

LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

DEPARTMENT OF ECONOMIC HISTORY

DOCTORAL THESIS

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**Economic Growth, Regional Development, and Nation  
Formation under Socialism  
Evidence from Yugoslavia**

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*Author:*  
Leonard KUKIĆ

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# Declaration

I, Leonard Kukić, certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it). The copyright of this thesis rests with the author. Quotation from it is permitted, provided that full acknowledgement is made. This thesis may not be reproduced without my prior written consent. I warrant that this authorisation does not, to the best of my belief, infringe the rights of any third party.

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# Abstract

Yugoslavia provides a fascinating historical setting to analyse the consequences of socialism – the greatest socio-economic experiment of the 20th century. Yugoslavia was one of the fastest growing countries in the world until the late 1970s. During this period, it followed a different institutional trajectory compared to other socialist economies. But, during the 1980s, economic growth came to a standstill, and the country eventually descended into civil war.

This doctoral dissertation is motivated by the aforementioned observations. It seeks to analyse them. The core of the thesis is composed of three closely related, but self-standing, papers. The unifying theme of the three papers is economic development in socialist Yugoslavia. The first paper revisits aggregate economic growth in Yugoslavia. I find that distorted labour incentives caused the slowdown of the Yugoslav economy. I argue that labour-managed firms hindered the ability of Yugoslavs to work.

Since Yugoslavia was extremely heterogeneous, the second paper moves below the aggregate level in order to reconstruct the regional development trajectories. I find that regional income divergence was caused by the failure of the poorer regions to converge towards the employment rates and efficiency levels of the richer regions. I argue that this failure was caused by labour-managed firms as well, whereby they had a spatially uneven economic impact.

In Yugoslavia, regional economic tensions were reinforcing, and were reinforced by, ethnic tensions. In the third paper, I explore ethnic relations by analysing the formation of Yugoslav national sentiment and its economic effects. I find that ethnically diverse municipalities were conducive towards the formation of Yugoslav sentiment because they stimulated ethnic intermarriage. In addition, I find that municipalities that contained a larger amount of self-declared Yugoslavs experienced a lower population fraction of deaths during the Bosnian War of 1992-1995.

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Although I was interested in economics and history as long as I can remember, my interest in economic history flourished during my Bachelor degree in economics at the University of Utrecht and LUISS Guido Carli. I am grateful to the two inspiring teachers I had at the University of Utrecht - Rob Bolder and Mark Sanders. They nurtured my first academic love for macroeconomics, and for economic growth in particular. I am also grateful to my teachers at LUISS Guido Carli, Marcello De Cecco and Carlo Viviani. They taught me how to use economic tools to understand both present and past times. They developed my interest in applied economics. The teachers I had during my BSc strongly shaped my interest in (applied) economic growth and development. Since economic growth and development is a long-run process, the decision to subsequently study economic history at the LSE seemed like a natural choice.

The LSE and the Department of Economic History taught me what research really is. I am grateful to every single member of the Department, whether current or former. But, a few special thanks are in order to Stephen Broadberry, Albrecht Ritschl, and Joan Rosés. I would also like to thank Tracy Keefe and Linda Sampson for wonderful administrative support and chats.

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As I mentioned before, this thesis has roots that go much deeper than the four yours of my PhD. One of the critical decisions I had to reach, like everybody else has to in the same situation, was what to do after high school. My arts high school teacher wanted me to go to an art school. My boxing coach thought it would be foolish to go to a university, and much smarter to focus on boxing. Myself, I was torn between studying medicine and economics. My dad encouraged me to study economics abroad. I decided to study economics, and that decision led to this thesis, for better or for worse.

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# Chapter 1

## Introduction

### 1.1 Motivation

Doctors deal with unhealthy people. They diagnose illness and propose a remedy. Similarly, development economists deal with currently poor nations, while many economic historians deal with nations at a moment or period of time when they were poor. Many normatively-minded economists also propose remedies as to how countries can become richer and improve the welfare of their citizens on the basis of evidence drawn from our contemporary times or from history.

Yugoslavia was an unhealthy country for most of its history. However, some of its organs, Slovenia and Croatia, have been in a persistently better condition than other organs. Following the Second World War, Yugoslavia conjured an unorthodox remedy to its ills that was initially based on the Soviet centrally planned development model. Yugoslavia started deviating from the Soviet prescription in the aftermath of its fallout with the Soviet Union in the late 1940s. The Yugoslav authorities devised a unique remedy, subject to continuous experimentation. Power became decentralised. Decentralisation was applied not only to economic, but also to social and political life. Authoritarianism was replaced by self-government as a basic principle of economic and social organisation, at least ideologically. A central plan was replaced by many, often mutually competitive, plans.

It seems that this medicine had improved the condition of the country dramatically. Between the early 1950s and the late 1970s, Yugoslavia was one of the fastest growing developing countries in the world. In their comparison of the growth performance of fast growing developing economies at similar levels of development, [Balassa and Bertrand \(1970\)](#) find that Yugoslavia did better, during the 1950s and the 1960s, than the average of these economies, in terms of both output and total factor productivity growth rates.

Due to such and similar observations, many observers believed that the Yugoslav socialist system provided a viable alternative to both a market economy and a planned economy ([Horvat, 1982](#)). For

many observers on the “left” disillusioned with the Soviet brand of socialism, Yugoslavia provided a template for democratic and market socialism.

During the late 1970s and the 1980s, however, the medicine started failing: economic growth eventually ceased altogether. Yugoslavia initially staggered on, but the nervous system became hypersensitive. Economic tensions were reinforcing, and were being reinforced by, ethnic tensions. Eventually, the immune system collapsed, and the country stumbled and violently imploded.

This doctoral dissertation is motivated by the aforementioned observations on Yugoslavia. It seeks to analyse them. The core of the thesis is composed of three closely related, but self-contained, papers (chapters 2, 3 and 4). Although the three papers can be read independently of each other, they are unified by the theme of economic development in socialist Yugoslavia. The first paper revisits the sources of Yugoslavia’s economic growth during the post-war period. The second paper moves below the aggregate growth patterns to show that these sources of growth induced regional income divergence. The third paper explores the implication of this divergence by analysing the flip side of national disintegration - the strength of Yugoslav sentiment or national cohesion. Methodologically, the thesis also follows a logical sequence: it moves from a national-level, over regional-level, to a local-level analysis.

The economics behind development under socialist systems is of profound interest, both historically and theoretically. Socialism was the greatest socio-economic experiment of the 20th century. The Bolshevik Revolution inspired numerous other development models, including those of Nehru’s India and Mao’s China. Moreover, the experience of the Soviet, state-led development model, influenced the work of several generations of development economists, including Arthur Lewis, Roy Harrod, Evsey Domar, Alexander Gerschenkron, and Walt Rostow.

Yet, economists, beyond the Soviet Union and China, largely ignore the developmental experiences of socialist countries. The thesis seeks to rectify this. The study of Yugoslavia emerges as, perhaps, the most peculiar case from which we can learn about economic development under socialism. The aim of studying economic development in socialist Yugoslavia is to make a contribution to the fields of economic history and economic growth and development.

The thesis contributes to the study of economic history primarily by offering a detailed quantitative analysis of an otherwise under-researched part of Europe. It provides new facts, evidence, and interpretations - the “bread and butter” of economic history. This provision will allow other scholars to examine similarities and differences in economic patterns on the basis of a marginally increased menu of country case-study options from which to choose from.

The thesis contributes to the study of economic growth and development in two ways. First, it contributes by shedding some light on the perennial debates concerning the viability of state-led

development strategies. In particular, it contributes to the political economy of development literature, which highlights the importance of the developmental state in the industrialisation process (Amsden, 2001; Cimoli, Dosi, and Stiglitz, 2009), and the need to tailor policies to local economic and political realities (Rodrik, 2007). Methodologically, the thesis contributes to our understanding of development under socialist systems by moving from the comparative economics literature that focuses on modes of economic management (Horvat, 1982; Kornai, 1992; Djankov, Glaeser, La Porta, Lopez-de-Silanes, and Shleifer, 2003), to the neoclassical growth literature that focuses on economic performance. Second, the thesis contributes to the more recent but buoyant literature concerning identity, ethnic diversity, and nation formation (Akerlof and Kranton, 2000; Alesina and La Ferrara, 2005; Clots-Figueras and Masella, 2013).

The goal of the introduction to the thesis is to set the stage and motivate further the three papers that form its core. I first provide a summary of each paper where I focus on the motivation, methodology, and findings. I note how they all come together to form something that is, hopefully, more than a sum of the parts. Then, I provide a brief historical overview of the evolution of the Yugoslav economy within its social, political, and institutional context. Finally, I provide a literature review and highlight the contributions that my papers make to the relevant literature.

## 1.2 Paper summaries

### 1.2.1 Paper 1: Socialist growth revisited: Insights from Yugoslavia

Beyond the Soviet Union, we know little about how institutions and policies affected the performance of socialist European economies. This paper fills the knowledge void by analysing socialist Yugoslavia using a diagnostic tool that identifies the mechanisms that drive economic growth - business cycle accounting (BCA). BCA, developed by Cole and Ohanian (2002) and Chari, Kehoe, and McGrattan (2007), is based on a standard neoclassical growth model, but includes “wedges”. These wedges measure the deviations of an economy from the perfectly competitive market economy in the domains of labour, capital, TFP, and demand. The wedges measure distortions or incentives that firms and households face. This paper systematically studies these wedges and connects them to the policies and frictions in the Yugoslav economy. The aim of the paper is to determine the sources of Yugoslavia’s economic growth during the post-war period, while focusing on the causes of its growth slowdown.

Numerous policies and distortions might have shaped the evolution of the Yugoslav economy. BCA allows me to estimate the relative quantitative impact of various distortions on the Yugoslav macroeconomy. The methodology offers two useful features in particular. First, the computations are relatively easy to make, since the wedges are extracted directly from equilibrium conditions. Second,

BCA circumvents the difficulty of explicitly modelling policies over the long-run that entails imposing strong assumptions about the equilibrium of the economy. Under BCA, policies manifest themselves in wedges.

To the best of my knowledge, this is the first modern neoclassical analysis of the Yugoslav economy. Next to the work of [Cheremukhin, Golosov, Guriev, and Tsyvinski \(2015, 2017\)](#), it is also one of the first modern neoclassical analyses of socialist economies. This does not mean that previous researchers did not attempt to model the Yugoslav economy. On the contrary, various macroeconomic models of Yugoslavia have been created. [Sapir \(1981\)](#) analyses the impact of external migration on the Yugoslav economy between 1965 and 1972. He uses 38 endogenous variables whose coefficients are estimated through ordinary least squares and two-stage least squares. Then, he uses a counter-factual simulation to gauge the impact of external migration on the Yugoslav economy. [Gapinski, Škegro, and Zuehlke \(1989\)](#) create a model of Yugoslav economic performance containing 39 structural equations that are estimated in a similar fashion as the [Sapir \(1981\)](#) model. They are, however, interested more in the general dynamics of the Yugoslav economy, rather than its response to any specific shock.

What these macroeconomic models have in common is that the [Lucas \(1976\)](#) critique applies to them. [Lucas \(1976\)](#) critique maintains that any change in policy systematically alters the structure of econometric models, given optimal decision rules of economic agents. It is invalid to infer an impact of a simulated policy on the basis of coefficients assigned to considered variables derived from historical data. Rather, macroeconomic models should be based on “micro-foundations”, like technology parameters and preferences which presumably govern the behaviour of economic agents, as in the BCA methodology.

Using new methodology and revised data, this paper provides novel findings. During the “Golden Age” of economic growth, total factor productivity (TFP) became gradually more important in sustaining economic growth. Distorted labour incentives were a major constraint on growth since 1965, and explain the deterioration of the economy during the 1980s. The deterioration of labour incentives coincides with the 1965 socio-economic reforms. These reforms allowed the work councils of labour-managed firms to distribute income between wages and investment. I argue that this allowed labour-managed firms to approach their governing objective of maximising income per worker, distorting the ability of Yugoslavs to work.

### **1.2.2 Paper 2: Regional development under socialism: Evidence from Yugoslavia**

The second paper of the thesis turns the focus to regional development within Yugoslavia. In order to understand the development record of the largest economy in South-East Europe, it is necessary take into account the extreme heterogeneity of the country. Yugoslavia was a federation consisting of six Republics and two Autonomous Provinces. These regions were divided along ethnic, religious, cultural

and economic lines. Treating a highly heterogeneous developing country like Yugoslavia as a single entity entails an aggregation bias. One could argue the same for large diverse emerging economies like Brazil, China, India, or Russia (BRICs).

In Yugoslavia, initially more developed regions grew faster than initially less developed regions. Thus, a question arises; why did the less developed regions (LDRs) grow slower than the more developed regions (MDRs)?

This paper analyses the proximate sources of regional development trajectories in Yugoslavia. I utilise new estimates of output, as well as physical and human capital. I apply standard growth and development accounting methods to reconstruct the regional development trajectories. Since Yugoslavia was overwhelmingly agricultural in the aftermath of WWII, the accounting methods are adjusted in order to account for the impact of structural modernisation on efficiency and hence output, by using and extending the [Vollrath \(2009\)](#) dual economy model.

I find that the LDRs grew slower than the MDRs because they failed to converge towards the employment rates and TFP levels of the MDRs. I interpret these failures as symptoms of a capital intensity bias inherent to the governing objective of labour managed firms. Their governing objective to maximise income per worker caused substitution of capital for labour. The bias towards capital intensity stood in sharp contrast to labour surplus in the LDRs. Production was skewed towards the use of a relatively scarce factor of production, while the use of the relatively abundant factor was discouraged. In addition to mitigating the expansion of employment rates, this caused inefficiency.

This paper is a direct extension of the first paper of the thesis. The results complement each other. The findings of this paper imply that labour distortions were acute in the LDRs, while TFP gains were concentrated in the MDRs.

### **1.2.3 Paper 3: The last Yugoslavs: Ethnic diversity, national identity, and civil war**

In the third paper, I analyse ethnic relations in Yugoslavia since regional distribution of income coincided with the spatial distribution of ethnic groups. Regional income inequality infused ethnic nationalism and undermined social cohesion. More specifically, I research why some people felt Yugoslav - the flip side of ethnic nationalism - alongside the economic significance of this feeling. This topic contains wider policy relevance because nation-building policies are often proposed as a device for integration and conflict reduction in ethnically divided societies. However, empirical studies on the determinants and consequences of national feeling are rare.

Two features make Yugoslavia an ideal historical setting to study the causes and consequences of nation formation. First, the formation of Yugoslav identity failed, because the country dissolved. But,

there were people who felt Yugoslav. This is empirically useful, as it allows me to exploit the variation in the intensity of Yugoslav feeling across the country. Second, the country was extremely heterogeneous in terms of socio-economic conditions. This is empirically useful as well, since it allows me to exploit the said variation, and the relation of various socio-economic factors to national self-identification.

I find that ethnically diverse communities were conducive towards the formation of Yugoslav sentiment because they stimulated ethnic intermarriage. I interpret this to mean that intermarried individuals, and their children, opted for the more hybrid Yugoslav identity that provided an alternative to forcing a single choice to people with conflicting ethnic identities. I establish causality by instrumenting ethnic diversity with past state changes because historians argue that state changes caused shocks to ethnic composition of communities.

Did the formation of Yugoslav sentiment have any economic significance? It did. Aligned with the notion that nation formation can reduce the incidence of ethnic conflict, I find that Yugoslav identification is negatively associated with the population fraction of deaths during the Bosnian War of 1992-1995.

## 1.3 Historical background

### 1.3.1 Political, social and institutional narrative

Yugoslavia was divided along ethnic, religious, historical, cultural, and economic lines. It was extremely heterogeneous. The literature usually divides the country into two distinct areas ([Pleskovič and Dolenc, 1982](#); [Milanović, 1987](#); [Bateman, Nishimizu, and Page, 1988](#); [Pleština, 1992](#)). The first, in the north-west, comprised of Slovenia, Croatia and Vojvodina. These regions are commonly referred to in the literature as the more developed regions (MDRs). The inhabitants were mostly Catholics and used the Latin alphabet. With the Schism of 1054 that marked the final separation between the Eastern Orthodox Church and the Western Catholic Church, these regions fell under the jurisdiction of Pope Leo IX. They became firmly grounded in Western culture ([Lampe, 2000](#)).

The north-west had close ties to European economic centres. The coastal regions were exposed to Mediterranean trade under the Venetian rule, while the inland regions were part of the Austro-Hungarian Empire and belonged historically and culturally to Central Europe. By the late 19th century, the north-western regions became more deeply engaged with commerce and industrialisation than the other regions with which they would later form Yugoslavia ([Lampe, 2000](#)).

The second area, in the south-east, fell under jurisdiction of the Constantinople's patriarch with the 1054 East-West Schism. It was composed of Serbia proper (excluding the two Autonomous provinces Kosovo and Vojvodina), Macedonia, Montenegro, Bosnia-Herzegovina and Kosovo. These regions are

commonly referred to in the literature as the less developed regions (LDRs). Serbia proper is, however, an intermediate case. It followed the average of Yugoslavia across a range of development indicators throughout the course of the existence of the country. I therefore do not treat Serbia in the thesis as either a MDR or a LDR.

Serbia, Macedonia, and Montenegro were Orthodox Christians and used the Cyrillic alphabet. Bosnia was composed of a mixed Orthodox, Catholic, and Muslim population. Concerning ethnic and religious diversity, Bosnia was, figuratively speaking, miniature Yugoslavia. Kosovo was inhabited largely by Albanian Muslims, being the only Yugoslav region populated by a mostly non-Slavonic group.

Since the 15th century, the south-eastern regions were largely dominated by the Ottoman Empire. They were detached from European economic centres and were less industrialised than their north-western neighbours (Lampe, 2000). Regional inequality in socialist Yugoslavia had thus deep historical roots.

In the aftermath of World War I, and the collapse of the Austro-Hungarian and Ottoman Empires, these regions clustered together to form the Kingdom of Serbs, Croats, and Slovenes. The state was renamed to Yugoslavia in 1929. The idea of Yugoslavia, at the time, was a relatively modern concept - it was developed during the early 19th century. The primary aim of the leading proponents of “Yugoslavism”, who were overwhelmingly Croats, was the cultural unification of the South Slavs, primarily of Croats, Serbs, and the Slovenes. The formation of a common language was the critical mean as to how they attempted to achieve cultural unification. Possible territorial unification of the lands populated by the South Slavs was considered unrealistic (Wachtel, 1998).

The collapse of the Austro-Hungarian and Ottoman Empires led to a power vacuum in South Eastern Europe. A new geopolitical environment, coupled with threatening border disputes, particularly with Italy, allowed and motivated the South Slavs to form a common state. The concept of Yugoslavia was primarily a Croatian invention, but the actual construction of Yugoslavia was led by the Kingdom of Serbia.

MacKenzie (1994) argues that Serbia played a role among the South Slavs like Piedmont did in Italy and Prussia did in Germany. Serbia was a dominant force of integration because it became the first modern South Slav nation-state in 1878. It was often idealised by the Croatian and Slovenian intellectuals residing in the Austro-Hungarian Empire as providing a template for national unification (Wachtel, 1998). Serbia’s subsequent alliance with the victorious Entente in World War I conferred it additional political clout and capital.

For the majority of citizens of Yugoslavia, the newly formed country led to an immediate change in the size and operation of the domestic market. The north-western areas that were part of the relatively

prosperous Austro-Hungary, with a population of 59 million, now found themselves confined to a small backward market which numbered 12 million people (Bičanić, 1973). For pre-war Serbia, the opposite was the case. The creation of Yugoslavia led to an increase in the domestic economy from 2.9 million inhabitants to four times that size (Bičanić, 1973). Notwithstanding these differences, the country was poor and overwhelmingly rural. More than 70 per cent of the population was engaged in agriculture throughout the interwar period (Bičanić, 1973). There was a qualitative change for the north-western areas as well. The relatively liberal capitalism of Austro-Hungary was replaced by, what Bičanić (1973) calls, monopoly capitalism.

Integrating the economies of former Austro-Hungarian and Ottoman lands with those of war-ravaged Serbia and tiny, isolated, and backward Montenegro, was a daunting challenge. In addition to different cultures and languages inhibiting the creation of a unified nation-state, the newly formed country faced significant administrative difficulties. There were three banking systems, four railway networks and legal systems, five currencies, and six different custom areas in operation (Singleton, 1985).

The Karađorđević dynasty leading the country responded to the unification challenge by indulging in state-led industrialisation and protectionism (Lampe, 2000). The National Bank of Yugoslavia channelled preferential credit to south-eastern areas, primarily to Serbia. The development strategy was justified on the grounds of promoting egalitarian development of the country.

Such policies infused political tensions between the north-western areas and the central government in Belgrade, given that the vast majority of capital was generated in the north-western areas. North-western areas favoured devolution of political power to a regional level, while the central government in Belgrade favoured centralisation. Belgrade's stated aim was to integrate the national market and promote a feeling of Yugoslav identity through centralisation (Banac, 1984).

The zenith of political tensions was reached with the 1929 assassination of a leading Croatian politician, Stjepan Radić, by a fellow member of parliament in Yugoslav parliament. This motivated the King of Yugoslavia, Aleksandar Karađorđević, to abolish the constitution and declare absolute monarchy, which lasted until his 1934 assassination in Marseille.

Although various attempts of political and regional compromise were pursued and some achieved, Yugoslavia was unable to achieve real stability. A weak sense of common identity contributed to the fast collapse of the country under the German invasion of 1941 (Wachtel, 1998).

World War II led to a radical change in the political and economic landscape. The country was completely dismembered during the war. Croatia, together with Bosnia-Herzegovina, became a fascist puppet state under the Croatian *Ustaša* regime. Germany, Italy, Hungary and Bulgaria partitioned the remainder of the country. This led to economic and political disintegration of the country, further inflaming regional and ethnic tensions during the post-war period (Jović, 2009).

The strong anti-fascist resistance movement, led by the Communist Party of Yugoslavia (CPY), seized power after the end of WWII. CPY did not face significant political opposition in the immediate post-war period. It was legitimated by the fight against the Axis powers and their domestic collaborators. As such, CPY was backed, to an extent, by genuine popular support (Pleština, 1992). It was not simply installed to power by the Soviet Union as its Red Army swathed through Central and Eastern Europe and occupied the regions that would later become part of the Soviet Bloc.

The evolution of the socialist economic system in Yugoslavia can be divided into four distinct phases that can be perceived as a gradual move from central planning through market socialism to decentralised planning. The first period in the immediate aftermath of WWII was characterized by rigid central planning stressing heavy industrialisation. Agriculture, industry, and the financial system, was nationalised, except for petty trade and small-scale agriculture (Horvat, 1971). Industrialisation was pursued through forced savings, primarily derived from the agricultural sector. Consumption was squeezed, and the heavy-hand of the government channelled capital to heavy industries and infrastructure through the General Investment Fund. Different republican interests were mediated at the federal level, with the interest of Yugoslavia as a whole taking precedence, at least publicly (Milanović, 1987).

The initial development strategy was an application of the Soviet strategy that began with its first five-year plan in 1928. Soviet development model was influenced by the ideas of Grigory Feldman and Evgenii Preobrazhensky. Grigory Feldman argued that the rate of economic growth was limited by the capacity of the capital goods industry. Evgenii Preobrazhensky extended Feldman's argument by stressing the role of the state in mobilising resources. In particular, the development of the capital goods industry was to be funded by the agricultural surplus extracted through price distortions and other mechanisms, like collectivisation. Heavy industries would in turn spearhead industrialisation and ensure rapid catch-up growth.

Joseph Vissarionovich "Stalin" best expressed the wider ideological drive behind rapid industrialisation. At Moscow's First Conference of Workers in 1931, he said, among other things: "We are fifty or a hundred years behind the advanced countries. We must make up this gap in ten years. Either we do it or they will crush us." (Berliner, 1966) (p. 161).

The "split" between the Yugoslav president Josip Broz "Tito" and Stalin in 1947/1948 was a critical juncture in Yugoslavia's history. The conflict between Tito and Stalin was, in essence, a power struggle between Yugoslavia and the Soviet Union regarding the influence of these two countries in the Balkans (Rajak, 2011). The cause of it was Stalin's rejection of Tito's plans to absorb Albania, Bulgaria, and Greece in a new socialist Balkan federation. Tito's plan was to set up and lead a large Eastern European bloc that would be largely outside Moscow's control.

The immediate result of the split was Yugoslavia's isolation from the Socialist Bloc and expulsion from the Communist Information Bureau in 1948. There was furthermore a threat that Soviet Union would invade Yugoslavia; Soviet troops were amassed at the Hungarian border with Yugoslavia.

Yugoslav authorities were desperate to regain favour with Stalin because of the threat of invasion. The Tito-Stalin split initially led to an intensified implementation of the Soviet development model in Yugoslavia. By the end of 1947, Yugoslavia began collectivising agriculture, which was not seriously considered before (Woodward, 1995). By 1951, 25 per cent of agricultural holdings were collectivised. The response of the peasants was the usual one - agricultural output collapsed (Stipetić, 2012).

As the rapprochement with Soviet Union was impossible while Stalin lived, and as the danger of Soviet invasion subsided, Yugoslav officials sought to distance themselves from the Soviet Union and its ideology by constructing a unique version of socialism. This period marks the second phase of development that lasted between the early 1950s and the mid 1960s.

Yugoslavia began gradually integrating, both economically and politically, with the West. Yugoslavia became a member or observer of some international organisations in which the Soviet Bloc did not participate, like the GATT (General Agreement on Tariffs and Trade) and OECD (Organisation for Economic Co-operation and Development).

Opening of Yugoslavia towards the West was rewarded. According to official sources, between 1945 and 1965, the United States provided military and economic aid to Yugoslavia amounting to around 1.6 billion US\$ in current prices.<sup>1</sup> During the early 1950s, U.S. aid was equivalent to about 10 per cent of gross investment in Yugoslavia. Similar to the Spanish receipt of U.S. aid (Prados de la Escosura, Rosés, and Villarroya, 2012), there were no formal economic or political conditions attached to it like in the Marshal Plan - it was not part of it. The aim was to support the country's efforts to maintain its independence from the Soviet Union. Nevertheless, the magnitude of aid that Yugoslavia received was lower than the amount of Marshal Plan aid that the recipient countries received (Eichengreen, 2008).

Furthermore, during this period, collectivisation was abandoned. Official output targets were dropped and a substantial degree of decision-making was delegated to firms (Horvat, 1971). Labour-managed firms were established, operating under the governing principle of self-management (Estrin, 1991).

Milanović (1987) argues that republican interests could not be openly expressed during this period, nor were they considered legitimate. Pleština (1992) reinforces this point by arguing that policy-makers pushed regional development to a low priority status due to the lingering threat of a Soviet invasion. They pursued investment projects that could deliver highest returns in the shortest possible time period, irrespective of their location.

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<sup>1</sup> *Jugoslavija, 1918-1988: Statistički Godišnjak* (Savezni Zavod za Statistiku, 1989).

The economic reform of 1965 opened the third phase of development that lasted until 1974. It was a heyday of market socialism. Market forces were strengthened and labour-managed firms obtained additional prerogatives (Horvat, 1971). Although the overall influence of the government declined in the post-1965 period, the balance of power between the central and regional government decisively shifted in favour of the latter. This became politically visible in 1966 with the fall of vice-president Aleksandar Ranković, a leading proponent of centralism that favoured greater power for federal institutions (Milanović, 1987).

