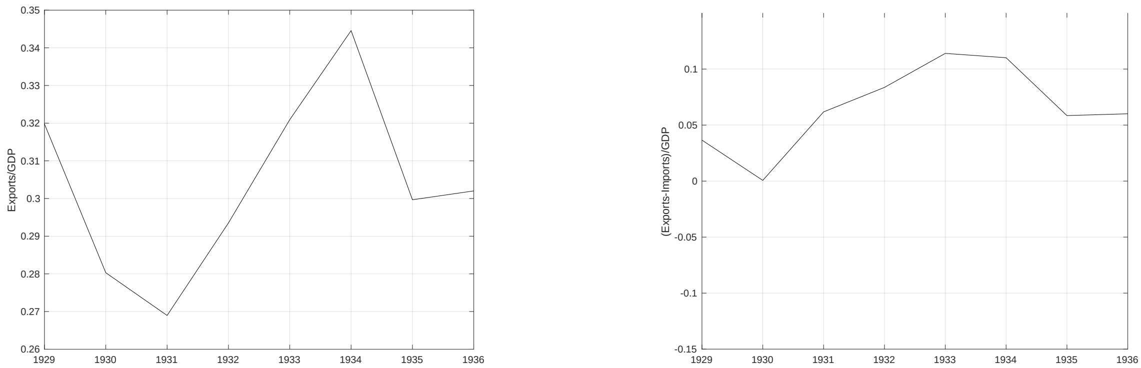


FIGURE A3.42: Price Indices Data - Netherlands

3A.15 Data New Zealand

TABLE A3.15: DATA SOURCES: NEW ZEALAND

Variable	Unit	Source	Note
Real GDP	m 1911 Pounds	Rankin (1992, p. 61)	
Nominal GDP	m Pounds	Statistics New Zealand (2016)	
Nominal Exports	m Pound	Mitchell (2014)	
Nominal Imports	m Pounds	Mitchell (2014)	
Export Price Deflator	Index (1929 = 100)	Mitchell (2014)	I build the implicit deflator from the nominal and real exports. The index by the League of Nations (1939a) seeems to overemphasise the fall in prices, leading to a strong growth in real exports.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.43: Trade Ratios - NewZealand

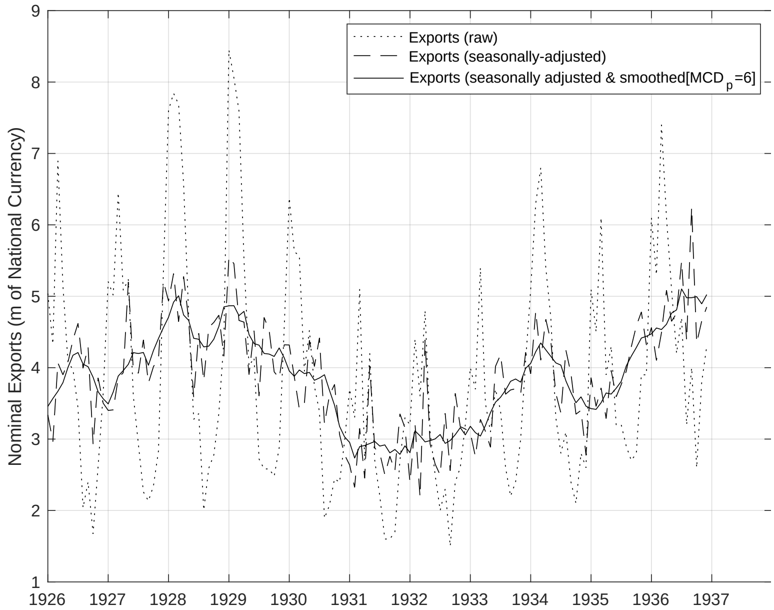


FIGURE A3.44: Monthly Export Data - New Zealand

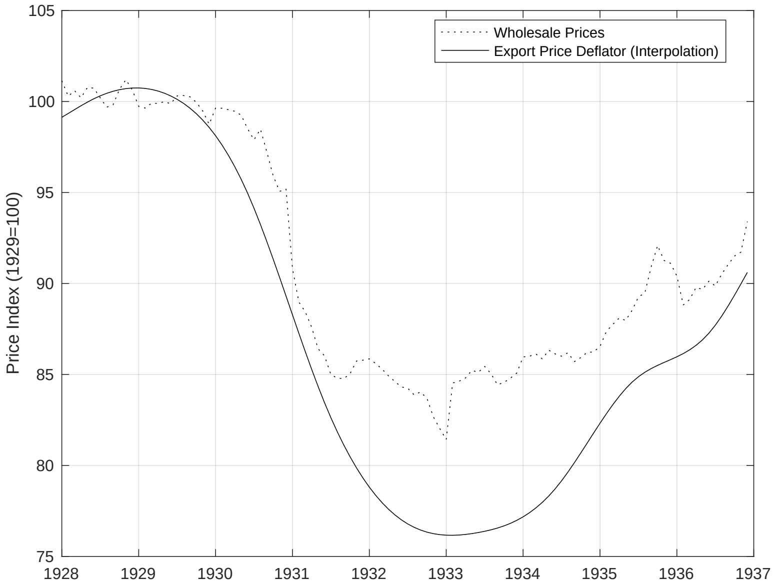


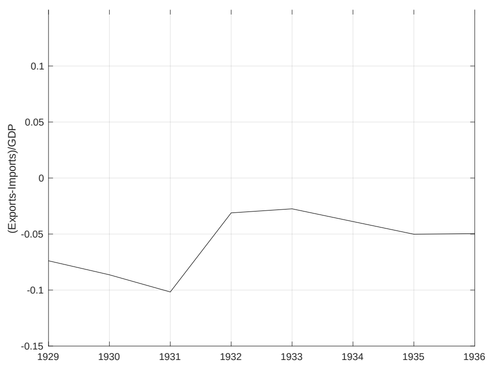
FIGURE A3.45: Price Indices Data - New Zealand

3A.16 Data Norway

TABLE A3.16: DATA SOURCES: NORWAY

Variable	Unit	Source	Note
Real GDP	m Kroner (1938 prices)	Central Bureau of Statistics Norway (1952, p. 128)	
Nominal GDP	m Kroner	Central Bureau of Statistics Norway (1952, p. 104)	
Nominal Exports	m Kroner	Mitchell (2014)	
Nominal Imports	m Kroner	Mitchell (2014)	
Export Price Deflator	Index (1927 = 100)	League of Nations (1939a)	

a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.46: Trade Ratios - Norway

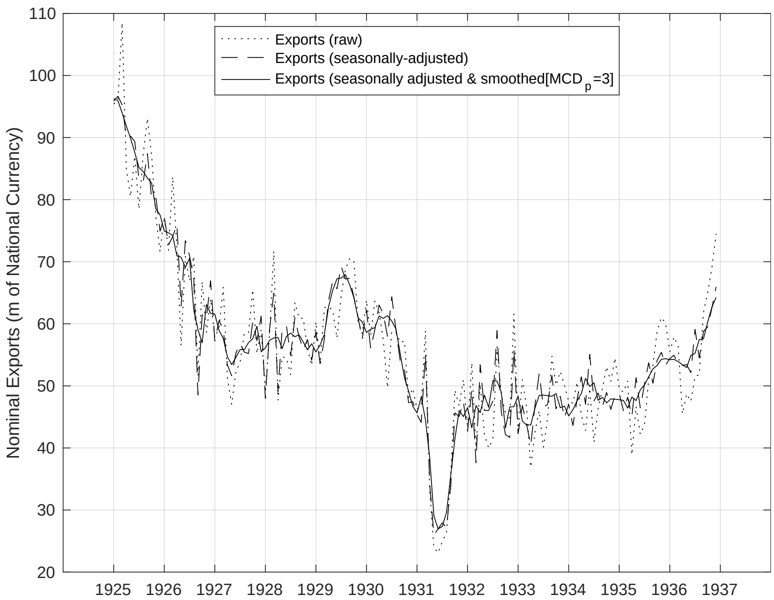


FIGURE A3.47: Monthly Export Data - Norway

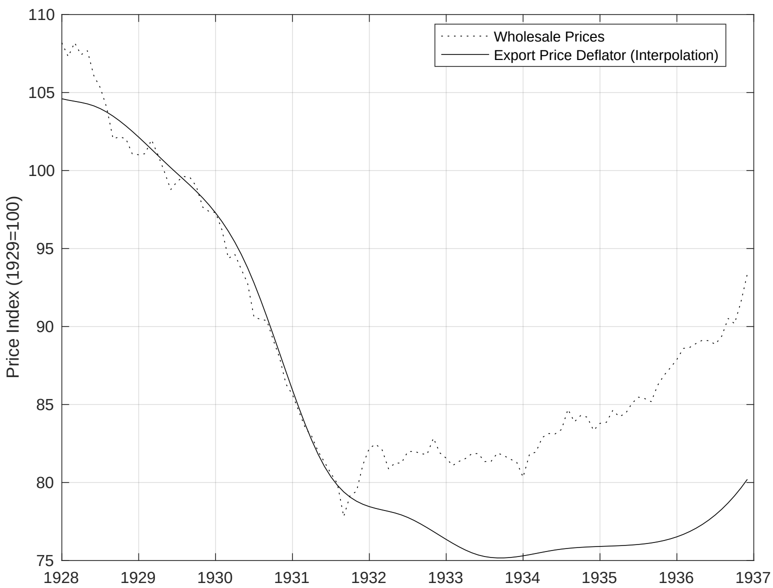
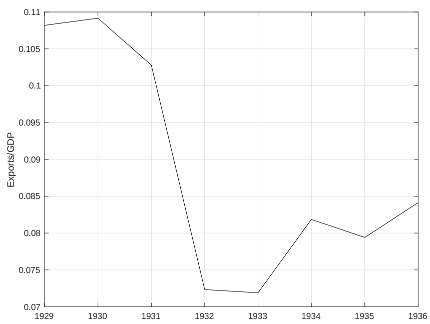


FIGURE A3.48: Price Indices Data - Norway

3A.17 Data Poland

TABLE A3.17: DATA SOURCES: POLAND

Variable	Unit	Source	Note
Real GDP	m 1929 Zlotys	Roses and Wolf (2010, p. 190), Broadberry and Klein (2012), Landau (1976)	GDP: I interpolate between the years 1925 and 1929 as no estimates are available. For this I use the 1922 estimate in Roses and Wolf (2010, p. 190) and GDP data from Broadberry and Klein (2012) for 1929 onwards. While this linear interpolation is far from perfect, it corresponds well with the growth path of industrial production estimates Mitchell (see 2014). Finally, I scale the estimate on the 1929 Benchmark value by Landau.
Nominal GDP	m Zlotys	Laski (1956, p. 90), League of Nations (1940, p. 236), Statistisches Reichsamt (1936, p. 222).	Constructed based on the GDP deflator and the real GDP.
Nominal Exports	m Zlotys	Mitchell (2014)	Includes gold movements until 1926. However, the difference for the year where both are given is very small.
Nominal Imports	m Zlotys	Mitchell (2014)	Includes gold movements until 1926. However, the difference for the year where both are given is very small.
Export Price Deflator	Index (1929 = 100)	Laski (1956, p. 90), League of Nations (1940, p. 236), Statistisches Reichsamt (1936, p. 222).	In the absence of a better alternative, I use the GDP deflator.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.49: Trade Ratios - Poland

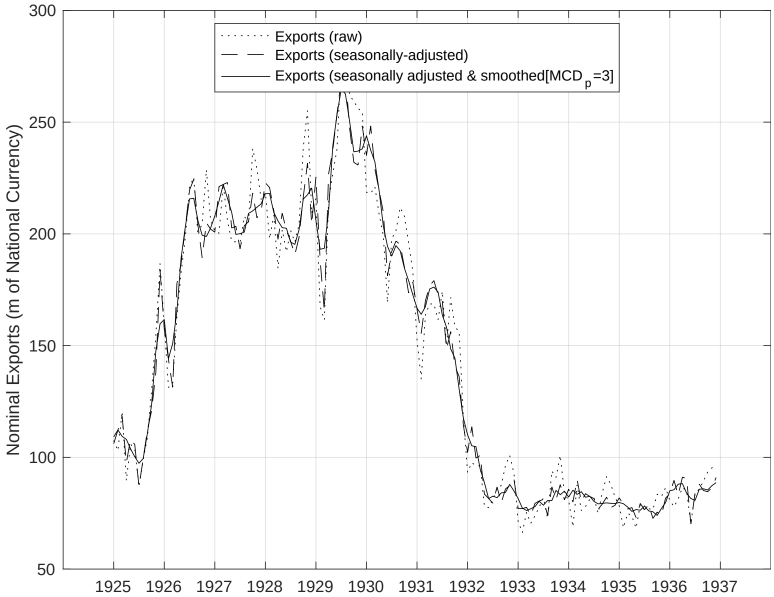


FIGURE A3.50: Monthly Export Data - Poland

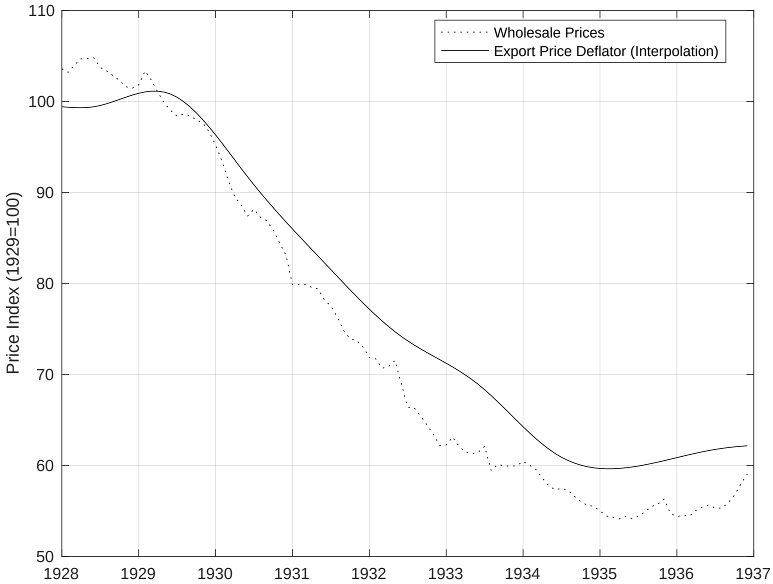
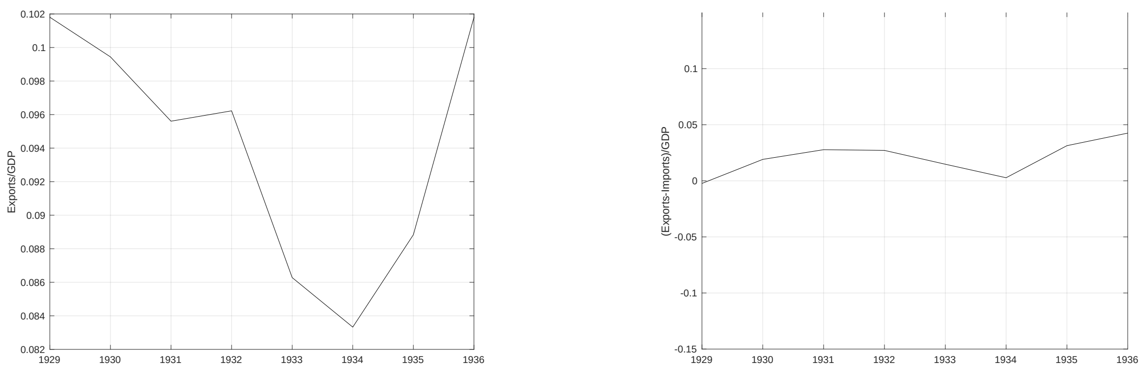


FIGURE A3.51: Price Indices Data - Poland

3A.18 Data Romania

TABLE A3.18: DATA SOURCES: ROMANIA

Variable	Unit	Source	Note
Real GDP	m 1929 Lei	Savoiu and Manea (2014),Bank of Greece et al. (2014)	I rebase the real GDP estimates given in Savoiu and Manea (2014) on the 1929 nominal GDP given in Bank of Greece et al. (2014).
Nominal GDP	m Lei	Bank of Greece et al. (2014)	
Nominal Exports	m Lei	Bank of Greece et al. (2014)	
Nominal Imports	m Lei	Bank of Greece et al. (2014)	
Export Price Deflator	Index (1929 = 100)	Savoiu and Manea (2014),Bank of Greece et al. (2014)	In the absence of a better alternative, I use the GDP deflator.



a) Export-GDP Ratio b) Trade Balance-GDP Ratio

FIGURE A3.52: Trade Ratios - Romania

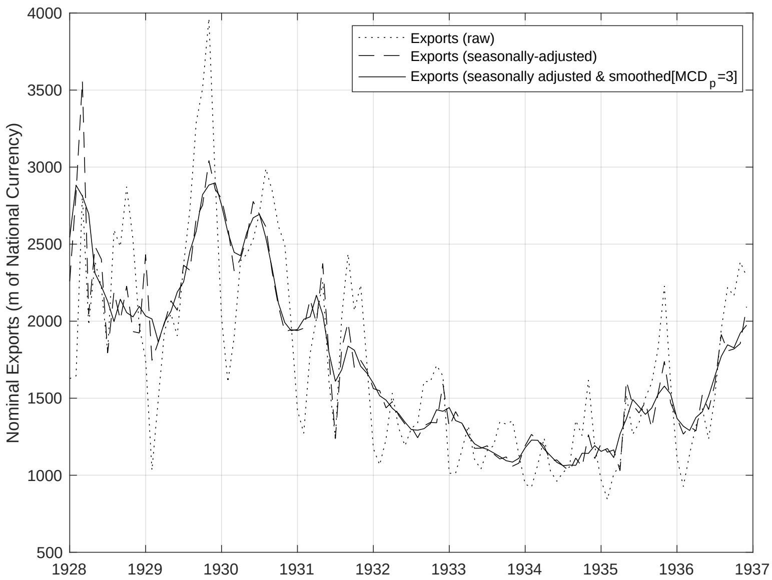


FIGURE A3.53: Monthly Export Data - Romania

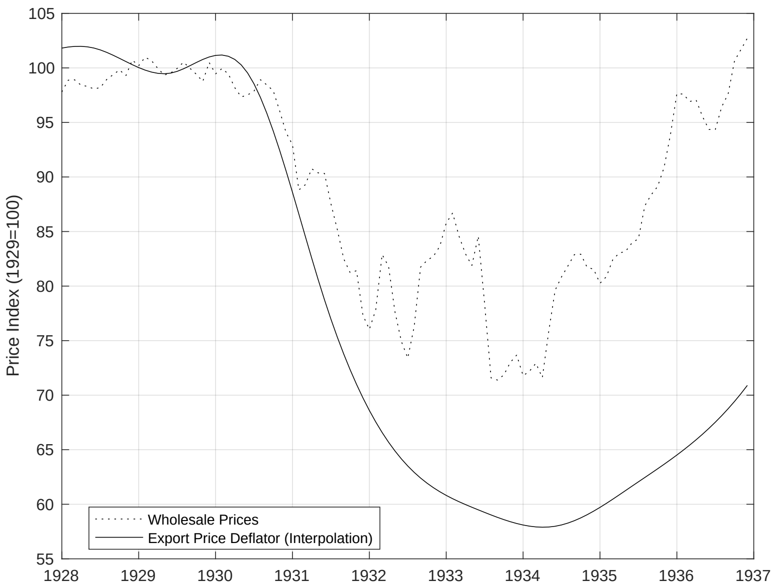
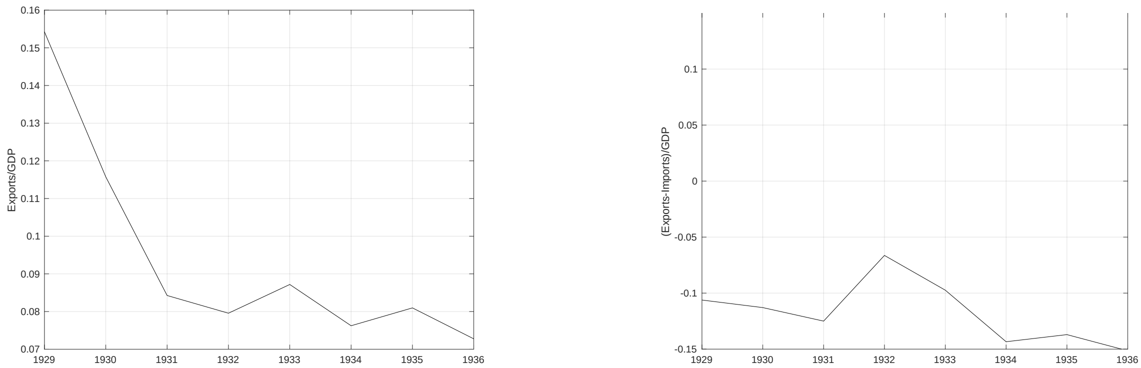


FIGURE A3.54: Price Indices Data - Romania

3A.19 Data South Africa

TABLE A3.19: DATA SOURCES: SOUTH AFRICA

Variable	Unit	Source	Note
Real GDP	m 2011 US $	Bolt et al. (2018)	I take the GDP per capita from the Madisson database and multiply it with the population estimate by Frankema and Jerven (2014).
Nominal GDP	m Rand	Mitchell (2007, p. 1062)	
Nominal Exports	m Rand	Statistisches Reichsamt (1936), League of Nations (1939a)	Excludes gold. Converted into Rand (1 : 2).
Nominal Imports	m Rand	Mitchell (2007, p. 1062)	Converted into Rand (1 : 2).
Export Price Deflator	Index (1927 = 100)	League of Nations (1939a)	



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.55: Trade Ratios - SouthAfrica

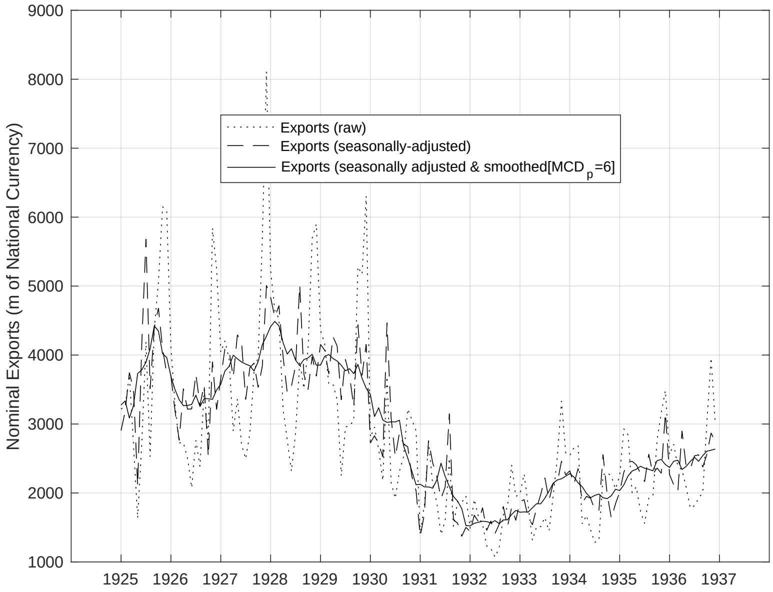


FIGURE A3.56: Monthly Export Data - South Africa

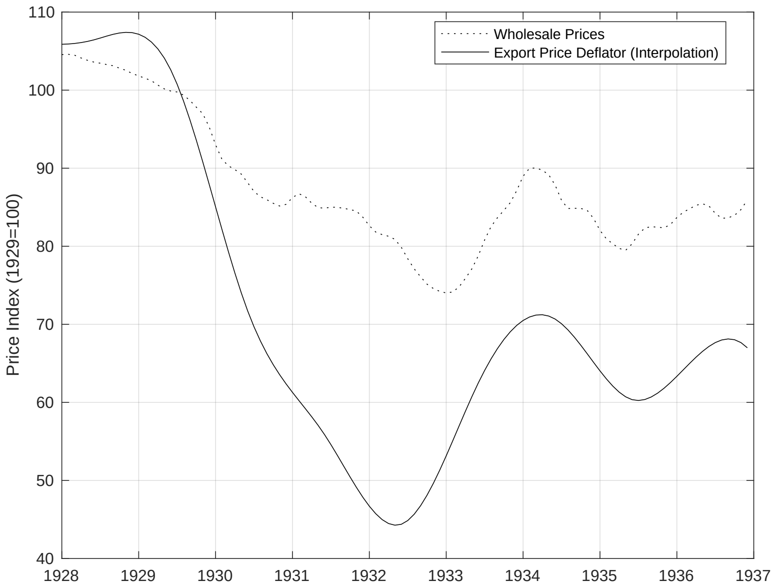
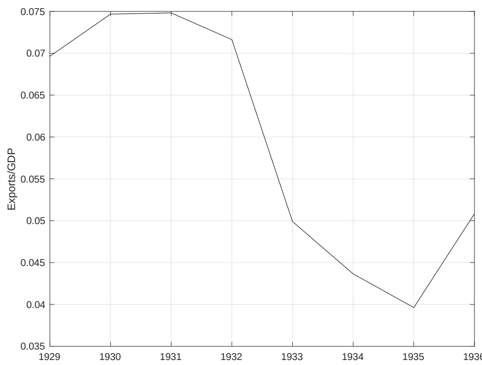


FIGURE A3.57: Price Indices Data - South Africa

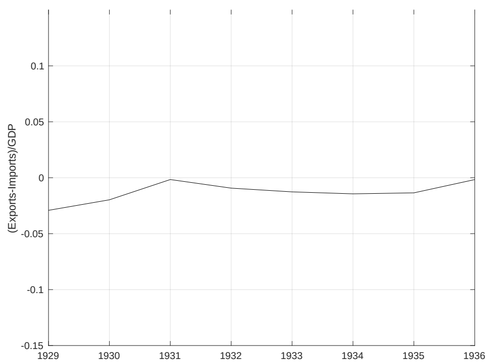
3A.20 Data Spain

TABLE A3.20: DATA SOURCES: SPAIN

Variable	Unit	Source	Note
Real GDP	m Euro (2010 prices)	Prados de la Escosura (2016)	
Nominal GDP	m Euro (current)	Prados de la Escosura (2016)	
Nominal Exports	Euro (current)	Prados de la Escosura (2016)	
Nominal Imports	Euro (current)	Prados de la Escosura (2016)	
Export Price Deflator	Index (2010 = 100)	Prados de la Escosura (2016)	



a) Export-GDP Ratio



b) Trade Balance-GDP Ratio

FIGURE A3.58: Trade Ratios - Spain

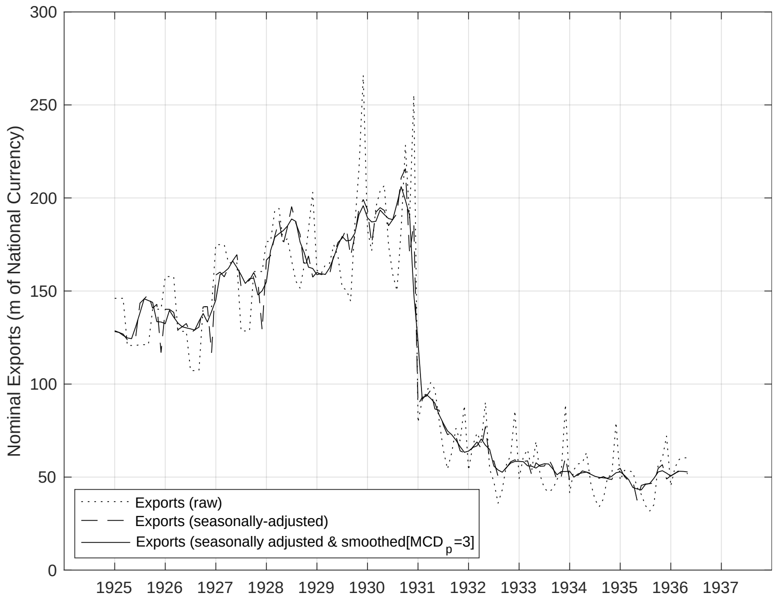


FIGURE A3.59: Monthly Export Data - Spain

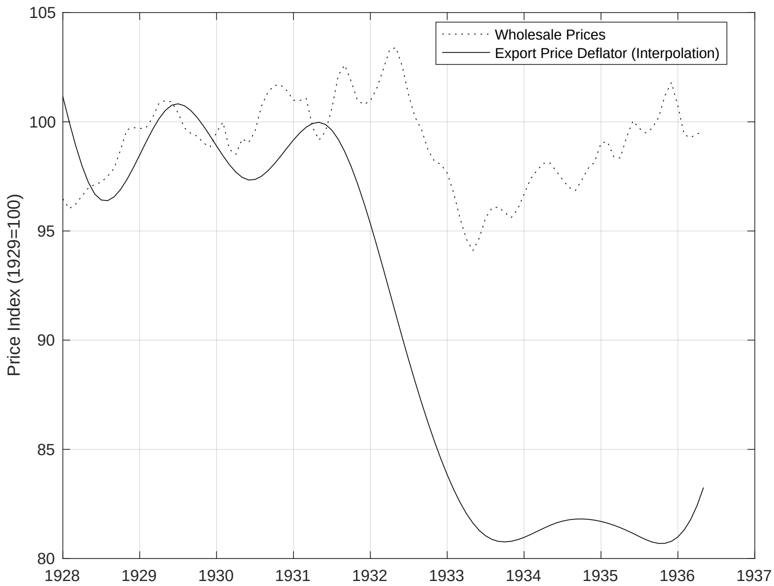
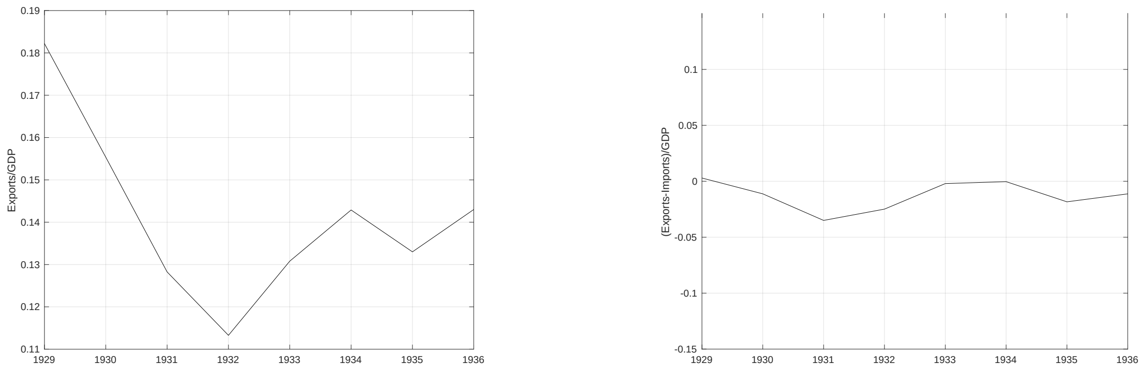


FIGURE A3.60: Price Indices Data - Spain

3A.21 Data Sweden

TABLE A3.21: DATA SOURCES: SWEDEN

Variable	Unit	Source	Note
Real GDP	m Swedish Crowns (1913 prices)	Johansson (1967, p. 153)	
Nominal GDP	m Swedish Crowns	Johansson (1967, p. 151)	
Nominal Exports	m Kronor	Mitchell (2014)	
Nominal Imports	m Kronor	Mitchell (2014)	
Export Price Deflator	Inde (1927 = 100)	Mitchell (2014), Johansson (1967, p. 141)	Implicit deflator based on nominal and real exports. I then base this index to 1927.