Further decentralisation of political power was reinforced by the 1974 constitution. This ushered the last period in Yugoslav economic development that lasted until the collapse of the country in 1991. The constitution gave regions the rights and the tools to be solely responsible for their own economic development. Kosovo and Vojvodina, the two Autonomous Provinces of Serbia, became *de facto* Republics.

It is usually conceived in literature that the 1974 constitution stimulated regional autarky. The argument maintains that, with increased power, each region attempted to construct its own “national” industrial base (Pavlowitch, 1988). Burkett and Škegro (1988), however, find no empirical evidence that would justify claims about increasing regional autarky and market disintegration.

Economic power was further decentralised to the level of departments or units within firms. Each distinct department or unit within a firm was moulded into a Basic Organisation of Associated Labour (BOAL). Work councils of BOALs were given some rights over the allocation of income. Firms became composed of a multitude of BOALs, whereby their rights and duties were stipulated by agreements and contracts. A BOAL could secede from the rest of the firm and become a separate firm. Decentralisation of this type, however, did not make the economy more market oriented. On the contrary, it was a period of de-liberalisation (Prout, 1985). It can be, perhaps, best perceived as a period of decentralised planning of various entities with often mutually overlapping jurisdictions.

### **1.3.2 The economic performance of Yugoslavia in global historical context**

How well did Yugoslavia perform compared to other countries in the second half of the twentieth century? The simplest indicator to use is GDP per capita. By this measure, two points emerge about the evolution of the world economy and one point about Yugoslavia’s place in it. First, the dominant tendency has been that of income divergence between the rich and poor countries. Even though there has been growth almost everywhere, countries that were initially rich in 1950 grew faster than countries that were initially poor. Table 1.1 illustrates this point. Between 1950 and 1990, GDP per capita increased by a factor of three in the rich countries. In the least successful regions (Latin America, Africa and Asia) it increased by around two times. OECD countries were initially seven times as rich

Table 1.1: GDP per capita around the world, 1950-1990, in 1990 Int. GK\$

	1950	1960	1970	1980	1990
Yugoslavia	1,551	2,437	3,755	6,063	5,646
World	2,104	2,764	3,725	4,511	5,149
OECD countries	5,087	6,880	10,136	13,111	16,168
Socialist Eastern Europe	2,044	3,030	4,259	5,426	5,282
USSR	2,841	3,945	5,575	6,427	6,894
Latin America	2,505	3,130	3,985	5,437	5,065
Africa	889	1,055	1,335	1,515	1,425
Asia	710	865	998	1,205	1,350

Source: Yugoslav GDP p.c. data is taken from [Maddison \(Online\)](#). GDP p.c. data for other countries is taken from [Bolt and van Zanden \(2014\)](#).

Notes: Turkey is not included in OECD countries. Yugoslavia is not included in socialist Eastern Europe.

as Asian countries. By 1990 they increased their lead to eleven times.

Second, very few countries managed to become rich and join the OECD “club” of developed countries. These include peripheral Western and Southern European countries. Next to these, Japan stands out. Its economic performance has been particularly impressive. It not only managed to join the rich, but it furthermore became one of the richest among the OECD members. More recently, Taiwan and South Korea have made the transition from “rags to riches”.

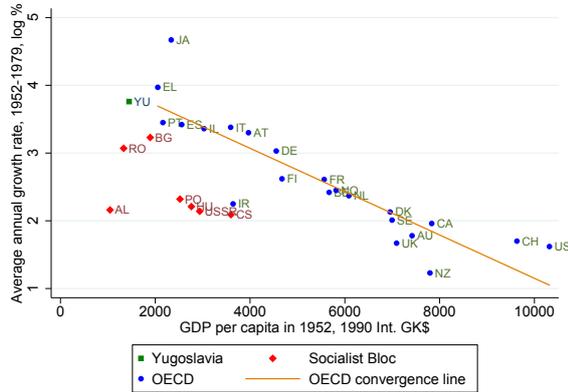
Third, Yugoslavia grew fast compared to other regions. In 1950, it started with a GDP per capita of 1,551 1990 Int. GK\$. Its income level was significantly below the global average which stood at \$2,104. It was a poor and backward economy by any benchmark: it was the third poorest country in Europe, after Albania and Romania, while the only global macro-regions which were poorer than Yugoslavia were Africa and Asia.

By 1990, Yugoslavia became an upper middle-income country, loosely defined. It’s GDP per capita increased by 4 times, to \$5,646. Yugoslavia surpassed the income per capita level of an average Latin American and Eastern European country. It grew particularly rapid in the period between 1952 and 1979. On an average annual basis, GDP per capita increased by about 4.5 per cent (logarithmic growth rates). Yugoslavia’s income level increased from 30 per cent of the OECD average to 46 per cent. Considering that OECD countries were a fast moving target, i.e. that they were experiencing fast growth during this period as well, Yugoslavia seems to have performed very good. It was the only Socialist country that managed to substantially narrow the income gap in relation to the OECD club during this period. In income convergence dynamics, it was more similar to Southern European countries than to other Socialist European countries.<sup>2</sup>

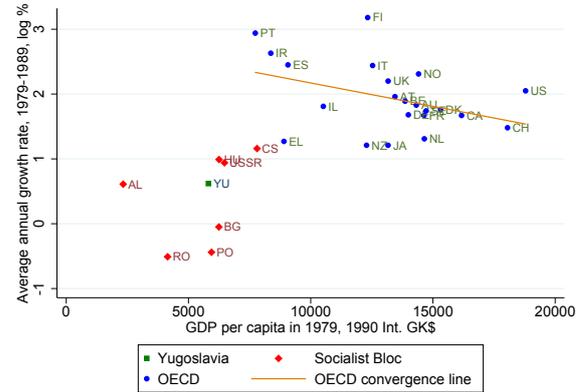
<sup>2</sup>Reconstruction dynamics in the aftermath of WWI obfuscate catch-up growth rates implied by figure 1.1, as many economies were far away from their steady states due to war destruction ([Vonyó, 2008](#)).

Figure 1.1: Economic growth and convergence in Europe and the OECD club, 1952-1989

(a) Panel a: Growth and convergence during 1952-1979



(b) Panel b: Growth and convergence during 1979-1989



Sources: Source: Yugoslav GDP p.c. data is taken from [Maddison \(Online\)](#). GDP p.c. data for other countries is taken from [Bolt and van Zanden \(2014\)](#).

Notes: The regression line is fitted to the actual values of the OECD countries. OECD countries are those that were members of the club in 1990. Iceland, Luxembourg, and Turkey are, however, excluded. Turkey is excluded because it was not part of the convergence club. Iceland and Luxembourg are excluded because they are not reported in the [Bolt and van Zanden \(2014\)](#) dataset.

Figure 1.1.a illustrates the above outlined facts. The vertical axis depicts annual log growth rate during 1952-1979. The horizontal axis shows the 1952 GDP per capita. The data points are grouped into OECD and socialist European countries (including USSR). Yugoslavia is shown separately. The trend line is the OECD unconditional convergence regression. It depicts a clear downward trend. This means that initially poorer OECD countries grew faster in subsequent decades, converging towards the income levels of the richer members. The socialist countries are clustered in the lower left hand side of the graph. This implies that they performed worse than comparable OECD countries.

Yugoslavia was by far the fastest growing socialist country in the period. It grew faster than all OECD countries except Japan and Spain. Yugoslavia sits at about the OECD convergence line. This implies that it performed similar to an average OECD country when allowing for initial income or catch-up growth.

Of course, the choice of the start year and the end year of analysis involves a sleight of hand. The range of years covers an arbitrary period when Yugoslavia performed particularly well in comparative context. 1952 marks the beginning of modern statistics in Yugoslavia, as well as the instigation of fast growth. The second oil shock of 1979, on the other hand, is a decisive turning point in Yugoslav macroeconomic history. It is associated with a sharp decrease of all macroeconomic indicators one would otherwise want to see increasing, if one is normatively minded and interested in welfare gains.

Thus, in the latter period, between 1979 and 1989, Yugoslavia's performance was dismal (figure 1.1.b). GDP per capita increased by only 6 per cent. Yugoslavia performed bad even when compared to

some other socialist countries, like Czechoslovakia, Hungary, and the Soviet Union. Yugoslav economic performance, it seems, was characterised by extremes. Its growth record was either comparatively very good or comparatively very bad.

## 1.4 Literature review and contributions

### 1.4.1 Ultimate and proximate sources of economic growth under socialism

The literature on economic performance under socialist systems can be divided into three strands. The first strand of literature focuses on models of central planning, primarily from a theoretical microeconomic perspective. The second strand of literature focuses on empirical issues in macroeconomics, primarily concerning economic growth rates and patterns. The final strand of literature focuses on the institutional underpinnings of socialist systems, alongside the associated incentive structures.

I focus below on the latter two strands of literature. They are directly related to the first two papers of the thesis. The first strand of literature is not directly relevant. Central planning was *de facto* abandoned in Yugoslavia during the early 1950s (Horvat, 1971). The literature I report is largely related to the economic performance of the Soviet Union. My choice of literature is driven by supply-side considerations as the existing literature overwhelmingly focuses on the experience of the Soviet Union. Nevertheless, the literature I report holds relevance for Yugoslavia as both Soviet Union and Yugoslavia were ultimately socialist.

I proceed with the relevant literature review by segmenting it into two parts. I first provide a literature review on some of the (institutional) characteristics and incentive structures of socialist systems relevant for economic growth. Subsequently, I provide a literature review on the “proximate” sources of growth, following the terminology of Maddison (1988).

#### 1.4.1.1 Some characteristics and incentive structures of socialist systems

During the late 1950s and the early 1960s, in the era of rapid Soviet growth, Sputnik, Laika, and Yuri Gagarin, many prominent Western economists were convinced that Soviet Union would overtake the U.S. (Levy and Peart, 2011). The question was not *if*, but *when*. Levy and Peart (2011) report that the most successful principles of economics textbooks in the U.S. were overconfident concerning the superior prospects for Soviet growth relative to the U.S. growth. The textbook of Paul Samuelson, *Economics: An Introductory Analysis*, is a famous case to the point. In the 1961 edition, under an optimistic scenario for the Soviets, Samuelson predicted that Soviet output would overtake U.S. output by 1984. In the pessimistic scenario, he projected Soviet Union overtaking the U.S. by 1997 (Levy and Peart, 2011).

Of course, the reality of Soviet catch-up growth turned bleak compared to Samuelson's pessimistic scenario. It is easy, however, to point to forecasting errors after the end of the forecasting horizon. Every fool can be wise *ex post*. Even Soviet specialists like Abram Bergson did not exclude the possibility that Soviet Union would catch-up with and overtake the U.S. (Bergson, 1961).<sup>3</sup>

As Soviet economic growth rates persistently declined since WWII, the attention of economists shifted towards explaining the slowdown of economic growth. This holds true for both Soviet Union and other socialist economies in Europe. Desai (1986); Ofer (1987) and Gregory and Harrison (2005) outline various factors in the literature offered to explain the downward trend.

The first factor that may have contributed to the slowdown is the growing complexity of the economy (Bergson, 1983; Banerjee and Spagat, 1991). The argument maintains that planning may have been simple in a backward economy that contained a limited range of alternative uses for scarce resources, and where consumer needs were relatively basic. Soviet planners had to mobilise and channel resources into manufacturing, while satisfying subsistence consumption.<sup>4</sup>

Furthermore, Soviet planners could benefit from the historical experience of early industrialisers. They could emulate, and facilitate through state-intervention, the industrialisation processes that occurred in Europe during the 18th and 19th centuries. Estimating precise opportunity costs associated with alternative investment projects was thus not that important during the early stage of economic development. This reduced the amount of information planners had to gather and process, decreasing information costs. It led to a selection of investment projects with high returns.

But, as the economy became industrialised and more complex, the number of alternative uses for scarce resources multiplied. Consumer needs became increasingly sophisticated and consumer preferences became increasingly diverse. Required information and coordination increased, alongside the associated costs.

Information costs could have been reduced by the adoption of information and communication technologies (ICT). Socialist economies were, however, unable to adopt ICT in a widespread manner during the late 1970s and the 1980s (Broadberry and Klein, 2011).

In short, planners were unable to keep pace with the increasing complexity of the economy. This may have led to poor investment decisions. Allen (2003) argues that these are in turn evidenced by the expansion of the remote and costly Siberian natural resource industry, causing aggregate inefficiency.

The second factor that may have contributed to the slowdown of the Soviet economy is a large and increasing size of defence burden (Allen, 2003). The argument maintains that resources were gradually diverted into a less productive use in the military complex. Numerous studies estimated the relationship between defence spending and economic growth. Easterly and Fischer (1995) find a

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<sup>3</sup>Abram Bergson is, perhaps, better known to the economics profession for his contributions to welfare economics.

<sup>4</sup>Soviet famine of 1932–33 demonstrates that this was not a simple task.

negative impact of defence spending on economic growth, albeit somewhat modest.

A third factor proposed by the literature to explain the slowdown of economic growth is the incentive framework that became increasingly unsuitable to sustain growth. Socialist economies needed to make a transition from extensive to intensive growth (Ofer, 1987; Kornai, 1992; Krugman, 1994). Extensive growth, based on the accumulation of inputs, is by nature exhaustible, as marginal products of inputs eventually decline. Only intensive growth, i.e. growth based on innovation and efficiency improvements that would counteract declining marginal products of inputs, can lead to sustained growth. Incentive structures that may have stimulated the accumulation of inputs may have de-stimulated the accumulation of knowledge and efficiency improvements (Ofer, 1987).

The literature that focuses on the institutional underpinnings of socialist systems and the associated incentive structures is vast. It has a long tradition as well. The initial economists that began criticising the socialist system were classical liberals.

Mises (1922/1981) was one of the earliest critics of socialist systems. He argued that collective ownership over the means of production would render rational economic calculation impossible. Without private property over the means of production, there could be no factor market. Without a factor market, there could be no prices for factors of productions, which would otherwise signal relative scarcities. Without market prices for factors of productions, planners would be unable to make rational economic calculation and investment plans. This would in turn cause inefficiency and eventually mass impoverishment.

Mises (1922/1981) opened the socialist calculation debate. The main source of contention was whether economic planning is superior to capitalism in terms of efficiency. Economists such as Lange (1936, 1937) responded to the critique of socialism by Ludwig von Mises. Oskar Lange provided a neoclassical analysis of a socialist economy based on collective ownership over the means of production. He argued that planners could use a trial-and-error approach to determine what to produce and how much, circumventing the need for market prices. That is, if prices (arbitrarily) chosen by planners were wrong, gluts or shortages would appear. This would in turn signal to planners to adjust prices in order to eliminate gluts or shortages, resembling a self-correcting mechanism of a free market. Trial-and-error planning would lead to an economic equilibrium and Pareto efficiency. It would rival a capitalist economy in terms of efficiency, if not surpassing it. Later, economists like Fred Taylor and Abba Lerner have extended the Lange model (Boettke, 2000).

Hayek (1937, 1945) had, in turn, extended the work of Mises (1922/1981). Friedrich Hayek focused on the knowledge property of market prices. Hayek (1937) argued that standard equilibrium theory, of the Lange (1936, 1937) type, assumes that economic agents have complete information. Instead, information is incomplete. Bits of knowledge are dispersed over a variety of agents.

In his most famous work, [Hayek \(1945\)](#) had extended and substantiated his earlier argument. He argued that the price mechanism serves to share and synchronise dispersed knowledge, which is local and personal. Prices convey information concerning scarcities and preferences. An economic agent, through observing relative prices, does not need to directly observe scarcities and preferences, which would be costly. [Hayek \(1945\)](#) argued that the price mechanism allows for more rapid adaptation to changes in particular circumstances of time and place than a socialist system does. Ultimately, while a planner might have more information about the particular circumstances of time and place than any other economic agent, she cannot have more knowledge than what is conveyed through the price mechanism of a free market.

The socialist calculation debate was highly theoretical. It mostly evolved around the ideal types of socialism and capitalism, as perceived by the protagonists of the debate. The situation in the socialist world was different in reality. Planners did not discard the knowledge content of market prices because they used world market prices to proxy scarcities. This was recognised by [Rothbard \(1962\)](#) (pp. 830-831):

“The extent of socialism is overestimated because most writers ignore the fact that Russia, socialist as she is, cannot have full socialism as long as she can still refer to the relatively free markets existing in the other parts of the world. In short, a single socialist country or bloc of countries, while inevitably experiencing enormous difficulties and wastes in planning, can still buy and sell and refer to the world market and can therefore at least vaguely approximate some sort of rational pricing of producers’ goods by extrapolating from the market. The well-known wastes and errors of this partial socialist planning are negligible compared to what would be experienced under the total calculational chaos of a world socialist state.”

[Rothbard \(1962\)](#) thus argued that socialism is theoretically impossible, but in practice it muddled through. The contribution of [Rothbard \(1962\)](#) is largely neglected by the mainstream economics profession. He has, however, anticipated almost all of the subsequent major developments in economics concerning the distortions of socialist economies ([Boettke, 2000](#)).

[Rothbard \(1962\)](#) recognised that measuring output in terms of quantity, and not value, provided the incentive to produce large quantities of output, irrespective of their quality and demand, causing inefficiency. He also recognised that incentives for innovation were distorted and that black markets were ubiquitous, as well as the associated corruption and graft. Black markets were themselves a symptom of production failures and the inability to satisfy increasingly sophisticated consumer needs.

The literature on incentive structures that were unsuited to sustain growth has strongly expanded after the aforementioned early contributions. It is widely perceived that socialist growth was extensive in nature, as mentioned before, characterised by high investment rates ([Desai, 1986](#); [Ofer, 1987](#); [Krugman,](#)

1994; Allen, 2003; Eichengreen, 2008). Extensive growth model had two important implications concerning the motivation to supply labour.

First, consistently high investment rates pursued by authorities implied an indefinite deferment of private consumption, de-stimulating effort. As noted by Ofer (1987) (pp. 1799-1800), this suggested “distant horizons, low time preferences, and low discount rates of future benefits”. Second, investment eventually became a goal *per se* (Kornai, 1992). This reflected perverse incentives of the system, rather than providing a mean to ensure higher consumption in the future, again de-stimulating effort.

The strategy of extensive growth and output targets led to a phenomenon that Kornai (1979, 1980) termed the “soft budget constraint”. This type of constraint had important implications concerning aggregate efficiency and the incentive to accumulate capital. In order assure the fulfilment of output targets, firms were ultimately allowed to use more resources than initially projected. They could disregard costs. Poorly performing firms were rarely allowed to fail. Their losses were instead socialised, or effectively dumped on the wider society. By extension, investment projects with high opportunity costs were selected. While the soft budget constraint certainly stimulated investment, it was presumably a major source of inefficiency. Investment projects with low returns were weakly discriminated against, causing misallocation of resources.

Finally, the incentive to invent and to innovate was highly distorted (Berliner, 1976; Hanson, 1981; Ammand and Cooper, 1982). This made the transition to intensive growth difficult. Before outlining some of these distortion, it is important to note one factor as to why a socialist economy would be, *a priori*, conducive to rapid technological change.

Research and development (R&D) activity is characterised by major spillover effects and knowledge externalities, possibly generating increasing returns, and ultimately economic growth (Romer, 1986, 1990; Audretsch and Feldman, 1996). However, knowledge creation is under-supplied due to the pervasiveness of externalities within a capitalist system characterised by private property. Under collective ownership of property on the other hand, all the potential benefits and costs of invention and innovation could be internalised. This would encourage rapid creation and diffusion of technology.

Despite this (theoretical) advantage of a socialist economy over a capitalist economy, the creation, adoption, and diffusion of technology was in practice frustrated by a multitude of factors (Berliner, 1976; Hanson, 1981; Ammand and Cooper, 1982). The R&D sector was over-bureaucratized and disjointed from production enterprises. The reward system was unsuitable at all relevant stages of the invention and innovation process. The emphasis on short-term production outcomes further discouraged innovation by firms.

Before closing this section, it is worthwhile to acknowledge findings from the more recent “revisionist” literature. It is revisionist in the sense that it stresses factors that remain neglected or are otherwise

discounted in the existing literature. For instance, [Vonyó \(2017\)](#) argues that, until the 1970s, the relative underperformance of socialist economies can be explained in a conditional convergence framework. Socialist European economies had relatively low, not high, investment rates during the Golden Age, and exhibited weak reconstruction dynamics. Both were due, at least in part, to a relatively larger labour shortage and inflexibility induced by comparatively larger WWII population losses. His explanation for the underperformance of socialist economies can be considered to be purely economic, in the sense it does not rely on an institutional analysis.

Next to this, [Vonyó \(2017\)](#) and [Vonyó and Klein \(2017\)](#) argue that the slowdown of socialist economies in Europe during the 1980s was precipitated by the 1979 oil shock. The increase in oil prices led to an increase in interest rates in creditor nations designed to curb inflation. The increase in interest rates increased debt servicing costs which caused a debt crisis in socialist European economies. Debt crisis was met by major austerity measures, causing a collapse of aggregate demand, similar to the experience of Latin American economies during the 1980s. [Vonyó and Klein \(2017\)](#) argue that austerity measures caused a major fall of investment rates in Czechoslovakia, Hungary, and Poland, retarding their economic growth rates. I make similar argument for Yugoslavia in the first paper of the thesis.

#### 1.4.1.2 Proximate sources of growth

The literature attempts to quantify some of the factors outlined in the previous section that may have constrained growth. The existing literature mostly focuses on analysing the relative contributions of factors of production and TFP to economic growth. Methodologically, it either employs some variant of growth accounting with functional forms developed by [Solow \(1957\)](#); [Kendrick \(1961\)](#); [Denison \(1962\)](#), and [Jorgenson and Griliches \(1967\)](#), or uses some econometric specification. It focuses on uncovering the proximate sources of growth.<sup>5</sup>

The early empirical studies have generally followed the growth accounting methodology pioneered by [Denison \(1962\)](#), while using the [Cobb and Douglas \(1928\)](#) production function. [Denison \(1962\)](#) peels away the TFP measure, which is calculated as a residual output growth after accounting for observable input growth, by accounting for inputs that were previously unconsidered.

[Kaplan \(1969\)](#) was one of the first to perform a growth accounting analysis of the Soviet Union by using the methodology of [Denison \(1962\)](#) and the Cobb-Douglas production function. He finds that the slowdown of growth until 1965 was caused by both declining input growth and declining TFP growth. [Cohn \(1976\)](#), using growth accounting as well, finds similar results. He argues that in the middle and

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<sup>5</sup>Solow made two canonical contributions to modern economic growth theory; he formed the neoclassical production function ([Solow, 1956](#)), and applied it to account for proximate sources of growth (growth accounting) ([Solow, 1957](#)). But, the roots of his work go deeper. In brief, [Tinbergen \(1942\)](#) was the first to use the aggregate production function to decompose output growth into input contributions, whereby he relied on the work of [Copeland \(1937\)](#). [Solow \(1957\)](#) adapted the concept of TFP from [Stigler \(1947\)](#), and used it as a parameter of the neoclassical production function. Solow offered an attractive approach to measuring the sources of growth that has remained the standard until today.

late 1960s, there has been a marked slowdown in the growth of educational attainment. He argues that labour, adjusted for quality, was the principal factor dragging down Soviet growth during the 1960s. The deceleration of TFP growth was of second-order importance.

[Bergson \(1983\)](#) provides the most comprehensive growth accounting exercise of the Soviet Union that relies on the Cobb-Douglas production function. After adjusting for quality of labour and land, structural change, economies of scale, and other factors, he finds that TFP growth was much smaller than what the existing literature typically finds. Furthermore, he finds that the rate of TFP growth has rapidly decreased since WWII. It decelerated from 2.9 per cent in the 1950s, to 1 per cent in the 1960s, and then 0.2 per cent during the first half of the 1970s.

[Ofer \(1987\)](#) updates the work of [Bergson \(1983\)](#). He finds that TFP growth continued slowing down. TFP growth turned negative in the second half of the 1970s, and fell further during the 1980s.

The big challenge to empirical studies that use a Cobb-Douglas production was delivered by [Weitzman \(1970\)](#). He argues that a constant elasticity of substitution (CES) production function with a constant rate of TFP growth provides a better fit to Soviet data than a Cobb-Douglas production function with declining TFP growth. He finds that Soviet Union was characterised by an elasticity of substitution of 0.4 and a 2 per cent rate of TFP growth during 1950-1969.

The distinction between the Cobb-Douglas production function with unit elasticity of factor substitution and the CES production function with low elasticity of factor substitution is of critical importance. Cobb-Douglas production function implies that the growth slowdown of socialist economies was primarily caused by a slowdown of TFP growth. CES production function implies that the source of socialist malaise lies instead in acute diminishing returns on capital.

Since the seminal work of [Weitzman \(1970\)](#), the centre of debate in the literature revolved around the functional form of the socialist production function. Following [Weitzman \(1970\)](#), a stream of econometric studies confirmed the existence of a CES production function for the Soviet Union ([Desai, 1976](#); [Rosefielde and Lovell, 1977](#); [Desai and Martin, 1983](#); [Easterly and Fischer, 1995](#)), Czechoslovakia ([Rusek, 1989](#)), and Yugoslavia ([Sapir, 1980](#)).

It is, however, difficult to generalise production function findings across time and space. Studies that use newer, revised, and disaggregated data, as well as non-linear estimation methods, find that the Cobb-Douglas production function typically provides a better fit to the data of socialist economies ([Cameron, 1981](#); [Desai, 1985, 1986](#); [Whitesell, 1985](#); [Bairam, 1991](#)). [Desai \(1986\)](#) and [Kontorovich \(1986\)](#) thus argue that no single factor can fully explain the slowdown of socialist economies throughout the post-war period.

There are, however, three important problems that afflict the aforementioned literature on proximate sources of growth. First, the majority of studies use official investment data at “face value”. This is

problematic because the official capital formation data is overestimated (Vonyó and Klein, 2017). At the same time, a majority of studies use alternative output data which yields lower growth rates than the official data. Since TFP is calculated as residual growth after accounting for the growth rate of inputs, the existing studies thus tend to underestimate the actual rate of TFP gains, irrespective of the production function they use. Thus, Vonyó and Klein (2017), upon using a Cobb-Douglas production function with downwardly revised capital formation data, find a much greater role for factor inputs in causing the retardation of socialist economies than what the existing literature typically finds.

Second, the tendency to use official investment data overestimates the capital to output ratio. This is problematic, because the magnified capital to output ratio presumably downwardly biases the estimation of elasticity of substitution in econometric exercises. In other words, one is more likely to find a CES production function by using overestimated capital formation data.

Third, the existing literature typically assumes that technological change was Hicks-neutral in socialist economies. This might be a poor assumption, as Terrell (1993) demonstrates for the case of Polish industry. More generally, Acemoglu (2002) and Caselli (2016) argue that technological change is factor augmenting across time and space. In particular, it might be the case that technology in socialist economies was capital biased, rather than Hicks neutral.

In the second of paper of the thesis, I argue that Yugoslav labour-managed firms were characterised by a capital intensity bias. This characteristic of labour-managed firms can be interpreted as a capital using bias in technological change. If so, this implies that MPK decline under CES estimates would be mitigated.

Capital bias, however, is not necessarily just a socialist phenomenon. Kumar and Russell (2002) argue it was largely a global phenomena between 1965 and 1990, while Allen (2012) argues it is a characteristic of modern economic growth since 1820. Capital bias might have further characterised the British Industrial Revolution (Allen, 2009), as well as the U.S. industrialisation process (Habakkuk, 1962).