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.61: Trade Ratios - Sweden

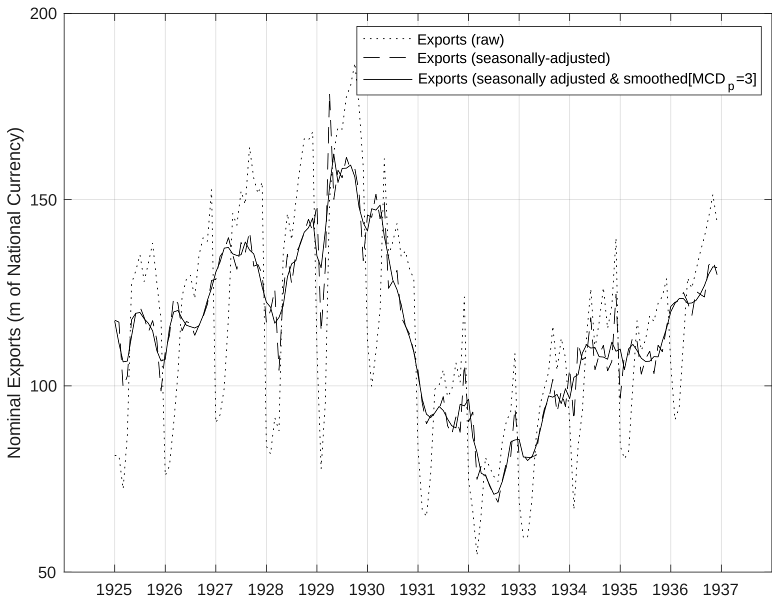


FIGURE A3.62: Monthly Export Data - Sweden

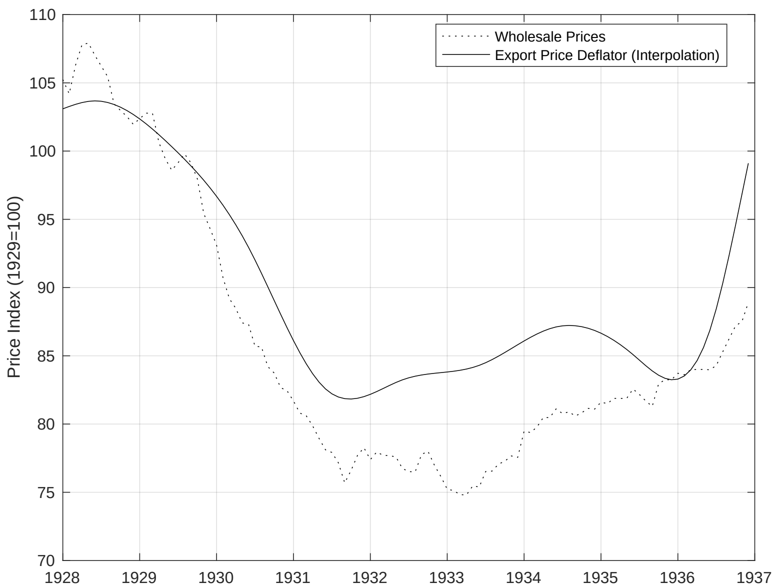
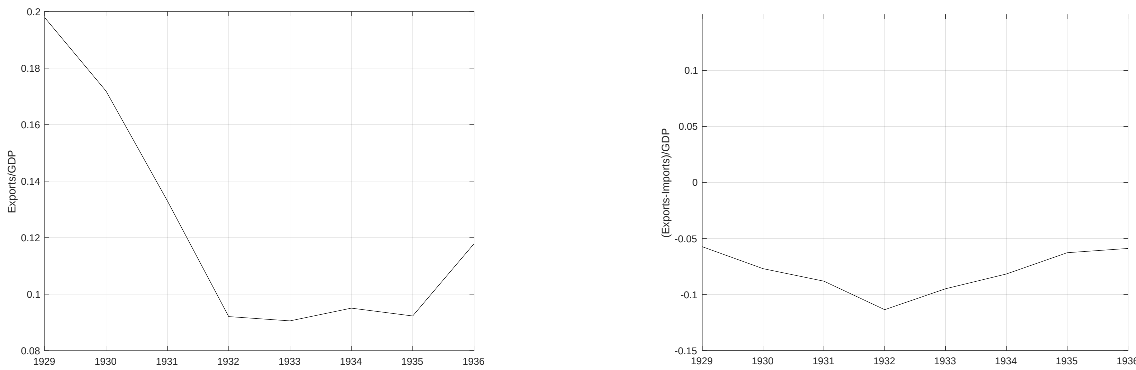


FIGURE A3.63: Price Indices Data - Sweden

3A.22 Data Switzerland

TABLE A3.22: DATA SOURCES: SWITZERLAND

Variable	Unit	Source	Note
Real GDP	m 1925 Swiss Frank	Gerlach and Gerlach-Kristen (2005), Historical Statistics of Switzerland (2016a, Q.16a)	I base the real indicator of Gerlach and Gerlach-Kristen (2005) on the 1925 GDP Historical Statistics of Switzerland (2016a, Q.16a).
Nominal GDP	m Swiss Frank	Gerlach and Gerlach-Kristen (2005), Historical Statistics of Switzerland (2016a, Q.16a)	I base the nominal indicator of Gerlach and Gerlach-Kristen (2005) on the 1925 GDP Historical Statistics of Switzerland (2016a, Q.16a).
Nominal Exports	m Swiss Frank	Statistisches Reichsamt (1936), League of Nations (1939a).	As data are only available from 1927 until 1933, I use the value index by the League of Nations (1939a) to calculate the nominal exports for 1931-1937.
Nominal Imports	m Swiss Frank	Statistisches Reichsamt (1936), League of Nations (1939a).	As data are only available from 1927 until 1933, I use the value index by the League of Nations (1939a) to calculate the nominal exports for 1931-1937.
Export Price Deflator	Index (1927 = 100)	League of Nations (1939a)	



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.64: Trade Ratios - Switzerland

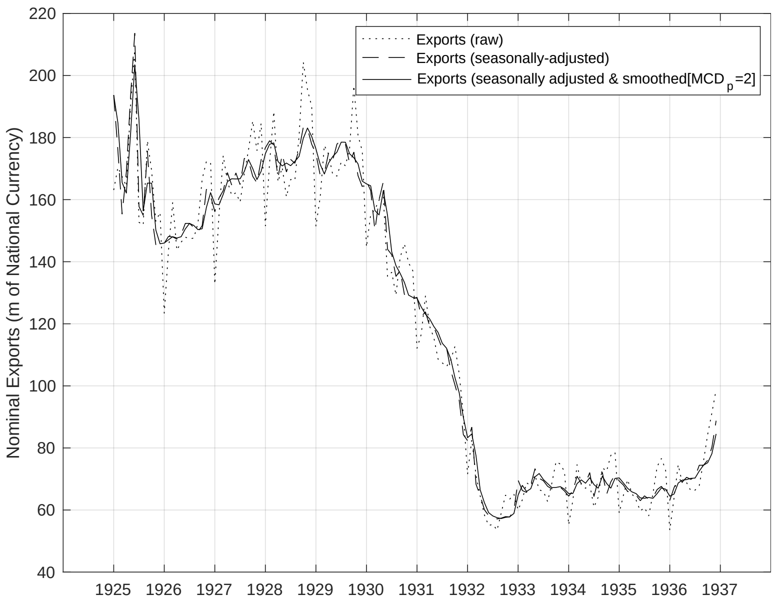


FIGURE A3.65: Monthly Export Data - Switzerland

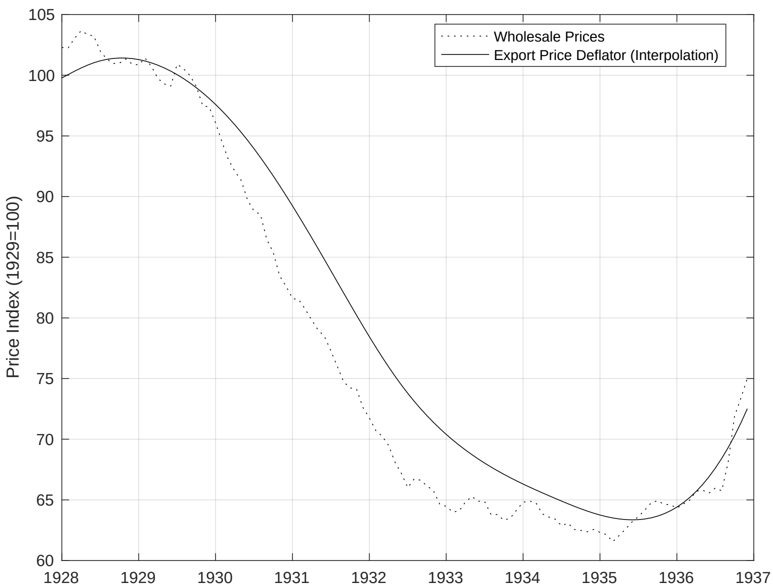
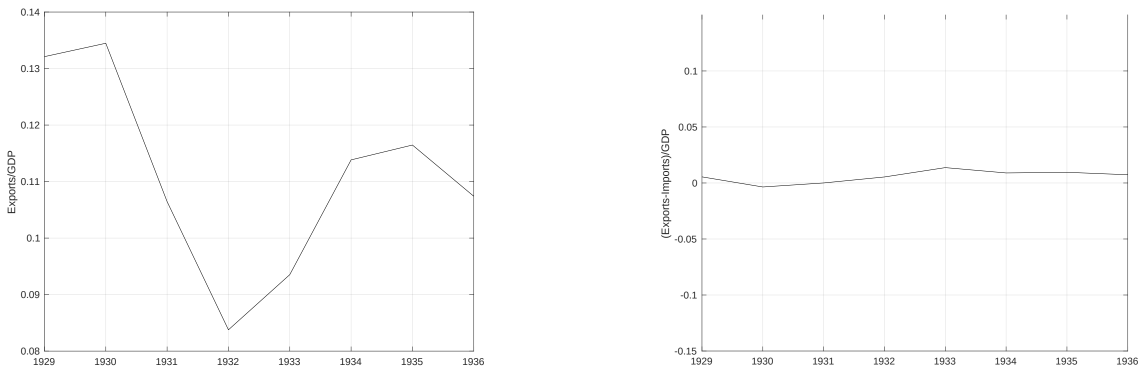


FIGURE A3.66: Price Indices Data - Switzerland

3A.23 Data Yugoslavia

TABLE A3.23: DATA SOURCES: YUGOSLAVIA

Variable	Unit	Source	Note
Real GDP	m Dinar (1938 prices)	Bank of Greece et al. (2014)	
Nominal GDP	m Dinar	Bank of Greece et al. (2014)	
Nominal Exports	m Dinar	Bank of Greece et al. (2014)	
Nominal Imports	m Dinar	Bank of Greece et al. (2014)	
Export Price Deflator	Index (1926=100)	Bank of Greece et al. (2014)	



a) Export-GDP Ratio

b) Trade Balance-GDP Ratio

FIGURE A3.67: Trade Ratios - Yugoslavia

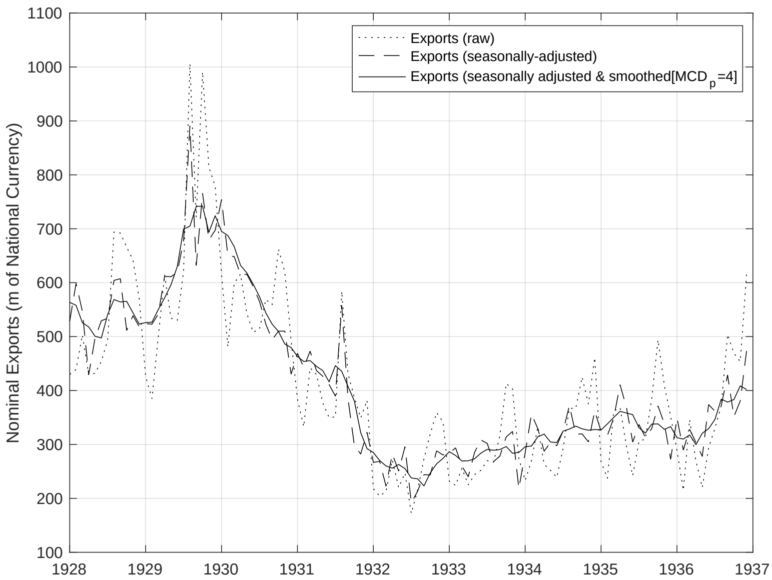


FIGURE A3.68: Monthly Export Data - Yugoslavia

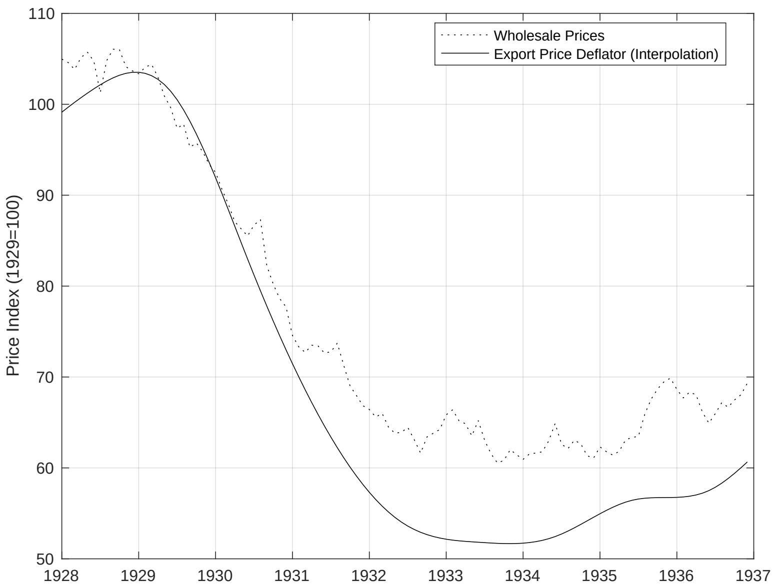


FIGURE A3.69: Price Indices Data - Yugoslavia

Appendix 3B Calculations

3B.1 Estimates of Counterfactual Trade Shares

TABLE A3.24: ACTUAL AND COUNTERFACTUAL TRADE SHARES WITH THE THREE LARGE ECONOMIES

	Germany		United Kingdom		United States	
	placebo	actual	placebo	actual	placebo	actual
Australia	34	17	32	73	34	10
Austria	35	73	38	15	27	12
Belgium	36	45	34	30	30	24
Bulgaria	37	94	39	4	24	2
Canada	32	5	36	44	32	51
Chile	33	14	34	47	34	39
Czechoslovakia	34	66	36	21	30	14
Denmark	34	26	37	73	29	1
Estonia	36	48	38	50	26	2
Finland	35	26	36	66	30	9
Hungary	36	82	39	15	25	3
Italy	35	41	35	28	30	30
Mexico	32	12	35	9	33	79
Netherlands	37	47	35	46	29	7
New Zealand	35	3	32	91	34	6
Norway	35	24	36	56	29	20
Poland	34	71	37	27	28	2
Romania	35	76	36	24	29	1
South Africa	34	8	33	90	33	3
Spain	36	23	34	49	30	28
Sweden	35	30	36	50	30	20
Switzerland	36	43	35	34	29	23
Yugoslavia	37	84	39	10	24	6

Source: See Appendix 3A for the underlying trade data. The miniature gravity model employed to derive these shares is discussed in Section 3.3.7.
Note: All values are given in percentages and based on trade data for 1927.

3B.2 Adjustments of Imports

TABLE A3.25: ADJUSTMENT OF IMPORTS

Estimator	*OLS*	*IV*
	m^{GDP}	m^{GDP}
xp^{GDP}	0.46***	0.54***
	(0.08)	(0.19)
Time FE	No	Yes
Country FE	Yes	Yes
Observations	368	368
R^2	0.20	0.34

Standard errors in parentheses and clustered at the country level.
Instrument is foreign demand as in all other regressions (partial F first stage: 15.07)
* $p < .10$, ** $p < .05$, *** $p < .01$

Appendix 3C Robustness checks

3C.1 Results - Two-way Clustering

TABLE A3.26: IV RESULTS (BALANCED SAMPLE) - TWO-WAY CLUSTERING OF ERRORS

Specification	Almunia et al.		Barro-Redlick			Placebo
	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
	xp	y	xp^{GDP}	y	xp^{GDP}	y
xp		0.19***				
		(0.05)				
xp^{GDP}				1.24***		1.12
				(0.42)		(1.81)
y^F	3.36***		0.52***		1.46	
	(0.85)		(0.11)		(2.08)	
Control Variables						
π	-1.18***	0.26***	-0.16***	0.22***	-0.14**	0.21
	(0.36)	(0.06)	(0.06)	(0.07)	(0.07)	(0.27)
GS	-0.07*	0.02**	-0.01*	0.02**	-0.01*	0.01
	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
XC	-0.07***	0.01	-0.01	0.01	-0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	368	368	368.	368	368	368
Partial F	15.66		22.63		0.49	

Standard errors in parentheses.
Standard errors clustered at the country and time dimension using the partial out option for the time fixed effects .
* $p < .10$, ** $p < .05$, *** $p < .01$

3C.2 Results - Including Lagged Dependent Variable

TABLE A3.27: IV RESULTS (BALANCED SAMPLE) - INCLUDING LAGGED DEPENDENT VARIABLE

Specification	Almunia et al.		Barro-Redlick		Placebo	
	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
	xp	y	xp^{GDP}	y	xp^{GDP}	y
xp		0.19***				
		(0.05)				
xp^{GDP}				1.17***		0.22
				(0.38)		(1.17)
y^F	3.41***		0.55***		1.42	
	(0.74)		(0.10)		(1.50)	
Control Variables						
π	-1.35***	0.24***	-0.18***	0.20**	-0.16***	0.05
	(0.30)	(0.07)	(0.05)	(0.08)	(0.05)	(0.17)
GS	-0.08***	0.02**	-0.01**	0.01*	-0.01**	0.00
	(0.03)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
XC	-0.06*	0.01*	-0.01	0.01	-0.01	0.00
	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
L.y	0.77***	0.16**	0.08	0.21***	0.07	0.28*
	(0.28)	(0.08)	(0.05)	(0.08)	(0.05)	(0.15)
Observations	345	345	345	345	345	345
Partial F	21.46		27.94		0.90	

Standard errors in parentheses.
Standard errors clustered at the country level.
* $p < .10$, ** $p < .05$, *** $p < .01$

3C.3 Results - Full Sample

TABLE A3.28: IV RESULTS - FULL SAMPLE

Specification	Almunia et al.		Barro-Redlick		Placebo	
	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
	xp	y	xp^{GDP}	y	xp^{GDP}	y
xp		0.23**				
		(0.10)				
xp^{GDP}				1.77**		-7.45
				(0.87)		(64.51)
y^F	1.10***		0.14**		0.07	
	(0.36)		(0.07)		(0.60)	
Control Variables						
π	-0.60***	0.11**	-0.07***	0.10*	-0.07***	-0.54
	(0.15)	(0.06)	(0.02)	(0.06)	(0.02)	(4.53)
GS	-0.02***	0.00	-0.00**	0.00	-0.00**	-0.03
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.20)
XC	-0.02***	0.00	-0.00***	0.00	-0.00**	-0.03
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.20)
L.y	0.33*	0.31***	0.06***	0.27***	0.06***	0.84
	(0.17)	(0.07)	(0.02)	(0.07)	(0.02)	(3.97)
Observations	963	963	963	963	963	963
Partial F	9.03		4.42		0.01	

Standard errors in parentheses.
Standard errors clustered at the country level.
* $p < .10$, ** $p < .05$, *** $p < .01$

3C.4 Results - Based on Economic Activity Indices Excluding Trade Data

In this sample, Bulgaria, Estonia and New Zealand are dropped as the economic activity indices excluding trade data were not available (minimum 5 indicators to base the monthly estimates on).

TABLE A3.29: IV RESULTS (BALANCED SAMPLE) - BASED ON ECONOMIC ACTIVITY INDICES EXCLUDING TRADE DATA

Specification	Almunia et al.		Barro-Redlick		Placebo	
	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
	xp	y	xp^{GDP}	y	xp^{GDP}	y
xp		0.20***				
		(0.07)				
xp^{GDP}				1.34**		2.59
				(0.53)		(3.08)
y^F	3.51***		0.54***		1.45	
	(0.96)		(0.13)		(1.65)	
Observations	320	320	320	320	320	320
Countries	20	20	20	20	20	20
Partial F	13.50		18.13		0.77	

Standard errors in parentheses and clustered at the country level.
Controls included, but not shown: wholesale price inflation, gold standard adherence, imposition of foreign exchange controls, time and country fixed effects.
The median ratio of exports to GDP for this sample is .161
* $p < .10$, ** $p < .05$, *** $p < .01$

3C.5 Results - Un-smoothed Data & Two-way Clustering

In this specification, neither the export data nor the wholesale price inflation data are smoothed before aggregating it into quarterly data. Two-way clustered standard errors are applied.

TABLE A3.30: IV RESULTS (BALANCED SAMPLE) - UN-SMOOTHED EXPORT & PRICE DATA

	1^{st} Stage xp	2^{nd} Stage y	1^{st} Stage xp^{GDP}	2^{nd} Stage y	1^{st} Stage xp^{GDP}	2^{nd} Stage y
xp		0.15***				
		(0.04)				
xp^{GDP}				1.05***		0.42
				(0.39)		(0.62)
y^F	4.24***		0.59***		4.26	
	(1.35)		(0.17)		(2.64)	
Control Variables						
π	-1.23***	0.24***	-0.17**	0.24***	-0.15	0.15
	(0.46)	(0.06)	(0.08)	(0.08)	(0.09)	(0.09)
GS	-0.07	0.02**	-0.01	0.02**	-0.01*	0.01
	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
XC	-0.05*	0.01	-0.01	0.00	-0.01	-0.00
	(0.03)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Observations	368	368	368	368	368	368
Partial F	9.90		12.46		2.60	

Standard errors in parentheses.
Standard errors clustered at the country and time dimension using the partial out option for the time fixed effects .
* $p < .10$, ** $p < .05$, *** $p < .01$

Chapter 4

Currency Devaluations and Beggar-my-neighbour Penalties: Evidence from the 1930s

Abstract

The currency devaluations of the 1930s facilitated a faster recovery from the Great Depression in the countries depreciating, but their unilateral manner provoked retaliatory and discriminatory commercial policies abroad. This paper explores the importance of the retaliatory motive in the imposition of trade barriers by gold bloc countries during the 1930s and its effects on trade. Relying on new and existing datasets on the introduction of quotas, tariffs, and bilateral trade costs, the quantification of the discriminatory response suggests that these countries imposed significant discriminatory beggar-my-neighbour penalties. The penalties reduced trade to a similar degree that modern regional trade agreements foster trade. Furthermore, the analysis of contemporary newspapers reveals that the devaluations of the early 1930s triggered an Anglo-French trade conflict marked by tit-for-tat protectionist policies. With regards to global trade, the unilateral currency depreciations came at a high price in political and economic terms. These costs must have necessarily reduced their benefit to the world as a whole.

4.1 Introduction

The currency depreciations of the 1930s were a precondition for the recovery from the Great Depression. While their effect on the initiating countries was unquestionably positive, their deflationary effect on those who stayed on the gold standard prevented them from being beneficial in a strictly Paretian sense (Eichengreen and Sachs, 1985, 1986). Furthermore, they had strong implications for trade policy. Policymakers abroad perceived the widespread exit from gold in 1931 as a commercial policy tool.[1] At the forefront, French policymakers retaliated by targeting their own commercial policy weapons specifically at those countries that had left the gold standard.[2] Other gold bloc countries reacted similarly. Belgium, Italy, Switzerland, and the Netherlands introduced discriminatory quotas, antidumping tariffs, or both.[3] Precisely because of their unilateral manner and beggar-my-neighbour character, the devaluations had provoked a wave of retaliatory and discriminatory trade policies.

This novel type of protectionism, a "pernicious" bilateralism (Irwin, 1993b, p. 109), has become exemplary for the disintegrating commercial world in the interwar period.[4] It was emblematic for the last of three stages of interwar protectionism. (Roorbach, 1933). It differed not only in the tools — quantitative restrictions gained importance — but in scope from the previous two stages. In the first phase of the Depression governments followed the classical protectionist motive and imposed tariffs to reduce competition for domestic producers (Roorbach, 1933, p. 224). In the second phase, they resorted to more protectionism, now including quotas, to balance their budgets and to protect their currencies. When countries started to leave the gold standard, this latter constraint became less binding and countries with depreciated currencies tended to become relatively less protectionist (Eichengreen and Irwin, 2010). However, the very action of leaving the gold standard gave way to a third stage of protectionism, in which countries staying

[1] See for example, Irwin (2012, p. 22-35). Like now, at the heart of this view was the argument that the country deliberately undervaluing her currency significantly gained at the expense of others. A lower real exchange rate would stimulate exports, which in turn would create current account problems abroad (Goldstein and Lardy, 2006, p. 423-425).

[2] This commercial policy episode is often mentioned anecdotally. See, for example, Eichengreen and Irwin (2010, p. 877). Shamir (1989, p. 121-137) refers to it as the Franco-British trade war.

[3] See Heuser (1939, p. 30-33) and Irwin (2012, p. 25).

[4] This resonates with the view of contemporaries as exemplified by League of Nations (1936b, Chapter 6). Kitson and Solomou (1995) are critical of this notion. The gravity literature can be interpreted in a similar manner (Eichengreen and Irwin, 1995; Wolf and Ritschl, 2011; Gowa and Hicks, 2013).

on the gold standard resorted to discriminatory commercial policies (Roorbach, 1933, p. 230). In contrast to the previous two stages, the quotas, tariffs, and exchange controls were often directed at specific countries. Such discrimination provided the breeding ground for trade wars. The devaluations had nurtured a protectionism of a new kind with new commercial weaponry and, more importantly, a strong discriminatory element.

This study explores the significance of the retaliatory motive in protectionism during the 1930s and discusses implications for our assessment of the economic effects of unilateral currency depreciations. Consistent with Shamir's (1989, p. 121–137) narrative, the qualitative analysis of contemporary newspapers reveals a change in public discourse, in which retaliatory sentiment gained momentum after the devaluations. Furthermore, it documents how French commercial policymakers imposed discriminatory trade policies. These were a direct response to the unilateral currency depreciations, which gold bloc countries perceived as a beggar-my-neighbour policy. Henceforth, such policies are thus referred to as beggar-my-neighbour penalties. To gauge their relative importance, the empirical assessment widens the scope of the study geographically by including more countries and thematically by assessing penalties' effects on trade. Relying on existing trade cost data for a number of countries (Jacks et al., 2011) as well as novel datasets on Swiss quotas and French tariffs, it empirically distinguishes beggar-my-neighbour penalties from non-discriminatory trade cost increases. Across datasets and specifications, the analysis suggests that the penalties were important by modern and historical standards. Likewise, their effects on trade were economically significant. A back-of-the-envelope calculation suggests that they reduced the gold bloc's imports from devaluing countries by between 16 and 22 %. Such magnitudes correspond well to the effects found for modern regional trade agreements – just with the opposite sign.[5]

How does accounting for the negative commercial policy externalities change our understanding of the unilateral currency devaluations of the 1930s? Incorporating these costs necessarily widens the gap between potential and realised benefits to the world as a whole. In light of the limited space to manoeuvre in the interwar policy arena, it probably remains true that unilateral devaluations were the only available policy option (Eichengreen, 2013). Yet, while the economics of currency valuations and discriminatory tariffs might remain the same, policy environments change. In a climate different from the one in the 1930s, other options

[5] Being in the range of the trade-creating effect typically found for the EU, they are slightly smaller than those found for NAFTA (Head and Mayer, 2014, p. 160).

might prevail as second-best solutions.

The remainder of the article is organised as follows. Focusing on the calculus of potential and realised benefits, Section 4.2 discusses recent and contemporary scholarship on the currency depreciations of the 1930s and their link to commercial policies. With a focus on the Anglo-French relationship, Section 4.3 provides a qualitative account of the link between devaluations and discriminatory protectionism, highlighting the escalating economic nationalism and rhetoric of retaliation. Equipped with the lessons from the qualitative analysis, Section 4.4 quantifies the force of the retaliatory response and investigates the effects on trade. Section 4.5 concludes.

4.2 Parity Choices and Commercial Policy Consequences

As previous research on the interwar period suggests, one cannot treat commercial and exchange rate policies independently in this episode. This section discusses recent scholarship, which links the rise of protectionism to the gold standard. Countries that had left the gold standard early felt less pressure to become protectionist. However, devaluations like those of the 1930s can be beggar-my-neighbour and might thus exacerbate general protectionist tendencies by provoking retaliation. Indeed, contemporary scholars made a strong connection between the devaluations, the following retaliation, and the corresponding increase in the overall level of protectionism. Incorporating this consideration into the analysis of the net benefits of the devaluations necessarily changes the calculus.

Inspired by the theoretical and empirical work by Eichengreen and Sachs (1985, 1986), a broad consensus on the positive effect of the devaluations for the depreciating countries emerged (see e.g. Bernanke, 1995; Campa, 1990; Mitchener and Wandschneider, 2015). Countries that had left the gold standard early, tended to recover faster. For those who stayed, Eichengreen and Sachs point out two counteracting effects. On the one hand, they would lose competitiveness as their exports would be relatively more expensive. On the other, gold inflows from devaluing countries could ease monetary conditions. This could outweigh the demand shift and "thus, a devaluation under a gold standard may or may not be beggar-thy-neighbor[...]" (Eichengreen and Sachs, 1986, p. 70). However, Eichengreen and Sachs conclude that the devaluations were in fact beggar-my-neighbour as depreciating countries on average acquired gold stocks in the aftermath of the devaluations. Hence, the devaluations were a double-edged sword.

This initial characterisation of the currency devaluations of the 1930s is illuminating, balanced, and highlights their unfulfilled potential. This study shall be as much a restatement as an extension of the initial cost-benefit analysis by Eichengreen and Sachs for two reasons. Firstly, the succeeding literature focuses on the shiny edge of the double-edged sword for the devaluing countries and largely ignores the gloomy one for those staying on the gold standard.[6] Secondly, the devaluations had important commercial policy externalities. These should be accounted for when assessing the net benefits of the devaluations. As for the monetary consequences, it is useful to highlight the asymmetric effects on gold standard countries and floaters.

For explaining the "trade policy disaster" in the interwar period, Eichengreen and Irwin (2010) and Irwin (2012) advance a modified macroeconomic trilemma illustrating the policymakers' constraints. They could choose only two of the following three policies: a fixed exchange rate, open trade, and independent monetary policy. Bound by their gold standard orthodoxy, i.e. the refusal to leave the gold standard, some resorted to protectionist policies such as quotas and tariffs to protect the value of their currency rather than reducing it. The trilemma explanation provides us with a powerful framework to understand what probably had set the general protectionist movement in motion besides the more classical motives such as unemployment. Furthermore, it illuminates why countries with depreciated currencies were, on average, less prone to become more protectionist.

On the other hand, gold standard countries did not simply become more protectionist, but the very nature of their commercial policies changed. Facing increased competition on international markets, countries responded with discriminatory restrictions against those who had left the gold standard rather than across-the-board tariffs and quotas. They retaliated against what they thought of as unfair competition. The contemporary academic discourse serves as a credible witness for this link between currency depreciations and discriminatory protectionism.

[6]Typically studies only highlight the positive aspects of the currency depreciations (Bernanke, 1995, e.g.) or stress the theoretical outcome of them not being beggar-my-neighbour per se (Campa, 1990, e.g.) but do not acknowledge their beggar-my-neighbour character. Given that these and other studies reference their study without or little qualification, it is important to point out that Eichengreen and Sachs (1985, p. 946) criticise both, the reluctance of some countries to leave the gold standard and the failed coordination of the devaluations.

It was in the 1930s that Joan Robinson (1937) popularised the "beggar-my-neighbour" term[7] by comparing the commercial policy environment to the famous card game with explicit references to the devaluations. She (1937, p. 210f) described what economists nowadays call a non-cooperative game:

> "In times of general unemployment a game of beggar-my-neighbour is played between the nations, each one endeavouring to throw a larger share of the burden upon the others. As soon as one succeeds in increasing its trade balance at the expense of the rest, others retaliate, and the total volume of international trade sinks continuously [...]. "

Robinson's stance was far from isolated. Other contemporary economists emphasised the negative commercial policy consequences. Amongst other reasons for the rise of protectionism, Liepmann (1938, p. 361–364) pointed to retaliation for exchange rate depreciation. In his free trade manifesto, Findlay (1934, p. 31) bemoaned the retaliation of twenty other nations after the devaluations, particularly emphasising paradigm shifts away from free trade such as in the Netherlands. Roorbach (1933, p. 89f) argued explicitly that the devaluation "resulted in a movement for still further restrictions of imports by the gold standard countries" or in the words of MacKintosh (1936, p. 1): "The protectionist plea is most likely to be heard when he [the producer] is asking to be protected against a fresh threat to his position."[8]

When assessing policy options in the mirror of history, it is important to take a balanced view of the past. The recent literature emphasises the positive effects of the devaluations based on the framework of Eichengreen and Sachs even though these authors themselves highlighted their beggar-my-neighbour character. With respect to commercial policy, subsequent literature has highlighted a positive effect as devaluing countries became relatively less protectionist. In contrast, contemporary academics pictured the devaluations themselves, and their unilateral manner in particular, as toxic for the commercial policy environment. According to them, they led to discriminatory trade policies. Ceteris paribus, such policies must have reduced the large potential benefits of the devaluations to the world as a whole. Before we empirically explore their magnitude and effects on trade,

[7] See Irwin (2012, p. 125). Sometimes, it is also referred to as "beggar-thy-neighbour," but not so in Robinson's work.

[8] Naturally, there were also some sceptics. While acknowledging that the "fear of exchange dumping" increased trade barriers, Graham and Whittlesey (1934, p. 411) argued in line with Irwin's (2012) trilemma that "it is at least equally probable that the attempt to maintain the nominal exchange value of a currency will lead to the erection of almost unscalable [trade] barriers."

the subsequent section documents the toxicity in the interwar commercial policy arena and explores the means through which countries discriminated against trading partners.

4.3 The Rhetoric of Retaliation - A Qualitative Account

Abstracting from quotas for the moment, the importance of retaliatory commercial policies over time is perhaps best summarised by Figure 4.1. It presents keyword counts from the Manchester Guardian for expressions related to either retaliation or tariffs more generally. It suggests that, while the tariff question was relevant throughout the 1920s with about 260 counts per year, retaliation became more topical in the beginning of the 1930s. While it was mentioned a mere 17 times per year from 1920-29 on average, the corresponding average for 1930-33 is 104. The increase in 1930 is clearly in response to the Smoot-Hawley legislation, but it trails the magnitude of retaliatory sentiment in 1932 by far. In this year, articles with the word combination "tariff" and "retaliation" appeared on average almost every other day.

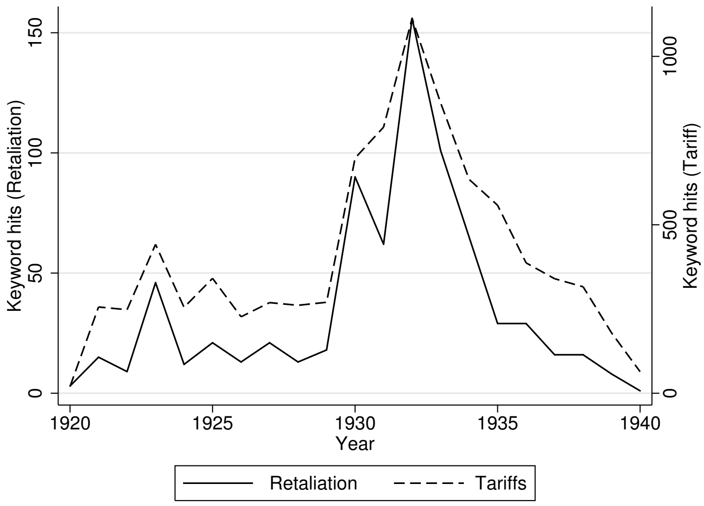


FIGURE 4.1: Frequency of keywords in the *Manchester Guardian*

Source: Own calculation from the *Manchester Guardian* digital archive by ProQuest.
Notes: "Tariffs" includes hits of "tariff" or "tariffs" in combination with "exports" or "imports." Retaliation includes hits of "retaliation" or "retaliatory" in combination with "tariff" or "tariffs" or articles containing the expression "tariff war." Advertisements are excluded. It is important to note that some of these counts might include coincidental hits. Yet, the margin of error seems small.

To add substance to these data and to characterise the general political climate, the following section discusses the Anglo-French commercial policy relationship based on articles from the *Manchester Guardian*, the *Financial Times* and *The Economist*. One can periodise this episode into three acts. In the prelude to the devaluations, the protectionist idea was gaining momentum in France. However, policy measures were more likely to meet leniency in Britain before 1931 and hopes for cooperation were still present. In the second phase starting with the devaluations, the rhetoric shifted towards a more nationalistic and retaliatory tone. Finally, this culminated in a perpetuating tit-for-tat game illustrated in the final part of this section.

Prelude

The move towards protectionism had already been visible in France before the crisis of 1931. She fought a tariff war with Australia in 1930 and 1931[9] and, like other countries, France considered retaliation immediately after the Smoot-Hawley bill was passed in June 1930.[10] France urged for negotiations and called the American MFN treatment into question.[11] While this threat did not materialise, France discriminated against the United States when she introduced a more draconian quota for American coal than for coal of other origins in July 1931. In light of the 89 % reduction of the American quota, the 6 % reduction on British coal seemed modest.[12] It may have been this comparison that provoked leniency in Britain. The Secretary of Mining, Shinwell, pointed out that the French quota did not aim to "embarrass" Great Britain, but was an effort by the French government to protect coal workers. Instead of calls for retaliation, there were calls for cooperation of the mining industries across Europe.[13]

Tariff proposals in Britain remained of "revenue nature" before the end of 1931. In September, the Chancellor of Exchequer, Phillip Snowden, proposed a revenue tariff on luxury goods.[14] As this was a large industry across the channel, this suggestion was met with "outstanding anxiety" in France.[15] The rhetoric began to change. Criticising the proposed measures, Rollin, French Minister of

[9] Manchester Guardian (1931d, p. 16).
[10] Manchester Guardian (1930a, p. 8).
[11] Manchester Guardian (1930b, p. 15).
[12] Manchester Guardian (1931b, p. 12).
[13] Manchester Guardian (1931b, p. 12).
[14] Manchester Guardian (1931l, p. 12).
[15] The Economist (1931g, p. 517).

Commerce, emphasised that tariff increases should only be legitimate as countermeasures against unfair competition such as dumping.[16] A British commentator hoped that the tariff menace could lead to new negotiations about a tariff truce, which had been initiated two years earlier but failed.[17] Such hopes did not materialise, especially after September 20, 1931, when the British devaluation "fell like a bombshell on the [French] market."[18] Economic nationalism and tariff war rhetoric soon replaced international sympathy and leniency. The spirit of cooperation and diplomacy came under strain.

Immediate Reactions to the Devaluations

The devaluation provoked "great surprise and consternation in French industrial and business circles" according to Naudau, president of French Chamber of Commerce in London.[19] The same was true for policymakers. Nevertheless, there was the hope that this would stop the British tariff plans. French Minister of Commerce Rollin commented, "it goes without saying that if the British Government have been thinking of new tariff measures, now that the depreciation in sterling constitutes an important bounty for British exporters, they must have given up the idea."[20] Once again, this illustrates that exchange rate and commercial policies were linked to the extent that policymakers would equate them.

In the initial weeks after the devaluation of the pound, the public did not perceive the float as a permanent situation. French newspapers speculated whether the pound will return at par or about 20 % below it.[21] Neither this hope nor the one concerning the tariffs materialised. In Britain, the tariff question became a dominant topic in the run-up to the general election, with Labour opposing and the Conservative Party favouring protection.[22] The conservatives won the election by a large margin indicating the substantial public support for protectionist policies.[23]

After the devaluations, small instances could trigger intense debates. When Britain announced the ban of French potatoes due to the Colorado Beetle, the *Journée Industrielle* considered this a protectionist measure and called for tariff

[16] Manchester Guardian (1931g, p. 11).
[17] Manchester Guardian (1931c, p. 12).
[18] French correspondent in The Economist (1931c, p. 550).
[19] Financial Times (1931b, p. 5).
[20] Manchester Guardian (1931f, p. 12).
[21] Manchester Guardian (1931m, p. 13).
[22] "At the very moment that a tariff has become not only a superfluity but an absurdity we are to have a general election, it is generally believed, on that question alone" (Manchester Guardian, 1931p, p. 8).
[23] Manchester Guardian (1931q).

reprisals.[24] About a month later, the French Minister of Agriculture threatened to ban coal, tea, and whiskey from Britain if the embargo was not lifted.[25] In the meantime, France had banned certain foodstuffs from early October until the end of the year.[26] In the case of butter and beef, this mainly hit two other depreciators, Denmark and Argentina.

In November, France reacted on a large scale to the devaluations. The surtax on goods from countries with depreciated currencies came into effect on 14 November 1931.[27] Certain goods such as grain and tea were exempted from this tariff and this list would be modified over time. The surtax in its initial form employed different rates across countries: 15 % for Great Britain, Australia, Denmark and Sweden, 10 % for Uruguay and Argentina, 8 % for Norway, and 7 % on British India and the Native States.[28] A month later the surtax was fixed at 15 % for all of these countries. However, given the many exceptions to it, the change of the tariff level against the individual country would not be equal to this amount.[29] Nevertheless, the British Mining Association reported immediate effects materialising in the cancelation of orders, because British coal exporters had become relatively more expensive for French importers.[30]

Because of this apparent level of discretion and the fact that no other large coal exporter went off the gold standard, the British industrialists suspected that the surtax unfairly targeted Great Britain.[31] The chamber of commerce argued that the surtax violated the MFN clause, which both countries had agreed upon.[32] To such criticism, the French Minister of Commerce Louis Rollin responded that the 15 % would still not be enough to compensate for the competitive advantage gained by British manufactures through the devaluations.[33] Moreover, a French correspondent argued that the new exchange rate resembled a 50 % ad valorem

[24] Manchester Guardian (1931n, p. 9).
[25] Manchester Guardian (1931a, p. 23).
[26] Manchester Guardian (1931e, p. 12).
[27] The Economist (1932b, p. 5f).
[28] The Economist (1931f, p. 956).
[29] While the bilateral tariff rate against countries such as Sweden and Denmark indeed increased by more than 15 % ad valorem between 1930 and 1932, the same measure for Great Britain "only" doubled from 5 to 10 % ad valorem. This seems to be due to the extensive use of exemptions of certain goods from the surtax (e.g. coal at a later point of time) as a bargaining device. Britain, however, was the exception rather than the rule. The quantitative section discusses the average effects taking into account all tariff measures rather than only the surtax.
[30] Manchester Guardian (1931h, p. 9).
[31] Manchester Guardian (1931i, p. 9).
[32] Manchester Guardian (1931j, p. 11). We shall later see, that the MFN treatment was actually more of an unspoken rule and no such contract existed.
[33] The Economist (1931h, p. 1006).

tariff. Regarding new proposed British tariff legislation, the correspondent stated: "The loss to France and to other countries will be very heavy, and many people here do not hesitate to say that the action of the British Parliament amounts to a declaration of economic war."[34] Clearly, the French industrialists had not hesitated to fuel this war. They insisted that the Minister of Commerce should not lose any time "in taking up the matter with the British government and, if necessary, to start retaliatory measures."[35] In sum, the last bits of leniency vanished after the devaluations and agitation took over in press and politics. The immediate reactions anticipated an increase in protectionism, which is documented in the following paragraphs.

The Upward Spiral of Retaliation

While trade continued to fall, retaliation spiralled further upward. Before the introduction of the General Tariff in early 1932,[36] the British parliament passed the Abnormal Importations Act on 17 November 1931.[37] It empowered the President of the Board of Trade, Runciman, to impose duties on wholly or mainly manufactured goods of up to 100 % for a duration of six months. One justification for the tariff was the French surtax. Referencing France's return to gold at one fifth of its pre-war parity, a commentator argued that Great Britain could have imposed a tariff of 400 % in 1928.[38]

With the new tools at hand, retaliation was discussed quite openly in the House of Commons. Members of parliament considered whether it was legal within the current treaty status to place special tariffs on French luxury goods and agreed they could. These discussions also made clear that while Great Britain had received most favoured nation treatment under an old French law, no binding treaty existed and thus any French tariff imposition would be legal.[39]

Tariff increases did not remain hypotheticals. Three decrees were issued under the Abnormal Importations Act. These fixed mostly prohibitive duties of 50 % on a variety of goods. While not aimed at specific countries per se, the tariff affected the United States, France, Germany and Holland the most as the

[34] Manchester Guardian (1931o, p. 9).
[35] Financial Times (1931a, p. 5).
[36] See Kitson and Solomou (1990) for a discussion of the effect of the General Tariff.
[37] The Economist (1932b, p. 5f).
[38] The Economist (1931a, p. 944).
[39] House of Commons (1931-1932c, col 1025). See also O'Connor's comment concerning the surtax: "Will not the best possible representation [regarding the French surtax] be made when we have a tariff of our own?" (House of Commons, 1931-1932a, col 841).

details of the first,[40] second[41] and the third[42] schedule demonstrate. According to *The Economist* the schedules were a small concession to protectionism in statistical terms but not in principal and hence the commentator concluded that Runciman was playing a "dangerous game."[43] Despite criticising the French surtax and discrimination, Runciman pointed out "there is no connection whatever between that decree and our orders, or the legislation which preceded them."[44] Considering the parliamentary debates and his own introduction of the speech, this statement does not appear overly credible.

French reactions to these emergency tariffs included the reduction of the quota on British coal less than eight days after the passage of the law,[45] which was "designed to restrict entries of British and other foreign fuels."[46] However, until the British General Tariff was introduced in the end of February 1932, France also made some concessions. She lifted the surtax on coal in order to obtain favourable treatment for some agricultural products.[47] This bargaining failed, at least at a large scale. It did not affect the British introduction of the General Tariff of 10 % ad valorem (Import Duties Act), which came into effect on 29 February 1932.[48]

Interestingly, the second section of the General Tariff provided the Board of Trade with powers "to impose supplementary duties in case of foreign discrimination" on top of the General Tariff.[49] While the final decision remained with the House of Commons, recommendations were made by the Import Duties Advisory Committee and it appears that the House always followed those (Capie, 1981, p. 160). Each of the 135 recommendations[50] issued between 1932 and 1936 included not only one but a list of goods on which additional tariffs should be charged. Despite its name, the General Tariff thus included discretionary elements.

[40] The Economist (1931d, p. 994).

[41] The Economist (1931j, p. 1061).

[42] The Economist (1931i, p. 1221).

[43] The Economist (1931i, p. 1220-1223).

[44] House of Commons (1931, p. 1473). According to The Economist (1931i, p. 1120–1123), the third schedule was probably not aiming at *one* specific country.

[45] The Economist (1932b, p. 5f).

[46] The Economist (1931e, p. 1006f). A report from the Manchester Guardian (1931k) demonstrates, that demands for retaliation were not unique to the Anglo-French relationship as experiences in other countries illustrate.

[47] Manchester Guardian (1932a, p. 15).

[48] The Economist (1932c, p. 725f).

[49] House of Commons (1931-1932b, Bill 33, 1931–1932, p. I.645).

[50] Counted in the House of Commons Archive provided by ProQuest (in 1932: 9 recommendations, 1933: 23, 1934: 36, 1935: 35, 1936: 32). For a more detailed account of this part of the Act, see also the work by Capie (1981).

France responded to the General Tariff with the introduction of new quotas in "rapid succession."[51] A particularly draconian example was the quota on British textile machinery, which reduced import allowances to less than 10 % in 1931 terms.[52] These new quotas also covered cotton yarn and piece goods.[53] In the following two years, the above characterisation as a tit-for-tat game remains true for Anglo-French commercial relations. For instance, a new anti-dumping bill in December 1932 was introduced, which allowed France to super-impose tariffs of up to 50 % on all merchandise from countries treating her less favourably than their other trading partners.[54] In 1933, there were still British demands for retaliation against the surtax.[55] This demand became even stronger, when France did not apply the surtax against the United States after the dollar devaluation. The *Manchester Guardian* argued that France had "fear of annoying the U.S."[56] The surtax against Britain was only suppressed from January 1934 onwards.[57] The quotas remained in place.

Focusing on the Anglo-French commercial policy relationship, this section has demonstrated the importance of retaliation following the devaluation of the pound in terms of rhetoric and actions taken. French policymakers understood the unilateral devaluations as a protectionist measure and retaliated. This led to similar reactions abroad. The "potato instance" vividly illustrates that small actions could provoke severe threats. This qualitative analysis informs the quantitative assessment in two ways. First, trade policy had indeed discretionary elements. Policymakers raised tariffs against certain countries by targeting their main export goods and by introducing a surtax on depreciated currencies. Second, quotas soon became the commercial policy tool of choice, which might render post-1932 tariff rates of secondary importance.

4.4 Discriminatory Commercial Policies - A Quantitative Account

The qualitative evidence suggests that French policymakers perceived the devaluations as a beggar-my-neighbour policy and retaliated accordingly. How large

[51] Manchester Guardian (1932c, p. 4).
[52] Manchester Guardian (1932b, p. 11).
[53] Manchester Guardian (1932b, p. 11).
[54] The Economist (1932d, p. 1081).
[55] Manchester Guardian (1933b, p. 12); Manchester Guardian (1933c, p. 4).
[56] Manchester Guardian (1933a, p. 9).
[57] Manchester Guardian (1934, p. 13).

was this beggar-my-neighbour penalty? How does this commercial policy reaction generalise to other gold bloc countries? From the newspaper evidence on France as well as from other qualitative sources for the remaining gold bloc countries,[58] we know that quotas and tariffs were the prime commercial weaponry in gold bloc countries. The fact that data on these are rarely recorded on the bilateral level makes it particularly challenging to identify discriminatory trade policies.[59] To overcome this difficulty, this section introduces three pieces of evidence. Firstly, it links increases of a synthetic trade cost measure to the devaluations. Secondly, the analysis of novel Swiss data on quotas and French data on tariffs elucidates the precise mechanisms of discriminatory import restrictions. Employing the estimated changes in trade costs, the final part of this quantitative assessment speculates about the effects on trade.

4.4.1 Evidence From Bilateral Trade Costs

In a data scarce environment, bilateral trade costs can be proxied by a synthetic measure (Novy, 2013). While the derivation is not trivial, its intuition is easily summarised. Based on data on internal trade of two countries as proxied by the respective tradable GDPs and a parameter assumption about the elasticity of substitution, one can calculate two hypothetical bilateral trade flows in a frictionless world. The difference between such hypothetical flows and the observed ones constitutes the trade costs. Conveniently, the resulting measure can be interpreted in ad valorem equivalent terms.[60]

How can we isolate commercial policy repercussions to the currency devaluations from these data? By construction, the trade cost measure does neither indicate what these trade costs are composed of nor which of the two countries is responsible for them. Fortunately, a set of fixed effects can partially alleviate

[58]The United States Tariff Commission (1934, p. 5, 21, 24) provides an overview about the legal aspects of commercial restrictions for other gold bloc countries. The Belgian government had the power to apply countervailing duties to countries with depreciated currencies and quotas against unfair competition. Italian law provided the opportunity to impose quotas and tariffs by decree against unfair competition of all sorts. In 1933, a new law with explicit reference to depreciated currencies was passed. The Dutch government passed antidumping and clearing acts in 1931 and 1932 respectively, introduced a quota system in December 1931, and established monopoly control for a large number of agricultural goods in 1932.

[59]This is reflected in the scarcity of studies using bilateral tariff data. Among the few works that come to mind are Dedinger (2012) and Varian (2018) on the late 19th century as well as Hayakawa (2013) on modern trade data.

[60]See Novy (2013), for details on the derivation of the measure. Whether the ad valorem equivalent interpretation holds strictly true for historical data is — given the imprecision of historical national accounts — unclear.

the former and fully address the latter of these two caveats. Firstly, pair-specific fixed effects account for most of the important trade costs such as distance and language similarity, which do not vary over short periods of time.[61] Secondly, time-varying country fixed effects account for the change of the trading partners? average trade cost levels. The remaining variation in trade costs stems from pair-specific changes over time. Can the devaluations help to explain this variation? The following equation addresses this question by employing an available trade cost dataset (Jacks et al., 2011):

$$ln(1+\tau_{i,j,t}) = \beta GS_{off} + \gamma_{i,t} + \psi_{j,t} + \phi_{i,j} + t_t + \epsilon_{i,j,t} \tag{4.1}$$

in which $ln(1+\tau_{i,j,t})$ is the logarithm of the mark-up due to trade costs τ between countries i and j at year t. GS_{off} takes the value of 1 if at least one country is off the gold standard. $\gamma_{i,t}$ and $\psi_{j,t}$ are time-varying country fixed effects for i and j respectively, $\phi_{i,j}$ a pair-specific fixed effect, and t_t a time fixed effect. If countries staying on the gold standard imposed beggar-my-neighbour penalties against devaluing countries, trade costs would increase for country pairs which were not linked by the gold standard relative to those who were. Hence, we would expect the coefficient β to be positive and significant.

While reverse causation concerns can be easily dismissed on historical grounds,[62] exchange rate volatility could potentially confound results of this specification due to its strong correlation with the gold standard variable.[63] The concern is thus that the β coefficient for GS_{off}, rather than capturing a discretionary protectionist response, picks up potential negative effects of exchange rate volatility. Using different samples and specifications allows us to gauge the importance of this factor. Firstly, one can compare the period, in which countries joined the gold standard, with the one, in which many countries left it. If the β coefficient had the same magnitude in both samples, the effect would be driven by exchange rate volatility. Secondly, one can analyse the role of exchange rate

[61] It is true that transport costs, unlike distance, vary over time. However, the general variation of transport costs is captured by the time fixed effect. While uncontrolled for, the differential effect on bilateral transport costs is unlikely to correlate with the gold standard adherence variable in the main specification. Countries around the world had left the gold standard in 1931, while others stayed on it at least until 1933. For a thorough discussion of the effect of transport costs on trade, see Chapter 5.

[62] For example, see Wolf (2008) for a discussion about the structural reasons and Accominotti (2012b) for the trigger for the exit from the gold standard.

[63] In contrast, the inclusion of a variable indicating the imposition of exchange controls by at least one trading partner did not affect the results. As the coefficient for this variable was insignificant, potentially due to strong multicollinearity with the time-varying country fixed effect, it is omitted from the presentation.

volatility by alternating the reference group. Specifically, one can compare country pairs with asymmetric exchange rate regimes GS_{as}, i.e. one trading partner on and one off the gold standard, with those in which both countries had either left or stayed on the gold standard. Finally, dropping the gold standard group, the corresponding regression compares only country pairs affected by exchange rate volatility. Yet, only one of them received the beggar-my-neighbour penalty.

Table 4.1 illustrates the results. To improve expositional clarity, the lower part of the table documents the reference group for the indicator variable of interest. The results in column 2 suggest that trade costs increased by $e^{0.045} - 1 \approx 4.6\%$ for country pairs which were no longer linked by the gold standard during the period 1930-34. Column 3 repeats the same exercise by focusing on the change from 1930 to 1932. The fixed effects included in the above equations facilitate an interpretation within a difference-in-differences framework, in which 1931 is dropped as the year in which the treatment occurred. Arguably, this specification represents the cleanest estimate of the beggar-my-neighbour penalty. It implies an ad valorem equivalent penalty of $e^{0.0498} - 1 \approx 5.1\%$.

TABLE 4.1: DISCRIMINATORY PROTECTIONISM IN BILATERAL TRADE COST DATA

Dep. Variable:	Trade Cost: $ln(1+\tau)$				
Specification	Off Gold			Asymmetric Regime	
Column	(1)	(2)	(3)	(4)	(5)
Sample	1925–1929	1930–1934	1930 / 1932	1930 / 1932	1930 / 1932
GS_{off}	0.00764	0.0450***	0.0498***		
	(0.63)	(2.88)	(3.28)		
GS_{as}				0.0249***	0.0409***
				(3.28)	(2.71)
Reference Group					
Off Gold – Off Gold				✓	✓
Off Gold – On Gold					
On Gold – On Gold	✓	✓	✓	✓	(dropped)
R^2	0.558	0.707	0.852	0.852	0.854
N	740	740	296	296	264

Notes: t statistics in parentheses; Confidence intervals: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Country-pair, time, and time-varying country fixed effects are included but not shown. Standard errors are robust. The underlying balanced sample of 148 country pairs per year is from Jacks et al. (2011). Gold bloc countries in the sample include Belgium, France, Italy, Netherlands, and Switzerland. The results are robust to the exclusion of country pairs containing France.

Column 1 suggests that this effect is not driven by exchange rate volatility. In the period 1925-29 many countries joined the gold standard, but the effects on trade costs were insignificant. If exchange rate volatility was playing an important role, we would expect an effect of similar magnitude and significance for this period. The specifications in column 4 and 5 lend further support to this notion. They focus on country pairs with asymmetric exchange rate regimes, meaning that one of the trading partners was on the gold standard while the other one was not. As only the reference group changes in column 4, the R^2 remains identical and large. On the other hand, the size of the coefficient changes - reducing the effect to $e^{0.0249} - 1 \approx 2.5\%$. This is not particularly surprising as the reference group now contains very heterogenous country pairs. The final column drops country pairs, in which both countries were on the gold standard. It thus compares two groups for which exchange rate volatility could have played a role. The effect of an asymmetric exchange rate regime is $e^{0.0409} - 1 \approx 4.2\%$. Compared to the point estimate of 5.1 % from the main specification, this allows some role for exchange rate volatility. Yet, it also implies that exchange rate volatility is not driving the effect. Taking tariff reductions through modern regional trade agreements as a point of reference,[64] the estimated size between 4.1 and 5.1 % implies that the beggar-my-neighbour penalty constituted a significant barrier to trade.

TABLE 4.2: NON-DISCRIMINATORY TRADE COST INCREASES IN GOLD BLOC COUNTRIES

	France	Belgium	Italy	Netherlands	Switzerland	$\varnothing$
$\tau^{ND}_{i,1932}$	2.02	5.21	2.33	1.21	0.55	2.26
Pairs	24	21	13	12	3	

To gauge its significance for this commercial policy episode in particular, Table 4.2 provides the non-discriminatory increase of trade costs $\Delta\tau^{ND}_{i,1932}$ in gold bloc countries for a comparison. $\Delta\tau^{ND}_{i,1932}$ follows directly from the time-varying country fixed effects $\gamma_{i,1932}$ in the difference-in-differences specification in column 3.[65] The lower part of the table shows the number of country pairs, in which the

[64] Burfisher et al. (2001, p. 127) report pre-NAFTA trade-weighted ad valorem equivalents of 4 % for the United States and 10 % for Mexico.