The debate in the literature on the sources of growth under socialist systems remains unresolved. However, the alleviation of the aforementioned problems that afflict the literature should lead to a convergence of findings. With downwardly revised investment data, TFP growth under a Cobb-Douglas production function should be higher than what the existing literature finds. If so, such findings would resemble more closely the empirical findings under the CES production function. With capital augmenting technological change under a CES production function, diminishing MPK would be attenuated, resembling more closely the empirical findings under the Cobb-Douglas production function.

### 1.4.1.3 My contribution to the literature

The thesis moves past the overwhelming focus of the literature on the economic performance of the Soviet Union, which experience is usually extrapolated to other socialist economies. In addition, I provide an alternative explanation for Yugoslavia's output retardation. In the first paper of the thesis, I argue that labour distortions were the most important relative contributor to Yugoslavia's growth retardation. This does not mean that diminishing TFP growth and diminishing MPK are irrelevant explanations. However, relative to labour distortions, these factors were of second-order importance in causing Yugoslavia's growth slowdown.

At a proximate level, my explanation for Yugoslavia's slowdown can be perceived as intermediate one between the TFP decline and diminishing MPK. Constrained labour input implies a low rate of labour utilisation. If not accounted for, low factor utilisation is reflected in low TFP. I argue that labour was the binding factor on growth, which is implied by the research that focuses on the role of diminishing MPK.

The thesis furthermore provides a spatial dimension to the analysis of economic growth under socialist systems, which is otherwise neglected by the existing literature. In the second paper of the thesis, I find that regional development trajectories resist monocausal explanations. TFP was a more important source of growth in the richer regions than it was in the poorer regions. The poorer regions experienced declining MPK, while the richer regions did not experience declining MPK.

At a more fundamental level, I find that, if Yugoslavia was characterized by embedded disincentives, the most important one that caused its failure was the incentive to work, which was in turn shaped by labour-managed firms. Furthermore, I hypothesise in the second paper of the thesis that a single national institution had a differential impact on regional development trajectories. Along the broadly conceived terminology of [Abramovitz \(1986\)](#), labour-managed firms were less technologically congruent with the local factor endowments in the poorer regions than they were in the richer regions, causing regional income divergence.

## 1.4.2 Labour-managed firms in Yugoslavia

The literature on labour-managed firms in Yugoslavia is immense. This section provides a brief overview. For a comprehensive survey, see [Estrin and Uvalić \(2008\)](#). I rely on their work. My papers are not concerned with improving our understanding of the behaviour of labour-managed firms *per se*. I therefore do not contribute to the literature on labour-managed firms directly. I instead use the existing literature as the foundation blocs for my interpretation(s) of Yugoslavia's development. The aim of this section is to provide more comprehensive information concerning the behaviour of these firms than I have provided in the papers. This section thus substantiates the background of the first two papers

of the thesis that feature labour-managed firms.

The seminal theoretical work of [Ward \(1958\)](#); [Domar \(1966\)](#); [Vanek \(1970\)](#) and [Meade \(1972\)](#) stipulates that labor-managed firms maximise average earnings per worker,  $y$ . They thus do not maximise profits as capitalist firms do. More formally, the governing objective of labour managed firms is:

$$y = \frac{pX - rK}{L} \quad (1.1)$$

where  $p$  denotes the price of output,  $X$ ,  $r$  denotes the rental price of capital,  $K$ , and  $L$  denotes labour.

Maximisation of per worker earnings has many implications, contingent on the wider institutional environment. In the remainder of this section, I outline some of these implications. I focus on the distorted behaviour of labour-managed firms, relative to their profit maximising counterparts. I contrast the theorised behaviour of labour-managed firms with the empirical evidence concerning their actual operation in Yugoslavia.

The most important theoretical result in the literature is that labour-managed firms restrict employment. The intuition behind this is simple. The objective function of a labour managed firm creates an incentive to limit employment in order to boost average earnings of the firm's existing members. Hiring additional workers would dilute average earnings per worker because of diminishing marginal product of labour. A labour-managed firm would thus tend to employ fewer workers than a profit maximising counterpart.

Theory stipulates another particularly perverse outcome concerning employment. When faced with increased demand, a labour-managed firm would decrease employment and by extension output. It would thereby decrease supply. The mechanism is as follows. A price increase would increase the marginal product of labour. However, a price increase would increase the average earnings at the initial employment level even more, due to declining marginal product of labour. A labour-managed firm would thus respond to a positive demand shock by reducing employment in order to maximise average earnings per worker.

Empirical research, however, firmly rejects this theorised, perverse, supply response. [Prašnikar, Švejnar, Mihaljek, and Prašnikar \(1994\)](#) directly test the behaviour of labour-managed firms using Yugoslav firm-level data from the 1970s and 1980s. They reject theoretical employment responses to output price variations. Even [Ward \(1958\)](#), the originator of the theory, was sceptical about the empirical significance of his prediction that firms would cut employment when faced with an increase in prices. He notes that enterprise managers and government officials had in practice significant control over the operation of firms in Yugoslavia. They prevented such behaviour. Furthermore, workers were presumably reluctant to dismiss themselves or their colleagues, irrespective of demand fluctuations.

Prašnikar, Švejnar, Mihaljek, and Prašnikar (1994) also test whether labour-managed firms were restricting overall employment. They argue that Yugoslav firms were setting employment somewhere between the level implied by the theoretical labour-managed firm and the level implied by a profit maximising firm. Yugoslav firms were thus indeed restricting employment, but not as much as implied by theory.

Furubotn and Pejovich (1970) developed the theoretical prediction that labour-managed firms would underinvest. They would underinvest because of the nature of property rights in Yugoslavia. Assets were “socially owned”, meaning that workers had no ownership rights over assets. They had, however, the right to use assets and their proceeds, as well as the obligation to preserve assets.

Given the absence of ownership rights, workers could not recoup their investment by selling an asset. As such, workers would demand a higher return on investment in order to be compensated for the absence of ownership rights. Furthermore, workers would be particularly reluctant to invest towards the end of their working career because they could not recoup their investment by selling their claim over an asset upon retiring. Labour-managed firms would thus tend to underinvest relative to their profit-maximising counterparts. Commensurately, workers would prefer to use the revenues of their labour-managed firm to finance higher current wages.

Empirical research refutes the prediction that labour-managed firms would underinvest. Tyson (1977) analyses the savings behaviour of Yugoslav firms during 1965-1971, when the institutional structure approximated that of an idealised labour-managed system. She finds no evidence that labour-managed firms were under-saving, and hence under-investing.

Uvalić (1992) also refutes the idea that labour-managed firms were under-investing using ordinary least squares and two-stage least squares estimation methods. She argues that labour-managed firms were operating under the soft-budget constraint of the Kornai (1980) type. Firms were in practice over-investing, like elsewhere in socialist Europe.

The tendency of labour-managed firms to restrict employment and to over-invest is well recognised in the literature (Vanek, 1977; Estrin and Uvalić, 2008). This behaviour follows from their governing objective. Firms could increase average earnings per worker through substituting capital for labour. This tendency is frequently termed in the literature as a “capital intensity bias”. I extensively discuss this bias in the second paper of the thesis.

Despite tending to employ fewer workers and use more capital than their profit maximising counterparts, Ward (1958); Vanek (1970) and Drezè (1976) argue that, in the long run, labour-managed firms operating under perfect competition would yield allocative efficiency. A crucial condition for allocative efficiency within a labour-managed economy is the free entry and exit of firms. Although a labour-managed firm would tend to restrict employment and expand capital, this would not be an

economic problem in the long-run if entry and exit of firms was free. Poorly performing firms would go bankrupt, and productive ones would emerge. Under competitive capital and labour markets, inputs would reallocate accordingly, ensuring allocative efficiency.

Empirical research, however, demonstrates that entry and exit of firms in Yugoslavia was low and far from free (Estrin and Uvalić, 2008). Furthermore, markets were, of course, far from competitive. Labour market was highly rigid, while the capital market was non-existent (Horvat, 1971; Prout, 1985)

Restricted employment of extra workers, and constrained process of entry and exit of firms, caused the emergence and persistence of large inter-industry and inter-firm wage differentials (Estrin, Moore, and Švejnar, 1988). Estrin (1983) finds that wage dispersion for a given job in a sector across firms varied on average by as much as 2.5:1. This is very large in international context (Estrin, Moore, and Švejnar, 1988). These wage differentials were further compounded by capital market imperfections which permitted capital rents to be appropriated by workers (Vanek and Jovičić, 1975).

Besides attaining allocative efficiency under perfect competition, many argued that democratic decision-making in workplace would improve productivity (Vanek, 1970; Horvat, 1982). There are two particularly important mechanisms outlined by Estrin and Uvalić (2008). First, incentives to provide effort, accumulate capital, enhance efficiency, and innovate, would improve through profit sharing. Second, cooperative practices would increase through employee participation in managerial decisions. Enhanced cooperative practices would decrease the salience of prisoner's dilemmas between managers and workers in investment decisions, stimulating investment.

Unfortunately, there is very little research whether labour-management processes enhanced firm productivity in Yugoslavia. This is largely caused by lack of variation. Almost all firms in Yugoslavia were labour-managed. A notable exception is agriculture, where labour-managed firms existed alongside private firms.

The few studies that exist thus focus on agriculture to determine the relationship between self-management and productivity. Boyd (1987), using a two-stage least square estimation method, finds that labour-managed firms outperformed in terms of efficiency the private, profit maximising, firms. Hoffer and Payne (1993) find, however, exactly the opposite via a stochastic production frontier estimation method. This method enables them to measure each farm's efficiency relative to its own potential production (production possibility frontier), or level of technology. They are thus able to make a firm distinction between efficiency and technology, unlike Boyd (1987), who implicitly assumes that each farm had the same level of technology.

### 1.4.2.1 My contribution to the literature

The existing literature on labour-managed firms in Yugoslavia focuses on the theory and practice of their behaviour. It is microeconomic in nature. I make a contribution to the literature with the first two papers of the thesis by hypothesising about the macroeconomic implications of labour-managed firms. I thus move away from the standard literature on labour-managed firms that analysed their governance and operation, to analysing the (associative) relationship between labour-managed firms and the economic performance of Yugoslavia.

In the first paper of the thesis, I argue that labour-managed firms caused labour distortions, and had macroeconomic consequences for Yugoslavia as a whole. In the second paper of the thesis, I go below the aggregate patterns to hypothesise about the impact of labour managed firms on regional development trajectories.

### 1.4.3 Yugoslav identity

The third and final paper of the thesis makes a contribution to the wider literature on identity and economics, ethnic diversity and economic outcomes, and the dissolution of Yugoslavia. My third paper extensively documents the relevant literature, and states my contribution to it. To avoid excessive duplication of effort, I do not repeat a similar literature review here. I instead take a slightly different approach by briefly outlining the meaning and content of Yugoslav identity. I provide anecdotal evidence by focusing on the work and thoughts of the leading proponents of a supranational Yugoslav culture - the unifying glue of a Yugoslav nation.

It is difficult to exactly define what Yugoslav identity meant. Yugoslavism was never clearly defined. It was interpreted in a variety of ways (Djokić, 2003). However, this does not mean that Yugoslav identity had no meaning or content. On the contrary.

Wachtel (1998) argues that attempts of Yugoslav nation building can be divided into three basic categories concerning how a national culture or identity should be created, and on what content should it be based upon. First, according to the earliest Yugoslav view, the South Slavs should have adopted a modified form of Serbian culture. The Serbs were the largest ethnic group and were the first in modern times to create an independent state.

The proponents of the second view thought that Yugoslav identity should be synthetic. The ideal Yugoslav culture should adopt the best elements from the separate South Slavic cultures to create an overreaching, synthetic, Yugoslav culture. The first two views, however, did not imply that separate South Slavic cultures should cease to exist. But, rather, that they would be made less relevant with the emergence of a new Yugoslav culture. Separate South Slavic cultures would take a role of local customs and traditions.

The third view that emerged in the postwar period was that common socialist features should be the unifying force of the country (Duda, 2017).

Wachtel (1998) argues that, of the above mentioned views towards the construction of Yugoslav identity, the second view of a synthetic culture was the prominent one during the 20th century. To get a better sense of what synthetic culture meant, it is useful to concentrate on the work and thoughts of the leading proponents of it. Wachtel (1998) argues that the two most publicly visible and famous proponents of a supranational synthetic Yugoslav culture were Ivan Meštrović, a sculptor, and Ivo Andrić, a Nobel prize winning author, both of whom were of Croatian origin.

During the interwar period, Meštrović became a world-famous artist and the leading spokesman for a new Yugoslav culture. Banac (1984) reports that those who knew Meštrović's views referred to him as "the prophet of Yugoslavism". Meštrović believed that sculpture offered an ideal form for expressing a new Yugoslav synthesis. Sculpture is more accessible to general audience than high literature. Moreover, by sculpting figures of mostly Serb epic poetry, South Slavic identities could be melded. Sculpture was largely non-existent in the Serbian Orthodox-based culture, which prohibits three dimensional figures of divinity. On the other hand, sculpture was well-developed in the renaissance Dalmatian towns.

Meštrović entered the Yugoslav public scene and became the best known domestic artist with his controversial exhibition at the Rome Exposition of 1911. There, he created a sculpture of Serbian folk-legend hero Prince Marko. Meštrović described the statue of Prince Marko as symbolising the Yugoslav people, "with its gigantic and noble heart" (Banac, 1984). At the Rome exhibition, Meštrović also created a model of the temple of Kosovo, which holds a central place in the Serbian national myth as a birthplace of the medieval Serbian Kingdom. His temple of Kosovo combined Catholic and Orthodox architectural elements. The visual symbolism was obvious: the aim was to create an architectural synthesis of Yugoslav identity. Temple of Kosovo was intended to be something to Yugoslavs what, say, Louvre is to the French (Wachtel, 1998). In addition to his visual representations of the Yugoslav nation, Meštrović wrote poetry speaking of a "Yugoslav race" (Banac, 1984).

As additional anecdotal evidence, consider the work of Ivo Andrić. His work symbolised, perhaps, the postwar Yugoslav literary canon the most. During WWII he wrote his two most famous novels, *Na Drini Čuprija* (The Bridge on the Drina) and *Travnička Kronika* (Bosnian Chronicle). The works were almost instantly proclaimed classics of the Yugoslav literature upon their release in the aftermath of WWII (Wachtel, 1998). His two great novels are set in multicultural and multi-ethnic Bosnia. They chronicle the difficult historical interaction of the ethnicities of Yugoslavia, while holding hope for a supranational union that might bind them together. For example, the bridge in the *The Bridge on the Drina* is often interpreted, rightly or wrongly, as symbolising Yugoslavia (Wachtel, 1998). Like the bridge, Yugoslavia was to be a mediator between Eastern and Western cultural traditions, connecting

and blending both in a unique synthesis.

There were, of course, other artists that promoted Yugoslav identity. A prominent institution whose aim was to promote and develop Yugoslav identity was the literary magazine *Književni Jug* (Literary South). Its explicit aim was to lay ground for a future Yugoslav literature. Its duration was short lived (1918-1919), but some of the greatest authors of the Yugoslav successor states, as perceived today, published there. These include the Slovenian Ivan Cankar, the Croatian Vladimir Nazor and Tin Ujević, the Serbian Sima Pandurović, and the Bosnian Aleksa Šantic (Milisavac, 1971).

In terms of popular culture, Yugoslav rock music is considered to be a crucial foundation of supranational identity in late Yugoslavia, especially in the youth. Ramet (1992) argues that rock music in Yugoslavia was seen as by many of its purveyors as pan-Yugoslav, a force that brought people together and created ties of mutual acceptance. It created a shared cultural space and common reference points, superseding ethnic boundaries (Perković, 2011). Ramet (1992) argues that, symptomatically, many of the leading figures of the Yugoslav rock scene emphasised that they were “Yugoslavs”, as opposed to say Serbs or Slovenes.

It was, however, not only rock music that served as a purveyor and constructor of Yugoslav feeling. Pop-folk, which reached extremely high levels of popularity during the 1980s (and remains equally popular today in Yugoslav successor states, if not more), also mattered. Consider the example of Fahreta Živojinović, better known as Lepa Brena. Since her pop-folk career began in the early 1980s, Lepa Brena became arguably the most popular singer in Yugoslavia. She still maintains a strong popularity in Yugoslav successor states. In 1989, Lepa Brena released the controversial song *Jugoslavenka* (Yugoslavian (girl)), which is unashamedly pro-Yugoslav. It remains one of her most popular songs. While there were plenty of popular song earlier celebrating Yugoslavia and its identity, many were implicitly or explicitly glorifying the socialist regime. As such, Ramet (1992) describes some of these “patriotic” songs as sycophantic. Yugoslavian by Lepa Brena, on the other hand, seems genuine. It was written at the time of rising ethnic nationalism. Pro-Yugoslav songs during the late 1980s were strongly damaging to a singer’s career (Perković, 2011). In the song, Lepa Brena relates features of a beautiful Yugoslav girl with the geographic and other features of Yugoslavia:

Where are you from, pretty girl  
who gave birth to the blue eye  
who gave you the golden hair  
who made you so passionate

Chorus x2

My eyes are Adriatic sea

my hair is Panonian wheat  
wistful is my Sloven soul  
I'm Yugoslavian

Where are you from, pretty girl  
where did you grow, spring flower  
where free sun is warming you  
when you dance so seductively

Chorus 2x

Where are you from, pretty stranger (girl)  
where have you been stealing sun's shine  
where were you drinking honey wine  
when your kiss is so sweet

Chorus 2x

It is, perhaps, not surprising that Lepa Brena still explicitly identifies herself as “Yugoslav”, and feeling “Yugonostalgic”. In her own words in 2008: “If someone has a right to declare themselves as Croat or Serb, I too have a right to declare myself as Yugoslav. Yugoslavia was specific in many ways... Similar to [former] Yugoslavia lives united Europe [today], which is a civilised society. I admit, I am Yugonostalgic, and I think you shouldn't close doors to other people. You have to respect the right of people with another colour of skin, religion, and diversity...” ([Index.hr, 2008, December 8](#)) (my translation, as well as inserted squared brackets).

#### **1.4.3.1 My contribution to the literature**

Although it was ambiguous and difficult to define, like any other national identity is to a smaller or larger extent, I take the meaning and content of Yugoslav identity as given in the final paper of the thesis. I focus instead on the determinants of Yugoslav self-identification. In a way, I just peel an outer layer of Yugoslav identity. I further analyse whether Yugoslav identification had economic implications.

## Chapter 2

# Socialist growth revisited: Insights from Yugoslavia

### 2.1 Introduction

Socialism was the greatest social, political and economic experiment of the twentieth century. Yet, beyond the Soviet Union and China, economists and historians largely neglect the performance of socialist economies. This is all the more surprising given the lessons these economies can provide to the perennial debates about the viability of state-led development strategies. Yugoslavia is, perhaps, the most peculiar case from which we can learn about the economics of socialism. Yugoslavia was the fastest growing socialist economy in the post-WWII era (Sapir, 1980). In fact, it was one of the fastest growing countries in Europe during the 1950s and the 1960s (Balassa and Bertrand, 1970). Socialism is mostly associated with central planning. Yugoslavia was, however, heralded by contemporaries as a template for market socialism and democratic socialism. To many it symbolized the “third way” between central planning and the market economy. Thus, Horvat (1971) attributed Yugoslavia’s growth performance to its labour-managed firm and to its decentralised socialist system that relied on market forces to a greater extent than did other socialist systems. But, the Yugoslavian socialist engine eventually ran out of steam, with economic growth coming to a standstill during the 1980s. Subsequently, the country disintegrated. The aim of this paper is to determine the sources of Yugoslavia’s economic growth during the post-war period, while focusing on the causes of its growth slowdown.

How can one account for the episodes of success and failure in an economy? Growth accounting is a useful tool to depict the development trajectory of an economy over time. But, since growth accounting focuses only on the supply side, it cannot provide an explanation for the evolution of capital, labour, and total factor productivity (TFP). I use an alternative methodology, namely business cycle accounting (BCA) methodology that preserves an accounting purpose, but moves towards the direction

of explanations. BCA, developed by [Cole and Ohanian \(2002\)](#) and [Chari, Kehoe, and McGrattan \(2007\)](#), is based on a standard neoclassical growth model, but includes “wedges”. These wedges measure the deviations of an economy from the perfectly competitive market economy in the domains of labour, capital, TFP, and demand. The wedges measure distortions or incentives that firms and households face.

This paper presents two key findings. First, until the 1980s, the rate of TFP growth was roughly constant. Since the growth rate of output per capita gradually declined, the share of economic growth due to TFP increased. During this period, TFP was likely driven by structural change, possibly by efficiency gains stemming from the gradual integration of Yugoslavia into the global economy, and possibly by the increased adoption rate of technology. Even though TFP did decrease towards the end of the 1980s, it did not drive growth retardation of the 1980s. These findings are consistent with the notion that, in its early stages, growth is primarily associated with capital accumulation, while TFP becomes more important in later stages of growth ([Collins and Bosworth, 1996](#); [Iacopetta, 2010](#)). These findings, however, contradict most of previous research on socialist countries. Existing growth accounts of planned economies typically find a declining rate of TFP growth, and in the 1980s often negative TFP growth ([Ofer, 1987](#); [Bergson, 1989](#); [van Ark, 1996](#); [Allen, 2003](#)). The findings of this paper are instead similar to the recent revisionist literature that challenges this view. Using downwardly revised investment data, [Vonyó and Klein \(2017\)](#) find higher TFP growth rates in socialist European economies compared to other existing studies.

Second, the labour wedge is quantitatively the most important determinant of the retardation of Yugoslavia’s economic growth. The labour wedge corresponds to the discrepancy between the marginal rate of substitution between consumption and leisure, and the marginal product of labour. The labour wedge is related to the structure of incentives determining the provision of labour. It is often interpreted as synonymous with the distortive effect caused by labour taxation. The labour wedge embarked on a steady worsening trend since 1965. This coincides with the 1965 socio-economic reforms. These reforms allowed the work councils of labour-managed firms to distribute income between wages and investment. I argue that this allowed labour-managed firms to approach their governing objective of maximising income per worker, distorting the ability of Yugoslavs to provide labour. Through restricting new labour entry, the already employed workers gained at the cost of the outsiders. Along the lines of theory of distributional coalitions capturing rents by [Olson \(1982\)](#), the work councils of labour-managed firms obstructed efficient allocation of labour. The opening of borders compounded the macroeconomic implication of distorted labour incentive. With increasing domestic unemployment, a large fraction of Yugoslavs responded by emigrating, draining the domestic supply of labour.

This paper contributes to the literature on socialist economic growth. By focusing on Yugoslavia, I

move past the overwhelming focus of literature on the economic performance of the Soviet Union. The existing literature uses two analytical models to explain the decline and failure of socialist economies. Under a Cobb-Douglas production function with unit factor substitution, the (comparative) decline is attributed to the (comparative) decline of TFP growth (Bergson, 1979, 1983, 1987a, 1989; Gomulka, 1977; Desai and Martin, 1983; Allen, 2003; Broadberry and Klein, 2011). Under a constant elasticity of substitution (CES) production function with low elasticity of factor substitution, the decline is attributed to diminishing marginal product of capital (MPK) (Weitzman, 1970; Desai, 1976; Sapir, 1980; Rusek, 1989; Easterly and Fischer, 1995). I contribute to this strand of literature by providing an alternative explanation for Yugoslavia’s output retardation. I argue that labour constraints were the most important relative contributor to Yugoslavia’s growth retardation. This does not mean that declining TFP and declining MPK are irrelevant explanations. TFP certainly did not boost economic growth during the 1980s, and Yugoslavia did encounter diminishing MPK since the early 1960s. However, relative to the labour wedge, these factors were of second-order importance.

The limitation of the aforementioned debate is that it does not move past what Maddison (1988) calls the “proximate” sources of growth. The inability of Eastern European countries to converge towards income levels of their market-oriented neighbours is attributed to the embedded inefficiencies of socialist economies (Kornai, 1980). Incentives for innovation were poor (Berliner, 1976), labour was demoralised (Ofer, 1987), and the system was unable to adapt to the requirements of flexible production technology (Broadberry and Klein, 2011). Thus, Krugman (1994) argues that socialist economies were bound to fail. I contribute to this strand of literature that focuses on what Maddison (1988) calls the “ultimate” sources of growth by analysing the impact of the labour-managed firm on the incentive to provide labour. If Yugoslavia was characterized by embedded disincentives that caused its failure, these poor incentives were not primarily related to incentives to innovate or imitate, but rather related to the incentives to work.

The remainder of the paper is organized as follows. Section 2.2 describes the evolution of the Yugoslav economic system. Section 2.3 defines the model, it specifies the used wedges, and it discusses the BCA procedure and related assumptions. Section 2.4 describes the data sources and parameters. Sections 2.5 and 2.6 present the results. Here, I provide detailed interpretation(s) concerning the evolution of each wedge. Finally, section 2.7 provides a conclusion, and includes remarks on the significance of the Yugoslav experience for wider developmental concerns.

## 2.2 Historical context

The strong anti-fascist resistance movement, led by the Communist Party of Yugoslavia (CPY) and its leader, Tito, was able to assert political power after the end of WWII. The CPY did not face significant

political opposition in the immediate post-war period. It was backed, to an extent, by genuine popular support (Lampe, 2000). The fight against the Axis powers and their domestic collaborators legitimated it.

The evolution of the socialist economic system in Yugoslavia can be divided into four phases that can be perceived as a gradual move from central planning through market socialism to decentralised planning. The first period, during 1945-51, was characterized by rigid central planning stressing heavy industrialisation along the development model set by the Soviet Union (Horvat, 1971).

The split between the Yugoslav president Tito and the Soviet leader Stalin in 1948 was a pivotal moment in Yugoslav history.<sup>1</sup> Yugoslav authorities initially attempted to regain Stalin's favour. As rapprochement with the Soviet Union turned impossible while Stalin lived, Yugoslav officials sought to distance themselves from the Soviet Union and its ideology. They started constructing a unique version of socialism. This period marks the second phase of development that lasted until 1965. Collectivisation and binding output targets were abandoned, as well as the most egregious price distortions. A substantial degree of decision-making power was delegated to enterprises (Prout, 1985). Firms became labour-managed, or organized along the principles of self-management. Work councils, supposedly representing the interests of workers, could, in conjunction with the local government, hire and fire the managers of the enterprise. Moreover, they could decide, to a degree, on marketing and production processes of an enterprise (Horvat, 1971).

Even though economic decision-making power was substantially decentralised, the Federal authorities still possessed effective control over the economy through the General Investment Fund. The creation of the Fund during the early 1950s replaced direct budget transfers as a main source of investment finance. The Fund centralised capital, which was then allocated to firms that either promised highest returns in investment auctions, or were deemed worthy of investment for political reasons (Bičanić, 1973).