[65] Specifically, $\Delta\tau^{ND}_{i,1932} = e^{\gamma_{i,1932}}$ if the specification is estimated without t_{1932}. Equivalent in the resulting coefficient and standard errors when t_{1932} is included, $\Delta\tau^{ND}_{i,1932}$ can be calculated as $\Delta\tau^{ND}_{i,1932} = e^{\frac{t_{1932}}{2} + \gamma_{i,1932}}$. This is because the reference group now contains a pair of countries rather than a single one.

respective gold bloc country is included. Given the small sample size, the estimates of these country-specific intercepts are subject to considerable uncertainty. It thus seems prudent to take the average non-discriminatory trade cost increase in gold bloc countries as a point of reference. Amounting to around 2.3 %, it is smaller than the beggar-my-neighbour penalty. Most conservatively, the largest non-discriminatory increase (Belgium) was about as large as the penalty. Hence, the beggar-my-neighbour penalty was substantial even in the high-tariff environment of the 1930s.

In sum, the analysis of trade costs suggests that the beggar-my-neighbour penalty was economically significant by historical and modern standards. While the qualitative evidence suggests that tariffs and quotas were the most common commercial policy weaponry, the synthetic trade cost measure is mute on how trade costs rose. The following part of this quantitative assessment thus elucidates the precise mechanisms underlying the changes in trade costs by analysing the introduction of Swiss quotas and French tariffs.

4.4.2 The Mechanisms - Evidence from Swiss Quotas

Quota and licensing systems were widely adopted in the 1930s (United States Tariff Commission, 1934; Heuser, 1939; Irwin, 2012). Typically, they covered a number of goods that were specified either by a special commission or the relevant trade authorities. As such, they could be used to discriminate a certain country group by imposing restrictions on goods, which were predominantly imported from it. A country imposing such restrictions was Switzerland. As opposed to France, she was a small open economy and had been an ardent proponent of free trade for as long as she could. Studying the introduction of licensing and quotas in Switzerland thus constitutes a complementary case with respect to the country size, general protectionist attitude, and the protectionist measure employed.

Having passed the corresponding legislation in December 1931, the Swiss government began to impose quotas and to require import licenses for certain goods from 1932 onwards. A council proposed a list of goods, which was then subject to approval by an industry commission and finally passed by the federal assembly (United States Tariff Commission, 1934, p. 34). An important justification was the protection of the trade balance (Heuser, 1939, p. 31). As such, these quotas were most effective when directed against countries that devalued their currency. Furthermore, a convincing case for a quota or license had to be made before the commission. This was most easily done if producers faced "unfair competition." While such institutional arrangements make discrimination likely, the words of Switzerland's chief commercial diplomat provide direct evidence. When Stucki defended the introduction of the quota system at the World Economic Conference in London in 1933, he made explicit references to the exit from gold by Great Britain via depreciation and by Germany via the introduction of exchange controls (League of Nations, 1933a, p. 94). Even more illuminating, because undisclosed at the time of their writing, are the American memoranda from the negotiations of a new Swiss-American trade treaty in 1935. Stucki explained the introduction of quotas with the devaluations and "frankly admitted that Swiss quotas discriminated against American commerce" (U.S. Department of State, 1952, p. 751).[66] Such statements indicate that the Swiss licensing and quota system was introduced in a discriminatory manner.

Gauging the extent of Swiss discrimination against devaluing countries requires a variety of data. Firstly, the de facto gold adherence was coded for all Swiss trading partners.[67] Secondly, import data by trading partner at the good level from 1931 allows one to calculate the share of imports for a given good from countries that would eventually devalue. As it proved impossible to transcribe the universe of trade flows for 1931, a list of goods typically traded in Europe from the Austrian National Committee of the International Chamber of Commerce (1927) was used to determine the sample.[68] The bilateral import flows for the according items were transcribed from the Swiss trade statistics.[69] Employing import data from a year prior to the actual implementation of the quota and licensing system in 1932 ensures that the results are not confounded by the effects of restrictions themselves. Thirdly, information on the introduction of import restrictions can be found in the tariff section of the 1933 issue of the Swiss trade

[66] See also his complained that "Switzerland being a gold standard country with high purchasing power served as a mecca for foreign companies from countries with devaluated currencies." (U.S. Department of State, 1952, p. 751).

[67] Data on gold adherence are from League of Nations (1941); Wolf and Yousef (2007); Bernanke and James (1991); Crafts and Fearon (2013a).

[68] This list was initially compiled to compute approximate tariff levels for a number of European countries. It contains 402 goods, of which 262 are unique items in the Swiss tariff code. One item (newspapers) was omitted as the total value of imports was a mere 10 franc.

[69] Specifically, the 1927 and 1931 issues of the *Statistique annuelle du commerce extérieur de la Suisse* by the Direction Générale des Douanes Fédérales. The cross-section for 1927 was transcribed to control for the price changes. The nonzero bilateral import flows total 2,710 in 1927 and 2,728 in 1931. For more details on the dataset, see Chapter 5 and specifically Appendix 5A.3 for a list of goods.

statistics.[70] With these data at hand, the following equation specifies a probability model for the introduction of quotas and licenses:

$$R_g = \beta_1 S_{Off\ gold,\ g} + \beta_2 ln(M_g) + \beta_3 \Delta P_g + I_i + \epsilon_g \tag{4.2}$$

in which R_g is an indicator taking the value one if import controls were introduced on good g, M_g is the total value of imports for good g in 1931, ΔP_g is its average price change between 1927 and 1931, and I_i is a fixed effect for industry i. The variable $S_{Off\ gold,\ g}$ is defined as the share of imports from countries that will devalue between the end of 1931 and 1933. Most accurately, this specification is estimated by a logit model as likelihood functions are seldom strictly linear. As results from such model differ little from those of a linear probability in this case, however, the linear probability model is chosen for ease of interpretation.

TABLE 4.3: DISCRIMINATION IN SWISS QUOTA SETTING

Dep. Variable:	Introduction of restriction/licensing					
Sample	Full			Excluding agricultural goods		
$S_{Off\ gold,\ g}$	0.200*	0.204**	0.173*	0.336***	0.310***	0.286**
	(1.86)	(2.08)	(1.66)	(2.76)	(2.77)	(2.38)
Import Value		0.0911***	0.0837***		0.111***	0.1000***
		(7.28)	(6.15)		(8.16)	(7.04)
Δ_{27-31} Price		-0.128**	-0.118*		-0.126**	-0.111
		(-2.51)	(-1.83)		(-2.34)	(-1.57)
Fixed Effects						
Industry			✓			✓
R^2	0.01	0.18	0.24	0.03	0.22	0.29
N	261	261	261	213	213	213

Notes: t statistics in parentheses; All standard errors are robust. Confidence intervals: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4.3 suggests that the discriminatory element in the introduction of Swiss quotas was strong. The first specification suggests that moving the share of countries with depreciated currencies for an imported good from zero to one would

[70]The data can be found on pages 5 to 35 in section C of the 1933 issue of the *Statistique annuelle du commerce extérieur de la Suisse* by the Direction Générale des Douanes Fédérales.

have increased the probability of the imposition of an import restriction by about 20 %. This magnitude is hardly affected when the change in prices, the total value, and industry fixed effects are controlled for.[71] The remaining three columns show the results when agricultural goods are excluded. The coefficient of interest becomes stronger in both economic and statistical significance, suggesting that the protection of farmers, a traditionally well-represented group, was another important motive for the introduction of quotas. Especially for non-agricultural goods though, Swiss policymakers applied the quota and licensing system in a profoundly discriminatory manner against countries that had left the gold standard.

4.4.3 The Mechanisms - Evidence from French Tariffs

Yet, quotas were not the only commercial policy weapon employed in a discriminatory manner. As discussed in Section 4.3, French policymakers retaliated against countries with depreciated currencies by imposing retaliatory tariffs. The manner, in which French statisticians recorded tariff revenues, provides a unique opportunity to quantify this response. To the best of the author's knowledge, they were the only ones among the main economic powers to record tariff revenues by trading partner during this period. It is thus possible to empirically distinguish discriminatory and non-discriminatory tariff increases.

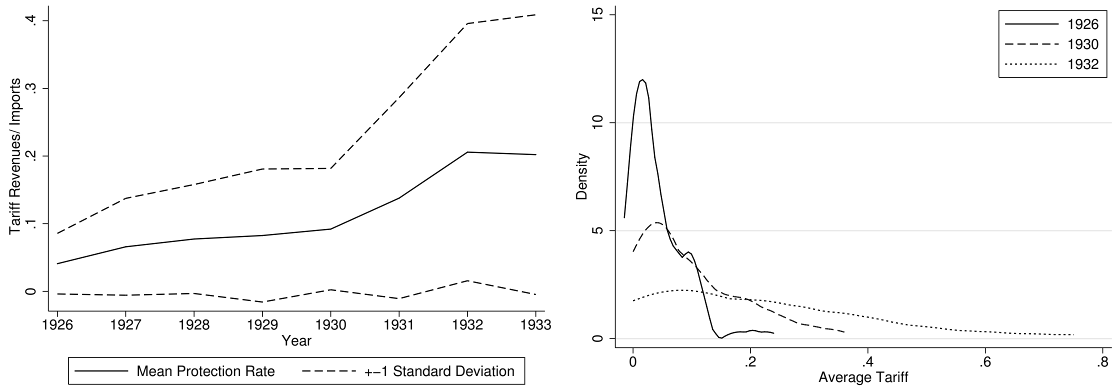
French data on bilateral import values and tariff revenues by trading partner for the years 1926 until 1933 were transcribed from various issues of the *Tableau général du Commerce de la France*.[72] From these data, we can calculate the average *bilateral* protection rate $tr_{i,t} = \frac{R_{i,t}}{M_{i,t}}$ where R is the tariff revenue and M is the value of imports from trading partner i at year t spanning the period 1926–33. If data permitted, it would have been preferable to employ even more disaggregated tariff data on the country-good level.[73] However, the aggregate counterpart of the bilateral protection rate, the average protection rate, usually provides a good

[71] They are also comparable to the logit results, which are available upon request.

[72] For unknown reasons, the French statisticians halted their data collection efforts after 1933. This is not of great concern for this analysis as it focuses on the cross-sections of 1930 and 1932. Another caveat of the data is worth mentioning. Unfortunately, the *Tableaus* themselves do not include any information on whether revenues from the surtax are included (see Section 4.3). However, a government memorandum from 1933 suggests so (Ministère des Finances, 1933, p. 133 & 427).

[73] For its potential relevance, see the now classic and then fierce debate between Nye (1991) and Irwin (1993a).

proxy for protectionism (see e.g. O'Rourke, 2000, p. 462).[74]



a) Mean Tariff Rate ± 1 SD   b) Epanechnikov Kernel Densities

FIGURE 4.2: Heterogeneity in tariff setting

Source: Tableau général du Commerce de la France, issues: 1926–1933

A first glance at the data (Figure 4.2) illustrates the important difference between this and many other studies on protectionism (e.g. Clemens and Williamson, 2004; Eichengreen and Irwin, 2010). Covering virtually all French imports, the left panel plots the mean tariff rate and its standard deviation for a balanced panel of 72 French trading partners for the period 1926-1933. Most studies on protectionism focus on a measure similar to the solid line above: the average protection rate.[75] In contrast, this study focuses on the variation around the mean as captured by the annual standard deviation in the graph. This variation can be thought of as the level of discretion applied by policymakers and the figure demonstrates how it increased substantially over the years. The right panel of Figure 4.2 provides another way to understand this intuition. It plots kernel densities, a form of smoothed histograms, for three different cross-sections. Suppose that French policymakers, just as their British counterparts, would have introduced a general ad valorem tariff of 10 % in 1932. Ignoring potential substitution effects between goods, this would have simply shifted the distribution of

[74]The use of bilateral rather than aggregate trade and tariff data should further mitigate one of the most serious concerns against this measure. The composition of imports by trading partner is not likely to change drastically from one year to the other.

[75] Conventionally, researchers define the average protection rate T as the sum of tariff revenues tr of country i from n trading partners j divided by the sum of i's imports M from n trading partners j. Hence it represents a trade-weighted average $T = \sum_{j=1}^{n} tr_j / \sum_{j=1}^{n} M_j$. In contrast, the graph takes the (unweighted) average of the protection rate against all countries in the sample, which is $T = \frac{\sum_{j=1}^{n} \frac{tr_j}{m_j}}{n}$.

1930 along the x-axis by 0.1 without altering its shape. However, the distribution of bilateral protection rates for 1932 is substantially flatter than the one for 1930. Hence, the discretion in the imposition of tariffs must have increased.

Did the beggar-my-neighbour-penalty drive this evolution of bilateral protection rates? Akin to the analysis of the trade costs, the structure of the data facilitates a difference-in-differences approach. Dropping 1931 as the year of the treatment, the following model compares the cross-sections of 1930 and 1932:

$$ln(1 + tr_{it}) = \alpha + \beta GS_{off,\, i,t} + c_i + t_t + \epsilon_{it} \tag{4.3}$$

where tr_{it} is the bilateral protection rate against trading partner i and $ln(1 + tr)$ the logarithm of the corresponding mark-up. $GS_{off,\, i,t}$ is an indicator variable capturing whether a country had left the gold standard. It is zero for all countries in $t = 1930$ and one for the treated countries in $t = 1932$.[76] c_i and t_t are country and time fixed effects respectively and α the constant, which make the above equation a difference-in-differences approach. The time fixed effect t_{1932} captures the non-discriminatory tariff increase, whereas β measures the beggar-my-neighbour penalty. Comparing the two coefficients shall inform us about the relative magnitude of retaliatory tariff policies in response to the devaluations.[77]

TABLE 4.4: THE MAGNITUDE OF THE FRENCH BEGGAR-MY-NEIGHBOUR PENALTY

Dep. variable:	ln(1+*tr*)				Imports
Estimator	(OLS)	(OLS)	(OLS)	(OLS)	(PPML)
Sample	(1)	(2)	(3)	(4)	(5)
Restriction	None	No Colonies	Import share>0.5 %	Restrictions (2&3)	None
GS_{off}	0.0903***	0.0736**	0.0911**	0.0680*	-0.301**
	(3.95)	(2.47)	(2.71)	(1.94)	(-2.22)
t_{1932}	0.0334***	0.0501**	0.0258***	0.0489***	-0.441***
	(2.74)	(2.22)	(3.15)	(4.34)	(-3.72)
N	120	86	56	40	120
R^2	0.519	0.545	0.509	0.529	
Pseudo R^2					0.986

t statistics in parentheses. Country fixed effects and constant included but not shown. Robust standard errors applied (clustered at trading-partner level). Confidence levels: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

[76]For a clean difference-in-differences estimate of the effect of the 1931 devaluations, the few countries that either devalued earlier or were not on the gold standard during this period at all are excluded.

[77] This model does not take retaliation against foreign tariffs into account. However, countries leaving the gold standard became relatively less protectionist as Eichengreen and Irwin (2010) show. Hence, any bias arising from this omission should thus bias strongly against finding significant effects for the retaliation against currency depreciation.

Table 4.4 displays the results for various subsamples. The estimates for the full sample imply a beggar-my-neighbour penalty of $e^{0.0903} - 1 \approx 9.5\%$ ad valorem. Columns 2-4 introduce various sample restrictions to analyse the robustness of the result.[78] The coefficient for the treatment variable $GS_{off,\ i,t}$ ranges from about 0.07 to 0.09 across specifications and remains significant throughout. The point estimate is smaller when the French colonies are excluded as this drops the part of the control group facing low tariffs. Depending on the point of view, their inclusion might lead to an overestimation of the retaliatory effect. Thus, the more conservative estimate in column 2 is preferred. It implies a beggar-my-neighbour penalty of $e^{0.0736} - 1 \approx 7.5\%$ ad valorem.

Across specifications, the coefficient for the time fixed effect capturing the non-discretionary tariff increase is consistently smaller than the penalty. The preferred specification implies a non-discriminatory tariff increase of $e^{t_{1932}} - 1 \approx 5\%$. Given the relatively small sample size, we should not overemphasise this difference of the point estimates. Yet, their comparison suggests that the beggar-my-neighbour penalty was at least as large as the non-discriminatory increase in protectionism. The French beggar-my-neighbour penalty was thus sizeable and, just like in the case of the trade cost estimation, comparable in magnitude to the average tariff reductions achieved by modern trade treaties.

4.4.4 The effects on trade

If the penalty was important for the increase in protectionism, what were its effects on trade? For the French data, we can test its significance directly. Column 5 shows the estimate of the treatment effect on imports using the PPML estimator (Santos Silva and Tenreyro, 2006). The specification mirrors the one for tariffs and can be thought of as a simple import demand function by countries. The coefficient is -0.3 and significant at the 5 % level thus suggesting a relative reduction of imports by $e^{-.3} - 1 \approx -26\%$. Yet, this exercise may fall short to properly capture the beggar-my-neighbour penalty's effect on imports. Firstly, the estimation is not theory-consistent, which might lead to biased coefficients.[79] Secondly, it only measures the relative effect. Thirdly and most importantly, it is confined to

[78]The coefficient of interest remains stable when (2) colonies are dropped, (3) small trading partners are excluded, or (4) both of these restrictions are applied. The parallel trend assumption is met to a reasonable degree for most subsamples and particularly for the most restrictive sample (4). For the corresponding graphs, see Appendix 4A.

[79]It misses the usual setting of fixed effects, which capture the multilateral resistance term. These time-varying fixed effects for each trading partner would also control for other variables such the competitiveness gained through the devaluation, exchange rate volatility or the trading

the case of France. To gauge the effects of the penalty on trade across gold bloc countries, it is thus more promising to employ the estimated tariff and trade cost changes in a back-of-the-envelope calculation.

Such a calculation has been used to verify the consistency of estimates for the effects of regional trade agreements, tariff elasticities and tariffs in the empirical trade literature.[80] Analogously, we divide the world into group (OG) suffering the beggar-my-neighbour penalty of 7.5 % and (G) just paying the non-discriminatory tariff increase of 5 % in 1932. Both groups face the following cost $\tau_{1930}^{G,OG}$ for exporting a good to a gold bloc country in 1930:

$$\tau_{1930}^{G,OG} = 1 + \kappa + tr_{1930} \tag{4.4}$$

in which $\kappa = 0.36$ captures the ad valorem equivalent of the home preference[81] and tr_{1930} captures the initial tariff level.[82] In the second period (1932), group G stays on the gold standard and pays only the non-discriminatory tariff increase tr_{1932} on top of $\tau_{1930}^{G,OG}$:

$$\tau_{1932}^{G} = 1 + \kappa + tr_{1930} + tr_{1932} \tag{4.5}$$

In contrast, group OG now faces the additional beggar-my-neighbour penalty η:

$$\tau_{1932}^{OG} = 1 + \kappa + tr_{1930} + tr_{1932} + \eta \tag{4.6}$$

Assuming a price elasticity $\epsilon = -5.3$[83] , the decrease of the gold bloc country's imports from the respective groups in 1932 relative to 1930 can be calculated as:

$$\rho_{G}^{1932} = \epsilon(ln\ \tau_{1932}^{G} - ln\ \tau_{1930}^{G,OG}) \tag{4.7}$$

and

$$\rho_{OG}^{1932} = \epsilon(ln\ \tau_{1932}^{OG} - ln\ \tau_{1930}^{G,OG}) \tag{4.8}$$

partner's GDP. Excluding them might lead to biased estimates as we know from the gravity literature. Including them, however, is not possible as their inclusion would leave no variation to base the estimate upon. See Head and Mayer (2014) for a discussion of gravity specifications.

[80] Except for a small extension, the following calculation mirrors the one by Head and Mayer (2014, p. 165) for a regional trade agreement.

[81] This is a standard parameter taken from Head and Mayer (2014, p. 164).

[82] For countries other than France, initial tariff levels are taken from Clemens and Williamson (2004) and, where unavailable, calculated from the tariff revenue and trade data by Mitchell (2014).

[83] The median point estimate from the meta study by Head and Mayer (2014).

The effect of the beggar-my-neighbour penalty on imports of the gold bloc country from group OG relative to group G is thus captured by:

$$\rho_{BTN}^{relative} = \epsilon(ln\ \tau_{1932}^{OG} - ln\ \tau_{1932}^{G}) \tag{4.9}$$

For ease of interpretation, it is useful to convert the ρ-coefficients into percentage terms: $\Delta M_r = e^{\rho_{BTN}^{relative}} - 1$. The corresponding absolute fall of imports ΔM_a for the gold bloc country can be captured by weighing the respective fall of trade for the two groups with the import shares m_{1930}^{G} and m_{1930}^{OG}[84]:

$$\Delta M_a = m_{1930}^{G}\ (e^{\rho_G^{1932}} - 1) + m_{1930}^{OG}\ (e^{\rho_{OG}^{1932}} - 1) \tag{4.10}$$

Naturally, the counterfactual fall in absolute imports in the absence of the beggar-my-neighbour penalty can be calculated as as ΔM_{cf} by setting $\eta = 0$.

TABLE 4.5: THE EFFECT ON TRADE - A BACK-OF-THE-ENVELOPE CALCULATION

Country	Import share	Trade cost parameters			Effects on trade			
	m_{1930}^{OG}	tr_{1930}	tr_{1932}	η	ΔM_r	ΔM_a	ΔM_{cf}	ΔM_{obs}
	Simulation based on tariff data							
France	63	10	5	7.5	-22	-27	-16	-28
	Simulation based on trade costs							
Belgium	52	5	5	5.1	-16	-24	-17	-34
Italy	63	11	2	5.1	-16	-17	-8	-40
Netherlands	69	3	1	5.1	-16	-15	-4	-32
Switzerland	58	11	1	5.1	-16	-11	-2	-15

Notes: Own calculations. Parameters: m_{1930}^{OG}: import share of countries that will go off the gold standard in 1931 as of 1930; tr_{1930}: initial tariff level in 1930; η: beggar-my-neighbour penalty; ΔM_r: relative fall in imports for countries receiving penalty; ΔM_a: absolute fall in trade as predicted by calculation; ΔM_{cf}: counterfactual fall in trade in absence of beggar-my-neighbour penalty; ΔM_{obs}: observed fall in imports. Data sources: see text.

Table 4.5 presents the data and results for the simulation based on the French tariff data and trade cost data for the other gold bloc countries. Reassuringly close to the empirical estimate, the results suggest that the beggar-my-neighbour penalty reduced French imports from those who left the gold standard relative to those who did not by $\Delta M_r \approx 22\%$. The corresponding effect for the remaining gold bloc countries is around 16 %. Albeit a bit smaller, the penalty's magnitude

[84]The shares are calculated for 1930 on the basis of the data from Gowa and Hicks (2013). Countries that will go off the gold standard by 1932 are grouped under m_{1930}^{OG}.

is comparable to the one of the effects found for regional free trade agreements in the gravity literature (Head and Mayer, 2014, p. 164f).[85]

Beyond analysing the relative effects as is common in the trade literature, discussing absolute effects is informative in its own right. Ultimately, two factors determine the importance of the beggar-my-neighbour penalty for the fall of trade in the 1930s: the force of the penalty and the number of countries receiving it. The column ΔM_a displays the absolute loss of imports as predicted by the back-of-the-envelope calculation. It is particularly informative to compare these effects to the column ΔM_{cf}, which draws out the relevant counterfactual — the change in total imports in the absence of the beggar-my-neighbour penalty. In the case of France, absolute imports would have dropped 11 % less than they actually did. For the trade cost data, the corresponding effects on total imports range from 7 to 11 %. These results suggest that the penalties in response to the devaluations did not only have large relative effects. Given that many countries received them, their effects on overall imports were substantial. Beggar-my-neighbour penalties in the 1930s contributed significantly to the fall in trade.

The final column contrasts these simulation results with the observed fall in imports.[86] Even though such comparison is approximate at best,[87] it provides a useful plausibility check and highlights the significance of the results. In the case of France, Belgium, and Switzerland the observed fall corresponds reasonably well to the results from the simulation. On the other hand, the simulation underestimates the fall of imports in the Netherlands and Italy substantially. One among many possible reasons is that assuming the same parameter for the

[85] Given the large dispersion of estimates of the price elasticity, there is a degree of uncertainty in this estimate. However, the same applies to CGE models estimating the effect of free trade agreements as Hillberry and Hummels (2013) point out.

[86] In order to ensure consistency with the trade cost data, the nominal import data was transcribed from Statistisches Reichsamt (1936) and deflated by the U.S. GDP deflator by Johnston and Williamson (2018).

[87] Two main effects other than protectionism affect the observed change. Firstly, income losses translate into a decrease of imports. Secondly, overvaluation, present and indeed a huge problem in gold bloc countries, increases import demand. Both effects work into different directions with respect to the fall in trade and thus the overall effect is unclear. Switzerland may serve as an illustrative case. Real GDP fell by about 7 % between 1930 and 1932 according to (Jacks et al., 2011). The real exchange rate against the pound fell by about 25 % between in the same period (Zurlinden, 2003). Let us assume the same rate for all other countries leaving the gold standard, whereas for those who stay we assume no change. Weighting the real exchange rates accordingly and multiplying the resulting sum with .5, a recent estimate of the elasticity for (export) trade with respect to the real exchange rate (Fitzgerald and Haller, 2018), would suggest that the overvaluation boosted import demand by around 7.5 %. Assuming an income elasticity of 1, the effect of the fall income is thus nullified by the overvaluation effect.

penalty across gold bloc countries may not reflect the heterogeneity of their responses.[88] Nevertheless, the fact that the actual fall is under- rather than overestimated suggests that these effects are plausible in magnitude even if they cannot fully explain the fall in trade.

In sum, the beggar-my-neighbour penalties in response to the 1931 devaluations were fierce and their effects on trade were large. Across the gold bloc, the penalty ranged between 5 and 7.5 % ad valorem whereas the general increase in tariffs amounted to 2.3 to 5 %. The corresponding decrease of imports from those receiving the penalty relative to those who did not varied between 15 and 20 %. The respective reductions of total imports were between 6 and 11 %. Because 1932 marked a first plateau rather than the culmination of protectionism, the cumulative effects of the subsequent retaliatory tit-for-tat policies certainly added to this significant initial fall in trade.

4.5 Conclusion

In response to the currency depreciations of 1931, countries remaining on the gold standard introduced discriminatory trade policies. The estimated size of these beggar-my-neighbour penalties was large by historical and modern standards. Their magnitude was comparable to the contemporary non-discriminatory increases in protectionism. Furthermore, it corresponds well with the tariff reductions achieved by modern regional trade agreements. Correspondingly, their effects on trade were considerable in both, relative and absolute terms. What are the historiographical and political implications of these findings?

Firstly, they provide a complementary explanation for the rise of protectionism during the interwar period. From a commercial policy perspective, the devaluations were a doubled-edged sword. Whilst facilitating a faster recovery and less protectionism in devaluing countries, they directly fostered protectionism abroad and opened doors for a third phase of commercial warfare. In this phase, protectionism shifted from a general to a discriminatory nature. This is not to question the trilemma framework by Eichengreen and Irwin (2010), but rather to provide a complementary explanation for protectionism in the 1930s and perhaps

[88] They include that (i) real exchange rate effects and demand effects due to the falling GDP do not cancel out each other, that (ii) the data limitations of the trade cost data affect the estimation of the non-discriminatory increase in a substantial manner, and that (iii) the imprecision of historical national accounts introduces a large measurement error in the calculation of trade costs changes.

to clarify why the previous literature and contemporaries have painted a much more chaotic picture of this commercial policy episode.

Secondly, the magnitude of economic and political costs caused by the devaluations raises doubts about their unqualified benevolent assessment in the literature, which Eichengreen and Sachs (1985) had initially cautioned against. Acknowledging the large difference between the potential and realised gains for the world as a whole leads to a more pessimistic view than common in the literature. The devaluations were a success and failure at the same time. A success, because their net benefit was certainly still positive[89] and perhaps they were the only available option.[90] A failure, because the costs of non-cooperation, the gap between potential realised gains, was so large. When drawing policy implications from this period, it is thus important to keep their success and failure in mind. The economics underlying overvalued currencies, deflation, depreciation, and retaliation may remain broadly the same, but policy environments change. Thus, unilateral devaluations may or may not be the second-best policy option in circumstances other than the 1930s.

[89]This conjecture emanates from considering the large positive effects for devaluing countries (Eichengreen and Sachs, 1985; Bernanke, 1995). For the world as a whole, these effects are likely to have outweighed the loss of the countries staying on the gold standard and the externalities on trade policies highlighted in this study. In consequence, their net effect would be positive. However, testing this conjecture in a formal manner lies beyond the scope of this study.

[90]Convincingly, Eichengreen (2013, p. 431) makes the point that "effective international coordination was impossible to achieve."

4.6 Appendix

Appendix 4A Pre-treatment Trends

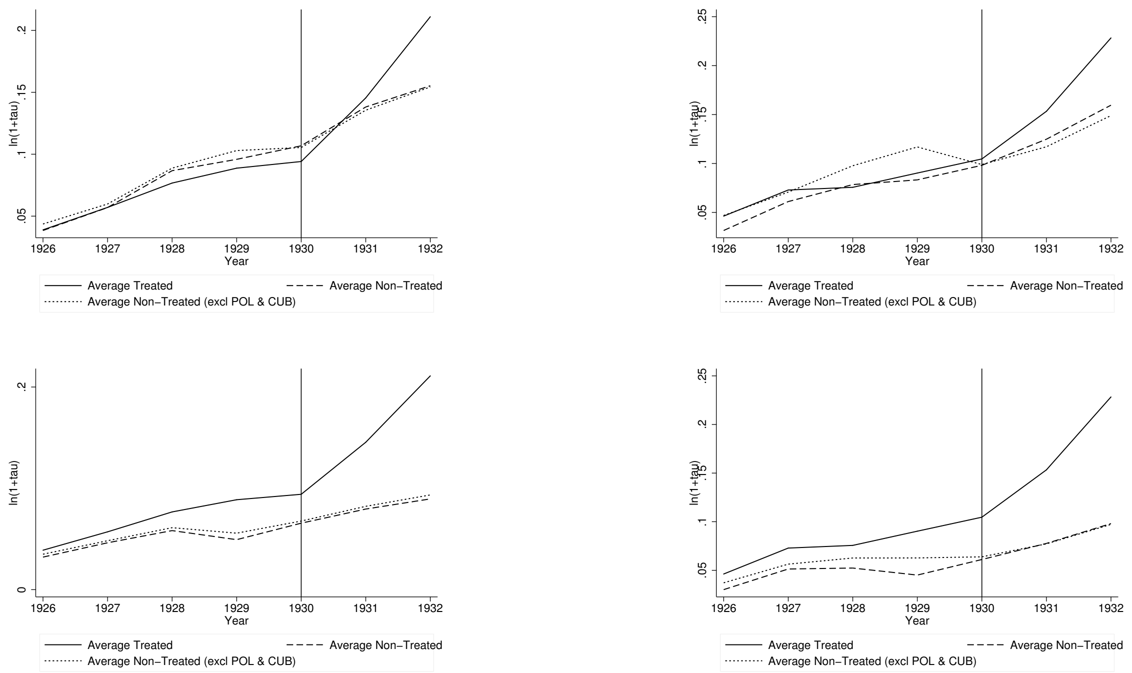


FIGURE A4.1: Pre-treatment trends

Notes: The upper two panels show the trends without colonies (the left one with the further restriction of excluding small trading partners). The lower left panel excludes only small trading partners and the lower right one shows the trends for the full sample. The graphs show that the parallel trend assumption is met only to a lesser degree for the samples including colonies. For this reason, much of the discussion in the article focuses on the results excluding them. All graphs also contain the trends with and without Cuba and Poland, which constitute outliers. Poland and France signed a new commercial agreement in 1929 as documented in the *American Journal of International Law* (American Journal of International Law, 1929, p. 641). The Cuban tariff rate drops from 50 to 10 percent within one year, most likely due to the change in the tariff on sugar.

Chapter 5

Transport Costs, Tariffs, and the Interwar Distance Puzzle

Abstract

This study analyses the relative importance of tariffs and transport costs for the fall in world trade during the interwar period. While micro-data on freight rates indicates an increase in distance-related transport costs, the changes were relatively small compared to those in tariffs when accounted for in ad valorem equivalent terms. Paradoxically, estimates from a structural gravity model even suggest a decline of the importance of distance for European trade. This finding constitutes the interwar distance puzzle and mirrors the missing globalisation puzzle of international trade for the post-war period. Taking into account internal trade solves the puzzle, because it provides a measure of the importance of political trade barriers relative to physical trade barriers. Theoretical considerations and a novel micro-dataset highlight two potential mechanisms which influence the importance of distance for international trade: the number of import varieties and the magnitude of tariff changes.

5.1 Introduction

Trade faces two main types of friction: transportation costs and political trade barriers such as tariffs and quotas. Conventional wisdom holds that the latter were the main driver of the fall of world trade during the interwar period.[1] In a seminal study, however, Estevadeordal et al. (2003) claim that the rapid increase in transport costs was a, if not the, major cause for the trade bust associated with the Great Depression. This study joins a chorus of research critical of this conjecture,[2] but introduces a new melody by analysing their relative significance and interaction through the lenses of micro-data and the gravity model of international trade. Data on freight rates for and prices of wheat suggest that real transport costs were indeed increasing. Paradoxically, estimates of the distance elasticity of international trade suggest the opposite. Understanding the roots of this interwar distance puzzle and solving it helps us to assess the relative importance of transport costs and tariffs during the interwar period. Accounting for internal trade and distances, Yotov's (2012) solution to the missing globalisation puzzle for the post-war period, solves the interwar distance puzzle within the gravity framework. However, internal trade and distances are not necessarily comparable with their international counterparts. Furthermore, the precise mechanism solving the puzzle remains unexplored. To shed further light on the latter, theoretical considerations highlight that the distance elasticity depends on tariffs. A novel good-level dataset on Swiss imports allows me to test this mechanism empirically. Indeed, tariffs made distance less important for international trade. After all, political trade barriers, not transport costs, brought down world trade.

The literature on the question whether or not transport costs were increasing during the interwar period is ambiguous (Hynes et al., 2012, p. 37). While the data by Mohammed and Williamson (2004) suggests a slight fall in real maritime transport costs, Estevadeordal et al. (2003) argue that they were increasing. To bring new evidence to this question, the first part of this study draws on novel micro data on wheat prices and freight rates. The limited data available indeed suggests that transport costs were increasing. However, when accounted for in ad valorem terms, arguably the only relevant metric when comparing trade costs,

[1] For example, see Irwin (2012) for a comprehensive exposition of this view. See Madsen (2001) for a quantification of the effect of tariffs and non-tariff barriers on world trade during this period.

[2] Hynes et al. (2012) and Irwin (2012) have argued that real transport costs were probably falling according to the freight cost series by Mohammed and Williamson (2004). This precludes the possibility that transport costs could have caused the fall in trade. However, Hynes et al. (2012) also state that there is some ambiguity with respect to the course of transport costs during this period.

these increases in transport costs are dwarfed by the changes in tariffs. This is all the more important as the focus on a low-value bulky good such as wheat provides an upper bound estimate for such a calculation. Relative to political trade costs, transport costs thus became less important.

Estimating the distance elasticity of international trade within the gravity framework provides an alternative way to assess the role of transport costs. If transport costs and thus the cost of delivering goods to distant trading partners increased, one would expect the distance elasticity to indicate an increase of the importance of distance.[3] In spite of increasing transport cost, however, the absolute value of the distance elasticity declined. This result strikingly mirrors the so-called missing globalisation or distance puzzle for the post-war period. According to this finding, the absolute value of the elasticity of aggregate trade flows with respect to distance increased from the 1960s onwards even though globalisation is an indisputable fact and transport costs declined (Coe et al., 2002; Disdier and Head, 2008).[4] Conversely, rising transport costs and the falling importance of distance coincided in the period under consideration. This finding constitutes the interwar distance puzzle. Solving it is key to understand the relative importance of tariffs and transport costs.

A number of studies aim to explain the post-war distance puzzle. Most of them focus either on econometric mis-specifications, long-run changes in the structure of trade, or the heterogeneity of changes in the distance elasticity of trade between low- and high-income countries.[5] Among those, Yotov (2012) and Bergstrand et al. (2015) have pointed to a mis-application of the gravity model in the international trade literature. They propose to include proxies of internal trade and distances in line with the original micro-founded formulation of the gravity model (Anderson and van Wincoop, 2003). Indeed, this also solves the interwar distance puzzle. This solution highlights the importance of distance-related trade costs relative to non-distance related trade costs for the estimation

[3]For the rest of the study, it is helpful to define some properties of the distance elasticity. The distance elasticity is negative and typically estimated to be around -1.1 (see Head and Mayer, 2014, p. 160 for results from a meta study). As such, it measures the sensitivity of trade with respect to distance. If it increases (decreases in absolute terms), distance becomes less important as friction for trade. Conversely, if it decreases (increases in absolute terms), distance becomes more important as a friction for trade.

[4]According to Hummels (2007), they remained stationary between 1952 and 1970, increased throughout the 1970s and 1980s, and entered a slow but steady decline thereafter.

[5]See Carrère et al. (2013) for an excellent early review of this fast-growing literature.

of the distance elasticity. Yet, the precise mechanism remains ambiguous, as internal distances and trade flows are not necessarily comparable with their international counterparts. In fact, they might just proxy the domestic market size. If so, any such proxy for market size would "solve" the distance puzzle.

The derivation of a simple import demand function illustrates a potential mechanism for solving the puzzle. Employing an Armington demand function and a trade cost function featuring transport costs and a tariff in the vein of Hummels et al. (2009), one can show that the distance elasticity depends on tariffs. As tariffs increase, the importance of distance should fall.[6] To test the proposed mechanism, this study relies on a novel hand-collected micro-dataset on Swiss bilateral import flows. Choosing Switzerland as a case study has desirable features. Being a small open economy, she refrained from making changes to her specific (per unit) tariffs. Hence, any change in the tariff was due to global price swings exogenous to Swiss demand. The granularity of the data allows me to estimate 240 distance elasticities for individual goods and to assess the effect of tariffs on those. The results suggest that changes in the distance elasticity indeed depended positively on tariffs. To a lesser degree, they also depended on the number of varieties that import businesses can choose from. However, more research is needed. Including a larger number of countries would facilitate a gravity-theory-consistent estimation, which would provide more robust evidence for this channel. Nevertheless, these results suggest that increasing tariffs drove the changes in the distance elasticity.

The remainder of this study is structured as follows. Section 5.2 illustrates the evolution of real transport costs and compares their magnitude to those of tariffs. Section 5.3 establishes the macro puzzle by discussing different specifications. Section 5.4 presents a solution to the distance puzzle by relying on existing research (Section 5.4.1). It then tests the proposed mechanism theoretically (Section 5.4.2) and empirically (Section 5.4.3). Section 6 concludes and provides an outlook.

5.2 Transport Costs in the Interwar Years

This section critically discusses the existing available data on maritime freight rates and presents new high frequency data on grain freight rates. To gain an impression of the movement of non-maritime transport costs, it analyses a novel

[6]This is closely related to the Alchian-Allen conjecture (Hummels and Skiba, 2004).

series on German railway freight rates. The evidence suggests that, while nominal rates were falling, real costs were increasing. Neither the public railway monopoly in Germany nor international shipping companies were able to adjust their freight charges as quickly as prices fell. Finally, the last part of this section compares increases in maritime transport freights and tariffs in ad valorem equivalent terms. By this metric, tariffs increased much more than transport costs.

5.2.1 The Existing Literature

While there is a consensus that nominal transport costs were falling in the interwar period, there is considerable disagreement about the course of their real counterparts. This section discusses the inconclusive available evidence, which motivates the gathering of further evidence on transport costs.

The available transport cost series for the interwar period (Isserlis, 1938; Mohammed and Williamson, 2004) are largely based on British in- and outbound shipping freight rates initially compiled by Angier (1921–1951). Estevadeordal et al. (2003) deflate the nominal Isserlis series by the British consumer price index. Based on the resulting real series, the authors claim that freight rates were increasing. Hynes et al. (2012) highlight three weaknesses of this approach: (i) Isserlis' original weighting and computation, (ii) the deflation by consumer prices rather than the respective commodity prices, and (iii) the endogeneity of the shipping sector. According to Hynes et al. (2012), Mohammed and Williamson (2004) substantially improve upon the first two of these issues by relying on a more representative sample and route-specific deflators.

The resulting indices for real maritime transport costs, averaged over five years in the published version of the study, reverse the results found by Estevadeordal et al. (2003). They suggest that real transport costs were roughly 10 % lower during the period from 1930 to 1934 than during the period from 1925 to 1929 (Mohammed and Williamson, 2004, p. 188). This result is particularly surprising with respect to the criticism of the deflator. It is not clear why the deflation by consumer (Estevadeordal et al.) rather than commodity prices (Mohammed and Williamson) should bias real costs upwards. Wholesale prices, and prices for commodities in particular, fell on average faster than consumer prices.[7] If anything, deflation by a consumer price index rather than commodity prices should thus bias real transport costs downwards for the period under consideration.

[7] Among commodities, this is particularly true for grain prices. We shall see that wheat prices typically fell more than two thirds between 1925 and 1932. More generally, the differential between commodity and consumer prices can be shown using data provided in Chapter 2.

There are two further potential problems with respect to the series presented in Mohammed and Williamson (2004). Like Isserlis, Mohammed and Williamson (2004) almost exclusively rely on the shipping data originally compiled in the January issue of the *Fairplay Magazine* (Angier, 1921–1951). First, the underlying price and freight rate data are at annual frequency. Hence it matters when the shipment took place and what type of price was recorded. The latter information cannot be recovered from the primary source (Angier, 1921–1951). This problem is aggravated by the composition of their sample as it comprises a large number of agricultural commodities for which prices varied substantially throughout the year. The second problem relates to the averaging. As Mohammed and Williamson (2004) focus on the long-run evolution of shipping costs, such averaging is naturally warranted for their research question. However, it introduces a second ambiguity into the series. Because the first average is for 1925-1929, it includes the British coal strike in 1926, which led to severe price distortions and increases in the freight market (Wickizer, 1938, p. 71).[8] Such price movements would bias the 1925-1929 average upwards relative to the 1930-1934 one. Hence, relying on five-year-averages could lead to severe mis-interpretations.

The annual deflated indices from the Mohammed and Williamson (2004) study draw a different picture than that shown by the five-year-averages presented in the published version.[9] Real freight rates increase until 1931, thereafter enter a steady decline until 1935, and reach a new high in 1936 (Figure 5.1). This graph is surprising in two respects. Firstly, real maritime freight rates stay above their 1929 level throughout the 1930s. Secondly, the coal strike of 1926 does not seem to substantially impact the data. Both are at odds with what one would expect. Mohammed and Williamson (2004) focus on the long-run evolution of transport costs. Such inconsistencies might thus be of less importance. However, the contradiction between the five-year-averages in the published version and the annual raw data matters for this study. If real transport costs were falling from 1925 to 1933, this precludes the possibility that they were a driver of the fall of world trade (Hynes et al., 2012, p. 136).

Conjecturing that there is a certain ambiguity with respect to the evolution of freight rates, Hynes et al. (2012, p. 136-138) propose an alternative metric to gauge the movement and importance of transport costs during the interwar period. While not at the centre of their study on market integration, they present

[8]Freight rates for some goods tripled for a period of 6 months, because most ships were employed to meet the demand for transporting coal (Wickizer, 1938, p. 72).

[9]Jeffrey Williamson kindly provided me with the data.

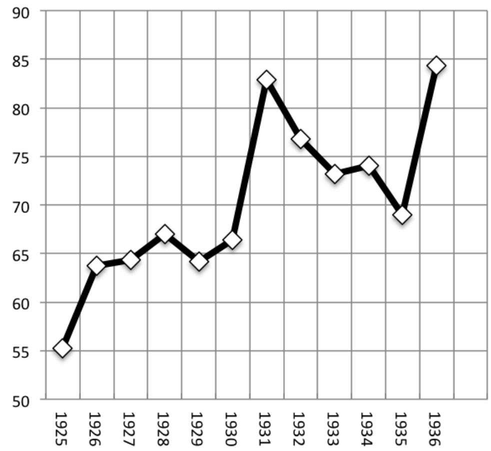


FIGURE 5.1: British maritime shipping costs with 8 Regions (1900=100)

Notes: The graph is an unweighted average of 8 regions of the index by Mohammed and Williamson (2004). The results do not change with the inclusion of the Bengal region, for which a year is missing. The 5-year-averages in their study differ for unknown reasons.

one route-specific real transport cost series. For this series, they match the freight rate for grain on the Winnipeg-London route with the price for the corresponding variety transported on this route. This allows them to express the importance of freight costs in ad valorem equivalent terms. While this one series indicates increasing real transport costs, the relative magnitude to other trade costs appears to be small. This is a promising approach, but the focus on one route precludes a generalisation at this point.

In sum, the available evidence on maritime freight rates is inconclusive. The existing indices suffer from various problems such as rapid changes in commodity prices, within-year fluctuations, and the difficulty of choosing the appropriate deflator. These problems do not prevent a sensible interpretation of long-run changes in these series per se. However, they caution against putting too much faith into their changes over relatively short time periods. In contrast, the exact matching of freight rates and prices constitutes a promising approach with respect to the problems described above.

5.2.2 New Evidence on Maritime and Overland Transport Costs

As the previous section identifies a lack of conclusive evidence on the movements of real maritime transport costs, this section provides new evidence on these. Furthermore, it provides indicative evidence on the movement of overland transport costs. Both types of data indicate that real transport costs were increasing.

Real Maritime Freight Rates

How can we cope with deficiencies in the indices discussed in the previous section? Extending the work by Hynes et al. (2012), this section uses high-frequency data on freight rates and wheat prices matched by quality. The focus on grain is strongly dictated by data availability. Naturally, it comes at the cost of failing to cover a larger basket of goods. Beyond data availability, however, there are four reasons for focussing on grain freight rates.

Firstly, increases in freight charges only have a minor impact on high-value manufactured and semi-manufactured goods as they typically constitute a very small part of the overall price of such goods. Thus, any results presented here provide an upper bound for the magnitude of transport costs. Secondly, a large share of the volume of international seaborne trade is in low-value bulky goods of which grain constitutes an important part. Wickizer (1938, p. 77) guesstimates that 20 % to 25 % of the actual volume of world trade in tons was in grains during the interwar period. Thirdly, "with negligible exceptions all grain contracts in the international trade are 'c.i.f.' (cost, insurance, freight) contracts by which, for a stated price, the seller agrees to provide the commodity and deliver it to the ship in the port of shipment, to insure it, and to pay the freight on it to the port of destination" (Wickizer, 1938, p. 81). Hence, most of the actual transport-related charges are accounted for. Finally, data for other commodities such as coal and pig iron could potentially be used. However, as prices for these goods are typically recorded without mentioning the quality, and given that large quality differences exist, choosing the appropriate deflator is almost impossible. In contrast, prices for different wheat varieties and the respective freight rate data can be unambiguously linked to calculate ad valorem equivalent transport costs.

The *Monthly Crop Report* and *International Yearbook for Agriculture* by the International Institute of Agriculture and the Statistisches Reichsamt (1936, 1937) provide monthly wheat price data. The prices for the varieties (e.g. "Manitoba wheat") recorded therein can be precisely matched with grain freight rates. Wickizer's (1938, p. 116–118) article in *Wheat Studies* provides the data for routes to the United Kingdom. The Statistisches Reichsamt (1926–1937, Verkehr section) provides corresponding data for the New York and Odessa routes to Germany.[10]

[10]See Appendix 5A.2 for a more detailed account of the sources, conversions of weights, and currency conversion for the German series.

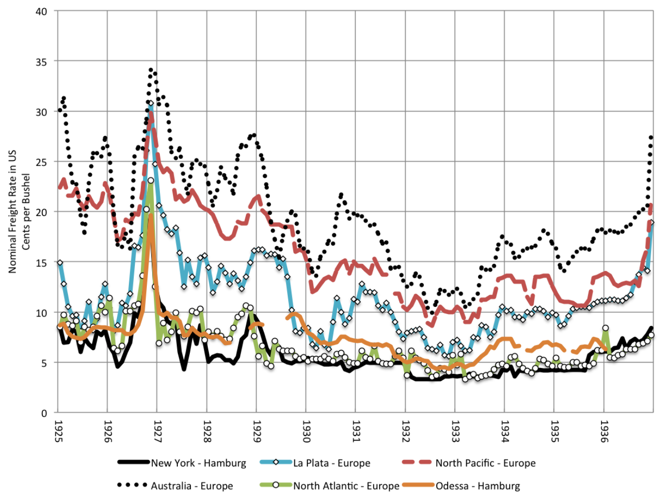


FIGURE 5.2: Nominal maritime transport costs

Notes: see text for sources.

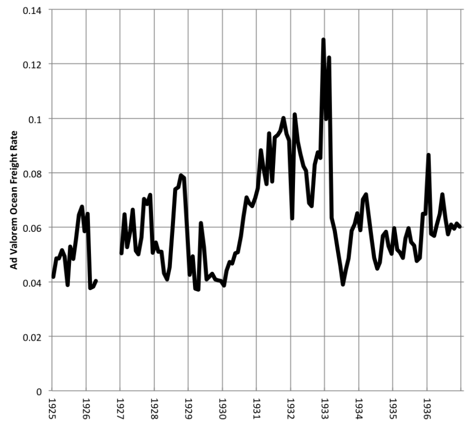
Figure 5.2 illustrates the movement of nominal maritime transport costs from 1925–1936 for six different routes in US cents per bushel. Freight rates on all routes were decreasing. The spike from mid-1926 to early 1927 is caused by the British coal strike, which led to new business opportunities for tramp ships usually employed in grain trade (Wickizer, 1938, p. 71 & 78). Small idiosyncrasies and the coal strike aside, nominal freight rates had roughly halved from 1925 until 1932 and started to recover thereafter. Naturally, the series differ in their levels based on the distance between the ports, but they exhibit a stark pattern of co-movement upon visual inspection. They are thus likely to be influenced by the same market conditions.

Wickizer (1938) focused mainly on the relationship between shipping and grain markets. In contrast, this analysis is concerned with the effect of transport costs on trade. Therefore, we are ultimately interested in the magnitude of the wedge that real transport costs drive between the domestic and foreign market. This wedge itself and its evolution are best measured in ad valorem terms (Finger and Yeats, 1976). The ad valorem transport freight rate is simply defined as the transport cost per bushel in US-$ divided by the respective wheat variety's price per bushel in US-$ at the place of origin. In this context, employing the price at the place of origin rather than the one in the destination market is more accurate, because the latter might also capture tariff and marketing costs.

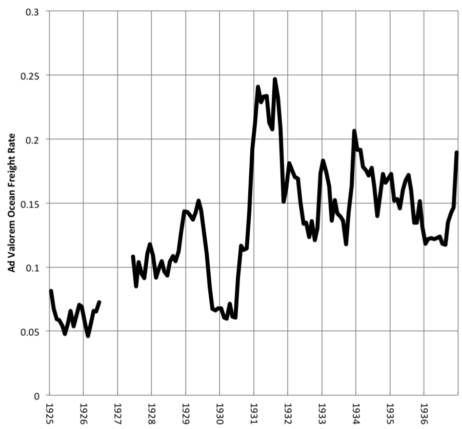
Figure 5.3 plots the ad valorem equivalent transport costs for four routes. With the exception of the La Plata-Europe series, real transport costs remained virtually stationary until 1929. As prices were falling much quicker than freight

FIGURE 5.3: Ad valorem maritime transport costs

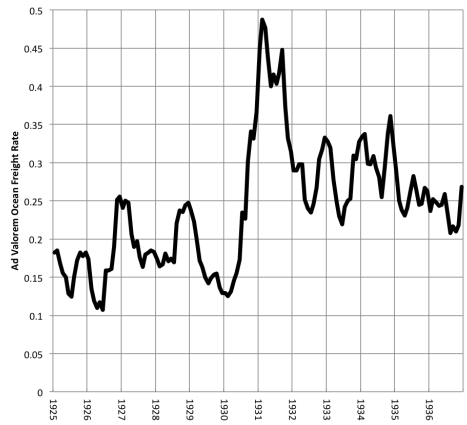
a) New York - Hamburg



b) North Atlantic - United Kingdom



c) La Plata - United Kingdom & Continental Europe



d) Australia - United Kingdom & Continental Europe

Note: Observations affected by the coal strike in 1926 are left out for illustrational purposes.

rates during the period from 1929-1933, real transport costs increased rapidly. In mid-1933, the New-York-Hamburg and the North Atlantic-United Kingdom series settle slightly above their pre-Depression levels. In contrast, Australian and Argentinian freights peter out at a much higher level compared to pre-Depression rates. How large were these level changes?

The level shifts in the non-American series amount to roughly 10 % ad valorem.[11] If we had built an index with 1925 as the base year rather than ad valorem equivalents, we would conclude that the changes were 300 % (La Plata - Europe)

[11]With increases of up to 30 % and 20 % ad valorem, the year 1931 was very abnormal for Australian and Argentinian freight rates. Most likely, the exceptionally good harvest in Australia was responsible for these movements. The yields almost doubled in comparison to 1929–1930 (The Economist, 1932a, p. 27), which depressed prices. As prices enter the denominator, this led to a stark increase in the real freight rate.

and 60 % (Australia - Europe) respectively. In contrast to the non-American series, the series for the New York - Hamburg and the North Atlantic - United Kingdom suggest a much smaller shift in transport costs. Their level shifted at most 1 % ad valorem in the long run, which corresponds to 20 % if calculated as a real index.[12]

In fact, these graphs show that real maritime transport costs were increasing, especially for the period 1930-1933 corresponding to the phase of deepest recessions in many countries. If measured in percentage terms, all these increases seem exceptionally large. Abstracting from 1931, however, they seem rather modest when accounted for in ad valorem terms. Note that analysing a low-value bulky good such as wheat provides the upper bound for such ad valorem equivalent changes.

Railway Freight Rates

As a substantial amount of international trade was carried out on railways throughout Europe, the focus on long-distance tramp shipping rates could be misleading. This section sheds light on the development of real railway prices of the biggest continental European economy of the time. Germany had a well-developed railway network that spanned large parts of Europe (Wolf et al., 2011). As in many other countries, the rail network was monopolised. It thus provides a useful case to highlight some features of the evolution of overland transport costs.

The Statistisches Reichsamt (1926–1937) provides the freight schedule for the German national railway service, the *Reichsbahn*. As one would expect from a monopolised public enterprise, the price adjustment was very slow. In fact, the railway freight schedule of the *Reichsbahn* only changed four times during the period 1925-1936. The schedule categorised goods into of seven different types (A-G),[13] for which different fees had to be paid depending on ten distance brackets. To get a general idea of the movement of railway freights, I take the arithmetic average of the good types by distance bracket and then arithmetically average across good types. To assess real transport costs, I deflate the resulting value in pfennig by the German wholesale price index (Chapter 2). Both the averaging and the use

[12] In the period 1930-1933 the highest change lies between 6 % and 8 % in ad valorem terms corresponding to a 150-200 % if expressed as an index number.

[13] I omit the good types "single items" and "reduced-price single items". The schedule in effect from 1924–1927 consisted only of 6 good types (A-F). Railway freight schedules across Europe were also used for protectionist motives by subsidising certain good classes and taxing others (Gabriel, 1935).

of a wholesale price index are imperfect solutions. However, they should provide us with a general idea about the evolution of overland transportation costs.

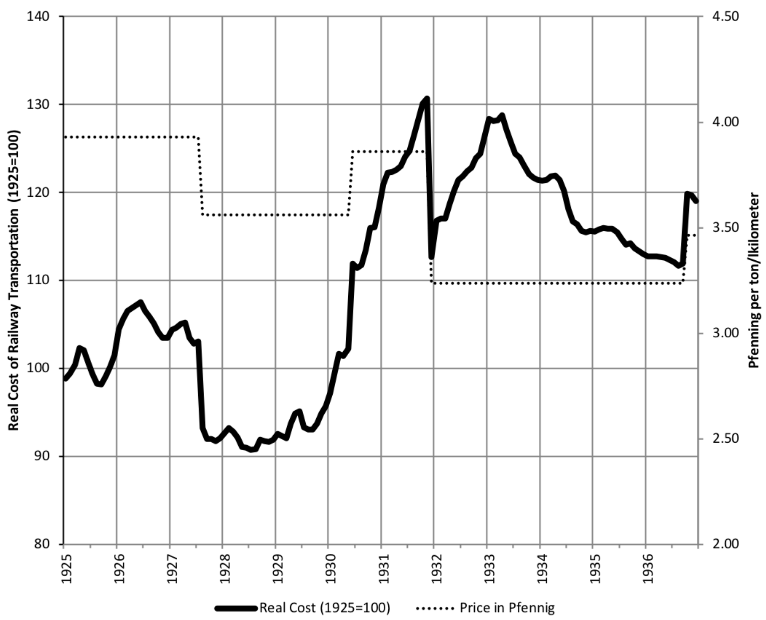


FIGURE 5.4: German railway freight rates

Notes: Real cost calculated by deflating the nominal cost by the German wholesale price index. For sources, see text.

Figure 5.4 plots both the nominal average rate in Reichspfenning per ton kilometre (right axis) and the "real cost" of railway transportation indexed to 1925 (left axis). The revision of the schedule in 1927 decreased nominal costs by around 10 %. Most of this reduction was nullified with another tariff revision in 1930. Only in 1932 a significant downward adjustment of about 20 % took place. Yet, for all we know about the evolution of prices during this period, this adjustment must have been too small to compensate the fall in prices. In consequence, real costs must have increased. If anything, employing a general wholesale price index like in the figure above probably rather under- than overstates the increase in real freight rates. Prices for agricultural goods, which were presumably the most common freight on railways besides coal, fell more rapidly on average than those for other wholesale products. Indeed, the real series indicates that the costs of transporting goods on railways increased by roughly 40 % between 1929 and the end of 1931. Despite a sharp drop in 1932 due to the new railway schedule, real costs for transporting goods on railways remained well above their pre-Depression levels throughout the rest of the period.

In sum, the evidence suggests that real costs were increasing for both modes of transport. Why shipping companies and railway monopolies were slow to adjust their rates to falling prices remains an open question. Estevadeordal et al. (2003, p. 378) argue that this could have been due to slower TFP growth in the transportation sector relative to the one in the economy as whole, rising labour militancy or increased cartelisation. Given the heavy fall in commodity prices, however, it seems at least as likely that the increase in real transport costs was simply due to the inability to offer transportation services at lower prices. More important for assessing the potential role of transport costs in the fall of world trade, however, is their magnitude relative to other trade frictions.

5.2.3 The Relative Importance of Transport Costs

To gauge the relative importance of physical and political trade frictions, Finger and Yeats (1976) suggest comparing tariffs and transportation costs in ad valorem equivalent terms.[14] On a much smaller scale, I replicate their exercise for the interwar period by calculating ad valorem equivalent rates for maritime transport and tariffs for selling Canadian wheat in Europe. This exercise suggests that tariffs rather than transport costs were the dominating force for changes in trade costs.

An analysis of changes in tariffs requires gathering data on wheat duties for two cross-sections. For the first one, I draw information on duties for 1928 published in a report prepared for the Assembly of the *League of Nations* by Ohlin (1931, p. 324f) and on a hitherto neglected compilation of European tariff levels by the Austrian National Committee of the International Chamber of Commerce (1927, p. 22).[15] A second cross-section is given in the *Monthly Crop Report and Agricultural Statistics* by the International Institute of Agriculture (1932). Unfortunately, the geographical coverage varies by cross-section. To make a comparison over time, it is thus necessary to drop various countries. Furthermore, some countries either monopolised (e.g. Sweden and Norway) or prohibited wheat imports in certain years (e.g. Spain).[16] Others maintained free trade for wheat until early 1932 (United, Kingdom, Netherlands) or introduced modest ad valorem

[14]Specifically, they focus on post-war US data. They find that the latter form of protectionism was at least as important as the former one during the time of the post-Kennedy round tariffs.