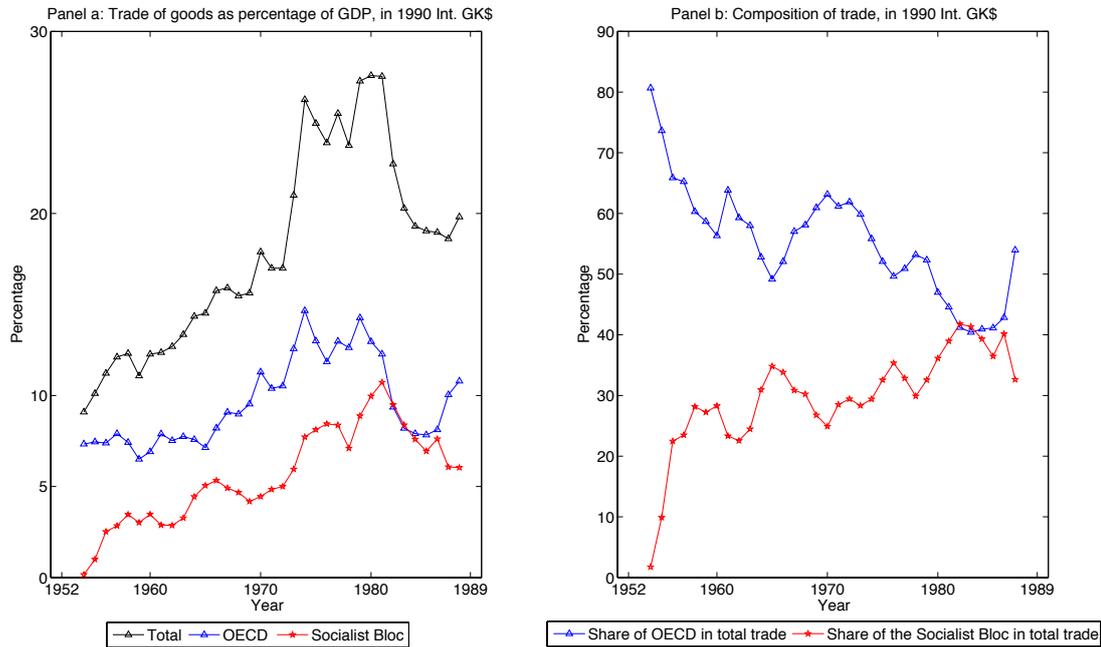
During the 1950s, Yugoslavia began gradually opening up to the West. Figure 2.1.b illustrates that Yugoslavia conducted most of its trade with the OECD countries. This is not to say that Yugoslavia was particularly open to the West, or to the wider global economy. Its share of total trade as percentage of gross domestic product (GDP, 1990 Int. GK\$) remained at relatively low levels during the 1950s (figure 2.1.a). Nevertheless, Yugoslav trade with both the OECD club and the Socialist Bloc gradually increased (figure 2.1.a).

The economic reform of 1965 opened the third phase of development that lasted until 1974. It was a heyday of market socialism. Yugoslavia joined the General Agreement on Tariffs and Trade (GATT) in 1966. Figure 2.1.a shows that the entrance into the GATT coincides with a strong increase in

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<sup>1</sup>See Rajak (2011) for the description of the episode.

Figure 2.1: Trade (exports and imports) as percentage of GDP (1990 Int. GK\$), and composition of trade, Yugoslavia, 1952-89



Notes: Measure of trade openness in figure 2.1.a can be considered real, since GDP is PPP adjusted.

Sources: Value of trade is taken from *Jugoslavija 1918-1988: Statistički Godišnjak* (Savezni Zavod za Statistiku, 1989) and *Statistički Godišnjak SFR Jugoslavije* (SGJ) (Savezni Zavod za Statistiku, 1991), and composition of trade is taken from OECD (1965, 1990)

Yugoslav trade with the OECD countries. In addition to this, market forces were strengthened through a liberalisation of prices, and through allowing enterprises to engage freely in foreign trade. Crucially, work councils of labour-managed firms were granted almost complete autonomy over the distribution of net income between further investment and higher wages. Furthermore, the previous fixed charge on the usage of capital by firms (it was a cost on capital in the absence of capital markets) designed to finance the General Investment Fund was scrapped. Banks became the primary financial intermediary, as opposed to the General Investment Fund in the previous period. Banks were intended to be the institutional channel through which scarce resources would be allocated to their most productive use. In effect, banks were subsidizing capital, and formed the soft budget constraint that firms faced (Prout, 1985; Uvalić, 1992). That is, along the lines of the theory of soft budget constraint formulated by Kornai (1979, 1980), firms had assured access to credit. Poorly performing firms were rarely denied credit (Prout, 1985; Uvalić, 1992).

One of the main aims of the economic reforms of 1965 was to increase the plough-back of profits into the enterprises through decreased taxation of enterprise revenues. The aim was to increase the real return on investment by incentivising firms to strengthen their risk-assessment capabilities. The total share of enterprise self-financing of fixed investment increased substantially from 28 per cent in 1965, to over 50 per cent in 1966 (Uvalić, 1992).

Since unemployment increased, a 1966 government bill opened Yugoslav borders to all labourers who wished to work abroad. Yugoslavs responded *en masse*. By 1981, approximately 10 per cent of labour moved to the West, primarily West Germany (Lampe, 2000).

The 1974 constitution further decentralised economic power. This ushered in the last phase of the economic system that lasted until the implosion of the country in 1991. Economic power was decentralised to departmental level within firms. Decentralisation of this type, however, did not make the economy more market oriented. On the contrary, it was a period of de-liberalisation. The 1974 constitution institutionalised the backlash of political elites against the increasingly independent managers. The economy became clogged with overregulation operated by overlapping authorities that formalized the relationship between the departments within a firm, between firms within a sector, between the sectors, and so on. Pejovich (1980) called this a system of contractual self-management that led to an increase in transaction costs and efficiency loss in the transmission of market information.

## 2.3 Methodology

BCA methodology is based on the standard Ramsay-Cass-Koopmans growth model, but includes wedges. Chari, Kehoe, and McGrattan (2007) and Brinca, Chari, Kehoe, and McGrattan (2016) argue that a large set of dynamic general equilibrium models are equivalent to a prototype neoclassical growth model embodying wedges in the first order conditions. BCA identifies the evolution of incentives (wedges) that firms and households face. The wedges can be thought of as shocks that influence decisions of economic agents. They together drive the overall economic growth. I use the labor wedge, capital wedge, income wedge, and efficiency wedge (TFP), and describe them below.

### 2.3.1 Prototype Ramsay-Cass-Koopmans model

The infinitely lived representative household derives utility at period  $t$  from per capita consumption ( $c_t$ ) and leisure ( $1 - l_t$ ):

$$\sum_{t=0}^{\infty} \beta^t N_t [\log(c_t) + \phi \log(1 - l_t)] \quad (2.1)$$

where  $N_t$  denotes the working age population, and  $\phi$  is the coefficient for leisure. The household discounts consumption and leisure with the factor  $\beta$ .

The representative firm is characterized by the Cobb-Douglas production function as in Hall and Jones (1999):

$$Y_t = K_t^\theta (x_t h_t L_t)^{1-\theta} \quad (2.2)$$

where  $Y_t$  denotes output, which is a function physical capital ( $K_t$ ), labour augmenting technological

progress ( $x_t$ ), human capital per worker ( $h_t$ ), and labour ( $L_t$ ).  $\theta$  is the elasticity of output with respect to physical capital. Assuming constant returns scale,  $1 - \theta$  is the elasticity of output with respect to labour augmented by quality ( $x_t h_t L_t$ ). All the components of output are determined outside the model, except physical capital, which is characterized by the usual law of motion:

$$K_{t+1} = (1 - \delta)K_t + I_t \quad (2.3)$$

where  $\delta$  is the depreciation rate, and  $I_t$  denotes gross investment.

In addition to the production function in equation 2.2, the equilibrium of a prototype neoclassical growth model is characterized by the following three equations:

$$\frac{(1 - \theta)y_t}{l_t} = \frac{\phi c_t}{(1 - l_t)} \quad (2.4)$$

$$\frac{(1 + \gamma)c_{t+1}}{c_t \beta} = 1 + \theta \frac{y_{t+1}}{k_{t+1}} - \delta \quad (2.5)$$

$$c_t + i_t = y_t \quad (2.6)$$

where  $Y_t$ ,  $I_t$ , and  $K_t$  are expressed in per capita terms as  $y_t$ ,  $i_t$ , and  $k_t$ , respectively.  $\gamma$  is the growth rate of labour augmenting technological progress. The household's first order condition in equation 2.4 states that the marginal product of labour (left-hand side) should be equal to the marginal rate of substitution between consumption and leisure (right-hand side). It determines the equilibrium condition for the supply of labour. Equation 2.5 defines the growth rate of consumption, by specifying that the intertemporal marginal rate of substitution (left-hand side) should be equal to the cross-period return on investment (right-hand side).<sup>2</sup> Equation 2.6 describes the resource constraint of the economy, by specifying that the total income of the economy (right-hand side) is spent on either consumption or investment (left-hand side).

### 2.3.2 Wedges

The rationale of BCA rests on the observation that, in real economies, the terms on the sides of equation 2.2, and of equations 2.4-2.6, tend to be different. These differences are regarded as wedges. These wedges measure the distortions that economic agents face.

The efficiency wedge, or TFP, measures the efficiency with which inputs are transformed into output. As in real business cycle models, the TFP wedge is measured as the deviation around the constant

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<sup>2</sup>I assume that economic agents have perfect foresight.

growth rate of labour-augmenting technological progress ( $\gamma$ ), or balanced-growth path. The model thus focuses on the accelerations or decelerations of growth around the balanced-growth path. Formally, TFP is based on equation 2.2, and is defined as:

$$z_t = \frac{y_t}{k_t^\theta (x_t h_t l_t)^{1-\theta}} \quad (2.7)$$

The labour wedge measure the discrepancy between the marginal rate of substitution of consumption for leisure, and the marginal product of labour. Incentives that drive the supply of labour to deviate from the level implied by equation 2.4 are reflected in the labour wedge ( $1 - \tau_{l,t}$ ):

$$1 - \tau_{l,t} = \frac{\frac{\phi c_t}{(1-l_t)}}{\frac{(1-\theta)y_t}{l_t}} \quad (2.8)$$

The labour wedge is related to the structure of incentives that determine the supply of labour. A rising labour wedge can be interpreted as rising return on labour that stimulates the provision of labour. The labour wedge is often interpreted as synonymous with the distortive effect caused by labour taxation (Prescott, 2004; Chari, Kehoe, and McGrattan, 2007; Ohanian, Raffo, and Rogerson, 2008). As such, a deteriorating labour wedge can be interpreted as a distortion arising due to increased taxation of labour - e.g. due to increased income taxation. For instance, if the marginal product of labour increases and the marginal rate of substitution remains constant, the labour wedge will deteriorate. Households are not receiving the proceeds of their product in the form of higher consumption or leisure. Following the tax analogy, this is equivalent to being taxed more.

The capital wedge measures the frictions that distort the intertemporal Euler equation, which specifies the trade-off between current and future consumption. Incentives that drive investments to deviate from the level implied by equation 2.5 are reflected in the capital wedge ( $1 - \tau_{k,t+1}$ ):

$$1 - \tau_{k,t+1} = \frac{\frac{(1+\gamma)c_{t+1}}{c_t^\beta}}{1 + \frac{\theta y_{t+1}}{k_{t+1}} - \delta} \quad (2.9)$$

The capital wedge is related to the structure of incentives determining saving and investment. An increasing capital wedge can be interpreted as an increasing return on capital that stimulates saving and investment. Analogous to the labour wedge, a capital wedge is often interpreted as synonymous with the distortive effect caused by taxation of capital. For instance, if the cross-period return on investment increases, given the intertemporal rate of substitution, the capital wedge will deteriorate. Households are undersaving because, following the tax analogy, the tax rate has increased.

The income wedge measures the discrepancy between output and domestic private demand - composed of consumption and investments - in equation 2.6. This discrepancy measures the expenditure

gap in order for the resource constraint to hold. The income wedge ( $\tau_{i,t}$ ) measures output appropriated by the government and the foreign sector:

$$\tau_{i,t} = y_t - c_t - i_t \quad (2.10)$$

The main limitation of BCA is that the measured wedges do not interact (Christiano and Davis, 2006). Each wedge evolves independently of the others, neglecting possible spillover effects. Furthermore, in order to understand the exact incentives that, say, increase the return on the supply of labour, a researcher should specify explicit mechanisms. This is not necessarily a weakness. A model with detailed mechanisms *a priori* assumes the importance of the same mechanisms, which might not be the case. BCA remains agnostic *ex ante* about important channels that drive macroeconomic fluctuations. It provides diagnostic results without assuming which factor may or may not be an important source of growth. BCA may thus be applied to a variety of countries in a variety of time periods. Finally, BCA cannot explain the evolution of TFP because it is not an endogenous growth model. In that sense, it shares a common problem with growth accounting. Relating the empirical findings to the existing literature on Yugoslav macroeconomic history can alleviate some of the aforementioned issues.

### 2.3.3 Fundamental assumptions

Implied profit-maximization is a poor description of firm behaviour within a socialist economy. BCA, however, can be applied to socialist economies. Cheremukhin, Golosov, Guriev, and Tsyvinski (2015, 2017) use an extended BCA framework to analyse the economic growth of socialist China and Soviet Union, respectively. Cheremukhin, Golosov, Guriev, and Tsyvinski (2017) provide a detailed description of how some frictions related to Soviet Union map into a neoclassical growth model characterized by wedges. A socialist economy can thus be perceived as a distorted version (embodied by wedges) of a perfectly competitive economy. If anything, the more liberal system of Yugoslav market socialism might be more suitable for BCA application than the more rigid socialist systems like Stalin's Soviet Union and Mao's China.

Turning to the production function, the Cobb-Douglas assumption of unit substitution between capital and labour might be wrong. Weitzman (1970) argues that the Soviet economy is better represented by CES production function with factor substitution below one. The implication of low factor substitution is that the Cobb-Douglas production function fails to register the true extent of diminishing MPK. It thus underestimates the contribution of TFP to growth. If this is true, my findings would be strengthened. The finding concerning the increasing importance of TFP in sustaining growth would be strengthened, since TFP would gain a greater weight as a source of growth. The deterioration of the labour wedge since the mid-1960s would be even more pronounced because labour

would gain a greater weight as a constraining factor of growth.

## 2.4 Data and calibration

### 2.4.1 Output and inputs

The period of analysis is between 1952 and 1989. The data this paper relies on is derived from both official and alternative sources. The aim is to maximise the quality of data. All value figures are converted into 1990 International Geary-Khamis dollars. This section briefly describes used data concerning Yugoslavia. A detailed analysis is provided in appendix 2.A.1. For context, I include additional countries in the analysis. The data sources for these countries are reserved for the data appendix, too (2.A.2). U.S. is included since it remains at the technological frontier. Greece, Portugal, and Spain are included since they were at a broadly similar level of development as Yugoslavia. Like Yugoslavia, these southern European countries were also partially planned economies under autocratic regimes. I do not include other socialist economies because the available data is not reliable.

I use GDP series from Maddison (online).<sup>3</sup> Annual employment data is taken from official sources.<sup>4</sup> Workers employed in private farming are reported only in population censuses (1948, 1953, 1961, 1971, 1981, and 1991).<sup>5</sup> For the remaining years of the analysis, agricultural labour is estimated through cubic interpolation. Labour is adjusted for hours worked from official sources.<sup>6</sup> Annual labour (total hours worked) is de-trended by 3600 hours, since the representative household spends a portion of the annual time endowment satisfying biological necessities (like sleeping).

Human capital is constructed following the method of Hall and Jones (1999). Average years of schooling are turned into mincerian human capital by adjusting for the income returns to education relative to labour without education. Return to education is assumed to be piecewise linear. The return to education under 4 years of schooling is taken to be 13.4 per cent, between 4 and 8 years of schooling it is taken to be 10.1 per cent, and above 8 years of schooling it is taken to be 6.8 per cent. Years of schooling are based on Yugoslav population censuses. They are taken from the second paper of the thesis.

For gross investment, I use official data, but exclude an investment category “other”.<sup>7</sup> I omit this category because, among other factors, it includes expenditure on product research and training of personnel, which is not part of physical capital. The exclusion of the category other reduces gross

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<sup>3</sup>Consumption series, however, are taken from official sources, since alternative long-run series are unavailable (SGJ, (Savezni Zavod za Statistiku, 1991)).

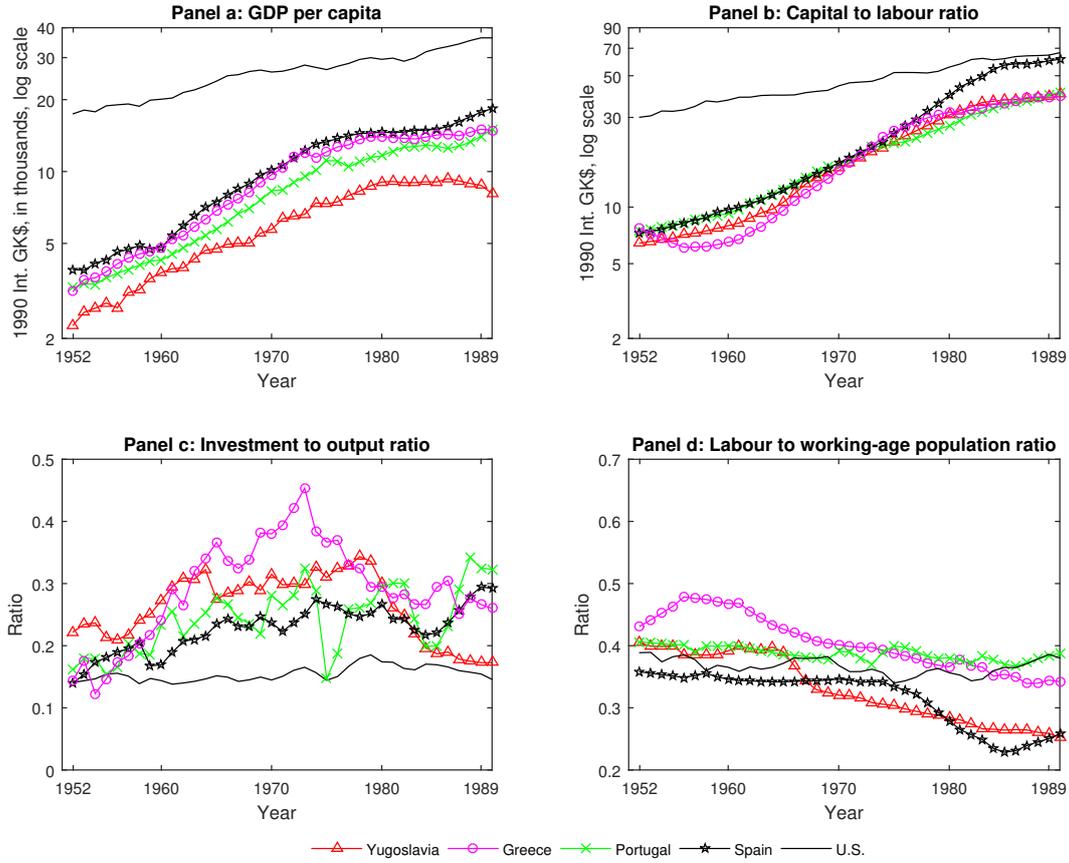
<sup>4</sup>SGJ (Savezni Zavod za Statistiku, 1991).

<sup>5</sup>Popis Stanovništva (Savezni Zavod za Statistiku, 1948, 1953, 1961, 1971, 1981) and International Labor Organization (ILO) for 1991 (online).

<sup>6</sup>SGJ (Savezni Zavod za Statistiku, 1952-1991).

<sup>7</sup>Investicije u Osnovna Sredstva SFR Jugoslavije, Socijalističkih Republika i Socijalističkih Autonomnih Pokrajina, 1952-1981, u Cenama 1972 (Savezni Zavod za Statistiku, 1983a) and Investicije (Savezni Zavod za Statistiku, 1982-1989).

Figure 2.2: Macroeconomic data, Yugoslavia and sample countries, 1952-89



Notes: Capita is defined as working-age person (15-64) through the text. Labour is total hours worked.

investment by approximately 10 per cent on an average annual basis. Gross investment is disaggregated into three components - equipment, residential structures, and non-residential structures. Finally, I initialise capital stock series by using existing national wealth estimates.<sup>8</sup>

Some of Yugoslavia's macroeconomic data, within context, is provided in figure 2.2. The oil shock of 1979 seems to be associated with the deterioration of most macroeconomic variables (GDP per capita, capital to labour ratio, and investment to output ratio). By contrast, labour to the working-age population ratio, indicating labour utilisation rate, gradually deteriorated since the mid-1960s.

## 2.4.2 Parameters

The discount factor ( $\beta$ ) is assumed to be 0.95, and the coefficient for leisure ( $\phi$ ) is taken to be 2. Similar assumptions are made in articles that use the same or similar methodology, and that analyse economic growth of countries at a similar level of development (Lu, 2012; Cheremukhin, Golosov, Guriev, and

<sup>8</sup>Equipment and non-residential structures are taken from the official survey of fixed assets: *Osnovna Sredstva Privrede Društvenog Sektora SFR Jugoslavije, Socijalističkih Republika i Socijalističkih Autonomnih Pokrajina, 1952-1981, u cenama 1972* (Savezni Zavod za Statistiku, 1983b). Residential structures are taken from Vinski (1978).

Table 2.1: Yugoslav TFP growth in the literature

	TFP share of output growth	Period	Sector	Capital share
<i>This paper</i>	46%	1952-89	Aggregate	0.4
Balassa and Bertrand (1970)	40%	1953-65	Manufacturing	0.65
Horvat (1971)	43%	1954-67	Manufacturing	n.a.
Jerome (1985)	26%	1950-80	Aggregate	n.a.
<i>Second paper of thesis</i>	32%	1953-86	Aggregate	0.43
Sapir (1980)	43%	1955-74	Manufacturing	0.13-0.28
Simon (2013)	55%	1953-89	Aggregate	0.29

Notes: Horvat (1971) estimated TFP gains in manufacturing, construction, and crafts. The capital share of income in Sapir (1980) is time-varying. These estimates are imperfectly comparable due to differences in analysed periods, sectors, and used capital shares.

Tsyvinski, 2015, 2017). It is possible to estimate these parameters from the data, albeit with subjective assumptions. The estimation of these parameters is reported in appendix 2.A.3.2. The choice of the discount factor and coefficient for leisure does not affect the results.

Assuming perfectly competitive markets, the elasticity of output with respect to capital ( $\theta$ ) is the capital share of income. I assume that  $\theta$  is 0.4. This is similar to the often estimated capital share of income in socialist countries (Easterly and Fischer, 1995). The remaining parameters are estimated from the data. Population growth rate ( $v_t$ ) is time varying, and is on average 1.1 per cent per annum. The growth rate of labour-augmenting technological progress ( $\gamma$ ) is 1.1 per cent, which is the average annual growth rate of labour-augmenting technological progress during 1952-89. The depreciation rate ( $\delta$ ) is 15 per cent for equipment, 3.1 per cent for non-residential structures, and 1.3 per cent for residential structures. I take these percentages from the Hulten and Wykoff (1981) depreciation rate estimates by asset type.

## 2.5 Results: The evolution and interpretation of wedges

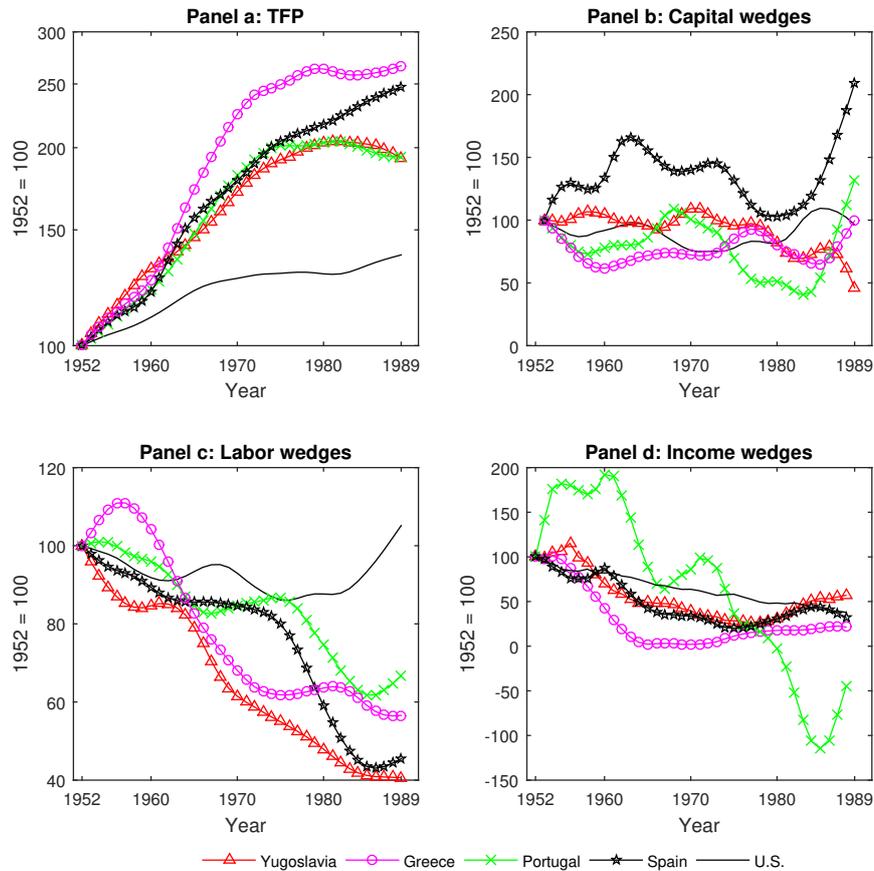
Figure 2.3 depicts the evolution of Yugoslav wedges within context. The evolution of wedges is the cornerstone of the analysis because the growth rates are robust to a variety of assumptions and specifications, while the levels are not (see appendix 2.A.3). In this section, I provide interpretation for the evolution of each wedge.

### 2.5.1 TFP

Between 1952 and 1989 Yugoslav TFP grew by 1.8 per cent on an average annual basis (figure 2.3.a). Table 2.1 compares this estimate to the TFP estimates in the existing literature. Measured TFP gains of this paper, as a share of output growth, fall within the mid-range of findings.

Yugoslav TFP grew faster than the U.S. TFP. This implies that Yugoslavia converged towards the

Figure 2.3: Yugoslav and sample-countries wedges, 1952-89



Notes: The increase in any wedge is beneficial to economic growth. However, with the exception of TFP, an increase in the wedge does not necessarily imply that its contribution to economic growth is overall positive. It may be that the impact of a wedge on economic growth is actually negative. But, as the wedge increases, its impact on economic growth will be less damaging and, in that sense, it will be beneficial to economic growth. Business cycles are removed using the Hodrick-Prescott filter (smoothing parameter = 6.25). No technological growth rate is imposed ( $\gamma = 0$ ), rendering TFP growth comparable to standard growth accounting exercises.

global technological frontier. It seems that TFP in Yugoslavia grew at a similar rate as in Portugal, but slower than in Greece and Spain. The evolution of Yugoslav TFP can be divided into two periods - before and after the second oil shock in 1979. Before 1979, Yugoslav TFP grew rapidly. It stagnated afterwards, and decreased towards the end of the 1980s.

The literature provides a set of viable interpretations underlying the evolution of TFP. [Nishimizu and Page \(1982\)](#) analyse Yugoslav TFP between 1965 and 1978. They find that the evolution of TFP was driven by efficiency, rather than by technology. This is consistent with [Hsieh and Klenow \(2009\)](#), who argue that the efficiency of resource allocation is a major component of TFP.

Improvements in resource allocation might have been driven by reconstruction dynamics. [Vonyó \(2008\)](#) argues that, for core Western countries, the intensity and variety of economic growth during the 1950s and the 1960s can be mostly explained by post-war reconstruction. Post-war reconstruction

Table 2.2: Relative productivity of non-agriculture and agriculture, Yugoslavia, 1953-86

	Ratio of non-agricultural to agricultural labour productivity	Ratio of non-agricultural to agricultural MPH
1953	4.365406	1.959573
1961	3.511758	1.610309
1971	3.074353	1.453791
1981	1.855458	0.959013
1986	1.643827	0.857754

Notes: The marginal product of human capital (MPH) is the derivative of output with respect to labour augmented by human capital. Physical capital in agriculture includes the value of land and livestock.