[15]The tariff data in the League report is given in gold franc per metric quintile (100 kilograms) . I convert these data into US cents per bushel wheat by employing information provided in Auboin (1955, p. 4), Statistisches Reichsamt (1936, p. 91), and Board of Governors of the Federal Reserve System (1943, p. 670). The data in Austrian National Committee of the International Chamber of Commerce (1927, p. 22) is given in Austrian Gold Kronas per 100 kg, which I convert by using the exchange rate provided by the Board of Governors of the Federal Reserve System (1943, p. 663).

[16]See Ohlin (1931, p. 325) for details.

tariffs (such as Belgium's 2 % tariff). These do not feature in the comparison of nominal tariff rates for 12 European countries in 1927 and 1932 in Figure 5.5.

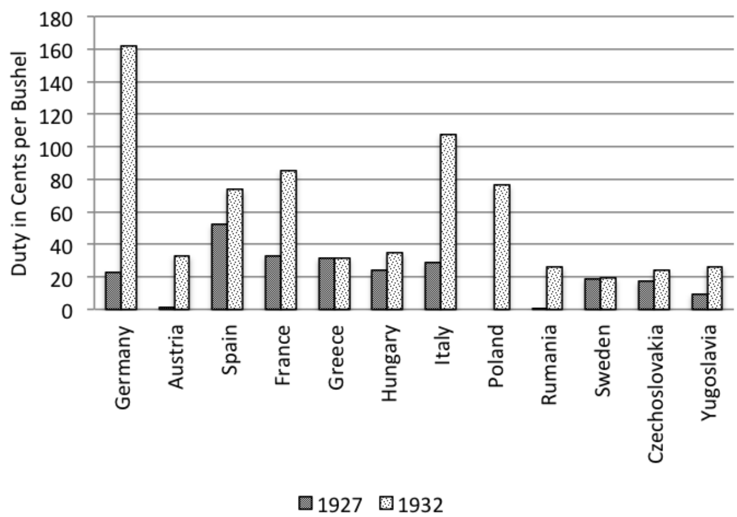


FIGURE 5.5: Nominal tariffs on wheat in European countries

Notes: Countries either imposing no specific tariffs throughout the period, monopolising wheat trade or for which only data for 1932 exist are excluded.

The data suggests that tariff restrictions grew in nominal terms in most of the countries included Figure 5.5. Germany increased her tariff from about 20 cents per bushel to 160 cents per bushel. In no other country tariffs for wheat reached such excessive heights, but the protectionist turn was far from modest elsewhere. Significant tariff increases occurred in Italy, France, Spain, and Poland. Romania and Austria, hitherto low-tariff countries with respect to wheat introduced specific rates far beyond 60 cents per bushel.

Based on the nominal freight and tariff data, we may ask how important transport costs could have been relative to the height of tariffs. Potential German wheat imports from Canada in 1932 serve as a truly excessive but illustrative example. The freight rate for wheat was about 5 cents per bushel, whereas the German tariff amounted to 162 cents for the same quantity. A back-of-the-envelope calculation suggests that instead of paying the German tariff, the Canadian exporters could have shipped the wheat more than four times around the globe.[17] Naturally, this calculation does not lend itself to suggesting that transport costs were of overarching importance.

[17] Assuming the ship could travel the simple great circle distance.

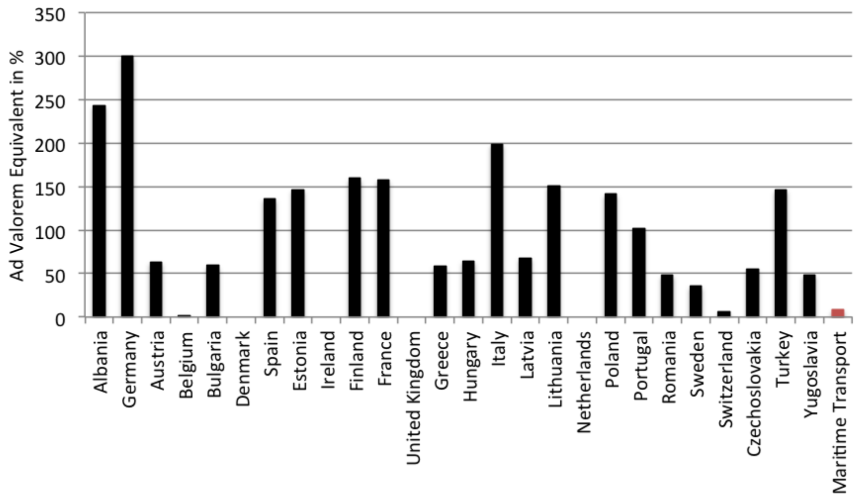


FIGURE 5.6: Ad valorem equivalents of freight rates and tariffs for wheat

Notes: Norway is left out as it monopolised trade but there is no tariff recorded. Only the basic duty (not the additional ones) are used to calculate the ad valorem equivalent tariff such that this figure provides a *lower* bound for many countries.

To generalise this point, Figure 5.6 shows the ad valorem equivalent tariffs for a cross-section of European countries as well as the corresponding maritime transport costs. The prices and freight rate for Manitoba wheat serve as the basis for this graph, whereas the tariff data is from the sources outlined above. While by early 1932 the classical free-trading nations such as the Netherlands and Britain had not imposed tariffs on wheat, in many European countries tariffs were a substantial fraction, if not multiples, of its price. In comparison, transport costs, even though they accounted for 8.5 % ad valorem in 1932, were modest.

In ad valorem equivalent terms, freight costs seemed to have mattered relatively less than tariffs when looking at one point in time. How does the picture change if we analyse changes instead? Except for countries in which the initial level of freight costs was higher than the specific tariff[18] any downward movement in price must mechanically increase the importance of tariffs in ad valorem equivalent terns. To illustrate this point, consider the following example. From the data used in the previous section we know that the average price of Manitoba wheat in 1927 was about 144 cents per bushel. Let us assume a hypothetical specific tariff of 20 cents per bushel by a European country. This corresponded to an ad valorem equivalent tariff of about 14 % in 1927. The freight rate was

[18] Ad valorem tariffs as such were rare exceptions as the data in a report by the Austrian National Committee of the International Chamber of Commerce (1927) illustrate.

about 5 % of the price. Hence the overall trade costs were 19 % ad valorem. By 1932, the average price of the Canadian wheat variety had dropped to 53 cents per bushel. Without any change of the tariff code, this translates into a new ad valorem equivalent tariff of 37 %, a change of 23 % ad valorem. In contrast, the ad valorem equivalent cost for shipping grain from North America and Canada to European ports doubled from 5 % to 10 %, a change of only 5 %. In part, the change is smaller because of the endogenous response by shipping companies, which adjusted their nominal freight rates downwards. In part, it is mechanical. Even if there was no downward adjustment of the nominal rate, the counterfactual ad valorem equivalent freight rate would have been 15 %, a change of 10 % ad valorem.[19] This is less than half of the 23 % ad valorem change due to the tariff. Naturally, in every case for which the initial specific tariff level is higher than the nominal freight rate, any movement of prices would lead to a higher ad valorem equivalent change in the tariff than in the freight rate.

In sum, the importance of physical trade costs relative to political trade frictions declined in the interwar period. While the evidence presented here draws on wheat prices only, there are good reasons to generalise this result. As argued above, transport costs are only an important part of the overall price in the destination market for low-value bulky commodities such as wheat. For semi- and fully manufactured goods, the relative importance of tariffs in overall trade costs must have been even larger. Under such conditions, any price movement mechanically leads to a larger change in the ad valorem equivalent of a specific tariff compared to the ad valorem equivalent of the transport cost. Estevadeordal et al. (2003) were right to point out that, most likely, real transport costs were increasing. However, their relative importance as a trade friction declined. Prima facie, this makes it unlikely that they became an important driver for the fall of world trade in the 1930s.

5.3 The Falling Importance of Distance in the Interwar Period

Another way to assess the evolution of transport costs is the distance elasticity of international trade. The previous section demonstrates that transport costs were increasing, albeit to a lesser extent than tariffs. If the distance elasticity only captures the importance of distance-related costs, one would expect it to increase

[19] This is the average freight rate of 1927 divided by the average of 1932 Canadian wheat prices.

in absolute terms under such circumstances. On the contrary, the estimates presented below suggest that distance became less important over time during the interwar period. This finding constitutes the interwar distance puzzle.

5.3.1 The Empirical Model

The gravity model is the workhorse model in empirical research on international trade (see Head and Mayer, 2014, for an excellent review of the gravity literature). The following equation originates in the micro-founded formulation of the gravity model by Anderson and van Wincoop (2003):

$$m_{i,j} = \beta D_{i,j} + \eta' x'_{i,j} + \alpha_i + \gamma_j + \epsilon_{i,j} \tag{5.1}$$

in which $m_{i,j}$ are the imports of country i from j, D is the logarithm of distance between the two, x' is a vector of bilateral controls, α an importer fixed effect and γ_j an exporter fixed effect. The vector of bilateral controls includes a standard set of dummies for this model class as well as indicator variables for pegs and exchange controls, which ought to have a large impact on trade during this period (see e.g. Irwin, 2012). All these controls are described in the data section (5.3.2) in more detail. Also note that country-specific variables such as remoteness or income are not separately identified but controlled for by the importer and exporter fixed effects. β is the coefficient of interest as it measures the sensitivity of international trade with respect to distance. If we repeat the estimation of the above equation for multiple years, changes in the distance elasticity β should inform us if distance, and thus ultimately transport costs, became a more important friction for international trade.

The above formula is estimated by the Poisson Pseudo Maximum Likelihood estimator (PPML). The Ordinary Least Squares (OLS) estimator, on which many of the estimations that substantiate the post-war distance puzzle are based upon, has been subject to critique. In the presence of heteroscedasticity and due to Jensen's Inequality, the OLS estimator can become inconsistent. Therefore, Santos Silva and Tenreyro (2006) propose the Poisson Pseudo Maximum Likelihood estimator (PPML), which yields consistent estimates even in the presence of heteroscedasticity.[20]

[20]While the OLS estimator has been subject to critique, the PPML estimator has problems to converge when a large number of fixed effects is included in the model. This problem is most severe when one wants to include dyadic fixed effects. As argued by Baldwin and Taglioni (2006) this can be important in order to control for unobserved heterogeneity. Hence, Figure A5.3 in

5.3.2 Data & Sample

Whereas Section 5.2 combines materials from a number of primary sources to sketch the development of transport costs in the interwar period, the estimation of the gravity model relies on a number of existing datasets. The dependent variable – import flows in US-$ – was compiled by Gowa and Hicks (2013). They collect import data from country-level sources (official trade statistics) and a number of other sources.[21] They reach a remarkable coverage for trade in the interwar period covering substantial parts of all continents except for Africa.

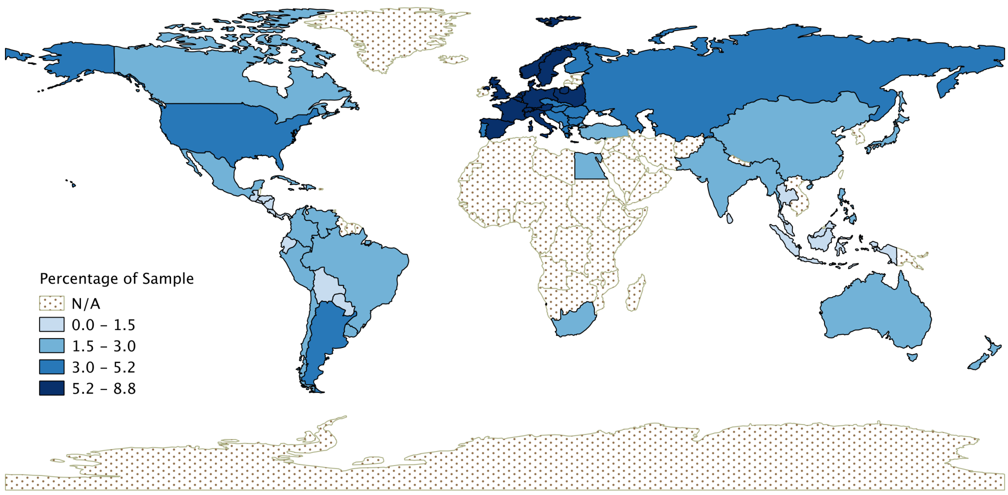


FIGURE 5.7: Geographical distribution of the sample

Note: Colours indicate the percentage of dyadic observations, in which the country appears.

Historical trade statistics are usually quite comprehensive and precise. Nevertheless, they come with a number of problems, which make various sample restrictions necessary. For an optimal trade-off between cross-sectional and time-series coverage, I balance the sample for the period 1925-1936.[22] This excludes the hyper-inflationary period of the early 1920s, for which a considerable amount

Appendix 5B.2 presents an alternative OLS panel estimate with dyadic fixed effects. These estimates measure the importance of distance relative to a defined base year (1936), as they are year-dummies interacted with the distance variable. Naturally, time-varying country and time fixed effects are included such that all identifying variation comes from pair specific changes over time.

[21] Alternatively, one could use the new *TRADHIST* dataset recently made available by Fouquin and Hugot (2016b). However, with the same restrictions (see below) the sample size reduces to 1112 observations. For this specific period (and purpose), the *TRADHIST* dataset has thus a lower coverage.

[22] Balancing the sample is important as one does not want the observed patterns to be driven by changes in the composition of the sample.

of data is missing, as well as the immediate years before World War II. It covers the main period of interest surrounding the Great Depression by including pre-crisis, crisis, and post-crisis trade flows. Employing a balanced sample of non-zero trade flows, this study analyses the intensive margin of trade only. This results in 1704 import flows per year for the global sample and 1222 flows per year for a sample (Figure 5.7), in which at least one of the trading parties is a European country.

The focus on the intensive margin by excluding flows with zero trade is dictated by data availability and the way trade statistics were recorded.[23] Firstly, historical trade statistics do not always refer to well-defined polities. For example, the Swiss authorities would include destinations like "other countries of the Near East" (Direction Générale des Douanes Fédérales, 1924). Not only did such regional categories differ across countries, but they would often vary over time within one country. In the Swiss case, the above destination would become Syria without any further explanation in the years following. Secondly, historical trade statistics would typically have a residual category for countries with whom they trade very little. Because of these two reasons, it is virtually impossible to know whether countries did not trade or the trade flow was not recorded. Hence one can simply not analyse the extensive margin of trade for this period in a consistent manner.[24]

Throughout the discussion, I rely on a sub-sample of trade flows, in which at least one country is European. This is true for around 72 % of the global sample or 1222 dyadic observations per year. The reason for this restriction is the aim of measuring the importance of transport costs for trade by analysing changes in the distance elasticity of trade. The inclusion of intra-developing country trade can severely disturb such a measure (Melitz, 2007). Typically, countries outside of Europe traded very little among each other. The reason for this pattern lies in their colonial history and factor endowments.[25] Most economies in the Southern Hemisphere heavily relied on commodities. The main consumers of these products were European countries. The resulting North-South trading pattern

[23]See Felbermayr and Kohler (2006), Hillberry and Hummels (2008) and Head and Mayer (2014) for the definition of the extensive and intensive margins of trade.

[24]This is not to question that the extensive margin matters for trade in the medium- to long-run run. However, it is unlikely that it is of much relevance for this study given the short period under consideration (12 years). That a reversed version of the post-war distance puzzle appears in the short sample period subject to this study casts doubts on solutions to the post-war distance puzzle based on the extensive margin (see Felbermayr and Kohler, 2006, for such an approach).

[25]For a discussion of the factor endowment argument using post-war data, see Melitz (2007).

meant that almost all of their trade was biased towards very long distances.[26] In this case, changes in the distance elasticity might not reflect changes in transport costs but changing trade opportunities (Melitz, 2007, p. 986). Put differently, with few markets for their goods in proximity, changes in transport costs could simply not re-direct trade towards closer markets. Most of the change in the distance sensitivity in international trade for those countries is then necessarily driven by the demand from the industrialised countries.[27] These considerations make it reasonable to focus on a sample, in which at least one trading partner is European. While one would not necessarily expect this, the results hold to a limited degree in the global sample.

In terms of covariates, this study relies on a variety of sources available in electronic format. Great circle distances between the capitals are taken from Gowa and Hicks (2013). As an alternative, Mayer and Zignago (2011) provide population weighted distances.[28] These have the attractive feature of being comparable with internal distances (Yotov, 2012), which will become important when solving the puzzle. Beyond the bilateral distances, a number of bilateral variables might influence trade. Mayer and Zignago (2011) provide colonial tie and common language dummies. While the dummy for adherence to the gold standard provided by Gowa and Hicks (2013) captures officially pegged currencies, it does not account for other pegged currency arrangements after the breakdown of the gold exchange standard in 1931. However, instead of exercising the newly acquired freedom of monetary policies, a large number of countries pegged their currencies either de facto or de jure against the dollar or pound.[29] In order to account for such pegs, I calculate a modified version of the peg measure by Shambaugh

[26]Peru serves as an illustrative example. Imports from her five neighbouring countries altogether were far below 1.5 % of the total imports (own calculation based on data by Gowa and Hicks, 2013). Her most important trading partner in South America in terms of imports in 1929 was Argentina, accounting for 3.3 % of her imports. At the same time, she was receiving 3.9 % of her total imports from Belgium (Statistisches Reichsamt, 1936, p. 481), which was much smaller, had a different official language, and was thousands of miles away.

[27]This is because the distance elasticity is ultimately identified from the relative share of long-distance trade.

[28]These distances are computed with modern population weights, not historical ones. However, given Zipf's law and the general persistence of the relative sizes of cities (see e.g. Davis and Weinstein, 2002), using this dataset seems a warranted simplification. The alternative would be to collect a whole new dataset on city sizes around the world during this period and re-estimating internal distances.

[29]For de jure pegs, see League of Nations (1939b, p. 220). This overview by the League of Nations is incomplete as it does not account for de facto pegs. A prime example is the case of Sweden, which is documented by Straumann and Woitek (2009). Urban (2009) provides corresponding cross-country evidence for de facto pegs.

(2004) as suggested by Mathy and Meissner (2011). Details can be found in Appendix 5A.1.

5.3.3 Results

Table 5.1 displays the results of the gravity estimation for three cross-sections in two specifications for the European sample. The first column for each year shows the estimate that is only conditioned on the logarithmised distance and a set of importer and exporter fixed effects. The second column for each year confirms the results by including additional covariates. Among the covariates, colonial ties and contiguity are obviously closely correlated with the distance between countries. As these coefficients vary over time in the repeated cross-sections, the first specification might be thought of as a “cleaner” representation of the puzzle albeit omitting important control variables.

TABLE 5.1: THE INTERWAR DISTANCE PUZZLE - EUROPEAN SAMPLE

	1925		1931		1936	
Distance	-0.733***	-0.526***	-0.636***	-0.490***	-0.504***	-0.317**
	(-6.34)	(-5.26)	(-6.03)	(-6.01)	(-4.59)	(-3.21)
Colonial Tie		1.258***		1.111**		1.234***
		(3.33)		(3.02)		(4.21)
Contiguity		0.907***		0.598***		0.725***
		(6.66)		(4.80)		(4.47)
Peg		-0.177		0.632***		0.0256
		(-1.20)		(6.47)		(0.21)
Imp. & Exp. FE	✓	✓	✓	✓	✓	✓
N	1222	1222	1222	1222	1222	1222
$Pseudo-R^2$	0.81	0.89	0.74	0.86	0.68	0.76

Notes: Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$;
z statistics in parentheses. Robust Standard errors applied.

Both specifications document the decaying importance of distance. From 1925 until 1936, this change accounts to 0.2. A 10 % increase in the distance, the model predicts, would lead to 7.3 % less trade in 1925 but only to 5 % less trade in 1936. Similarly, the second specification also suggests that a country would trade 2 % more with a country 10 % further away in 1936 than it would have done in 1925. Interestingly, these magnitudes correspond well with the finding of the meta study by Disdier and Head (2008, p. 43), which popularised the post-war distance puzzle.

Moreover, the coefficient for contiguity in the second specification accentuates the notion of the falling importance of distance throughout this period. As contiguity is positively correlated with distance, a falling coefficient must necessarily indicate that distance has become less important. In contrast, the coefficient for colonial ties oscillates. Its magnitude is not significantly different in 1936 from the one in 1925. This lends support to the hypothesis that policymakers were unable to "defy" gravity with pro-empire policies (Jacks, 2014). However, it is at odds with other recent research suggesting the opposite (Gowa and Hicks, 2013; Bromhead et al., 2017).

In light of the existing literature on large trade-creating effects of the classical gold standard (e.g. López-Córdova and Meissner, 2003), the evolution of the coefficient for *Peg* is surprising. It suggests that countries with pegged currencies did not trade more in two out of the three years shown above. More generally, the coefficient in the other years (not shown) is relatively unstable in sign, magnitude and significance until the breakdown of the gold standard in 1931. This finding warrants closer examination, but doing so lies beyond the scope of this study.

The *Pseudo-*R^2 is large, but decreases over time in both specifications. This indicates that the model becomes less powerful, potentially due to the advent of more bilateral (pair-specific) trade policies. Not only quotas gained momentum in the 1930s (Eichengreen and Irwin, 2010; Irwin, 2012), but so did retaliatory tariffs (Jones, 1934).[30] Unfortunately, the gravity literature typically omits this variable due to the absence of adequate data.[31]

With regard to the distance elasticity, the variable of interest, Figure 5.2a) illustrates the results in a more accessible way by plotting the distance coefficient for the baseline specification without controls over time. The decline is smooth and steady until 1933, when it reaches its new plateau. Figure 5.9b) confirms this result when population-weighted distances rather than capital-capital distances are used.[32] This baseline result holds qualitatively and quantitatively after the

[30] These are quantitatively explored in Chapter 4 of this thesis.

[31] In the only exception known to this author, Hayakawa (2013) finds no serious bias stemming from the omission of bilateral tariff data in gravity models. However, his study employs only post-1990 data. This is problematic as, a priori, one would expect little or no bias given an environment dominated by low tariff levels and the WTO's enforcement of rules regarding non-discriminatory trade policies.

[32] As a further robustness check, Appendix 5B.1 presents results for a specification, in which the distance variable categorised in quartiles. These can be thought of as short-, medium-, long- and very long-distance trade. The differences in levels are marginal.

inclusion of the control variables mentioned above.

FIGURE 5.8: The interwar distance puzzle

a) Capital-capital distances

b) Population-weighted distances

Note: Distance elasticity estimates from repeated cross-sectional PPML gravity estimation of a balanced panel of 1222 intra- & extra European trade flows per year. No controls but importer and exporter fixed effects are included

The interwar distance puzzle is also prevalent in the full sample as Figure A5.2 (PPML) and Figure A5.3 (OLS with dyadic fixed effects) in Appendix 5B.2 reveal. The OLS estimates indicate an evolution of the distance elasticity similar to the European sample. In contrast, the PPML estimates for the full sample draw a somewhat different picture. From 1925 to 1931, the distance elasticity increases from .6 to .7 in absolute terms and falls to .5 thereafter. However, the data section discussed in detail why we would expect a much weaker effect, if any, for the full sample.

In sum, the gravity estimations suggest that the importance of distance for European trade was declining throughout the interwar period. This result is robust in a number of specifications including several potentially relevant control variables. It holds to a lesser degree for a global sample. What mechanisms could explain the fact that, despite rising transport costs, distance was losing importance for European trade?

5.4 A Solution to the Distance Puzzle

The previous section has revealed a puzzle. While Section 5.2 suggests that transport costs were increasing, the estimates of the distance elasticity in the gravity framework indicate that trade became less sensitive to distance. This finding mirrors the post-war distance puzzle which highlights the coincidence of an increasing distance elasticity (in absolute terms) and falling transportation costs (Disdier and Head, 2008). A natural starting point is thus making use of available strategies, which aim to solve the puzzle in the post-war data. Among those available,[33] a solution based on the slow secular decline of non-distance related trade cost would represent a particularly promising candidate. Tariff barriers shot up quickly in the interwar period, but it took decades to dismantle them.[34] In consequence, such an explanation would be compatible with both, the interwar and post-war distance puzzle. Yotov (2012) proposes to measure the importance of international distances relative to *intra*national distances. This solves the puzzle because it indirectly takes the declining trade barriers into account. Applied to the interwar period, this approach (Section 5.4.1) indeed solves the puzzle. A priori, however, it is not clear that the proxies for internal distance and trade are comparable with their international counterparts. Nor is the mechanism explicitly outlined in Yotov's solution. To elucidate the latter, Section 5.4.2 provides theoretical considerations. These suggest that the distance elasticity depends, among other factors, on tariffs. In the vein of Berthelon and Freund (2008), Section 5.4.3 tests the proposed mechanism with Swiss good level import data. Indeed, tariffs changed the sensitivity of trade to distance.

5.4.1 A Macro Approach

Yotov (2012) points out that gravity models solely relying on international trade flows measure the importance of some international trade costs such as distance relative to other international trade costs. With reference to the micro-founded formulation of the gravity model by Anderson and van Wincoop (2003), he states that internal trade flows and distances should be included in the gravity model to capture the importance of distance adequately. This leads to the following empirical specification:[35]

$$m_{i,j} = \beta_{international} ln(D_{i,j}) + \beta_{internal} ln(D_{i,i}) + \alpha_i + \gamma_j + \epsilon_{i,j} \tag{5.2}$$

[33] See Carrère et al. (2013) for an early review.

[34] According to Klasing and Milionis (2014), trade openness only reached its 1913 level in 1974.

[35] In a follow-up study, Bergstrand et al. (2015) lay out a panel version including a further dimension of fixed effects (flow-specific bilateral fixed effects). Because of a number of computational constrains and for the sake of brevity, I follow the original cross-sectional formulation by Yotov. Nevertheless, I am confident that my results would hold in the panel setting. The inclusion of bilateral fixed effects seems particularly important in unbalanced samples as they, to some degree, account for changes in the composition of the sample over time. My sample, however, is balanced.

in which $\beta_{international}$ captures the importance of all international distances $D_{i,j}$ between countries i and j. For all countries $i \neq j$, the logarithm of population weighted distances between countries is employed. For internal trade, the logarithm of the international distance is set to zero. Conversely, internal distances for international trade flows $m_{i,j}$ are set to zero, whereas those for internal trade flows $m_{i,i}$ are computed as the logarithm of internal distances.[36] The importance of distance for international trade relative to internal distance is then captured by $\hat{\beta}_{international} - \hat{\beta}_{internal}$.

How does one measure internal trade? Yotov (2012) suggests to simply take the difference between nominal GDP and exports as a proxy. Unfortunately, nominal GDP data is not universally available for this period. For the exercise at hand, however, it seems appropriate to rely on the short-cut nominal GDP estimates by Klasing and Milionis (2014).[37] In contrast to the GDP data, aggregate export data in US-$ is readily available. Federico and Tena-Junguito (2016b) provide a well-documented online database (*Federico-Tena World Trade Historical Database*). With these data, we could implement Yotov's empirical setup for the period under consideration. However, Fouquin and Hugot (2016a) point out that GDP is a value-added concept whereas international trade is not. The comparable metric would be gross output, which includes intermediary goods. When assessing internal trade, Fouquin and Hugot (2016a) thus scale the nominal GDPs up by a factor of 3.16 to proxy gross output.[38] Internal trade for country i is thus proxied by:

$$m_{i,i} = (3.16 * GDP_i) - X_i \tag{5.3}$$

This one-size fits all approach is somewhat unsatisfactory. In the absence of a better alternative, however, the same technique is followed in this study. Ultimately, the focus lies on changes over time. This should render this lack of detail an unfortunate omission rather than crucial for the results.

Table 5.2 and Figure 5.9 present the results for the macro-solution to the

[36] Internal distances are defined as the population-weighted great circle distances between cities (Mayer and Zignago, 2011).

[37] Yet, not even the short-cut GDP estimates are available for all countries in the sample. The sample size decreases by 15 % (from 1222 to 1054 trade flows) due to the inclusion of internal distances and trade flows. As an alternative, Fouquin and Hugot (2016a) provide a collection of "proper" country-specific estimates. However, their coverage is less comprehensive and would lead to a much smaller sample.

[38] This factor is derived from post-war data.

distance puzzle. Indeed, the importance of distance ($\hat{\beta}_{international} - \hat{\beta}_{internal}$) increased slightly from 1930 until 1936 when internal distances are accounted for. This is precisely what one would expect based on the evidence regarding the evolution of transport costs discussed earlier. While the results generally lend support to Yotov's solution, they also reveal a potential culprit. Surprisingly, the sign of the internal distance coefficient is positive.

TABLE 5.2: A MACROSOLUTION TO THE INTERWAR DISTANCE PUZZLE

	Without Internal Flows			With Internal Flows		
	1925	1930	1936	1925	1930	1936
International Distance	-0.99***	-0.88***	-0.67***	-0.40***	-0.51***	-0.32***
($\hat{\delta}_{international}$)	(0.11)	(0.11)	(0.10)	(0.07)	(0.07)	(0.07)
Internal Distance				0.60***	0.50***	0.80***
($\hat{\delta}_{internal}$)				(0.09)	(0.08)	(0.09)
$\hat{\delta}_{international} - \hat{\delta}_{internal}$				-1.00	-1.01	-1.12
Imp. & Exp. FE	✓	✓	✓	✓	✓	✓
N	1054	1054	1054	1099	1099	1099

Notes: Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

This result casts doubts on the comparability of the internal trade flows and distances with their international counterparts. After all, the elasticity for internal distances should still exhibit a negative sign. Ceteris paribus, transporting goods from city A to city B is more expensive as the distance between them increases. This should hold irrespectively of whether A and B are cities in the same country or different polities. It is reasonable to assume that there exists a strong positive correlation between the size of the market and internal distances. What the internal distance variable might thus capture is the importance of the domestic market relative to the international market at any given point of time. If so, replacing $\hat{\beta}_{internal}$ in $\hat{\beta}_{international} - \hat{\beta}_{internal}$ with any variable capturing domestic market potential would solve the puzzle.

In sum, the interwar distance puzzle can be solved by taking internal distances and trade flows into account. However, there is a certain ambiguity as to whether the internal distance coefficient actually captures distances. It is more

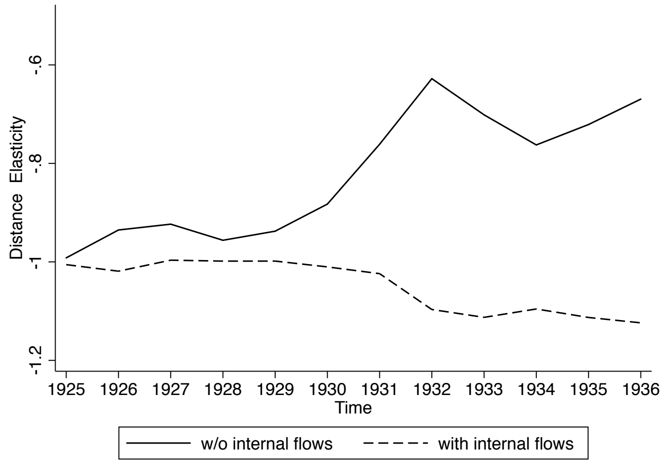


FIGURE 5.9: The macro solution to the interwar distance puzzle

Note: The distance elasticity taking into account internal trade flows is calculated as the difference between the elasticities for international and internal trade ($\hat{\beta}_{international} - \hat{\beta}_{internal}$) as in Yotov (2012).

likely that it measures the importance of the domestic economy relative to international trade. This does not invalidate Yotov's solution per se. However, it might just be that the emergence of the puzzle and globalisation (the decreasing importance of the internal market) are two secular and unrelated trends in the post-war period. Prima facie, the emergence of the interwar distance puzzle as documented in this study renders this unlikely. Nevertheless, more evidence is needed. The following two sections highlight a potential mechanism that renders distance less important in periods of de-globalisation and more important in periods of increased globalisation.

5.4.2 Insights from an Import Demand Function

This section illustrates how changes in transport costs and tariffs affect the distance elasticity. It derives the distance elasticity from a demand function for imports, which *realistically* assumes the presence of a non-distance related trade cost component. It then shows that the distance between countries becomes a larger friction as transport costs increase.[39] Moreover, the theoretical considerations imply that increasing tariffs decrease the importance of distance.[40]

[39] While highly intuitive, Bosquet and Boulhol (2015, p. 3) challenge this proposition.

[40] These considerations shown here are not embedded in a full trade model. For such a derivation, see an unpublished manuscript by Días (2011). Instead, the mechanism highlighted here is similar to the one underlying the Alchian-Allen conjecture. This conjecture states that the introduction of a per-unit cost increases the demand for the high-quality varieties of a good as these

To illustrate the argument, I follow the very basic assumptions and derivations of the model in Hummels et al. (2009). In a world of N countries the representative consumer i, having a taste for variety, derives the following utility from an Armington-differentiated good:

$$U_i = q_{ii} + \sum_{j=1}^{N} q_{ij}^{\frac{(\sigma-1)}{\sigma}} \tag{5.4}$$

where q_{ii} is i's numeraire good (and produced at home) and q_{ij} is the variety of j imported by i. σ is the elasticity of substitution between goods and positive ($\sigma > 0$). To analyse the effect of different types of trade costs on the distance elasticity, I assume the following trade costs structure that is added to the price p_j for an imported variety having the price p_{ij}:

$$p_{ij} = p_j + \tau + \delta D_{ij} \tag{5.5}$$

where τ is a specific tariff, δ the per kilometre shipping cost for a unit of q_{ij} and D_{ij} the distance between i and j. If we focus on the case of the i's consumption of the imported good q_{ij}, the relative marginal utility from the numeraire q_{ii} and q_{ij} must equal the ratio of the prices of the two goods such that:

$$\frac{\sigma}{\sigma-1} q_{ij}^{\frac{1}{\sigma}} = \frac{p_{ii}}{p_{ij}} \tag{5.6}$$

rearranging, expressing the price $p_{i,j}$ of good q_{ij} in terms of the numeraire, and substituting the expression for p_{ij} from 5.5 yields

$$q_{ij} = \left[\frac{\sigma}{\sigma-1}(p_j + \tau + \delta D_{ij})\right]^{-\sigma} \tag{5.7}$$

The elasticity of the demand for q_{ij} with respect to the distance D_{ij} is thus:

$$E_D = \frac{\partial q_{ij}}{\partial D_{ij}} \frac{D_{ij}}{q_{ij}} = \frac{-\sigma\delta}{p_j + \tau + \delta D_{ij}} \tag{5.8}$$

To better understand the impact of a change in transport costs on the distance elasticity, we take the partial derivative of the distance elasticity with respect to the unit transport costs δ and find that it is negative:

$$\frac{\partial E_D}{\partial \delta} = \frac{-\sigma(p_j + \tau + \delta D_{ij}) + \delta(-\sigma D_{ij})}{(p_j + \tau + \delta D_{ij})^2} = \frac{-\sigma(p_j + \tau)}{(p_j + \tau + \delta D_{ij})^2} < 0 \tag{5.9}$$

become relatively cheaper. Hummels and Skiba (2004) provide empirical evidence for this mechanism focusing on transport costs.

This suggests that a marginal increase in transport cost leads to a decrease in the distance elasticity. As the distance elasticity is negative, this translates into a larger absolute value of the distance elasticity signalling a rising importance of distance. It is puzzling that we observe the opposite in the distance elasticity estimates presented above. However, the formula for the distance elasticity derived in equation 5.8 illustrates that the role of distance for trade is not solely determined by transport costs. To analyse the effect of a marginal increase in tariffs, we take the partial derivative of the distance elasticity with respect to τ and find it to be positive:

$$\frac{\partial E_D}{\partial \tau} = \frac{\sigma\delta}{(p_j + \tau + \delta D_{ij})^2} > 0 \tag{5.10}$$

This suggests that tariff increases lead to an increase in the distance elasticity (or decrease in absolute terms), signalling the decaying importance of distance. To gauge the intuition underlying this finding, consider the following example. A consumer in Switzerland wants to import wine from Spain and Australia that have the same price if picked up at the winery in the respective country. Ideally, as she likes both varieties of the wine, she would import them to the same degree. However, transport costs are higher for the Australian variety. This decreases the observed demand for this variety. Now the government of Switzerland introduces a specific tariff that she has to pay irrespective of the variety she is importing. This increases the price for both varieties in absolute terms. However, the Australian variety has become cheaper *relative* to the Spanish one. This is because transport costs are now a smaller part in the overall trade costs. In consequence, we would observe that the consumer imports more Australian wine.[41] Distance has become less important through the introduction of the tariff.

How do these insights relate to the estimates of the gravity equation and to Yotov (2012)'s solution presented above? First of all, the derivation of the distance elasticity in this simple import demand framework suggests that the distance elasticity is ultimately a composite elasticity. It depends on both the level of tariffs and transport costs. One interpretation stemming from these theoretical considerations would be that the "tariff effect" on distance might have been stronger than the "transport costs effect," leading to the overall empirical result of a declining importance of distance in the standard gravity model. In other

[41] Note that this mechanism is closely related to the Alchian-Allen conjecture (Hummels and Skiba, 2004).

words: while transport costs drive the world apart and thus increase the effective distance between countries, the erection of higher tariff barriers might have "shrunk" it by a larger amount. This could lead to the effect that goods travel longer distances despite de-globalisation and increasing transport costs.

5.4.3 Evidence from Disaggregated Trade Data

While the macro-solution to the distance puzzle remains ambiguous with respect to the precise mechanism, the theoretical insights highlight tariffs as a potential determinant of the distance elasticity. This section takes the hypothesis to disaggregated import data for Switzerland. While this comes at the cost of being unable to provide gravity-consistent estimates,[42] some advantages stand out. Firstly, and in contrast to gravity models, the granularity of the import data allows me to embed tariffs explicitly in the estimation. Secondly, the variation in the tariff rates can be assumed to be purely exogenous. A small open economy such as Switzerland had no impact on world prices. At the same time, the Swiss tariff code remained unaltered between 1927 and 1931.[43] As virtually all tariffs were specific, the global fall in prices created exogenous variation in their ad valorem equivalents. Finally, the disaggregated data allows me to analyse trade on the good rather than aggregate level. This provides ample variation to test the hypothesised effect of tariffs on the distance elasticity.

The Data

Swiss import and tariff data are available in the *Statistique annuelle du commerce extérieur de la Suisse*. The data have been manually transcribed for the years 1927 and 1931. As it was impossible to transcribe the entire universe of import data for both years, a rule of how to choose which goods to include was necessary. Fortunately, the Austrian National Committee of the International Chamber of Commerce (1927) had collected the national tariff classification number and specific tariff for 402 goods for a number of European countries. The authors of the study paid much attention to collect these specific tariffs and classification numbers such that for each industry a reasonable number of goods was included. However, it is hard to tell to what extent this list of goods is representative of European or even world trade. On the other hand, the proposed mechanism should

[42] Gravity models require bi-directional trade data.

[43] Furthermore, quantitative restrictions were only introduced in 1932 (Häfner, 1934, p. 36).

not be very sensitive to such representativeness concerns. Furthermore, employing such a list of goods makes it possible to easily extend future work to other countries within the framework outlined below.[44]

As a substantial number of the 402 goods is not separately classified in the Swiss tariff and not enough trading partners existed for some goods,[45] the actual number of goods is reduced to 248. A further eight goods are excluded because they are grains. From which countries Switzerland imported them depended to a large degree on the harvest in the cultivating countries, not on trade costs. Because the quantities are so large, including grains has undue influence on the results.[46] As the grain trade is not the focus of this study, they are thus omitted from the analysis. The final list of 240 items covers a wide range of imports ranging from commodities other than grain, to semi-manufactured and manufactured goods.[47]

For each of the 240 goods, there are, in principle, 61 potential trading partners for two years. This results in 29,280 potential observations. Naturally, many of these observations are zero. Furthermore, trading flows below the value of 500 franc were, at least in some cases, subsumed in a residual category. Unfortunately, the rule for when those were included and when not, is not given in the trade statistics. For consistency reasons, it is thus necessary to drop all trade flows that do not meet this threshold in either year. Finally, 4762 import flows remain above if the threshold.[48]

Empirical Strategy

In the first step the disaggregated data allows me to confirm the puzzle by estimating the following equation:

[44]Alternatively, one could follow the approach by Bromhead et al. (2017), who build SITC classifications for historical trade data.

[45]For a meaningful analysis of changes in the distance elasticity, it is necessary that a good was imported from multiple trading partners. As a rule to be included in the estimation, it was required that at least eight non-zero import flows exist. The results are not sensitive to changing this threshold to four or six import flows. A threshold of two would lead to dropping the observation in the model presented on the following page due to perfect collinearity with the good-year fixed effect.

[46]In fact, the noise introduced is so strong that it renders the results for the first specification in Table 5.3 insignificant. In the less rigid specifications (second and third column), the coefficients even flip and become significant. In contrast, including the grain data has no effect when good-specific elasticities are estimated (Section 5.4.3). In that exercise, their influence is limited because they comprise only 8 of the 248 observations.

[47]A full list is given in Appendix 5A.3.

[48]Dropping this sample restriction, one retains a total of 6166 observations for 251 goods. The results remain virtually the same, except for one specification (see Appendix 5B.4).

$$m_{g,i,t} = \beta_{\Delta} ln(dist_i) * t_{1931} + \alpha_{g_i} + \eta_{g,t} + t_t + \epsilon_{g,i,t} \tag{5.11}$$

in which $m_{g,i,t}$ is the import in Swiss franc of good g from country i in year t. Interacting, the logarithmised distance $ln(dist_i)$ with the time dummy for 1931 t_{1931} allows me to capture the change of the distance coefficient between 1927 and 1931.[49] The corresponding coefficient of interest is denoted β_{Δ}. Trading partner specific characteristics are captured by the country-product fixed effect α_{g_i}. Including this fixed effect is of particular importance as it captures, for example, how large the industry producing good g in the trading partner's country is. $\eta_{g,t}$ denotes a good-time fixed effect. It captures the Swiss demand for a certain product in each year. This makes sure that all identifying variation comes from the geographical composition of imports on the goods-level over time.

Berthelon and Freund (2008) show that the change in the distance sensitivity varies across goods. They thus propose to estimate the distance elasticity on the industry level. This study adapts their approach to the data gathered for this study. Rather than industry-specific estimates, it provides good-specific estimates for the change of the distance elasticity β_i for each of the i goods by estimating the following equation:

$$m_{g,i,t} = \beta_{\Delta,g} ln(dist_i) * t_{1931} * G_g + \alpha_{g_i} + t_t + \epsilon_{g,i,t} \tag{5.12}$$

in which G_g is an indicator variable for each good. As before α_{g_i} is a trading partner-good fixed effect. t_t denotes a time fixed effect capturing the general decline of demand from 1927 until 1931.[50]

This approach allows us to analyse the distribution of the 240 good-specific estimates of the changes of distance elasticity $\beta_{\Delta,g}$. Specifically, we can analyse the mean and distribution of the changes in the distance elasticity. If the mean of these 240 distance elasticities is positive, this signals that, on average, distance has become less important.[51] Furthermore, the variation across varieties provides us with the opportunity to analyse the drivers of the distance elasticity. Specifically, I estimate:

[49] Tracking the changes of the distance coefficient this way is common in the trade literature (Bergstrand et al., 2015).

[50] In an alternative specification (not shown), I replace the time fixed effect t_t with the good-specific time fixed effect $\eta_{g,t}$. Unfortunately, the number of trading partners is too small for certain goods such that this leads to two extreme outliers. However, the main result of this study, the sensitivity of the distance coefficient with respect to tariff changes, remains qualitatively unaltered.

[51] Recall that the distance elasticity is negative per se. If it increases (decreases in absolute terms), this means that distance has become less important.

$$\beta_{\Delta,g} = \beta_1 ln(Product\ Varieties) + \beta_2 \Delta ln(1+\tau_g) + \beta_3 \Delta ln(P_g) + \epsilon_i \quad (5.13)$$

in which *Product Varieties* denotes the the number of product varieties (number of total trading partners) from which the good is imported. $\Delta ln(1+\tau_g)$ denotes the ad valorem change of the tariff for good g between 1927 and 1931. Finally, $\Delta ln(P_g)$ captures changes in the average price of the good. As argued before, the price changes and thus the changes in the tariff are exogenous as Switzerland could not influence the price of individual goods on the global market.

Confirming the Decreasing Importance of Distance

Table 5.3 reports the results for the first empirical specification outlined above. This specification includes country-product and product-year fixed effects. The former ensures that the general size of the trading partner's industry is controlled for. The latter captures the Swiss demand for each good in each year. This renders the inclusion of two other potential fixed effects, a product group/industry-year and a time fixed effect, obsolete as they would be perfectly collinear with the product-year fixed effect. Because of the included fixed effects, all identifying variation for the coefficient of interest stems from changes in the geographical composition of trading partners at the good level.

TABLE 5.3: THE CHANGING IMPORTANCE OF DISTANCE - AN IMPORT DEMAND FUNCTION APPROACH

	Imports	Imports	Imports
Distance *x* $Time_{1931}$	0.18^{***}	0.11^{**}	0.12^{**}
	(0.04)	(0.05)	(0.06)
Fixed Effects			
Country-Product	✓	✓	✓
Product-Year	✓		
Product Group-Year	(✓)	✓	
Year	(✓)	(✓)	✓
N	4762	4762	4762
Products	240	240	240

Notes: The symbol (✓) indicates that the fixed effect is collinear with another fixed effect and thus accounted for in the estimation. Standard errors in parentheses; * $p < .10$, ** $p < .05$, *** $p < .01$

The coefficient reported in the first column suggests that the distance elasticity changed by .18 from its level in 1927. As the level of the distance elasticity is negative, this implies that distance must have become less important (a level elasticity closer to 0). This estimate does not only confirm the change of the distance elasticity in the disaggregated trade data. It also corresponds well to the magnitude of .2 found in the aggregated trade data (Section 5.3.3). The second and third column in Table 5.3 report alternative specifications with less restrictive fixed effects. The second column includes fixed effects at an industry level.[52] Thus only the industry-specific demand is controlled for. Finally, the third column replaces this fixed effect with a time fixed effect. In consequence, only the general fall in Swiss demand between 1927 and 1931 is controlled for. The magnitude and the precision of the estimates for these less restrictive specifications decrease slightly, but the results qualitatively and quantitatively similar. While the first specification is preferred for the reasons outlined above, it is re-assuring that these specifications confirm the result that distance became less important for trade between 1927 and 1931.

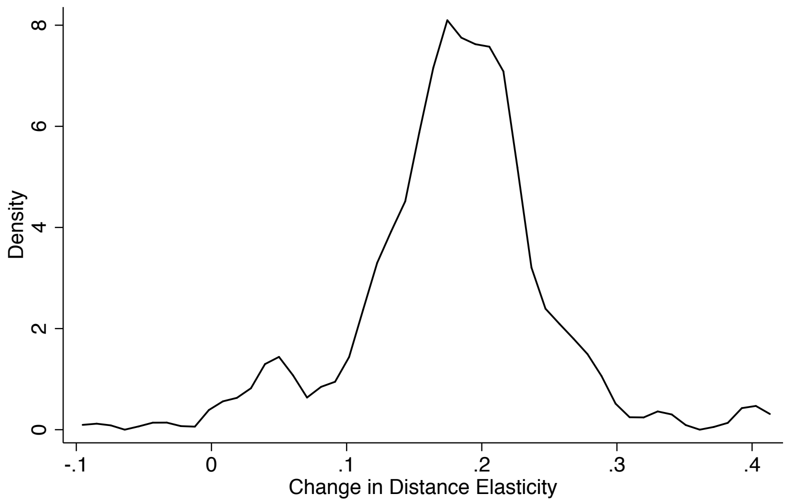


FIGURE 5.10: Distribution of changes in distance elasticities

Note: Own Calculation.

As outlined above, an alternative way to answer the question whether the importance of distance declined during this period is to estimate good-specific elasticities. Based on the estimation of equation 5.12, Figure 5.10 plots the kernel density of the 240 good-specific estimates of the changes in the distance elasticity. While not perfectly so because of the relatively small number of observations, the

[52]The classification follows the one in the source material (Austrian National Committee of the International Chamber of Commerce, 1927).

distribution of the changes of the distance elasticity looks remarkably Gaussian. This is reassuring as Berthelon and Freund (2008) find the same for their sample based on modern data. Moreover, it shall give us confidence when interpreting the mean increase in the good-level elasticities: $\bar{\beta}_{\Delta,i} \approx .17$. It indicates that, averaging across all goods, distance has become a less important friction for trade.

In sum, estimates derived from good-level data from Switzerland confirm the declining importance of distance. Not only is the qualitative result identical, but the magnitudes are very similar to those found when using aggregate bilateral trade data. In contrast to the macro-level results presented in this study, the granularity of the data allows us to identify the drivers of the change in the importance of distance during this period.

What drives changes in the distance elasticity?

Table 5.4 displays the results from estimating equation 5.13. The dependent variable is the estimated change in the distance elasticity from 1927 to 1931. This change is regressed on three variables. The coefficient for the number of existing product varieties is expected to be positive. As the number of trading partners increases, it becomes more likely that one or a number of them are significantly further afar. Only substituting a variety from a (geographically) close trading partner for one from a trading partner further away and vice versa will affect the distance elasticity.[53] The second independent variable Δ *Tariff* is the change in the ad valorem equivalent tariff. The third variable Δ *Price* captures changes in the average price of the good.

As expected, the three specifications show a positive effect of changes in tariffs and the number of product varieties on the distance elasticity. A 10 % change in the ad valorem equivalent tariff, roughly corresponding to the mean change across all goods,[54] increases the distance elasticity by .13. This implies that tariff increases made distance significantly less important in statistical and economic terms. The coefficient for the number of varieties is .04. Because the variable is expressed in logarithms, the estimated effect is no longer linear. It is thus helpful to relate it to the standard deviation ($\approx$ 4.5) and mean ($\approx$ 10) of the sample. The mean number of varieties was 10 and the standard deviation around 4.5. For goods with one standard deviation ($\frac{14.5}{10} - 1 = 45\%$) more of varieties than the

[53]To be less abstract, consider the following example. If Switzerland imports a good from 20 different countries, the probability that at least one of the varieties does not come from its neighbours is one. If Switzerland imports varieties from only four countries, this is not the case.

[54]The sample mean for the variable Δ $Tariff$ is .11, reflecting a mean change of 11 % ad valorem.

sample mean, the distance elasticity increased $ln(1.45) * .004 \approx 0.015$. Relative to the effects of the number of varieties, the changes in tariffs were thus the more important driver of the changes in the distance elasticity.

TABLE 5.4: DRIVERS OF THE CHANGES IN THE DISTANCE ELASTICITY

	Δ Elasticity	Δ Elasticity	Δ Elasticity
ln(Product Varieties)	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)
Δ Tariff		0.13**	0.11*
		(0.06)	(0.06)
Δ Price			-0.00
			(0.00)
N	240	240	240
R^2	0.06	0.08	0.08

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$. Appendix 5B.3 shows the plots for the conditional effects of tariff changes and the number of varieties.

In contrast to the number of varieties and changes in tariffs, price changes do not serve as a good predictor for changes in the tariff elasticity. This is perhaps not too surprising. While the level of the price might signal quality, and higher quality goods might be less sensitive to transport costs in general, this signal does not necessarily apply to price changes.[55]

For the model as a whole, the R^2 suggests that the variables included in the estimation can only explain a small part of the variance of the dependent variable. This is not necessarily concerning as it does not inevitably imply that important variables have been omitted. In the framework presented here, the dependent variable itself is an estimate. This introduces a further element of noise, which is then reflected in the low R^2.[56] One obvious solution to this problem is to simply add more data. While the cost of collecting such data are high, this seems the appropriate strategy to make the above findings more robust by increasing the model fit.

[55] Another reason may be some collinearity with the tariff variable.

[56] Slightly higher R^2 values in similar regressions are found by Berthelon and Freund (2008). Most likely, this is because they (i) estimate the elasticity at the industry-level rather than the good-level and (ii) can draw on a much larger dataset.

In sum, the estimates shown in this section lend support to the hypothesis that the increase in tariffs caused the decline in the importance of distance. In statistical terms, the number of varieties available to Swiss importing businesses is also significant. In terms of economic magnitude, however, this effect is small. After all, tariffs were the main driver of the changes of the distance elasticity.

5.5 Conclusion

This study offers new insights into the relationship between physical and political trade frictions in the interwar period from three different perspectives. All of them prove fruitful, especially when combined.

The macro evidence suggests that distance became less of an obstacle to trade during the interwar period. This is puzzling as the micro-data on transport costs substantiates the claim by Estevadeordal et al. (2003) that, if anything, real transport costs were increasing. When internal trade and distances are accounted for the puzzle disappears. Theoretical considerations illuminate the mechanism through which this result, most likely, appears. Increasing tariffs make varieties from countries afar relatively cheaper. Thus, the magnitude of the distance coefficient does not depend on distance alone but also on non-distance related trade costs. When tariffs increase it seems like the world is becoming closer, as transport costs matter relatively less.

Exploiting exogenous variation in tariff rates for Swiss good-level import data, the final part of the study confirms the validity of the mechanism. The increase in tariffs limited the importance of distance. This causal evidence corroborates insights from the comparison of the relative magnitudes of changes in tariffs and transport costs. Those render it unlikely that transport costs played a major role for the fall in world trade. Measured by real price indices and thus relative to previous values, increases in transport costs seem very large. However, this metric teaches us little about the changing size of the transport wedge for international trade. Ultimately, the ad valorem equivalent magnitude matters. If accounted for in such terms, the changes in tariffs are much larger than those in transport costs. Hence, political trade barriers, not transport costs, must have brought down world trade in the 1930s.

The implications of this study are not limited to the role of trade frictions during the interwar period. They also provide fresh evidence for the debate surrounding the post-war distance puzzle, a prominent topic in the international trade literature. In fact, they lend support to Yotov's (2012) insight: whenever we measure the distance elasticity of trade in international data, we measure the importance of distance relative to other trade costs.

5.6 Appendices

Appendix 5A Data

5A.1 Peg Measure

Exchange rates for all countries vis-a-vis with the US-$ ($e_{i,us}$) are provided by Global Financial Data (2015). I transform these to bilateral exchange rates via cross-calculation to the bilateral exchange rate e between countries i and j:

$$e_{i,j} = \left[\frac{e_{i,us}}{e_{j,us}}\right]^{-1} \tag{5.14}$$

To determine whether a country pegged its currency, I follow Mathy and Meissner (2011) and calculate for every month of a year whether the exchange rate remained within a two percent band relative to the annual exchange rate:

$$Peg(e_{i,j,m}) = ln(e_{i,j,m}) - ln(\sum_{m=1}^{12} \frac{e_{i,j,m}}{12}) \tag{5.15}$$

$$\mathbf{I}_{Peg_{ij}} = \begin{cases} 1 & if \quad Peg \in [-0.02, 0.02] \\ 0 & if \quad Peg \notin [-0.02, 0.02] \end{cases}$$

If the indicator variable $I_{Peg_{ij}}$ equals 1 in eleven of twelve months for a given year, the bilateral exchange rate regime between i and j is classified as a de facto peg.

5A.2 Grain Prices and Freight Rates

This part of the Appendix presents briefly the sources for all routes and prices presented in the paper:

New York - Hamburg

Freight Rates: various issues of Statistisches Reichsamt (1926–1937). The monthly data is recorded in the "Verkehr" section.

Prices: St. Louis quality is assumed and the prices are taken from various issues of International Institute of Agriculture (1925–1937a).

Exchange Rates: Global Financial Data (2015)

Conversions: Freight rates are in tons. One bushel is 27.216 kilogram (U.S. Department of Commerce, 1994).

North Atlantic - United Kingdom

Freight Rates: Wickizer (1938, p. 116)

Prices: Average price calculated from St. Louis and Manitoba Wheat from International Institute of Agriculture (1925–1937a,-).

Exchange Rates: Global Financial Data (2015)

Conversions: No conversions necessary.

La Plata - United Kingdom & Continental Europe

Freight Rates: Wickizer (1938, p. 117)

Prices: Weekly prices for 1925–1926 in Paper Pesos were taken from the 1928/1929 publication ofInternational Institute of Agriculture (1925–1937a, p. 476). These were then converted to monthly averages. Thereafter monthly averages in gold francs per quintal were taken from the 1931/1932 (p. 640) and 1935/1936 (p. 858) publication of International Institute of Agriculture (1925–1937b).

Exchange Rates: Global Financial Data (2015) and the 1935/1936 publication of International Institute of Agriculture (1925–1937b, p. 857)

Conversions: Paper Pesos are converted using the GFD exchange rate. Thereafter conversion factors are given in International Institute of Agriculture (1925–1937b, p. 857).

Australia - United Kingdom & Continental Europe

Freight Rates: Wickizer (1938, p. 117)

Prices: Monthly Prices are taken from Statistisches Reichsamt (1936, p. 529) Statistisches Reichsamt (1937, p. 178) and are given in shillings and pence.

Exchange Rates: Global Financial Data (2015)

Conversions: Prices are converted into Pounds. 12 Pence are one Shilling and 20 Shillings are one Pound.

5A.3 List of Items - Disaggregated Trade data.