Source: Sectorial level data is taken from the second paper of the thesis.

might matter for socialist European countries as well. [Vonyó \(2010\)](#) finds that post-war reconstruction drove the growth dynamics of Hungary during the 1950s and the 1960s. Unfortunately, the quantitative contribution of reconstruction to Yugoslavia's growth is impossible to measure. Reliable macroeconomic aggregates are not available for the interwar and the immediate post-war period. It is difficult to speculate about the extent to which reconstruction efforts might have mattered.

Yugoslavia was overwhelmingly agricultural in the aftermath of World War II. But, it experienced rapid structural modernisation during the post-war period.<sup>9</sup> Reallocation of resources from low productivity agriculture to high productivity manufacturing and modern services certainly stimulated TFP.<sup>10</sup> Table 2.2 demonstrates that the sectorial labour product gap declined rapidly between 1953 and 1986. The reduction of the marginal quality-adjusted labour product gap is strongly indicative of efficiency gains associated with a process of structural modernization (column 2 of table 2) ([Herrendorf, Rogerson, and Valentinyi, 2014](#)). Moreover, it seems that TFP gains during the 1970s were sustained partially by structural modernisation, since the reduction of the marginal product gap accelerated.<sup>11</sup>

Nevertheless, it seems unlikely that structural modernisation is sufficient in explaining the evolution of TFP. In the second paper of the thesis, I find that efficiency gains associated with structural modernisation can account for one-quarter of conventionally measured TFP gains in Yugoslavia. Further explanations concerning the evolution of TFP are required.

Trade might, beyond boosting aggregate demand, indirectly impact output through TFP ([Alcalá and Ciccone, 2004](#); [Madsen, 2007](#)). The gradual integration of Yugoslavia into global markets (figure 2.1.a)

<sup>9</sup>According to official statistics, agricultural workers formed 74 per cent of total workforce in 1952. By 1989, agricultural workers formed 19 per cent of total workforce.

<sup>10</sup>As in other socialist economies, policy-makers attempted to stimulate structural modernization by relative price distortions. Prices of agricultural goods were set below world prices, while prices of industrial goods were set above world prices. [Allen \(2003\)](#) argues that such policies were conducive to the expansion of industry and aggregate output of the Soviet Union. This price distortion was gradually alleviated in Yugoslavia. According to official data, I find that the annual inflation rate of agricultural goods was on average 2 percentage points higher than that of non-agricultural goods during 1952-86 (*Jugoslavija 1918-1988 Statistički Godišnjak*, ([Savezni Zavod za Statistiku, 1989](#))).

<sup>11</sup>During the 1970s, the sectorial marginal product gap was reduced by 4 per cent on an average annual basis, while in the 1950s and the 1960; it was reduced by 2.5 and 1 per cent, respectively (table 2.2).

might have stimulated TFP through three channels. First, by increasing competitive pressures and hence stimulating domestic companies to improve their efficiency. Second, by allowing the internationally small Yugoslav economy to realise economies of scale by producing for foreign markets. Third, by facilitating the adoption of foreign knowledge.<sup>12</sup>

The previous interpretations focused on efficiency gains, neglecting possible technological gains. DeLong and Summers (1991) argue that machinery and equipment investment has strong association with growth. Equipment investment might be positively associated with growth through TFP because equipment embodies technology. Moreover, Caselli and Wilson (2004) provide evidence that the composition of equipment influences TFP, since different types of equipment embody different intensities of research and development (R&D), and hence technology. As a proxy for possible technological gains, I examine equipment investment as percentage of GDP and the composition of equipment investment. As a proxy for the composition of equipment investment, I examine the composition of equipment imports. Yugoslav trade statistics allow me to differentiate between electrical equipment, non-electrical equipment, trucks, and other vehicles. In the Caselli and Wilson (2004) dataset, electrical machinery is characterized by higher R&D intensity than other types of equipment I can identify. Figure 2.4.a shows that equipment investment as percentage of GDP increased since the mid-1960s until the late 1970s. Figure 2.4.b shows that imports of electrical machinery as percentage of total machinery imports increased as well. Conjecturally, both figures suggest that increased adoption rate of technology sustained TFP gains during at least the 1970s.

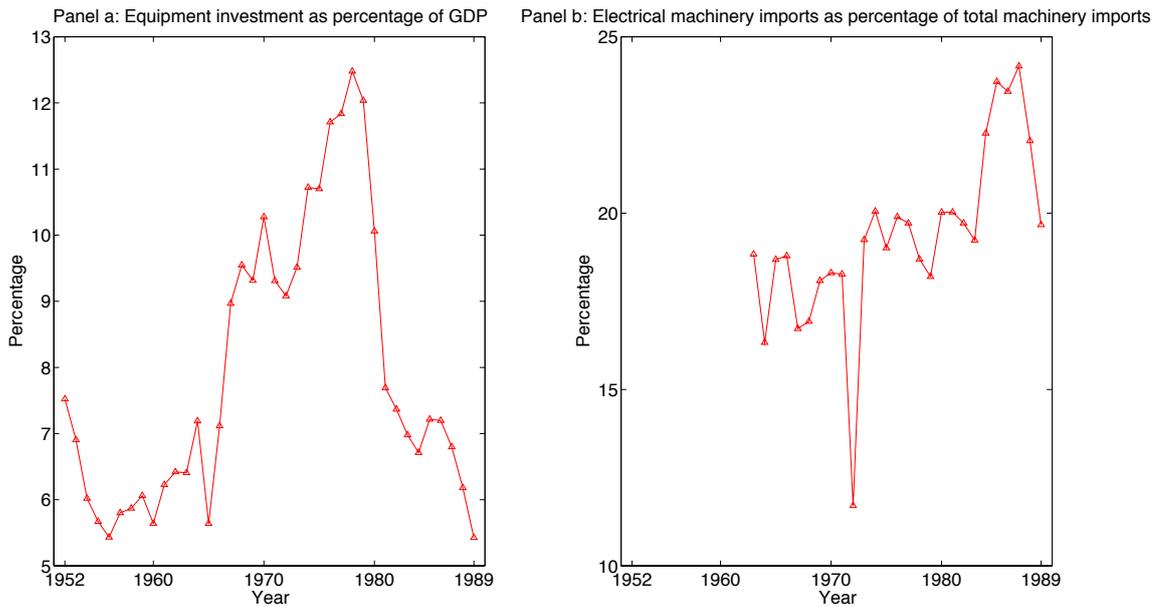
Turning to the 1980s, can technology explain the stagnation of TFP? Broadberry and Klein (2011) argue that Eastern European economies performed relatively well in an era of mass production during the 1950s and the 1960s. They were, however, unable to achieve satisfactory productivity performance with the onset of flexible production technology in the late 1970s and the 1980s. Equipment investment, embodying flexible production technologies (like information and communication technologies), did precipitously decrease since the late 1970s.<sup>13</sup> This, however, seems to be related to a deep crisis that was instigated by the second oil shock in 1979. During the 1970s, with available cheap capital in global financial markets, total external debt level increased by nearly eight times, rendering Yugoslavia vulnerable to external shocks (Dyker, 1990). External shocks came in two closely related forms.

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<sup>12</sup>Starting in the 1960s, the development of tourism along the Adriatic coast is an illuminative example that Yugoslavia, to an extent, did specialize in the production of goods and services according to its comparative advantage (Allcock, 1986). This may have boosted TFP as long as it caused efficiency improvements and enhanced knowledge absorption. In addition to this, OECD trade in Yugoslav GDP has sharply increased following Yugoslavia's accession to the GATT in 1966 (see figure 2.1.a). Trade might have thus (partially) sustained TFP gains during the 1960s and the 1970s. That is, as long as the entry into the GATT realigned Yugoslav resources to more productive uses through increased trade with the OECD club, as opposed to the more autarkic socialist system.

<sup>13</sup>The absolute value of electrical machinery has precipitously declined, too, although its share in total machinery imports has increased (figure 2.4.b). For instance, between 1981 and 1985, collapsing domestic demand and severe austerity measures caused a 25 per cent decline of the nominal value of electrical machinery, even though output prices increased by a factor of five during the same period.

Figure 2.4: Equipment investment and composition of equipment imports, Yugoslavia



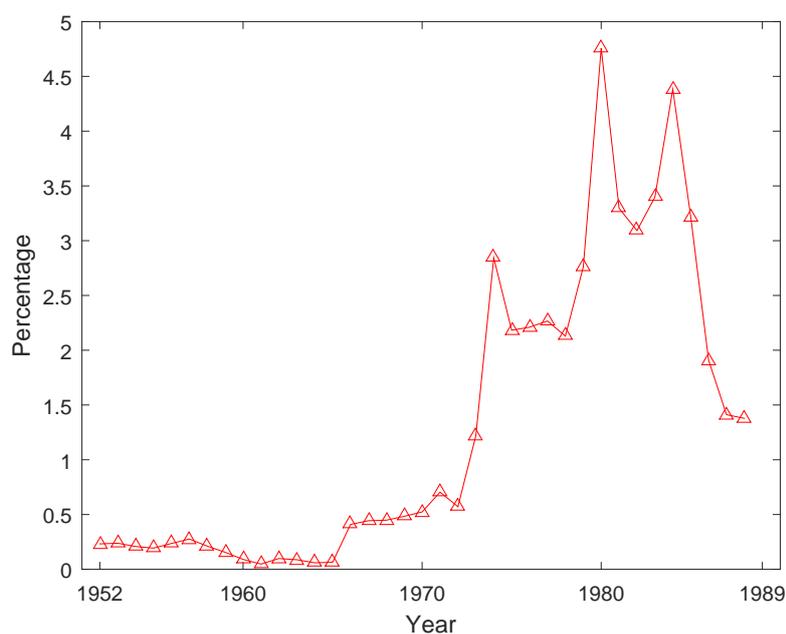
Note: It is not possible to identify the import categories of equipment before the early 1960s.

First, the 1979 Iranian Revolution rattled the global energy markets (Hamilton, 2013). Figure 2.5 plots crude oil imports as percentage of Yugoslavia's output. The 1979 oil shock, as well as the 1973 oil shock, is associated with a sharp increase in this figure. Yugoslavia was particularly vulnerable to energy shocks because it was using two to three times more energy per unit of output than the OECD countries during the early 1980s (Dyker, 1990). The second oil shock was brought about by increased interest rates in creditor nations designed to reduce inflation, increasing Yugoslavia's debt-servicing costs.

The two combined effects led to a sharp increase in the current account deficit. In just one year, 1978-79, it increased by a factor of three (Dyker, 1990). With constrained export demand, the only way to avoid a crushing balance-of-payments crisis was to limit other components of aggregate demand. From 1979 to 1983, severe austerity measures resulted in a collapse of real personal incomes by approximately 30 per cent, and a precipitous fall in the investment to output ratio (figure 2.2.b). Aggregate demand collapsed, and did not recover during the remainder of the 1980s.

Recessions are typically characterized by decreased capacity utilisation of both capital and labour. If not explicitly accounted for, this would be otherwise reflected in declining TFP (Paquet and Robidoux, 2001). Table 2.3 shows that capacity utilisation had decreased during the 1980s. The declining utilisation rate seems to have been driven by work stoppages and labour unrest that dramatically increased during the 1980s (table 2.4). By contrast, hours worked by engines in plants have increased during the 1980s, according to official sources (SGJ (Savezni Zavod za Statistiku, 1978-1991)). This

Figure 2.5: Crude oil imports as percentage of output, nominal values, Yugoslavia, 1952-89



Notes: Output is Social Product (SP), the socialist equivalent of GDP. Discussion of SP is provided in appendix 2.A.1.

Sources: Crude oil imports and nominal SP are taken from SGJ (*Savezni Zavod za Statistiku*, 1991) and *Jugoslavija 1918-1988: Statistički Godišnjak* (*Savezni Zavod za Statistiku*, 1989).

indicates that firm management attempted to substitute capital for labour to combat declining capacity utilisation.

## 2.5.2 Capital wedge

The Yugoslav capital wedge was stable until the late 1970s (figure 2.3.b). Afterwards, it rapidly decreased. This means that the incentive to save and invest remained stable before decreasing during the late 1970s. In contrast, the Southern European capital wedges increased during the 1980s. To an extent, the relative retardation of Yugoslav economic performance during the 1980s seems to have been caused by diverging capital wedges.

The transition from a centralised provision of capital to a more market-oriented one based on investment auctions during the 1950s does not seem to be reflected in an increase of the capital wedge. Nevertheless, to examine this transition period in greater depth, it is necessary to include the period of central-planning into the analysis (1945-1951). This is unfortunately impossible given the absence of reliable data for the period. Otherwise, one can only surmise that the relegation of investment decisions from central planners to other economic agents stimulated the accumulation of capital.

The introduction of banks as an important financial intermediary in 1965, the scrapping of the fixed charge on the usage of capital, as well as the devolution of investment decisions to labour-managed

Table 2.3: Capacity utilisation rate in Yugoslav manufacturing, in per cent, 1977-89

Year	Capacity utilisation
1977	81
1978	81
1979	81
1980	80
1981	80
1982	77
1983	77
1984	78
1985	77
1986	77
1987	76
1988	75
1989	75

Notes: Capacity utilization rate is an official estimate of feasible output, according to initial design, if factories were operating at full capacity, given capital and labor. Estimates prior to 1977 are un-available. The level at the beginning at the sample period seems internationally comparable. For instance, the 1967-2015 U.S. average of capacity utilization is 80 per cent ([Federal Reserve Bank of ST. Louis](#), online). Sources: SGJ ([Savezni Zavod za Statistiku](#), 1978-1990).

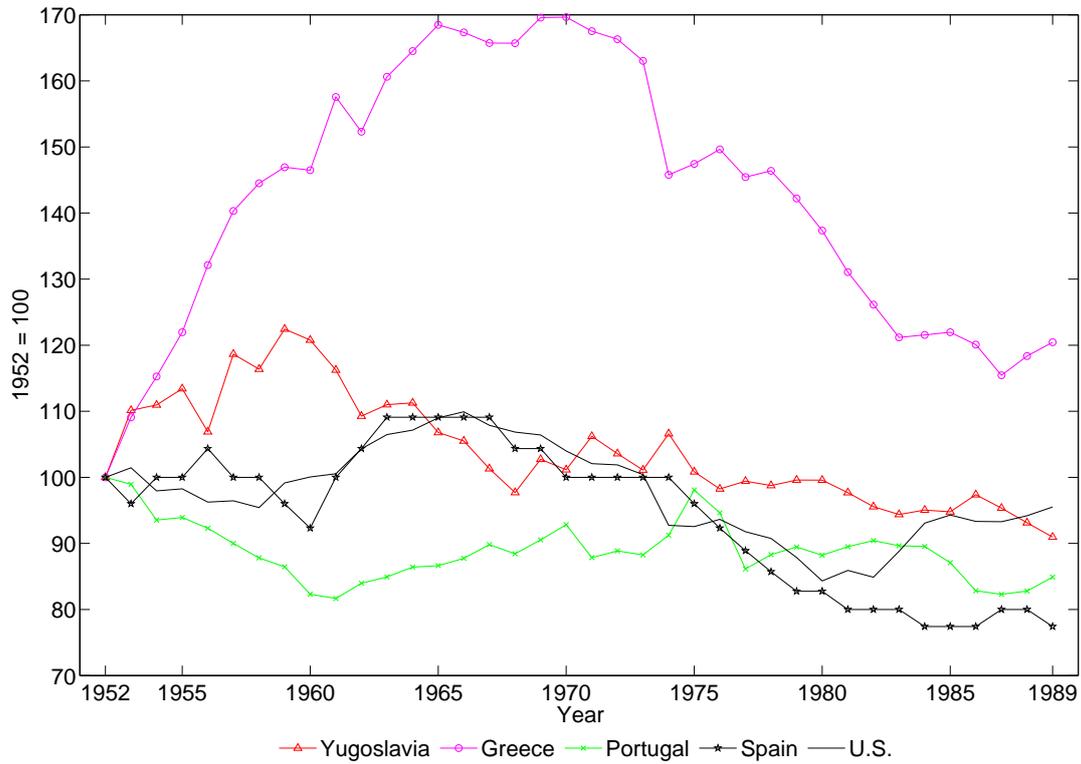
Table 2.4: Work stoppages in Yugoslavia, 1958-89

	Frequency of strikes*	Number of strikes	Number of workers on strike	Media reports of strikes
1958	2.8	n/a	n/a	n/a
1978	30	n/a	n/a	n/a
1980	62	235	13,504	3
1981	47	216	13,507	8
1982	18	174	10,997	24
1983	96	336	21,776	36
1984	100	393	29,031	86
1985	104	696	60,062	158
1986	163	851	88,860	195
1987	227	1685	288,686	734
1988	228	n/a	n/a	320
1989	232	n/a	n/a	n/a

Note: \*1980 to 1989 shows data for Slovenia, a member republic of Yugoslavia.

Sources: [Stanojević \(2003\)](#) for the frequency of strikes; [Jovanov \(1989\)](#) for the number of strikes and the number of workers involved; [Lowinger \(2009\)](#) for media reporting of strikes.

Figure 2.6: Marginal product of capital in Yugoslavia and sample countries, 1952-89



firms, seems to be reflected in a slight increase of the capital wedge.

Similar to the evolution of TFP, the 1979 oil shock is a major turning point for the evolution of the capital wedge. The economy did encounter diminishing returns on capital since the early 1960s (figure 2.6). However, the decrease of MPK is gradual and modest. The evolution of MPK cannot explain the sharp deterioration of the capital wedge since the late 1970s in figure 2.3.b. Rather, it seems that the macroeconomic instability of Yugoslavia, characterized by high and persistent inflation (Frenkel and Taylor, 1993), had increased the preference to consume in the present rather than in future, causing a deterioration of the capital wedge. In addition, the sovereign debt crisis of the 1980s hampered access to credit (Dyker, 1990). This should be reflected in deteriorating capital wedge, because smoothing consumption and financing investment became more difficult.

### 2.5.3 Labour wedge

Yugoslav labour wedge initially deteriorated during the 1950s, but had stabilized by 1965 (figure 2.3.c).<sup>14</sup> Subsequently, it persistently decreased. If Yugoslavia was characterized by embedded disincentives that furthermore intensified over time, they are reflected in the deterioration of the labour wedge. The incentive or ability of households to supply labour deteriorated over time.

<sup>14</sup>The initial decline of the labor wedge is explained by the existence of subsistence consumption in appendix 2.A.3.4.

According to figure 2.3.c, the steady deterioration of the labour wedge during the post-war period is not unique to Yugoslavia. Nevertheless, unlike in Yugoslavia, the labour wedges of Portugal, Spain and the U.S. have rebounded during the mid-1980s. The beginning of the steady deterioration of Yugoslavia's labour wedge coincides with the socio-economic reforms of 1965. Although labour-managed firms were formally established in 1950, they did not operate freely outside government control until 1965 (Sapir, 1980; Estrin, 1983). The 1965 reforms, as mentioned in section 2.2, provided almost complete autonomy to labour-managed firms to distribute their net income between wages and investment.

A large group of scholars argue that labour-managed firms were maximising income per worker (Ward, 1958; Vanek, 1970; Meade, 1972; Estrin, 1983). Moreover, their governing objective was reinforced by the 1965 reforms (Vanek and Jovičić, 1975; Sapir, 1980). Figure 2.7 demonstrates that labour-managed firms were indeed attempting to maximise income per worker. Real hourly wages divided by the marginal product of labour (MPL) (figure 2.7.a) and by TFP (figure 2.7.b) had dramatically increased in Yugoslavia since 1965.<sup>15</sup> This implies that the governing objective of labour-managed firms raised the wage rate above its market clearing level, preventing households from satisfying their condition for the marginal rate of substitution between consumption and leisure, causing the deterioration of the labour wedge. A similar spike in real wages coincides with the deterioration of the Greek, Portuguese and Spanish labour wedges during the 1970s, corroborating the importance of real wages in driving the evolution of the labour wedge.

The evolution of real wages in Yugoslavia does not appear sufficient in explaining the deterioration of the labour wedge since the late 1970s. Real wages had dramatically declined. Further mechanisms linking the behaviour of the labour-managed firm to the evolution of the labour wedge are required.

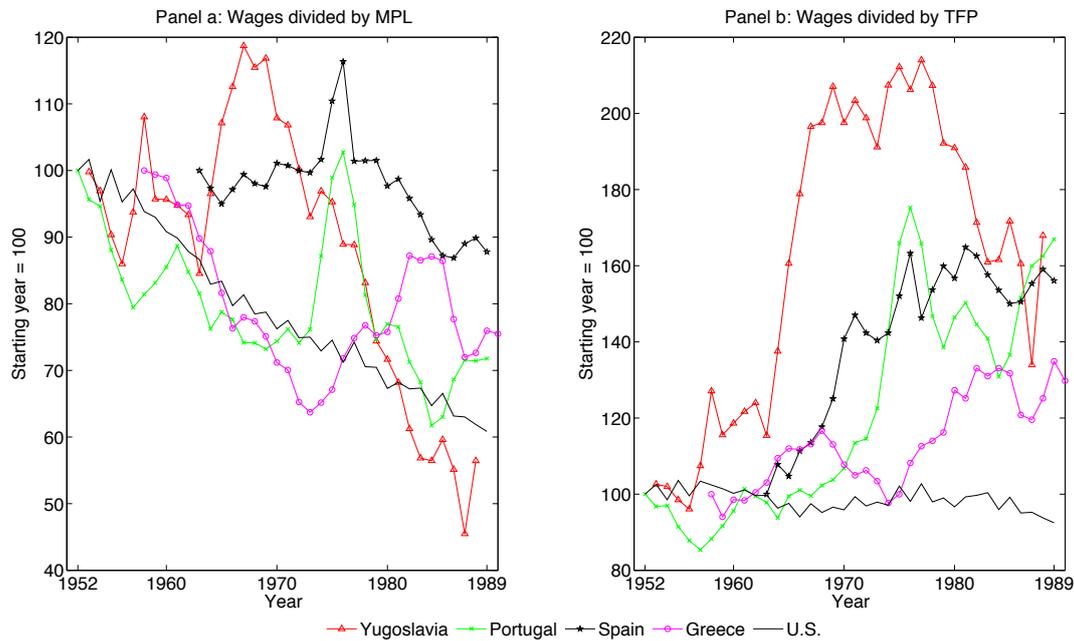
The governing objective of labour-managed firms was partially achieved through restricting new labour entry into existing firms (Milenkovitch, 1971; Sapir, 1980). Even though real wages had collapsed during the 1980s, existing workers were able to capture a larger share of the wage bill than it would have been possible if entry of labour into existing labour-managed firms were not restricted. This behaviour resembles insider-outsider models of labour markets characterized by strong trade unions.

The tendency of labour-managed firms to restrict employment is theoretically well grounded (Ward, 1958; Meade, 1972). Allowing free establishment of firms could have alleviated such distortion. This was not possible since the local government decided whether to allow an establishment of a firm within its administrative boundaries (Horvat, 1971). Furthermore, access to finance was limited (Prout, 1985). Banks were founded and owned by existing firms. It is unlikely that an established firm would be willing to finance a new potential competitor through a proxy.

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<sup>15</sup>The rationale of dividing wages by the MPL follows from the standard first order condition of the firm of equating wages with the MPL. However, workers in Yugoslav labour-managed were appropriating capital rent, and their income depended partially on the capital to labour ratio (Vanek and Jovičić, 1975). As such, dividing wages by TFP might be a better indicator of the extent to which workers managed to maximise their incomes.

Figure 2.7: Hourly real wage rates divided by marginal product of labour (MPL) and TFP, Yugoslavia and sample countries



Note: Real wages are wage rates in manufacturing, in order to ensure comparability of series among the sample-countries.

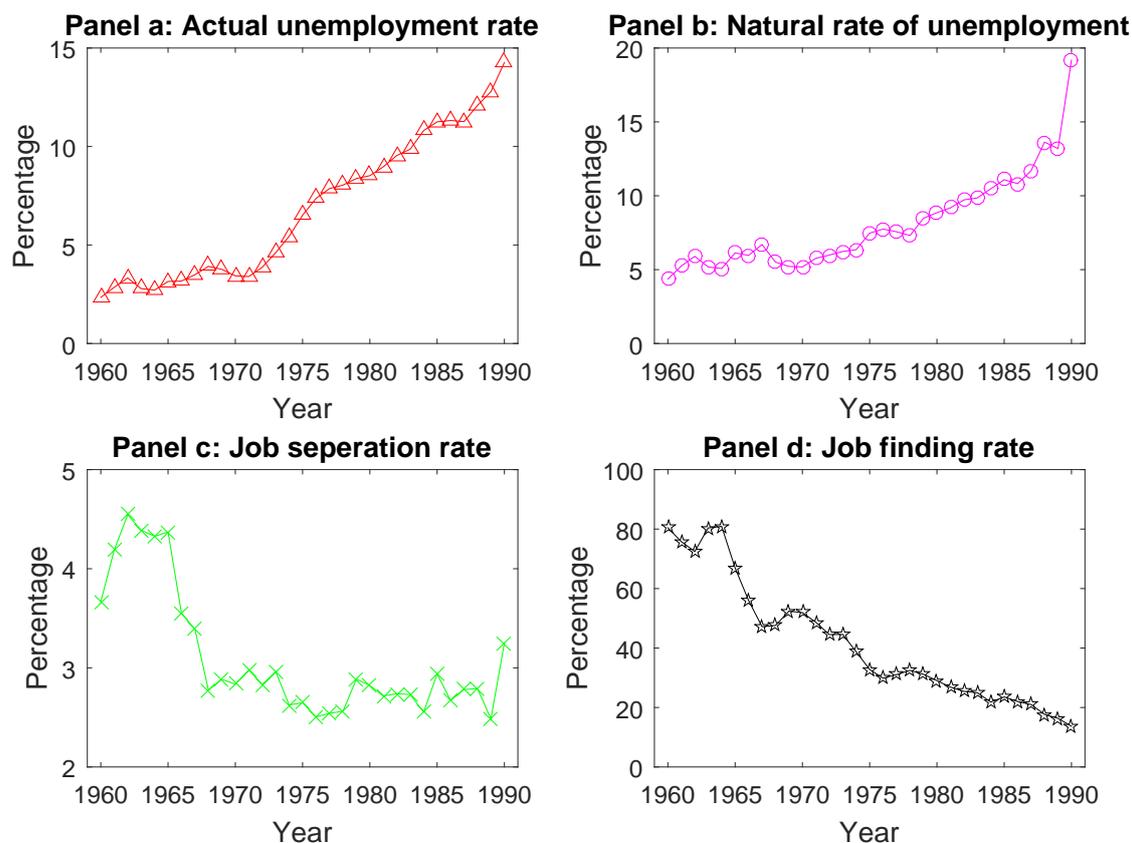
Sources: For Yugoslavia: SGJ ([Savezni Zavod za Statistiku, 1952-1991](#)); for Greece, Portugal and Spain: [Mitchell \(2013\)](#); for U.S.: [BLS](#) (online).

The restriction of labour mobility is reflected in a sharp decrease in the job separation rate (figure 2.8.c) and the job finding rate (figure 2.8.d) in the immediate aftermath of the 1965 reforms. The ability of Yugoslavs to supply labour was severely limited due to the governing objective of labour-managed firms, causing further deterioration of the labour wedge. This was subsequently magnified by the macroeconomic instability instigated by the 1979 oil shock.

The decrease of the job finding rate after 1965 is not immediately reflected in either the actual unemployment rate (figure 2.8.a) or the natural rate of unemployment (figure 2.8.b) due to emigration of labour. With the elimination of travel restrictions in 1966, a large fraction of labour moved to West Europe in search for higher wages (about 10 per cent) ([Lampe, 2000](#)). This drained the domestic supply of labour, possibly causing further worsening of the labour wedge. To speculate, it is possible that friends and relatives of emigrants that stayed in the country were willing to decrease their labour supply because of the massive influx of remittances. Between 1966 and 1989, remittances could fund, on average, about 15 per cent of the expenditure side of the balance of payments position.<sup>16</sup>

<sup>16</sup>SGJ ([Savezni Zavod za Statistiku, 1967-1990](#)).

Figure 2.8: Labour market dynamics in Yugoslavia, 1960-90



Notes: The data on labour market dynamics prior to 1960 is not available. The natural rate of unemployment ( $U$ ) is calculated as;  $U = \frac{s}{(s+f)}$ , where the job separation rate ( $s$ ) represents the fraction of employed workers who lost their job in a particular year, while the job finding rate ( $f$ ) represents the fraction of unemployed people who were able to find a job within a particular year. Interestingly, the natural rate of unemployment is higher than actual unemployment rate. This could be due to data issues, but might further indicate disguised unemployment.

Sources: SGJ ([Savezni Zavod za Statistiku, 1961-1991](#)).

## 2.5.4 Income wedge

The evolution of the income wedge (figure 2.3.d), has been shaped by net exports. Net exports have particularly deteriorated during the 1970s, driving the deterioration of the income wedge. In 1969, I find that imports exceeded exports by 1 percentage point of GDP, while in 1979, imports exceeded exports by 7 percentage points of GDP. As the country entered the debt crisis, depressed domestic demand limited imports of both consumer and investment goods. Furthermore, [Dyker \(1990\)](#) argues that imports of both consumer and investment goods were deliberately decreased in order to mitigate a balance of payment crisis. Exports, given constrained foreign demand, were promoted at any cost. Consequently, the current account position of Yugoslavia improved. For the first time in its history, exports exceeded imports by 1983, driving the improvement of the income wedge.<sup>17</sup> The evolution of

<sup>17</sup>In 1986 as a record year, exports exceeded imports by 1.6 percentage points of GDP.

the income wedge implies that the external shocks to the Yugoslav economic performance after 1979 were partially positive. They caused a forceful restructuring of the balance of payments position, and the structure of GDP.

## 2.6 Simulation results: The contribution of wedges to economic growth

### 2.6.1 Baseline results

From the previous section, it is impossible to assess the quantitative contribution of each wedge to economic growth. Table 2.5 displays the contribution of wedges to the average annual growth rate of each macroeconomic variable of interest (output per capita, labour, capital to labour ratio, and physical capital). The contribution of each wedge is isolated by holding constant the value of all the remaining wedges to their average 1952-7 levels. The contribution of each wedge reveals how much a variable of interest would have grown solely because of the evolution of that wedge, relative to its realised or actual growth rate.

During the 1950s, TFP growth is able to replicate 119 per cent of realised economic growth (first column of table 2.5). In the 1960s, the ability of TFP to replicate actual economic growth increases to 136 per cent, and to 151 per cent during the 1970s. Thus, during these three decades, economic growth would have been higher were all the other wedges fixed. During the 1980s, TFP would have made economic growth negative by a smaller degree were it not for the evolution of the other wedges. The increasing importance of TFP in sustaining economic growth during the Golden Age is reflected in the increasing contribution of TFP to the growth rate of the capital to labour ratio (third column of table 2.5). TFP increased the steady state level of output, while convergence towards the steady state was facilitated through an increase in the capital to labour ratio.

The capital wedge stimulated growth in each decade, primarily through stimulating the capital to labour ratio. The income wedge stimulated growth strongly during the 1970s and the 1980s through increased net foreign demand for domestically produced goods and services. Increased net foreign demand indirectly stimulated growth through increased demand for labour (column 2 of table 2.5) and the capital to labour ratio.

The labour wedge was of minor importance in stimulating output between 1950 and 1980, and it drove the retardation of economic performance during the 1980s. Throughout the sample period, the labour wedge was a major constraint on growth through decreasing labour and physical capital (fourth column of table 2.5).

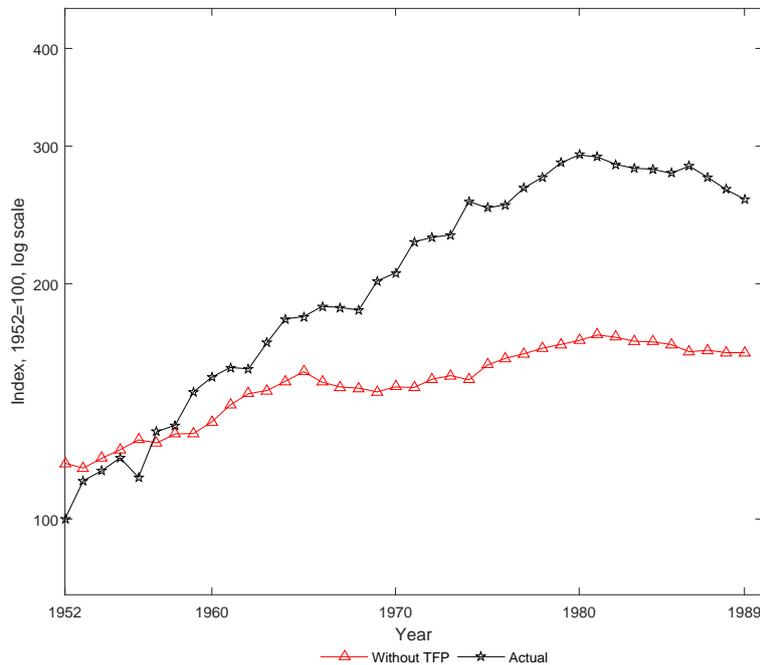
Segmenting periods is a useful quantitative summary of results, but can obfuscate the dynamic dimension. The remainder of this section seeks to reinforce the two main findings of this paper. First,

Table 2.5: The contribution of wedges to the growth rate of selected macroeconomic variables in Yugoslavia, 1952-89

	Output per capita	Labour	Capital to labour ratio	Physical capital
1952-1960				
<i>Average annual Growth rate</i>	5.4	-1.3	4.6	5.0
TFP	119%	408%	-28%	466%
Capital wedge	33%	-85%	33%	-6%
Labour wedge	22%	-454%	74%	-12%
Income wedge	48%	77%	37%	-98%
1960-1970				
<i>Average annual Growth rate</i>	3.1	-7.1	6.2	4.2
TFP	132%	-20%	71%	24%
Capital wedge	48%	7%	26%	19%
Labour wedge	6%	-127%	74%	-107%
Income wedge	71%	13%	40%	119%
1970-1980				
<i>Average annual Growth rate</i>	3.5	-3.6	5.5	-1.4
TFP	151%	31%	109%	-457%
Capital wedge	14%	-111%	18%	786%
Labour wedge	11%	-111%	36%	-129%
Income wedge	89%	108%	47%	-64%
1980-1989				
<i>Average annual Growth rate</i>	-1.4	-2.5	1.0	-12.8
TFP	-29%	-160%	490%	-95%
Capital wedge	86%	120%	-70%	82%
Labour wedge	-64%	-164%	130%	-38%
Income wedge	36%	-64%	80%	-120%

Notes: The annual growth rates of selected macroeconomic variables is detrended by the labour-augmenting technological progress. The table depicts the share of actual growth of a selected macroeconomic variable a wedge can replicate, conditional on the other wedges remaining fixed.

Figure 2.9: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), 1952-89, Yugoslavia



Note: If the two lines move in parallel, it means that the combined capital, labour and income wedges are responsible for most of economic growth.

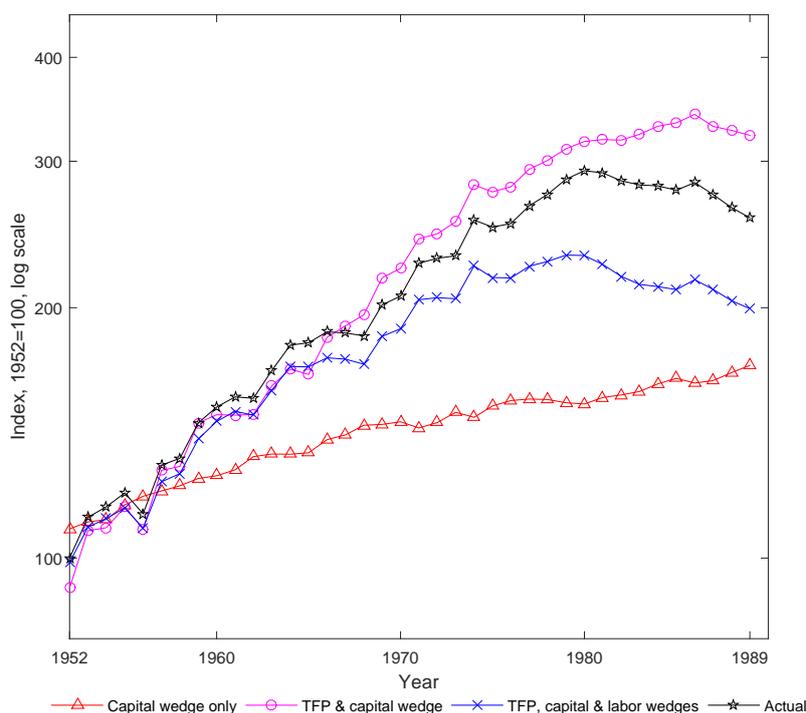
that TFP became more important over time in sustaining growth. Second, that the labour wedge was the most important constraint on growth.

Figure 2.9 plots the evolution of output per capita determined by all the wedges except TFP (the line “without TFP”), in relation to the actual evolution of output per capita. The line without TFP depicts simulated economic growth were TFP growth absent. The gap between the two plotted lines is due to TFP.

Figure 2.9 reveals that in the early stages of growth (approximately until the early 1960s), the path of the actual output and the counterfactual output track each other closely. This means that the combined capital, labour and income wedge are able to replicate most of economic growth. The gap between the two lines widens over time, meaning that TFP became more important in sustaining growth with time.

To gauge further the relative significance of wedges, figure 2.10 estimates the marginal contribution of each wedge to economic growth. It adds to the prototype model one at a time the capital wedge, TFP, the labour wedge, and the income wedge. The four wedges in tandem match the data (the line “actual”). When the sequential addition of wedges makes the simulated path of economic growth move more in tandem with the actual path of economic growth, the newly added wedge is responsible for that movement.

Figure 2.10: Simulations of GDP per capita versus the actual movement, 1952-89, Yugoslavia



The model that includes just the capital wedge systematically underestimates economic growth since the late 1950s. Before, it generates a higher level of growth than implied by data. When TFP is added to the model containing the capital wedge, the path of simulated economic growth tracks the actual path closely. Thus, this model reconfirms that TFP became gradually more important in sustaining economic growth. When the labour wedge is added to the model containing the capital wedge and TFP, the simulated path of economic growth is nearly identical to the actual path until 1965. Afterwards, the discrepancy between the actual path of economic growth and the simulated path gradually widens (the discrepancy is due to the remaining income wedge). This reconfirms that the labour wedge was a major constraint on economic growth. The model with the capital wedge and TFP reinforces this finding. It implies a higher level of GDP per capita than the data from the mid-1960s.

## 2.6.2 Robustness checks

This section briefly reports the sensitivity of the baseline findings to alternative settings. I reserve a detailed discussion of each robustness check to appendix 2.A.3.

In appendix 2.A.3, I experiment with the choice of parameters (coefficient for leisure, discount factor, capital share, technological growth), functional forms (utility function with linear leisure, and subsistence income), and other settings (exclusion of income wedge, alternative labour data).<sup>18</sup> The

<sup>18</sup>For parameters, I calculate the coefficient for leisure and the discount factor from the data. This exercise yields the

level of wedges can be highly sensitive to the choice of parameters - coefficient for labour and capital share in particular. Other settings do not change the level of wedges significantly compared to the baseline setting. The evolution of wedges, however, which is the cornerstone of the analysis, remains largely unchanged across a variety of settings compared to the baseline setting. In other words, different settings result in different wedge values, but the trends and patterns remain qualitatively unchanged compared to the baseline case. The results of this paper are therefore not driven by the choice of parameter values, functional forms, and other settings. Under a variety of settings, TFP still gradually accounts for a larger share of output growth. Labour wedge remains the main retarding factor of Yugoslavia's economic growth.

## 2.7 Conclusion

Until the late 1970s, TFP became incrementally more important in sustaining Yugoslavia's economic growth. TFP growth was likely sustained by the accelerated process of structural modernisation; possibly by efficiency gains stemming from the gradual integration of Yugoslavia into the global economy; and possibly by the increased adoption rate of technology. The stagnation of TFP during the 1980s, as well as the stagnation or decline of other macroeconomic variables, is related to the deep crisis instigated by the 1979 oil shock. Even though TFP stagnated, and decreased towards the end of the 1980s, it was of second-order importance in causing Yugoslavia's output retardation. Instead, the deterioration of the labour wedge is the most important factor bringing Yugoslav economy to a stalemate. In turn, intensifying labour distortions were caused by the greater devolution of economic power to labour-managed firms. Yugoslavs were incentivized to undersupply labour domestically. They responded by supplying labour abroad.

In sum, Yugoslav growth retardation has been caused by both internal and external factors. On the internal side, labour-managed firms distorted labour incentives. On the external side, the 1979 oil shock was the main culprit. These results are complementary to the recent work of [Vonyó \(2017\)](#). He argues that the convergence of socialist Eastern Europe towards the income levels of Western Europe was constrained by labour supply inflexibility induced by WWII population losses. It is possible that

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coefficient of leisure of 3.5 and the discount factor of 0.95 (identical to the baseline case). Capital share effectively serves as weight on components of growth. To test the sensitivity of my results to the capital share, I push the capital share to a lower and upper bound of plausibility, 0.3 and 0.5, respectively. Assuming a constant growth rate of labour-augmenting technology might be inappropriate for Yugoslavia which experienced growth regime changes. I test the sensitivity of my baseline findings to this parameter by setting it to zero. Concerning functional forms, I experiment with alternative utility functions. I test the sensitivity of my baseline findings to a utility function with linear leisure, which assigns a greater role to labour in driving the fluctuations of macroeconomic variables. I also experiment with the Stone-Geary utility function, which accounts for the presence of subsistence consumption. Concerning other settings, I exclude the income wedge, as it is questionable whether demand shocks have a persistent impact on long-run output. Finally, I smooth average hours worked between the initial year of analysis and the final year of analysis, as the data is characterized by a structural break in average hours worked in 1965, which may or may not be a statistical artefact.

this labour supply inflexibility interacted with labour-managed firms to distort the ability of Yugoslavs to supply labour.

Given their capacity to embark on radical reforms during the early years, how come Yugoslavs were unable to reform their economy later on? Policy makers were aware of remedies, but politics got into way. Dušan Bilandžić, a historian and a politician, reports in his memoirs that in 1970 the Central Committee of the CPY accepted draft proposals aimed at liberalising capital markets and entry of firms (Bilandžić, 2006). The aim of these policies was to diminish or eliminate the apparent labour distortions. However, these policies were abandoned with the flaring of political and ethnic tensions by the 1971 calls for democracy in Croatia, a member republic of Yugoslavia.

The inability of Yugoslavia to cope with the 1979 oil shock was compounded by a major domestic shock. The lifelong president of Yugoslavia, Tito, died in 1980. He was replaced by an ineffectual collective presidency containing nine members. They lacked political capital to pursue planned reforms.

It is natural to wonder whether the findings of this article have wider implications. They do. The recent growth slowdown of China has reinvigorated the debate about the viability of state-led development strategies. The findings of this article can inform this debate. For that matter, Yugoslavia was one of the initial reform models for Chinese policy-makers and their incremental reforms that began in 1978 (Rozman, 2014). The experience of Yugoslavia implies that, in a partially reformed economy, gradual elimination of distortions begets new distortions. Agents that are freed from centralised control respond by exploiting rents in the unreformed parts of the economy. One is left with taking a leap of faith in the omniscience and good intention of planners.

## 2.A Appendix

### 2.A.1 Data: Yugoslavia

#### 2.A.1.1 GDP

*Net Material Product*, or *Social Product* (SP) in case of Yugoslavia, was the official metric of output in socialist countries. SP is conceptually equivalent to GDP. Official estimates of the output of socialist economies are however criticised. They are criticized due to index number problems ([Gerschenkron, 1947](#)), distorted prices ([Staller, 1986](#)), and perhaps outright fabrication by enterprises in order to maximise the allocation of scarce resources within a shortage economy. For these reasons, I use alternative GDP series from [Maddison](#) (online). [Maddison](#) (online) used the output series created by a group of Western scholars that were published in a series of papers within the *Research Project on National Income in East Central Europe*, and led by Thad P. Alton from Columbia University. They relied on physical output indicators published in official sources that they transformed into GNP at factor cost. They relied on the method developed by [Bergson \(1953\)](#) to estimate Soviet national income. They imputed the value of output by estimating the returns to factors of production (labour, fixed capital, and agricultural land), and then by multiplying these returns by the volume of factors of production. They consistently applied western national accounting standards (System of National Accounts), making their estimates comparable to output series of market economies. Their publications, covering the whole period under analysis, include [Alton \(1970\)](#) and [Alton, Badach, Bass, Bakondi, Brumaru, Bombelles, Lazarcik, and Staller \(1992\)](#). Their GDP dataset is largely considered to be the most reliable one concerning socialist European countries. It is widely used in empirical research on socialist economies in Europe. For recent examples, see e.g. [Vonyó \(2017\)](#) and [Vonyó and Klein \(2017\)](#).

It is worthwhile to note why I am not using the newest collection of GDP estimates by [Bolt and van Zanden \(2014\)](#). They include the GDP estimates of Yugoslav successor states by Branko Milanović. His aim was to produce comparable GDP levels of the successor states of Yugoslavia. He has, however, projected their historical growth rates by official data (information obtained through personal correspondence). Thus, in the [Bolt and van Zanden \(2014\)](#) dataset, the economic growth rates of Yugoslavia are based on official estimates, which are inflated. As such, I prefer to use the earlier [Maddison](#) (online) dataset, where growth rates are more reliable.

#### 2.A.1.2 Gross investment, physical capital stock, and consumption

The most problematic data required for the analysis is gross investment. Similar to output, gross investment was likely inflated due to price distortions (prices of producer goods were set above world prices, while prices of agricultural goods were set below world prices), index number problems, and

perhaps outright fabrication from enterprises.<sup>19</sup> While alternative output series have been produced in response to the criticism of official output series, there are no existing alternative investment series. As such, I embrace the data produced by government statisticians, but make an adjustment using their own data. As mentioned in the body of the text, I exclude an investment category called “other”. I have decided to omit this category since it includes expenditure on product research and training of personnel, which is not part of physical capital. Furthermore, it includes revaluation of inventory stock, while Madžar (1985) reports that, in the presence of high inflation of the 1970 and the 1980s, these values have been inflated.

There are additional factors that distort the investment ratio. The existing literature typically imputes the investment ratio by dividing gross investment by SP. This is a grave mistake that overestimates the investment ratio. Official gross investment includes all the sectors of the economy, while the SP does not. The SP excludes the “non-productive sectors” - education, healthcare, culture, administration, housing, and finance. Government statisticians thought these sectors did not contribute to the value-added of a socialist economy. This means, for instance, that the so-constructed investment ratio includes education in the numerator, but not in the denominator. This, naturally, magnifies the investment ratio. To solve this problem, I divide investment by GDP, rather than by SP.

Another common problem in computing the investment ratio is to rely on data expressed in current prices. This is misleading because investment was valued at the end of year, while output was not. This magnifies the so-constructed investment ratio. To solve this valuation problem, I rely on data expressed in constant 1972 prices, before converting it to 1990 Int. GK\$. Contextually, the newly constructed investment series do not seem particularly high, or implausible (figure 2.2.c).

The initial level of capital stock is estimated using existing national wealth estimates. Vinski (1978) has made a pivotal estimate of national wealth in Yugoslavia. He has used 1953 as the benchmark year. He has relied on an official survey of physical capital in 1953, but extended it to include a much greater array of physical capital. For instance, he estimated the value of residential structures, which the government statisticians ignored. I initially estimate capital stock by type (equipment, residential structures, and non-residential structures) through perpetual inventory method, given the initial value of capital. Subsequently, I aggregate the capital stock types into a single series. Thus, I do not estimate the contribution of each physical capital sub-input to economic growth. In the absence of a capital market, it is not possible to estimate the rental prices of capital sub-inputs with which capital sub-inputs could be otherwise weighted into a single capital aggregate and adjusted for “quality”.

In order to derive the level of consumption, I use the official annual consumption to output ratio, and multiply it by Yugoslavia’s annual GDP provided by Maddison (online).

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<sup>19</sup>For example, under controlled prices and resource allocation, investment goods producers had an incentive to increase output by degrading quality. This created the problem of hidden inflation (Bergson, 1987b).

### 2.A.1.3 Population

Official data concerning population seems reliable. In the literature on Yugoslavia, or socialist economies more generally, I have not encountered criticism concerning official population data. I take annual estimates of the working-age population (15-64 years) from *Vitalna Statistika* (1950-4) ([Savezni Zavod za Statistiku, 1950-1954](#)) and *Demografska Statistika* ([Savezni Zavod za Statistiku, 1955-1989](#)). Government statisticians have derived these estimates from population censuses, given the fertility and mortality rates. It excludes labour that moved abroad.

Total labour is derived by multiplying the headcount of workers by average hours worked. Yearly hours worked per average worker are defined as effective hours worked, e.g. excluding sick leave but including overtime. These averages are taken from SGJ ([Savezni Zavod za Statistiku, 1952-1991](#)).

I take the human capital estimates from the second paper of the thesis. There I estimate human capital for the population that is actually employed, including agricultural labour. Human capital is initially estimated for benchmark years (1953, 1961, 1971, 1981, and 1986). For the remaining years of the analysis, I linearly interpolate human capital. For 1987-9, human capital is extrapolated by its average growth rate during 1981-6.

Figure 2.11 plots population-related data. The sharp decline in the labour to the working age population ratio in figure 2.2.c in 1965 is driven by the sharp decline in labour (figure 2.11.a), since the working age population has steadily increased throughout the sample period (figure 2.11.b). Over the whole period, labour has slightly decreased. This is driven by the decline in average hours worked by 20 per cent during the post-war period (figure 2.11.c), since the amount of workers has increased by 18 per cent during the sample period (figure 2.11.d). The decline in average hours worked in 1965 is very sharp. As a robustness check, I assess whether this has an implication concerning the estimated labour wedge in appendix 2.A.3.5. I linearly interpolate hours worked between the initial and final year, so as to smooth the evolution of average hours worked. The baseline findings are unaltered.

## 2.A.2 Data: Greece, Portugal, Spain, and the U.S.

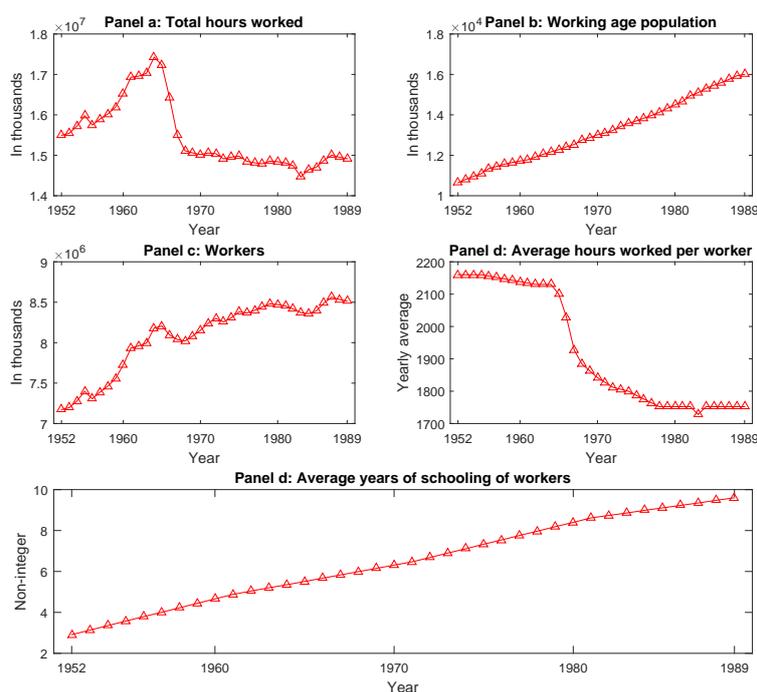
### 2.A.2.1 GDP

For Greece, Portugal, Spain, and the U.S.: GDP data in 1990 Int. GK\$ is taken from [Bolt and van Zanden \(2014\)](#).

### 2.A.2.2 Labour

For Greece, Portugal, Spain, and the U.S.: Data on the number of workers and average yearly hours worked are taken from the [Conference Board](#) (Total Economy Database) (online).

Figure 2.11: Population data, 1952-89, Yugoslavia



### 2.A.2.3 Working-age Population (15-64 years)

For Greece, Portugal, Spain, and the U.S.: Working-age population is taken from the United Nations (UN) - Department of Economic and Social Affairs (online). The data by the UN is provided in five-year intervals. As such, the in-between years are linearly interpolated.

### 2.A.2.4 Human capital – average years of schooling

For Greece, Portugal, Spain, and the U.S.: Data on average years of schooling is taken from Barro and Lee (2013) for the working-age population. Their data is provided at five-year intervals. As such, I linearly interpolate the remaining years.

### 2.A.2.5 Consumption, gross investments, and government expenditure

For Greece, Portugal, and Spain: Consumption and gross investment GDP shares are taken from Penn World Table 8.1 (PWT.8.1) in Feenstra, Inklaar, and Timmer (2015). These shares are subsequently multiplied by Bolt and van Zanden (2014) GDP series to impute the value of consumption and investment in 1990 Int. GK\$.

For the U.S.: Data is taken from the U.S. Bureau of Economic Analysis (BEA) (online), and deflated into 1990 Int. GK\$ using the official U.S. output deflator.

### 2.A.2.6 Physical capital stock

For Greece: in the absence of long-run national wealth estimates, the physical capital is derived from PWT.8.1 in [Feenstra, Inklaar, and Timmer \(2015\)](#). The capital to output ratio for 1950 is taken from PWT.8.1 and multiplied by the GDP of Greece in [Bolt and van Zanden \(2014\)](#) to impute the value of physical capital stock in 1990 Int. GK\$.

For Portugal: Physical capital stock is derived from [Silva and Lains \(2013\)](#). They initialise their series in 1910 using the steady state approach with 2006 euros. I convert these series into 1990 Int. GK\$ through a few steps. First, I derive the capital to output ratio for 2006, where GDP data for 2006 in current prices is taken from [Statistics Portugal](#) (online). Second, the capital to output ratio derived is converted into 1990 Int. GK\$ using the GDP series of [Bolt and van Zanden \(2014\)](#). The value of physical capital for the years of the analysis is imputed by applying the real growth rates of physical capital of [Silva and Lains \(2013\)](#) to the capital to output ratio in 1990 Int. GK\$.