TABLE A5.1: ITEMS AND SUMMARY STATISTICS

Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Agricultural produce		
Malt	3.05	10
Wheat flour	9.86	7
Alimentary pastes	20.11	4
Figs	0.31	11
Lemons	8.44	7
Oranges	19.80	7
Grapes	20.91	15
Apples	2.81	15
Plums	6.03	7
Apricot-Marmalade	33.91	23
Onions	14.63	12
Potatoes	10.51	16
White cabbage	14.63	12
Sugar	22.40	7
Cacao, powdered	26.79	5
Chocolate confectionery	18.13	25
Confectionery	18.13	25
Cattle, oxen	9.08	10
Meat-Swine	20.85	8
Beef, fresh	13.96	7
Ham	13.84	17
Sausages	12.63	12
Eggs of poultry	7.37	22
Cheese	8.08	11
Butter, fresh	4.63	18
Lard	10.98	11
Olive oil	3.89	4
Arachis oil (sweet oil)	7.39	12
Fish oil	1.08	11
Bone oil	1.08	14
Linseed oil	7.39	12
Meats preserved	23.07	15
Vegetables canned	23.06	13
Tomato paste	26.49	5

Table continues on the following page

ITEMS AND SUMMARY STATISTICS (CONTINUED)

Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Sardines in Oil	7.47	18
Beer	26.80	4
Wine	38.17	14
Wine Brandy (French Cognac)	13.78	10
	Chemical produce	
Colophony	0.57	5
Turpentine oil	0.46	5
Creams for shoes	15.77	10
Soap common	21.99	4
Soap, toilet	22.12	11
Stearin candles	13.98	6
Ochres	4.03	12
Earth colours	9.40	6
Minium	8.67	5
Zinc-white	2.32	8
Ultramarine blue	4.71	6
Mono-azo dyes	2.45	9
Printer's ink	6.71	8
Enamel lac white (interior)	11.01	11
Lead-pencils	4.93	8
Superphosphates	8.43	7
Nitrogen of potash	8.43	7
Sulphuric acid	8.78	5
Nitric acid	4.14	4
Hydrochloric acid	20.90	4
Tartaric acid	0.91	7
Caustic soda	2.05	6
Sodium sulphate	5.25	7
Sodium bicarbonate	1.96	6
Permanganate of potash	0.87	7
Chlorate of potassium	4.61	5
Blue vitriol	9.97	5
Superoxide of hydrate	4.61	6
Carbolic liquid Acid	1.54	12
Glue	7.21	9
Dextrine	8.77	6
Perfumes	16.64	13
Dynamite cartridges	25.19	6
Matches	27.93	8
	Textiles	
Cotton yarn, nr. 20	3.35	6
Cotton yarn, nr. 80	5.83	7
Cotton sewing thread	6.79	8
Linen yarn, nr. 18	3.27	10
Linen yarn, nr. 30	4.84	9

Table continues on the following page

ITEMS AND SUMMARY STATISTICS (CONTINUED)

Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Jute yarn, nr. 6	7.16	4
Twists of hemp, more than 1 millimetre diameter	12.98	10
Worsted yarn, nr 16, metric	4.04	8
Worsted yarn, nr 52, metric	1.88	8
Hand-knitting yarn of wool	6.35	9
Artificial silk, coloured and twisted	8.98	6
Molletons, raw, first quality	19.00	9
Cottons, raw, medium class	12.02	8
Fine shirtings (calicoes), bleached	15.77	9
Linings, black cloth	14.53	11
Blues of cotton	10.08	12
Zephyrs (shirtings)	15.01	10
Cotton velvet	3.57	9
Cotton ribbons	10.24	10
Oil cloth	10.66	8
Linen, raw	7.41	8
Linen ticks, plain	9.17	8
Linens, medium class, bleached, plain	10.21	6
Linen damasks	12.73	11
Water-proof clothes	9.84	7
Jute bags and sacks	23.69	4
Hemp hoses	10.31	4
Double woollens	8.45	13
Worsted, figured	2.24	15
Linings of silk	5.09	23
Ribbons wholly of silk	3.84	7
Gents' vests	13.91	12
Cotton gloves	4.79	5
Cotton stockings, American	6.75	12
Wool stockings	8.17	12
Knitted wool gloves	5.73	8
Ladies' pullovers	9.70	15
Stockings of artificial silk	10.21	11
Knicker trousers of artificial silk	11.26	12
Boot and shoe laces	14.46	7
Galloons of artificial silk	7.27	8
Buttons of linen yarn	10.40	21
Lace curtains	7.54	5
Laces, cheap quality	8.61	7
Machine embroideries, cotton	7.06	7
Jute floor coverings	17.79	9
Wool carpets	11.47	30
Linoleum	22.62	6

Table continues on the following page

ITEMS AND SUMMARY STATISTICS (CONTINUED)

Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Leather & rubber produce		
Hair felts for soles	7.73	7
Polishing felts	14.13	9
Paper felts	10.20	8
Gents ' wool hats	8.04	8
Gents fur hats	4.60	9
Ladies fur hats	4.98	7
Collars for shirts	10.61	6
Shirts, white	11.20	9
Overcoats of double woollens	9.23	17
Suits of cheap cheap cheviots	2.73	12
Ladies' costumes of woollens	6.89	12
Ladies' dresses of crepes de Chine	4.39	15
Ladies' fur mantles	3.48	19
Artificial flowers	3.60	4
Neckties	7.26	8
Rubber heels	5.73	12
Patent rubber hose	2.08	9
Rubber balls	14.88	14
Overcoats of rubber	10.53	11
Neat's sleek leather	11.42	5
Upper-leathers Box-calf	3.17	12
Gents' boots of box-calf	9.60	20
Children's boots and shoes, nailed	9.59	4
Trunks of vulcan fibre	21.43	9
Sheep skin Ladies' bags	6.06	21
Ladies' gloves	4.27	10
Leather driving belts, sewn	9.48	12
Wood & wooden ware		
Round timber, oak	1.25	29
Round timber, fir	7.31	10
Sawn timber, beech, unsteamed	9.54	22
Sawn timber (Fir or Pine)	14.79	15
Plywood, raw	11.58	17
Carpenters' work	20.35	7
Oak-wood barrels	18.93	6
Softwood kitchen furniture	14.76	14
Bentwood chairs	21.11	7
Bedroom furniture	15.30	19
Bottle corks	9.07	8
Celluloid	0.59	18
Artificial resin, raw	0.54	20

Table continues on the following page

ITEMS AND SUMMARY STATISTICS (CONTINUED)

Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Carving materials and goods made thereof		
Cellulose, bleached	11.22	9
Wrapping paper	11.84	6
Printing paper, medium quality	25.84	13
Tissue paper, white	20.32	10
Carbon paper	15.79	9
Note paper with envelopes in blotting book	22.15	7
Note books in Artificial Leather Cover	21.33	12
Cigarette paper in booklets	19.63	11
Stone, earthenware & glass		
Portland cement	35.17	5
Quick lime	17.28	7
Magnesite Bricks	20.72	8
Asbestos	16.05	9
Carborundum grinding disks	15.04	10
Grinding paper in sheets	19.00	6
Earthenware floor-covering	13.77	6
Earthenware plates, white	20.95	9
Porcelain plates, white	17.78	18
Porcelain insulators	9.29	10
Plate glass	13.42	6
Beer bottles	10.62	7
Tumblers with cut edges	9.43	13
Pressed glass	16.75	11
Iron and iron goods		
Steel iron, raw	4.63	11
Bar iron, round	8.82	9
Black iron-plate	14.69	10
Tin plate	6.58	8
Rolled hoop iron	5.71	10
Iron wire, unwrought	1.84	9
Iron wire, coasted with zine	11.07	10
Wire for binding flowers	19.15	9
Cast iron tubes	14.32	7
Gas tubes of wrought iron	2.41	13
Water conduit tubes	12.78	11
Fittings for gas pipes	5.11	9
Street canal grates	15.92	7
Cog wheel material of steel casting	12.98	11
Axles	20.01	10
Mine ropes	15.76	6
Cans of tin plate	14.80	11
Cans for milk-transport	15.82	12
Enamelled goods for household use	22.76	9

Table continues on the following page

ITEMS AND SUMMARY STATISTICS (CONCLUDING)

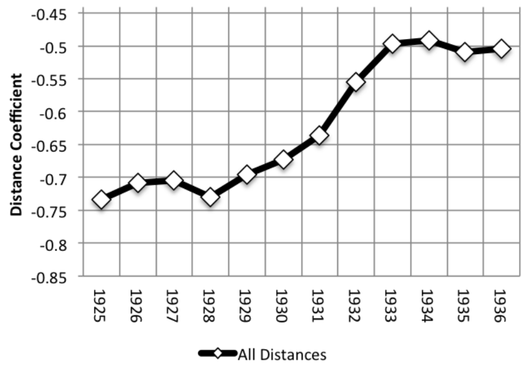
Item name	$\Delta ln(1+t)$ (in %)	Number of export markets
Scythes	5.97	7
Files	12.33	7
Spiral borers	8.18	11
Planes	14.23	11
Wire tacks	16.81	5
Iron screws with nuts	24.55	6
Link chains	25.52	6
Bedstands of steel tubes	11.07	10
Pocket knives	5.51	13
Pens	6.07	12
Goods made of metal other than iron		
Zinc plates	3.30	5
Copper plates	4.68	10
Aluminium plates	20.21	4
Copper Wire, 3.5mm	6.53	6
Wire for electric conduct	9.92	10
Lead pipes	4.92	5
Metal fabrics	4.40	4
Water conduit cocks	12.01	21
Tin tube	10.06	11
Electric reversible lamps, cast	17.38	10
Aluminium cooking Utensils	17.44	12
Alpaca Knives, Forks and Spoons, not silver-plated	9.83	10
Alpaca Knives, Forks and Spoons, silver-plated	4.23	12
Machines, vehicles & instruments		
Steam boilers	11.27	5
Threshing Machines with Beating Device	16.70	11
Ploughs for animal traction	12.77	8
Milk separators	6.02	9
Cotton weaving looms	9.92	7
Home sewing machines	18.07	8
Lever switches	5.25	14
Wall telephones	3.15	16
Electric flat irons	17.02	4
Electric glow lamps	6.84	12
Motor cycles	12.48	8
Bicycles	21.04	8
Typewriters	3.45	10
Pianos	4.59	8
Gramphones	21.34	12
Alarm Clocks	9.20	4

Note: Item names are given as in the original source. Some translations might thus sound somewhat antiquated.

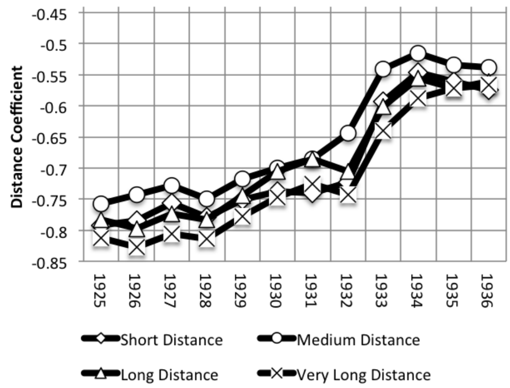
Appendix 5B Robustness

5B.1 Quartile Distances

FIGURE A5.1: The European Interwar Distance Puzzle



a) Single Distance Elasticity



b) Distance Elasticity by Quartile

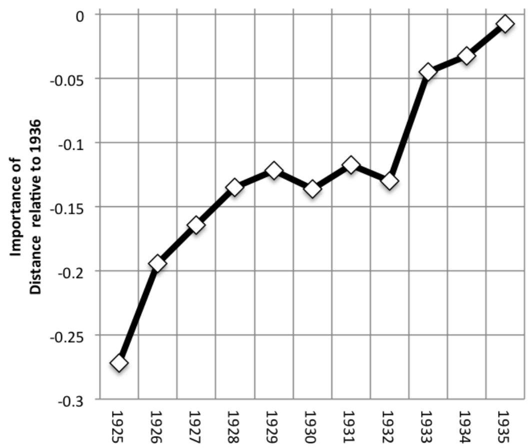
Distance elasticity estimates from repeated cross-sectional PPML gravity estimation of a balanced panel of 1222 intra- & extra European trade flows per year. No controls but importer and exporter fixed effects are included

5B.2 Estimation with full Sample

FIGURE A5.2: The Interwar Distance Puzzle - Full Sample (PPML)

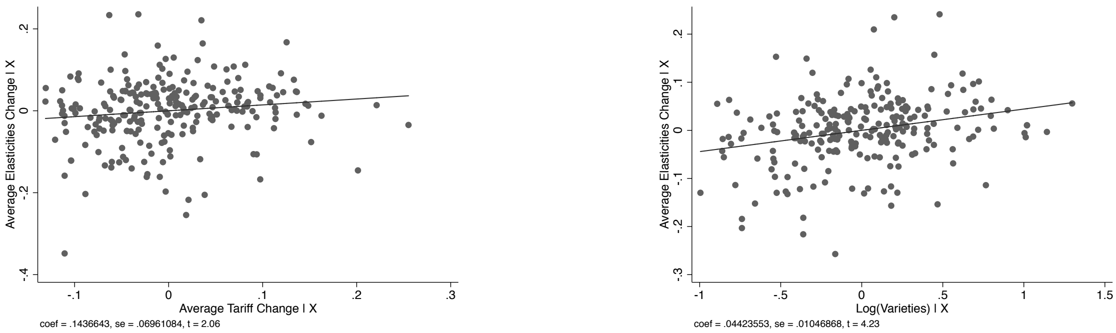
Repeated cross-sectional PPML gravity estimation of a balanced panel of 1704 global import flows per year.

FIGURE A5.3: The Interwar Distance Puzzle - Full Sample (OLS)



Repeated cross-sectional OLS gravity estimation of a balanced panel of 1687 global import flows per year with dyadic fixed, time-varying country, and time fixed effects.

5B.3 Graphical Representation of Conditional Effects of Tariffs and Varieties on Changes of the Distance Elasticity



a) Conditional Effect of Tariff Change

b) Conditional Effect of Number of Varieties

FIGURE A5.4: Conditional Effects of Tariffs and Varieties on the Distance Elasticity

5B.4 Robustness when including trade flows smaller than 500 Franc

TABLE A5.2: THE CHANGING IMPORTANCE OF DISTANCE - AN IMPORT DEMAND FUNCTION APPROACH

	Imports	Imports	Imports
Distance *x* $Time_{1931}$	0.18***	0.11**	0.12**
	(0.04)	(0.05)	(0.06)
N	6166	6166	6166
Products	251	251	251
Fixed Effects			
Country-Product	✓	✓	✓
Product-Year	✓		
Product Group-Year	(✓)	✓	
Year	(✓)	(✓)	✓

Standard errors in parentheses; * $p < .10$, ** $p < .05$, *** $p < .01$

Note: The symbol (✓) indicates that the fixed effect is collinear with another fixed effect and thus accounted for in the estimation.

TABLE A5.3: DRIVERS OF THE CHANGES IN THE DISTANCE ELASTICITY

	Δ Elasticity	Δ Elasticity	Δ Elasticity
ln(Product Varieties)	0.05***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)
Δ Tariff		0.11*	0.10
		(0.06)	(0.07)
Δ Price			-0.00
			(0.00)
N	251.00	251.00	251.00
R^2	0.12	0.13	0.13

Standard errors in parentheses; * $p < .10$, ** $p < .05$, *** $p < .01$

5B.3 shows the plots for the conditional effects of tariff changes and the number of varieties.

Chapter 6

Conclusion & Implications

"I would like to say to Milton and Anna: Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again."

Bernanke (2002)[1]

Abstract

The conclusion of this thesis draws implications for the economic history and macroeconomics literature. Moreover, it lays out some wider policy implications. Even though we might not be able to learn from history what to do, studying the Great Depression suggests that history may teach us what not to do.

[1]On Friedman's 90th birthday referring to the FED's policy mistakes during the Depression.

This concluding chapter will not repeat the motivation, analysis, results and contribution included in each of the chapters. Instead, by synthesising the presented work, it briefly outlines implications for the academic and political discourse and highlights avenues for future research.[2]

6.1 Implications for Economics and Economic History Debates

The following paragraphs draw out two major implications for economic history research and then present two broader implications for the trade and macroeconomic literatures.

A "real" link between the "old" and "new" views of the Great Depression

Eichengreen (2004, p. 1) distinguishes the "new" (global) and "old" (US-centric) views of the Great Depression. A consensus view would admit the relevance for both, the faulty international monetary system and national policy mistakes. Such a view has to specify the transmitter of the crisis, which not only ties the "old" and the "new" view but indeed countries around the world together. Eichengreen highlights financial and monetary links. Complementarily, this thesis provides evidence for another powerful link, which could explain the variance in the Great Depression around the globe: the trade channel. Of course, it is not a substitute for the gold standard view of the Depression. It cannot, and in fact does not aim to, explain the Depression in the core industrialised economies. Nor does question the importance of leaving the gold standard for the recovery or the importance of financial contagion, the latter of which even focuses on other outcome variables. Yet, a salient feature of such trade view on the Great Depression is that it has the potential to explain much of the heterogeneity of the Depression's onset around the globe, its severity and timing in particular. In doing so, it shifts the role of crippling export markets from being a consequence to being an important contributing factor. This holds particularly true for small open economies. Inevitably, such view poses another question.

[2] The views presented here emanate from my reading of literature and the analysis presented in this thesis. To improve readability for this concluding chapter, only key references are given. As such, this part of the thesis should not be read as a "stand-alone-chapter." The reader is kindly referred to the respective chapters for more detailed references.

The contribution of protectionism to the Great Depression

If the fall of trade contributed a great deal to the Great Depression in small countries, what was the role of the rise in protectionism for the fall in incomes? Not least because any answer to this question will remain necessarily speculative at this point, Chapter 3 has largely circumvented it. Yet, the concluding chapter of a thesis seems the appropriate space for such speculation.

The work on the trade channel provides the key ingredient – the estimate of the trade multiplier – to come closer to an answer. In light of the scale of interwar protectionism, it is surprising that, to the best of the author's knowledge, the only attempt to quantify the effect of protectionism in the 1930s on global GDP is Irwin's (2012, p. 111f) back-of-the-envelope calculation. The below calculation generally follows his approach but introduces two important modifications. Firstly, it estimates the fall of global trade caused by protectionism using the same framework used in Chapter 4.[3] Secondly, it applies the trade multiplier identified in Chapter 3.[4] Table 6.1 provides the corresponding parameters and results.

TABLE 6.1: THE EFFECT OF PROTECTIONISM ON GLOBAL GDP: A BACK-OF-THE-ENVELOPE CALCULATION

Observed changes in tariff level and GDP data				***Implied fall of trade due to protectionism***	
tr^{global}_{1929}	$\Delta tr^{global}_{1929-32}$	$X^{global}_{1929} / Y^{global}_{1929}$	$\Delta Y^{global}_{1929-32}$	$\Delta X^{global}_{1929-32}$	$\Delta X^{global}_{1929-32} / Y^{global}_{1929}$
15 %	8 %	11 %	-12 %	-23 %	-2.51 %

Trade multiplier	***Effects on income***	
m_x^{TB}	ΔY^{Prot}	$\Delta Y^{Prot} / \Delta Y^{global}_{1929-32}$
0.7	-1.76 %	15 %
1	-2.51 %	21 %

Notes: tr^{global}_{1929}: global tariff level in 1929; $\Delta tr^{global}_{1929-32}$: Change in global tariff level between 1929 and 1932; $X^{global}_{1929} / Y^{global}_{1929}$: Export to GDP ratio for 1929; $\Delta Y^{global}_{1929-32}$: Change in global GDP; $X^{global}_{1929} / Y^{global}_{1929}$: predicted fall in world trade between 1929 and 1932 based on changes in tariffs (see text); $\Delta X^{global}_{1929-32} / Y^{global}_{1929}$: Change in exports over 1929 GDP; m_x^{TB}: Trade multiplier; ΔGDP^{Prot}: Fall in world GDP due to protectionism; $\Delta Y^{Prot} / \Delta Y^{global}_{1929-32}$: Share explained in total fall of global GDP.

[3] In contrast to Irwin's calculation, this circumvents the problem that the observed fall of trade in a certain time period is endogenous to the fall in income during this period.

[4] Irwin employs Feyrer's (2009) estimate for the elasticity of income with respect to trade, which he identifies from the closure of the Suez canal.

The world tariff level was $tr_{1929} \approx 15\%$ in 1929 and reached $tr_{1932} \approx 23\%$ at its peak in 1932 (Clemens and Williamson, 2004).[5] It is important to point out that these values constitute a lower bound and must necessarily underestimate the increase in protectionism.[6] Plugging the initial tariff level and the change from 1929 to 1932 into a system of equations, such as in Chapter 4, suggests that the rise of protectionism caused global trade to fall by 23 % between 1929 and 1932.[7] Given an approximate global export to GDP ratio of 11 % in 1929,[8] it follows that trade must have fallen by about 2.5 % in terms of the 1929 GDP due to protectionism.[9] Multiplying this fall with the impact multiplier of .7[10] implies that the increase in world protectionism led to a fall of 1.8 % in global GDP. Allowing for some dynamic effects by assuming a multiplier of around 1 implies a fall of around 2.5 % in global GDP. Given a 12 % fall of global GDP between 1929 and 1932,[11] these magnitudes imply that protectionism could explain around 15-20 % of the global downturn.

Though very conservative assumptions have been made throughout this back-of-the-envelope calculation, the very nature of such calculation is explorative rather than definitive. The fact that the estimated effect is likely to be a lower bound estimate should be as much as an illumination of the relevance of trade for the Depression as an agenda for future research. Much more systematic work is required. Firstly, it should incorporate trade costs other than tariffs. Secondly, it should investigate the phase of the recovery more closely rather than focusing on peak-to-trough values. Finally, the inclusion of the United States hides the large asymmetries in the impact of protectionism across the globe. Given its dominance in the sample and its status as a large but relatively closed economy, the effects of the rise of protectionism on small open economies must have

[5] This constitutes the unweighted average of a balanced sample of 31 countries.

[6] Because of its ex-post nature, taking the tariff-revenue-to-import ratio $\frac{\sum Revenue}{\sum Imports}$ does not account for the role of prohibitive tariffs (O'Rourke, 2000, p. 462). Furthermore, it does not include non-tariff barriers to trade such as quotas and exchange controls. Given their rise and importance during the 1930s, this proxy must thus necessarily underestimate the increase in protectionism.

[7] Specifically, I compare the world in 1929 to the one in 1932 in the same vein as equations 4.4, 4.5, 4.7 do.

[8] See Federico and Tena-Junguito (2017). Their estimate is consistent with the one by Klasing and Milionis (2014, Figure 5), who rely on a larger sample but apply a shortcut method to estimate nominal GDPs.

[9] Given an observed 5-6 % total fall of the global export-to-GDP ratio, this number corresponds well with the work by Madsen (2001). He attributes about 50 % of the fall in world trade to increased protectionism.

[10] See Chapter 3.

[11] Global GDP is defined as the sum of all available GDPs (51 countries) from Maddison (2007). Including the estimates for the Soviet Union reduces the fall from 11.74 % to 10.5 %.

been much larger in these than reflected by the global average. While the estimates above call for further research on this question for the Great Depression period, they also have broader implications for the trade literature. In particular, they pose the question whether or not the gains from trade are time- and state-dependent?

The theoretical and empirical gains from trade - statics and dynamics

The above calculation represents an estimate of the "lost" gains from trade. It thus mirrors what the theoretical trade literature refers to as the gains from trade. In a recent seminal paper, Arkolakis et al. (2012) demonstrate that the below formula for measuring the gains from trade follows from a large class of trade models:

$$\Delta W_d = \Delta \lambda^{-\frac{1}{\epsilon}} \tag{6.1}$$

where ΔW_d is the change in real income, $\Delta\lambda$ denotes the change in domestic expenditure,[12] and ϵ the trade elasticity. With such few data constraints, it is possible to calculate the gains from trade in terms of GDP. The formula can then be employed for an ex-post welfare evaluation of a certain policy or for assessing the gains from economic integration relative to autarky.

Indeed, Federico and Tena-Junguito (2017) provide such estimates based on a large new dataset covering the period 1830 to 2007. Despite using a trade elasticity that would over- rather than understate the gains from trade,[13] the "lost gains" from trade as identified in their study are around a mere 1.4 % for the years 1929-1932. At first sight, such magnitude is broadly consistent with the back-of-the-envelope calculation above (Table 6.1). Yet, it is important to note that in that calculation most conservative assumptions have been made in order to bias the results against finding a large importance for protectionism. There are two ways to interpret this result. Firstly, Federico and Tena-Junguito (2017) choose the right estimate of the trade elasticity even though it does not necessarily represent the most common one. Secondly and perhaps more likely, there is the possibility that there are important differences between the gains from trade

[12] Also defined as 1 minus the import penetration ratio.

[13] They apply a trade elasticity of 3.78 rather than the median point estimate of 5.13 by Head and Mayer (2014). As they concede, this biases the resulting welfare gains substantially upwards (Federico and Tena-Junguito, 2017, p. 618). Arkolakis et al. (2012, p. 95) report that the trade elasticity is typically estimated in the range between -5 and -10. As noted earlier in this thesis, subsequent research has provided a more precise "average" estimate of the trade elasticity. Head and Mayer (2014) report -5.13 in their meta analysis of a large number of gravity studies.

in static and dynamic environments. As vice and virtue, the gains from trade formula by Arkolakis et al. (2012) does neither take the structure of the economy and exports nor the time dimension into account. This is a virtue as it allows to calculate the gains from trade with very little data. Yet, it is a vice because it does not take into account that sudden increases of protectionism might lead to more dislocations than if the same change had occurred in a less rapid manner.

By providing a framework to estimate the export multiplier, this thesis lays the foundation to better address the dynamic aspects of sudden changes in protectionism and the associated lost gains from trade. Future research should thus aim to draw out this distinction more conceptually by investigating the precise mechanisms and providing more empirical evidence.

The importance of bilateral trade costs & the iceberg assumption

A response to the final broader implication for the macroeconomic literature would require more theoretical and empirical solutions rather than more evidence. When structural gravity models gained importance after the seminal contribution of Anderson and van Wincoop (2003), the relevance of differences in bilateral tariff levels across trading partners had already declined. This led to conclusions such as that the omission of bilateral tariff levels is not "serious" (Hayakawa, 2013). What holds true for modern data, however, does not necessarily do so for past episodes. Since the end of World War II, the General Agreement on Tariffs and Trade and later the World Trade Organisation have levelled tariffs across trading partners through the MFN mechanism. This resulted in a status quo, in which the omission of bilateral trade costs is unlikely to considerably bias coefficients of interest in gravity models. Before this levelling, however, trade costs differed substantially across trading partners. What does this mean for the application of gravity models to historical data?

To the extent that the omitted bilateral trade costs are not correlated with the variables of interest, the distinction between bilateral trade costs and their average[14] might be considered a niche topic in the trade literature. However, this is unlikely to be the case in practice. It seems inconceivable that the variation of bilateral trade restrictions is random with respect to policy variables such as the conclusion of regional trade agreements. When economists derive policy conclusions from their work, the economic magnitudes of the effects — and thus the

[14] This average is captured by the fixed effects in structural gravity models.

extent of the bias — matter. To understand the magnitude and direction of such biases better, seems an important matter for future research.

Finally, the chapter on the distance puzzle points to a related and well-known problem[15] of gravity models: trade costs are modelled as iceberg-type costs. Picturing this necessary modelling assumption as a reflection of reality is neither innocent nor innocuous. As soon as a non-proportional cost such as a specific tariff is introduced, one can observe significant effects on the geography of trade. Hence, future work should further explore the relevance of bilateral trade costs and modifications of the iceberg assumption.[16]

6.2 Policy Implications

As economic history is ultimately a study in historical political economy, some of the conclusions for the academic discourse lead to policy implications that can be viewed in light of recent post-Great Recession debates.[17] Those emanating from this thesis may rectify some judgements about the status quo. If we think of a counterfactual mirroring the 1930s, one is likely to become an optimist these days. The moaning about the slow progress of the World Trade Organisation seems ludicrous, the complaints about the instability of the political and economic climate perhaps premature, and the criticism about the inaction of policymakers in smaller countries during the crisis out of place. If we think instead of a counterfactual mirroring the *Golden Age*, the world is a dark place. Most likely, the truth lies somewhere in between. Policy as well as judgements about it should thus be based on counterfactuals on both ends of the spectrum. As the current discourse has developed a strong taste for pessimism, the following paragraphs focus on the optimistic view.

To begin with, it is important to contrast the short-term political or economic gain with the long-term economic and political costs. Once done, it is prudent to establish institutions that moderate change. A very characteristic of such institutions is that they are slow-moving. This vice in a *Golden Age* world can become a virtue in a *Great Depression* state of affairs. The judgement about the effectiveness of policies and institutions, however, should not only depend on a counterfactual

[15] See, for example, Hummels and Skiba (2004).
[16] Of course, this not to say that no such work exists.
[17] This insight lies at the heart of Eichengreen's (2014) analysis in the "hall of mirrors."

through time. It should also be understood, and in fact communicated, by the actual ability of policymakers to change economic outcomes.

Breaking up is costly and hard to reverse

While economists might disagree on the precise desirable level, and more importantly, speed of trade liberalisation, no serious economist would advocate for the levels of protectionism witnessed in the 1930s. In light of that consensus, this thesis provides an important lesson for policy. It took until the mid-1970s to recover pre-World War I openness levels.[18] Yet, the beggar-my-neighbour game contributing to interwar protectionism meant that the trade barriers were erected only in a few years time. Once granted, it took decades to unravel the protectionist privileges for whole economic sectors. This implies that a break-up of global trade integration is not only costly in the short-run. If one accepts the premise that freer trade, on average, leads to higher welfare, the costs of disintegration accumulate massively over time. When making decisions that put a relatively liberal trade order at risk, such long-term considerations should enter the calculus.

The value of safeguards & slow-moving institutions

Especially before 2007, countless political commentators[19] as well as academics[20] pictured institutions such as the European Union and the World Trade Organisation in a dire state. At the heart of the criticism was that the procedural barriers within these institutions prevented faster progress. This might have led some to even call into question the value of such institutions more generally.[21] While limited to the realm of commercial policy, this thesis provides an important insight for such critics. When assessing formal institutions like the above ones, it is important to take the state-dependency of the judgement into account. Depending on whether the economic environment is crisis-ridden or prosperous, the very

[18] See Klasing and Milionis (2014) for this metric. The work on the distance puzzle can be interpreted in a similar manner: It was only when the trade barriers from the 1930s were fully unravelled that distance gained importance.

[19] For example, see Martin Wolf's (2003) criticism on how France and India caused the collapse of the WTO ministerial meeting in Cancún in the *Financial Times*.

[20] Baldwin (2006) makes the argument that the complexity of the rules, the proliferation of bilateral and regional free trade agreements, the shift in bargaining power, and an increased emphasis on "fairness" make reaching the goal of progress in liberalisation more difficult. See also Sally (2004) for a similar critique focusing on the institutional barriers in the WTO decision-making process.

[21] Even though the authors argue against such a view, the title "Is the WTO passé?" of the recent literature review by Bagwell et al. (2016) provides testimony of that.

attribute of being "slow-moving" can have asymmetric effects for the fulfilment of the mandates of these institutions.

The progress of trade liberalisation as orchestrated by the World Trade Organisation provides a prime example of such state dependency. Many bemoaned the slow progress in trade liberalisation at a time in which the average protection level in WTO countries was about 4 %.[22] Historically speaking, the barriers were already incredibly low and thus the potential gains from pushing liberalisation further limited. This does not imply that the slow progress was something positive per se. However, it was the very inability to change the status quo quickly and the general commitment to liberal trade policies associated with a WTO membership that made an outbreak of 1930s style protectionism unlikely in the recent crisis. As much as the same inflexibility slows the World Trade Organisation in fostering trade integration, it facilitates to fulfil better another mandate – guarding against globalisation backlashes.

That the vice of prosperous times becomes the virtue in crisis times shall thus remind us of a core difference between large intergovernmental or supra-national institutions and independent treaties or bilateral contracts. As Irwin (2012, p. 171) points out, these formalised institutions represent a commitment device for the countries participating. Contrary to bilateral agreements, ending such commitments would incur very large costs. This might explain why the commercial policy experience of the Great Recession is so different from the one of the Great Depression. No such institution for commercial policy was present during the latter period. The incurring economic and political costs of this absence, a central theme of this thesis, mirror the economic and political value of institutions such as the World Trade Organisation. Slowing change in times of uncertainty is one of their major achievements. Not least, this characteristic is important for economies that heavily depend on the large economic players and for which a move towards economic autarky is even more costly.

Openness & policy space in small open economies

This thesis demonstrates the great importance of the fall of foreign demand for small open economies in the 1930s. In light of this finding, one might want to recast some judgements about policy responses of small countries during global economic crises. One lesson emanating from the analysis is that their power to

[22] The trade weighted average amounted to 4.1 % and the arithmetic one to 3.9 % (World Trade Organization, 2008, Appendix Table 7).

influence the own economic fate is limited. Whatever policymakers do — or fail to do — might only influence the observed fall in economic activity to a small extent. This shall not absolve them from making appropriate fiscal and monetary policy decisions to stem the tide. However, the judgment about their success requires the relevant counterfactual and contextualisation of their policy space.[23] Communicating the magnitude of this space remains a major challenge.

[23] Albeit in the German and thus quite different context, such an implication also stems from Borchardt's (1991) controversial hypothesis on Brüning's economic policy during the Depression.

Chapter 7

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