For Spain: Physical capital stock is derived from [Prados de la Escosura and Rosés \(2010\)](#). They initialise the physical capital in 1850 using the steady state approach. I multiply their capital to output ratio by the GDP series of [Bolt and van Zanden \(2014\)](#) to derive physical capital in 1990 Int. GK\$.

For U.S.: Physical capital stock is taken from the [BEA](#) (online) - fixed assets and consumer durable goods net of government.

## 2.A.3 Robustness checks

### 2.A.3.1 Absolute level of wedges of baseline case (figure 2.3), and general comments

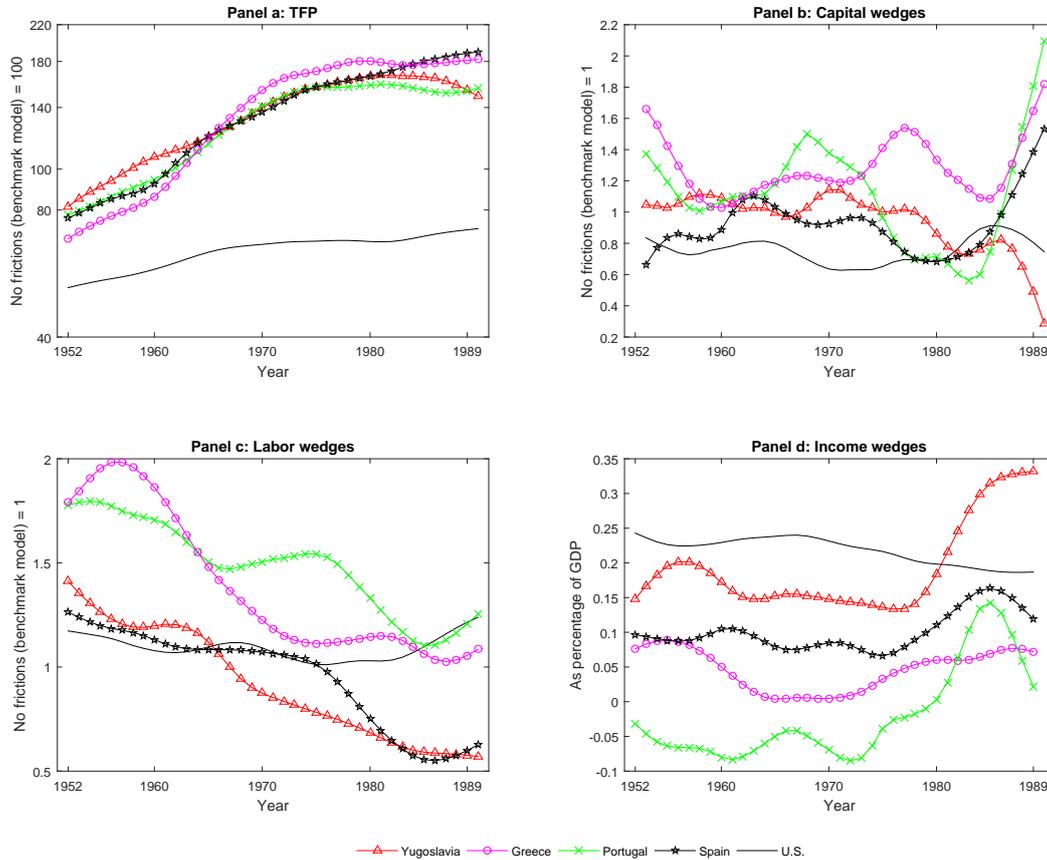
This section shows the absolute level of wedges of the baseline case (figure 2.3) in figure 2.12. The absolute levels of wedges should be interpreted with caution. Each wedge is calculated relative to the frictionless steady state of the analysed country. Thus, the levels of wedges are conditioned by TFP, investment rate, and the like. As these factors vary among countries, it is very difficult, if not meaningless, to interpret differences in the levels of wedges between countries.

Moreover, as shown in a variety of robustness checks below, the level of wedges can be highly sensitive to the choice of parameters (coefficient for leisure, discount factor, capital share, technological growth) functional forms (utility function with linear leisure, and subsistence income), and other settings (exclusion of income wedge, alternative labour data). The broad evolution of wedges, however, remains largely unchanged compared to the baseline case. In other words, different settings result in different wedge values, but the trends and patterns remain qualitatively unchanged compared to the baseline case. TFP still gradually accounts for a larger share of output. Labor wedge remains the main retarding factor of Yugoslavia's growth.

Each robustness check below reports the relative and absolute level of wedges. Then, each robustness

check assesses the sensitivity of the baseline simulation results to different settings by replicating figures 2.9 and 2.10 of the main text.

Figure 2.12: Yugoslav and sample-countries wedges, absolute levels, baseline case, 1952-89



### 2.A.3.2 Country-specific coefficient for leisure and discount factor

This robustness check constructs  $\beta$  and  $\phi$  from the data for each sample-country. If the results are similar to the baseline case, then the baseline choice of these two parameters is not driving the results of the paper.

To estimate  $\phi$  for each sample-country, labour wedge is assumed to be equal to 1 in equation 2.8 for 1990, the terminating period. If so, then:

$$\phi = (1 - l_{1990}) \frac{(1 - \theta) \frac{y_{1990}}{l_{1990}}}{c_{1990}} \quad (2.11)$$

This exercise yields: Yugoslav  $\phi$ : 3.5; Greek  $\phi$ : 1.8; Portuguese  $\phi$ : 1.6; Spanish  $\phi$ : 3.1; U.S.:  $\phi$ : 1.6.

Similar to the coefficient for leisure, to estimate  $\beta$  from the data, the capital wedge is assumed to

be equal to 1 in equation 2.9 for year 1990, the terminating period. If so, then:

$$\beta = \frac{1 + \gamma}{1 + \theta \frac{y_{1990}}{k_{1990}} - \delta} \quad (2.12)$$

This exercise yields: Yugoslav  $\beta$ : 0.95; Greek  $\beta$ : 0.98; Portuguese  $\beta$ : 0.94; Spanish  $\beta$ : 0.94; U.S.  $\beta$ : 0.90.

Figure 2.13 plots the wedges as in the baseline case of figure 2.3. The discount factor and the coefficient for leisure affect the levels of wedges, particularly the labour wedge (figure 2.14), but not the evolution of wedges. Thus as mentioned before, it makes more sense to interpret trends rather than levels. Since the analysis of the growth rates is the cornerstone of the analysis, the baseline results remain robust.

Figure 2.13: Yugoslav and sample-countries wedges, relative levels, country-specific coefficient for leisure and discount factor, 1952-89

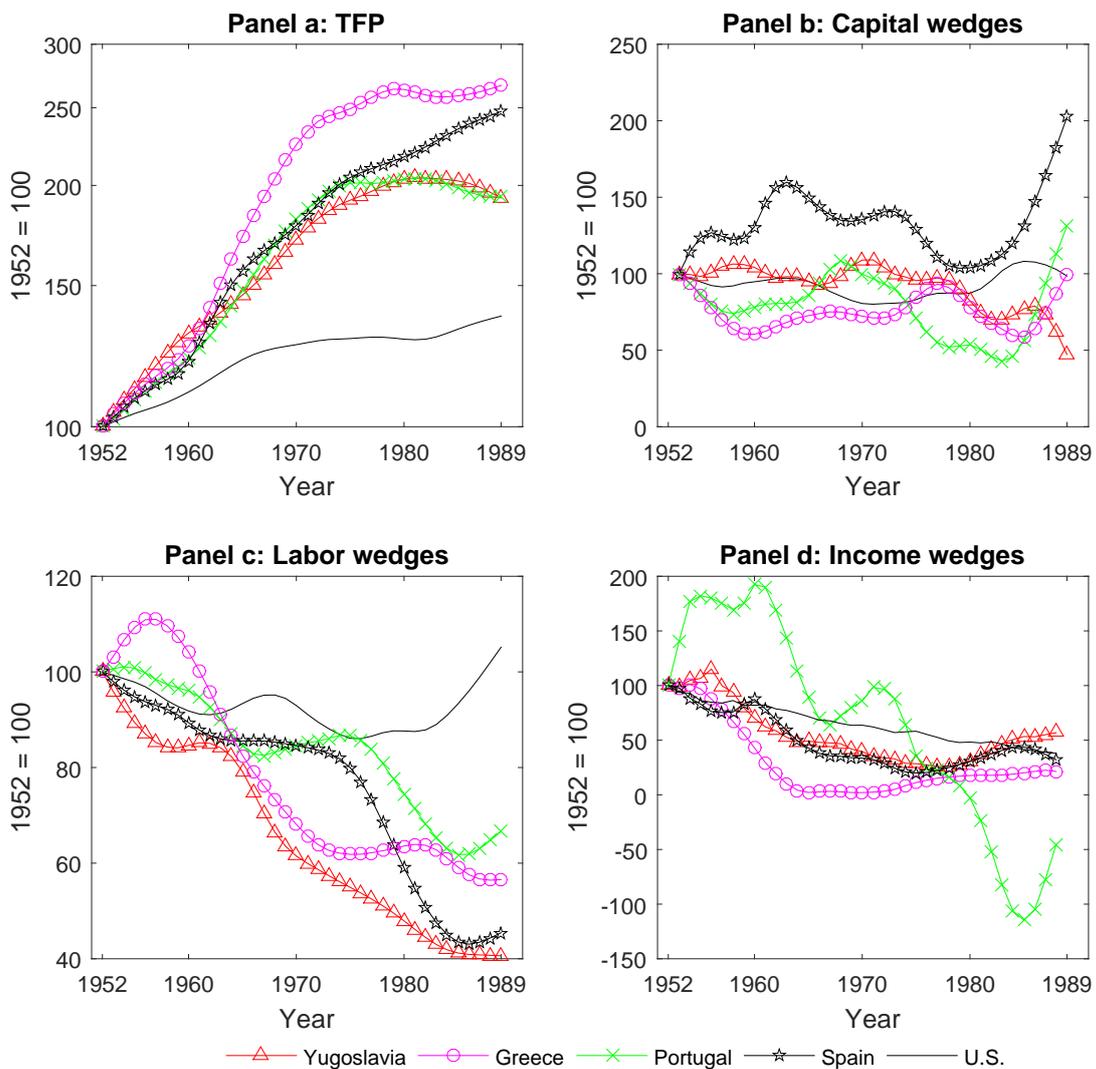
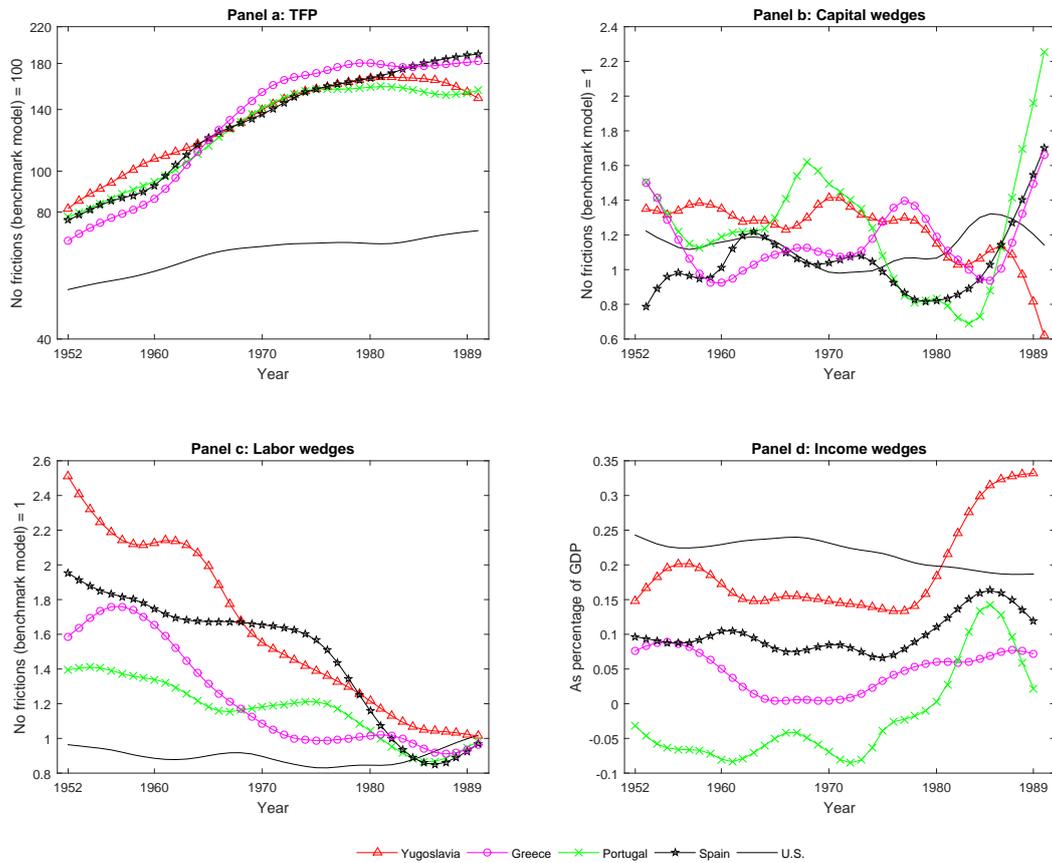


Figure 2.14: Yugoslav and sample-countries wedges, absolute levels, country-specific coefficient for leisure and discount factor, 1952-89



Figures 2.15 and 2.16 replicate the simulation exercises of the baseline case, but using the newly estimated parameters. Figures 2.15 and 2.16 are indistinguishable from figures 2.9 and 2.10 of the baseline case.

### 2.A.3.3 Utility function with linear leisure

In order to assess the sensitivity of the findings of this paper (labour wedge in particular) to the choice of the baseline utility function, I use an alternative utility function with linear leisure. That is:

$$\sum_{t=0}^{\infty} \beta^t N_t [\log(c_t) + \phi(1 - l_t)] \quad (2.13)$$

This utility function assigns a greater role to labour in driving the fluctuations of macroeconomic variables.

Figure 2.17 plots the wedges as in the baseline case of figure 2.3. Introduction of linear leisure affects the level of the labour wedges (figure 2.18), but not its evolution. Hence, the baseline results for Yugoslavia remain robust.

Figure 2.15: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), country-specific coefficient for leisure and discount factor, 1952-89

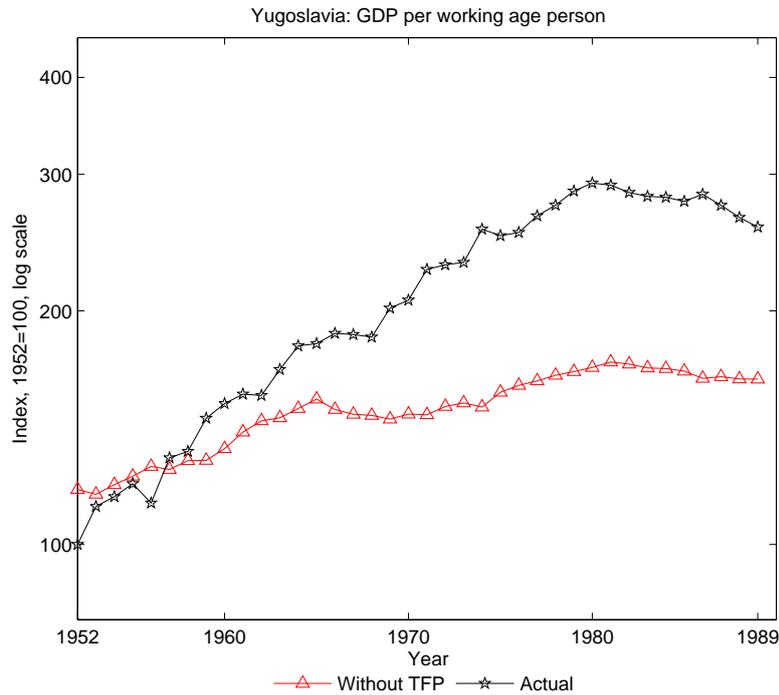
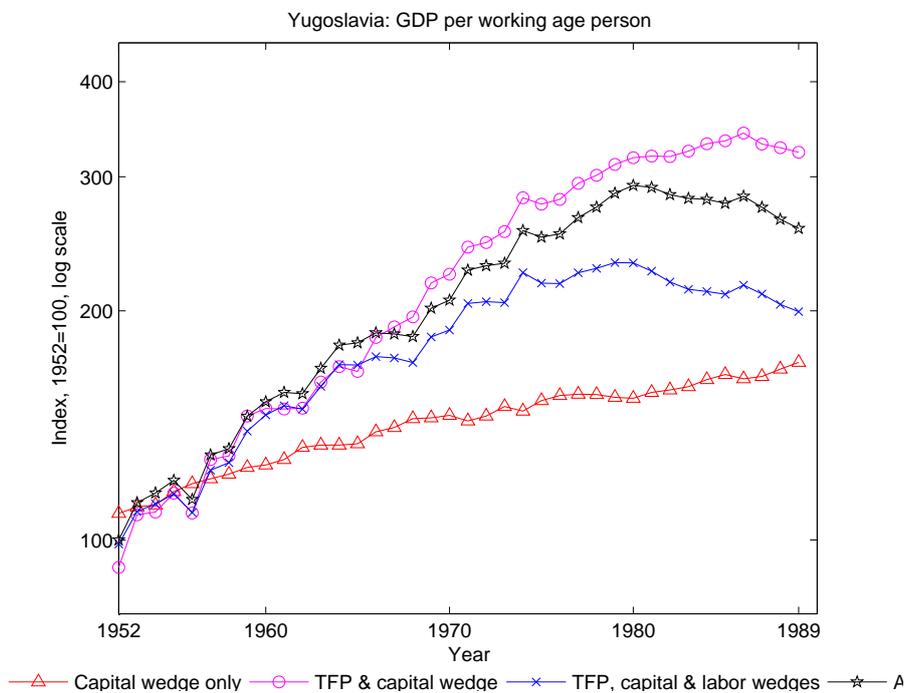
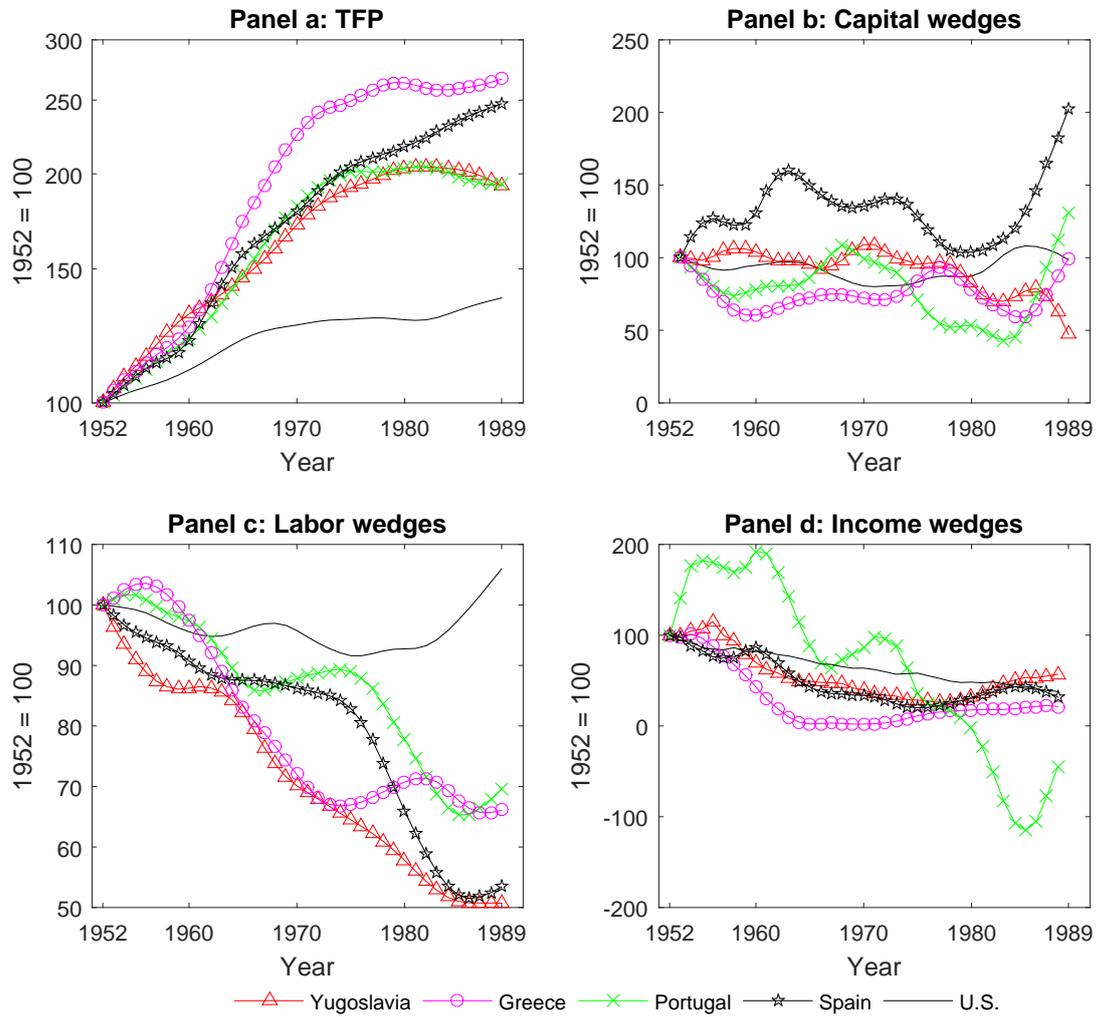


Figure 2.16: Simulations of GDP per capita versus the actual GDP per capita, country-specific coefficient for leisure and discount factor, 1952-89



Figures 2.19 and 2.20 replicate the simulation exercises of the baseline case, but using the utility function with linear leisure. The results remain robust. Figures 2.19 and 2.20 seem identical to figures 2.9 and 2.10 of the baseline case. However, the simulated output paths seem to fluctuate to a larger

Figure 2.17: Yugoslav and sample-countries wedges, relative levels, utility function with linear leisure, 1952-89



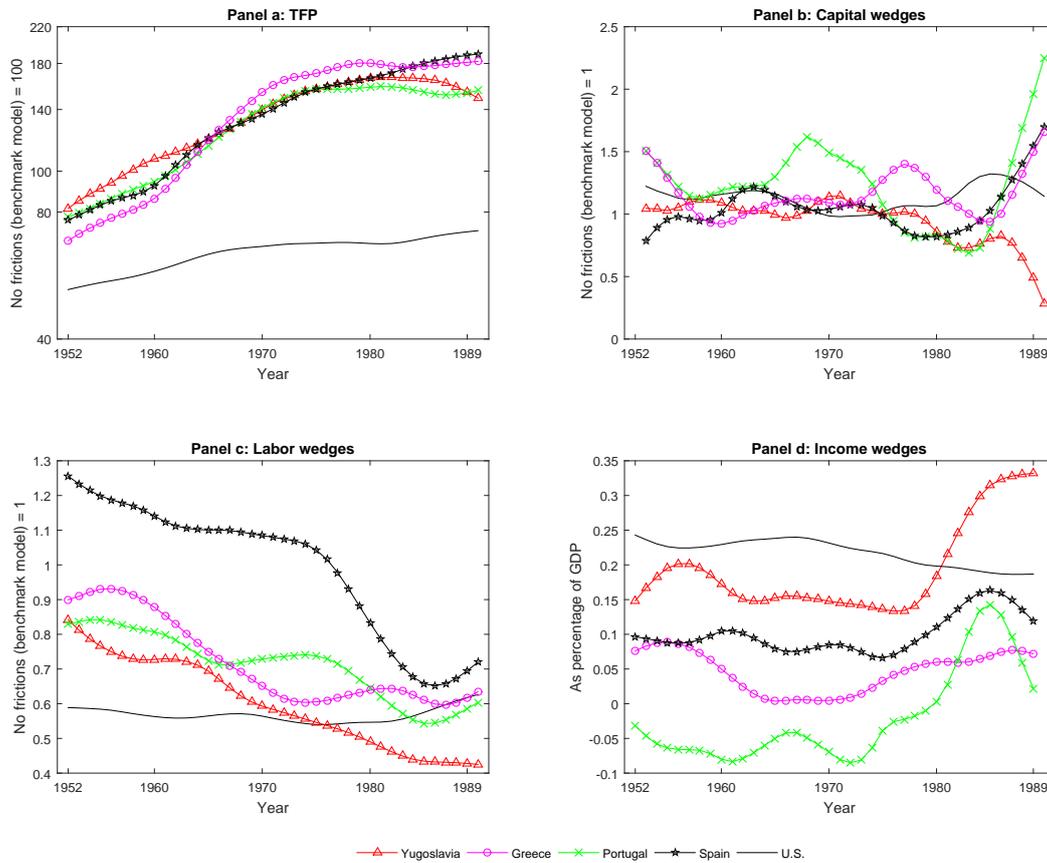
extent, reflecting the greater weight assigned to the fluctuations of labour.

#### 2.A.3.4 Stone-Geary utility function

The existence of subsistence income levels might affect the estimated wedges. In developing countries, due to subsistence levels, individuals might in effect have less choice in the allocation of time between work (consumption) and leisure. Subsistence needs might exhaust a large share of their household expenditure. To deal with this issue, I use the Stone-Geary utility function:

$$\sum_{t=0}^{\infty} \beta^t N_t [\log(c_t - \bar{c}_t) + \phi \log(1 - l_t)] \quad (2.14)$$

Figure 2.18: Yugoslav and sample-countries wedges, absolute levels, utility function with linear leisure, 1952-89



where  $\bar{c}_t$  denotes subsistence level, which is fixed. In order to estimate the subsistence level from the data, I assume the labour wedge is equal to one in the first five years of the analysis, thus:

$$\bar{c}_t = c_t - \frac{((1 - \theta)\frac{y_t}{l_t})(1 - l_t)}{\phi} \quad (2.15)$$

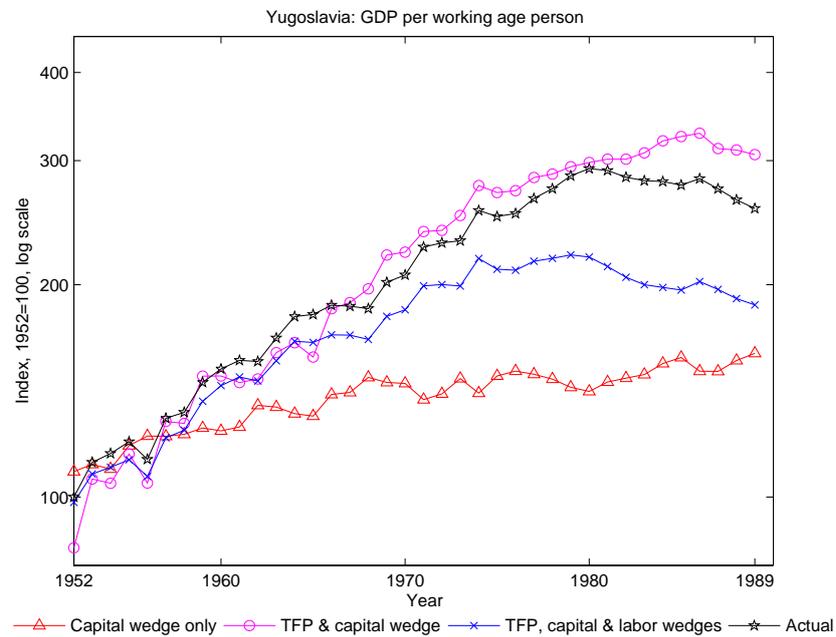
Figure 2.21 displays the wedges. Compared to the baseline case of figure 2.3, the labour wedges tend to be more stable in the beginning of the sample. For Yugoslavia, the initial decline of the labour wedge in the 1950s is quite small. Thus, the existence of subsistence income can explain the initial decline of the labour wedge, which reinforces one of the main conclusions of this paper that the Yugoslav labour wedge embarked on a steady decline since 1965.

However, inclusion of subsistence levels changes the dynamics of the labour wedge in Greece and Portugal quite a bit. In case of Greece, the decline of the labour wedge since the late 1950s is much smoother, while the Portuguese labour seems to have actually improved between the start of the sample-period and the mid-1970s, before experiencing a sharp decline. As expected, the U.S. labour wedge is not impacted by the existence of subsistence levels..

Figure 2.19: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), utility function with linear leisure, 1952-89

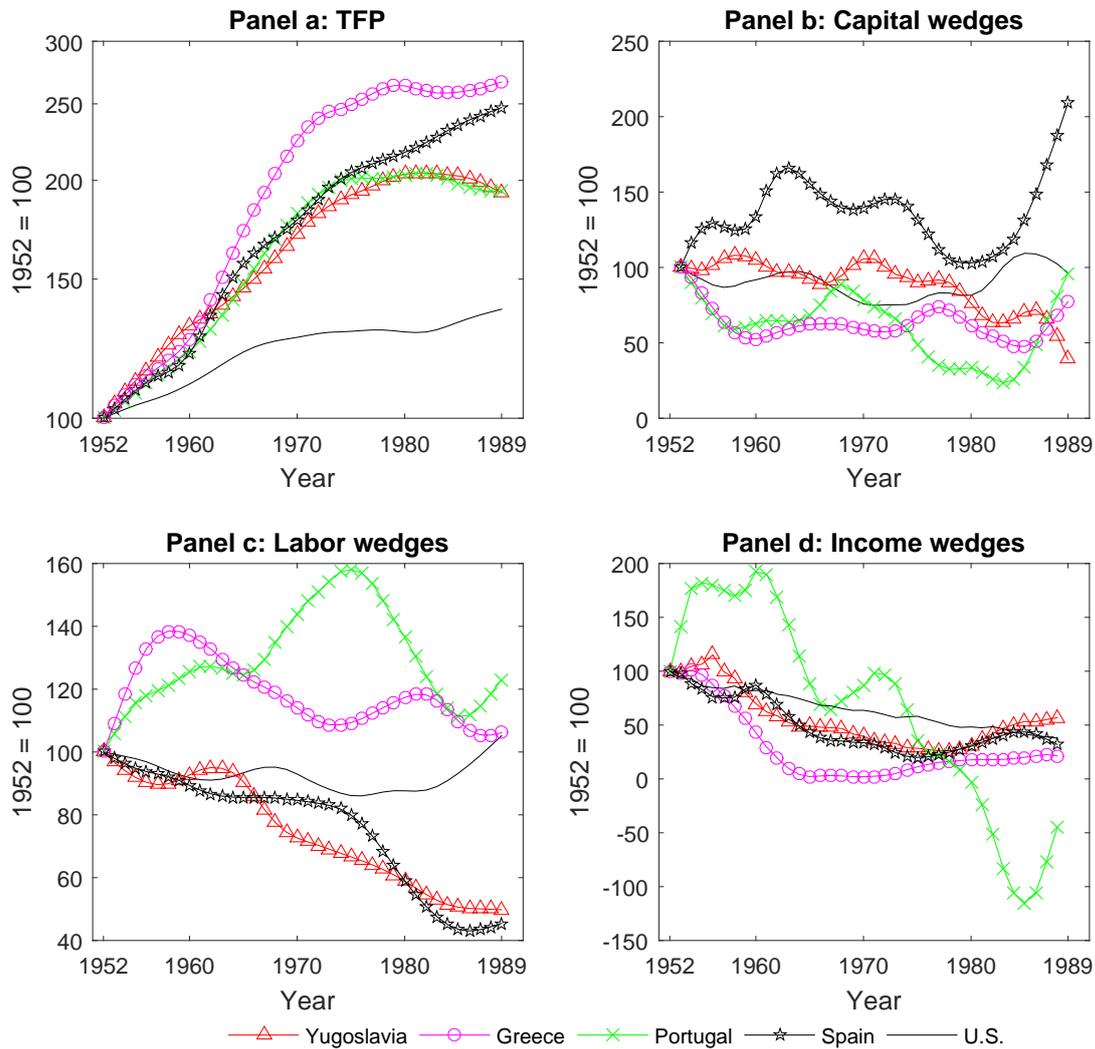


Figure 2.20: Simulations of GDP per capita versus the actual GDP per capita, utility function with linear leisure, 1952-89



Figures 2.23 and 2.24 replicate the simulation exercises of the baseline case, but using the Stone-Geary utility function. The baseline results concerning Yugoslavia remain robust.

Figure 2.21: Yugoslav and sample-countries wedges, relative levels, Stone-Geary utility function, 1952-89



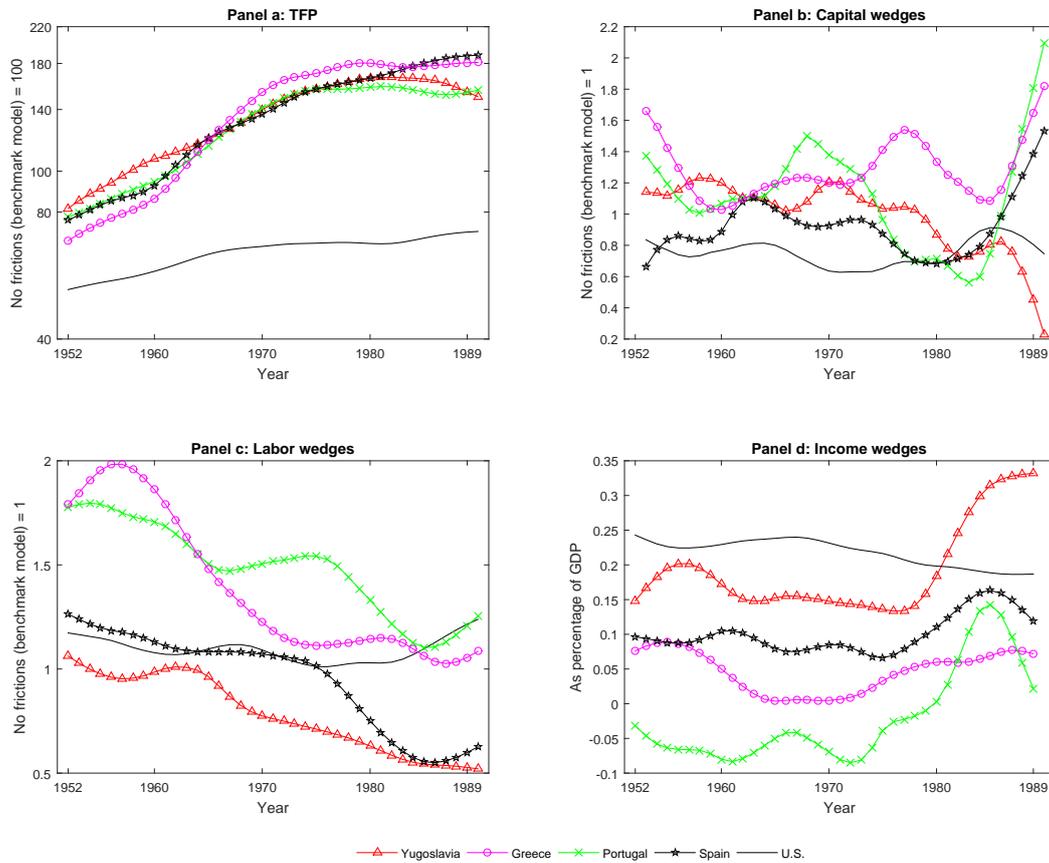
### 2.A.3.5 Alternative labour data: linearly interpolated average yearly hours worked

Here I assess the sensitivity of the labour wedge to average hours worked. Hours worked embarked on a sharp downward trend since 1965, which might be a statistical artefact. To assess the sensitivity of the results to this movement, I smooth the Yugoslav average hours worked by linearly interpolating them between the initial year of the analysis, 1952, and the final year of the analysis, 1989. I do not change hours worked for other sample countries.

Figure 2.25 presents the wedges. Compared to the baseline case, the decline in the labour wedge is less sharp since 1965, but is still pronounced and steady. The initial level of wedges is identical to the baseline case (figure 2.26).

Figures 2.27 and 2.28 replicate the simulation exercises of the baseline case but using linearly interpolated hours. The sharp decline in average yearly hours worked since 1965 does not seem to have

Figure 2.22: Yugoslav and sample-countries wedges, absolute levels, Stone-Geary utility function, 1952-89



a substantial bearing concerning the baseline findings.

### 2.A.3.6 Without income wedge

The income wedge measures demand “shocks”. It is questionable whether demand has a persistent impact on long-run output. Furthermore, the income wedge, or at least components of it, is likely endogenous to the other wedges. Here I exclude the income wedge, and assess whether my baseline findings remain robust.

Figure 2.29 depicts the evolution of wedges, without the income wedge. Figures 2.31 and 2.32 recreate the simulation exercises of the baseline case. The initial level of the labor wedge decreases compared to the baseline case (figure 2.30). In figure 2.31 the contribution of TFP is much greater than in the baseline case. Without the income wedge, the labour wedge is counteracting the positive contribution of the capital wedge to economic growth (the line “without TFP” in graph 2.31).

From figure 2.32 it is hard to determine the impact of the labour wedge on growth. To visualize the contribution of the labour wedge more explicitly, in figure 2.33 I isolate the contribution of each

Figure 2.23: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), Stone-Geary utility function, 1952-89

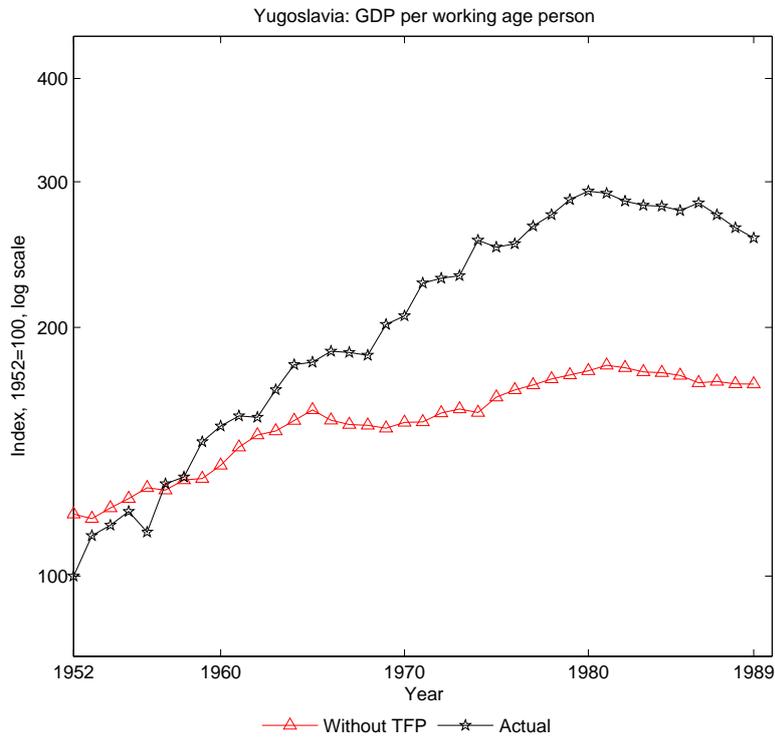


Figure 2.24: Simulations of GDP per capita versus the actual GDP per capita, Stone-Geary utility function, 1952-89

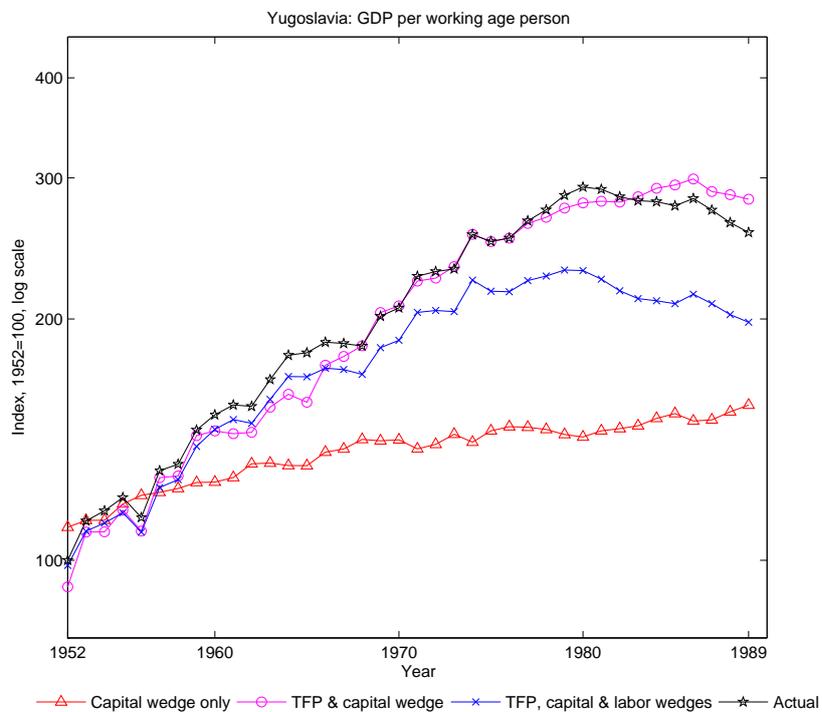
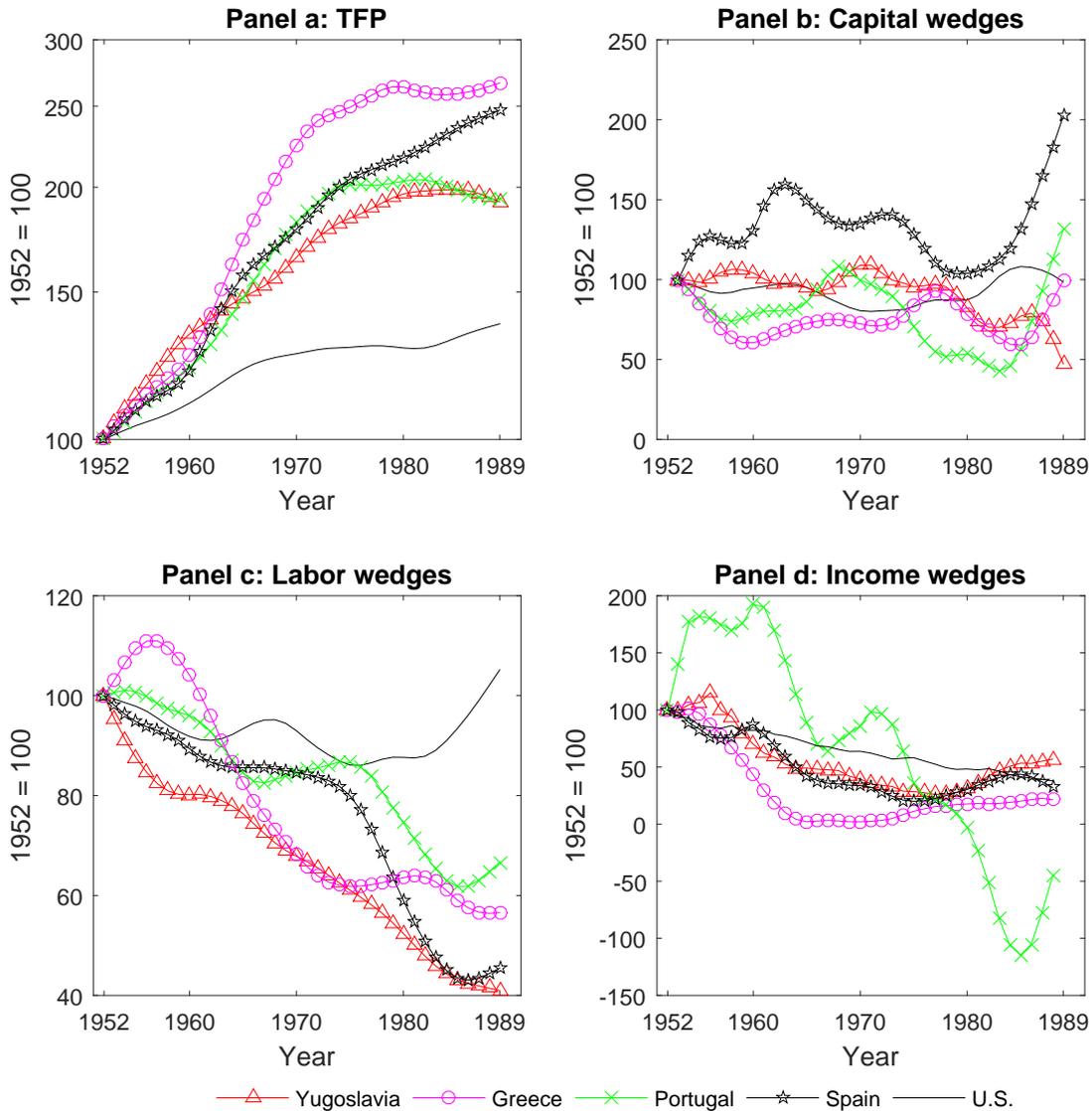


Figure 2.25: Yugoslav and sample-countries wedges, relative levels, alternative labour data, 1952-89

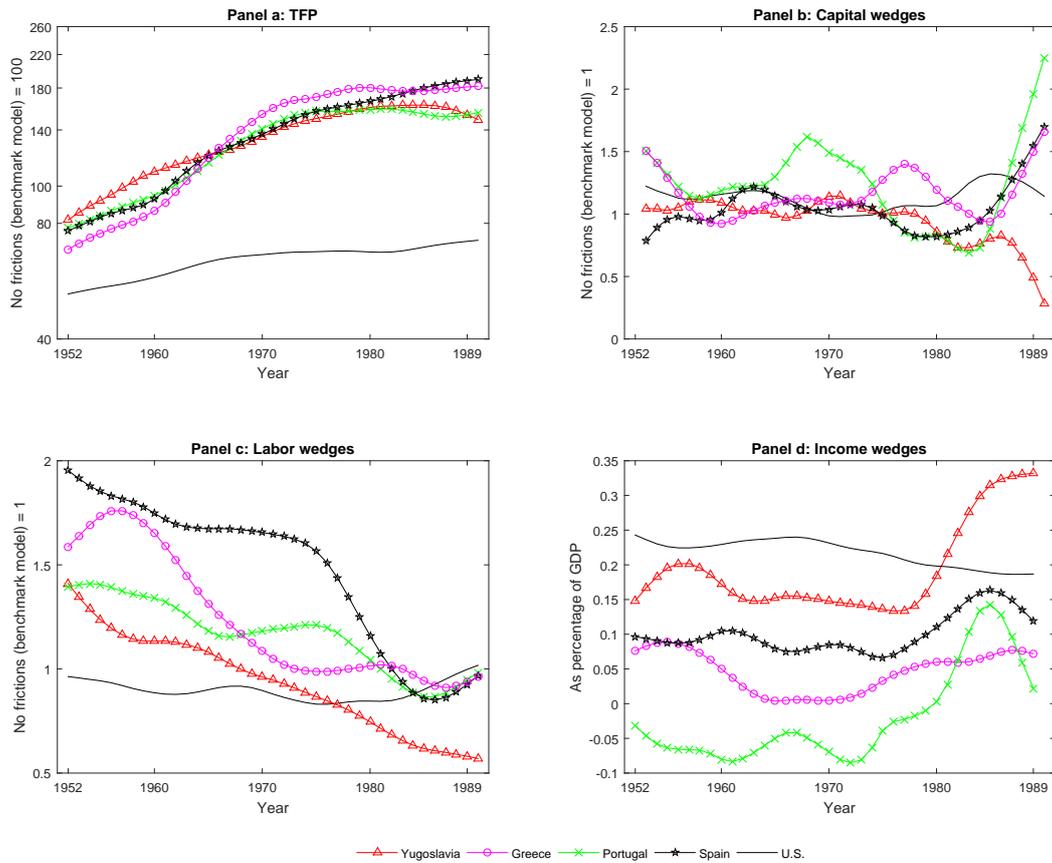


wedge to growth by holding the other wedges fixed. Figure 2.33 makes it clear that the labour wedge remains the major constraint on growth with the exclusion of the income wedge. If all the other wedges remained fixed, labour wedge would have made GDP per capita only barely higher at the end of the period, compared to the beginning of the period. Thus, the baseline results remain robust to the exclusion of the income wedge.

### 2.A.3.7 Without trend growth rate of labour-augmenting technology

Because I have included the trend growth rate of labour-augmenting technological progress in the simulation exercises, the baseline model focuses on accounting for fluctuations of economic growth around its trend. That is, it makes a distinction between a balanced-growth path, and the accelerations

Figure 2.26: Yugoslav and sample-countries wedges, absolute levels, alternative labour data, 1952-89



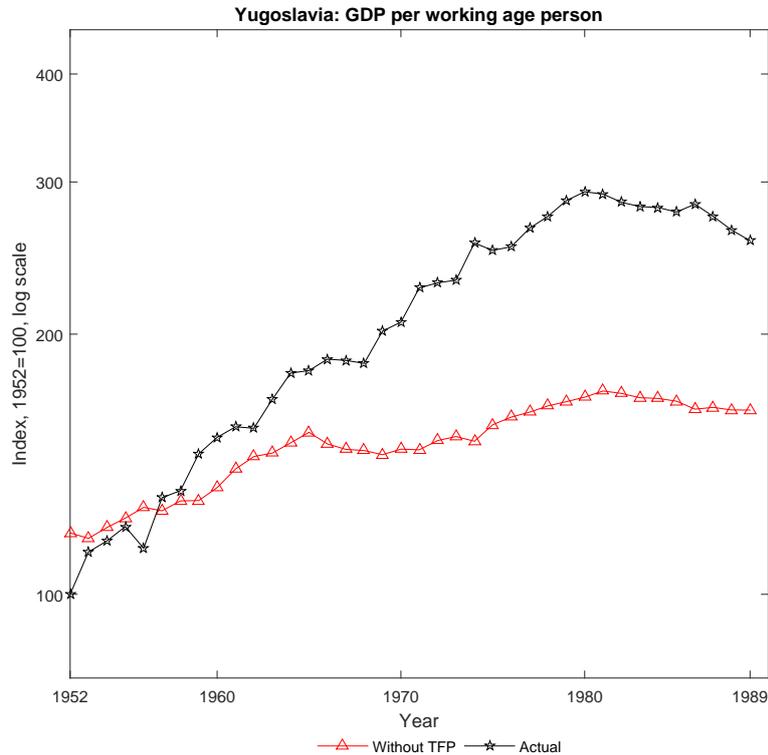
or decelerations of growth around that path. Since Yugoslavia experienced growth regime changes, assuming a constant growth rate of technology might be inappropriate.

As a robustness check, I exclude the trend growth rate, and assess the sensitivity of the baseline results. I do not show the evolution of wedges here since the baseline case already excluded the trend growth rate of technology, in order to make TFP comparable to standard growth accounting exercises. Figures 2.34 and 2.35 recreate the simulation exercises of the baseline case, but setting the trend growth rate of technology to zero. Note that the evolution of wedges in both figures is similar to the baseline case. However, TFP of this section seems to account for a larger share of growth than in the baseline case. Note also that since macroeconomic variables are no longer detrended by a constant rate of technological gains, the actual growth rate of GDP per capita is also higher than in the baseline case.

### 2.A.3.8 Capital shares

The capital share is a critical component determining the percentage contributions of physical and human capital to growth. Therefore, I examine how different values of capital share affect the results of this paper. I change the capital share only for Yugoslavia.

Figure 2.27: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), alternative labour data, 1952-89

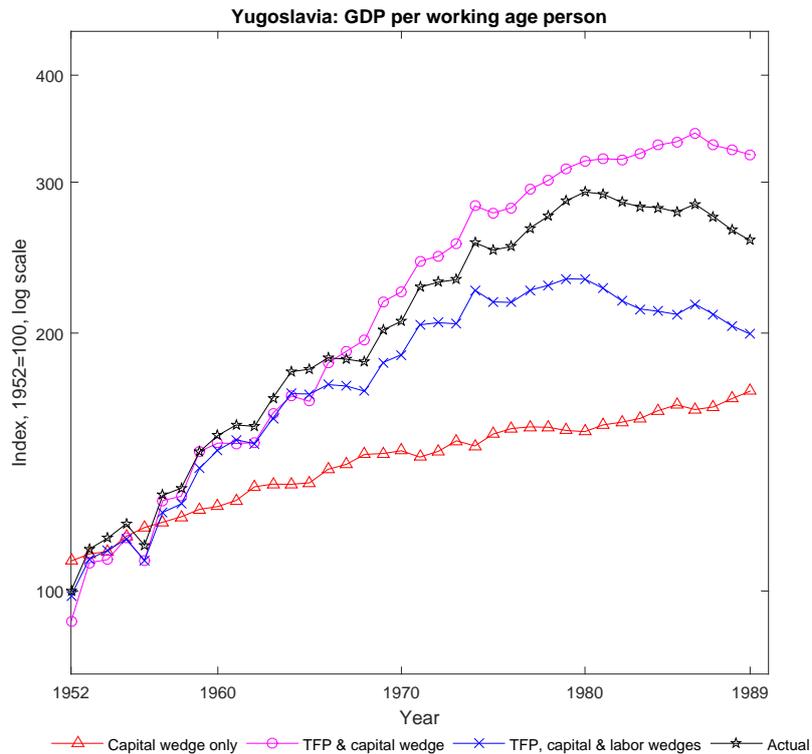


I examine two scenarios. I push the capital share to a lower and an upper bound of plausibility (0.3 and 0.5). Then, I assess whether these exercises can overturn the results of the paper. These exercises clearly have a bearing on the proportion of output explicable by TFP. But, the main result concerning TFP remains robust. TFP gradually accounted for a larger share of output, and did not drive the growth retardation of the 1980s.

**2.A.3.8.1 Capital share: 0.3** In this section, I decrease the capital share to a lower bound of plausibility, 0.3. Figure 2.36 depicts the new trend of wedges, while figure 2.37 depicts the new level of wedges. TFP growth rate is now higher. The level of TFP is higher, too. Therefore, decreasing the capital share of output increases both the share of output growth and the level of output that can be attributed to TFP. This reinforces one of the findings of the paper that TFP did not drive the retardation of Yugoslav growth.

But, it is unclear whether decreasing the capital share has a bearing on the finding that TFP gradually accounted for a larger fraction of economic growth. Figure 2.38 and 2.39 show that TFP still gradually accounts for a larger fraction of economic growth when using a lower capital share. However, it seems that with a lower capital share, the fall of TFP towards the end of the 1980s is more pronounced compared to the baseline case.

Figure 2.28: Simulations of GDP per capita versus the actual GDP per capita, alternative labour data, 1952-89



**2.A.3.8.2 Capital share: 0.5** In this section, I push the capital share to the upper range of plausibility, 0.5. Figure 2.40 depicts the new trend of wedges, while figure 2.41 depicts the new level of wedges. Increasing the capital share reduces the share of output growth than can be attributed to TFP (figure 2.40). It also decreases the level of output that can be attributed to TFP (figure 2.41). This does not overturn the main results of the paper. TFP still gradually accounts for a larger fraction of output growth over time (figures 2.42 and 2.43).

Figure 2.29: Yugoslav and sample-countries wedges, relative levels, without income wedge, 1952-89

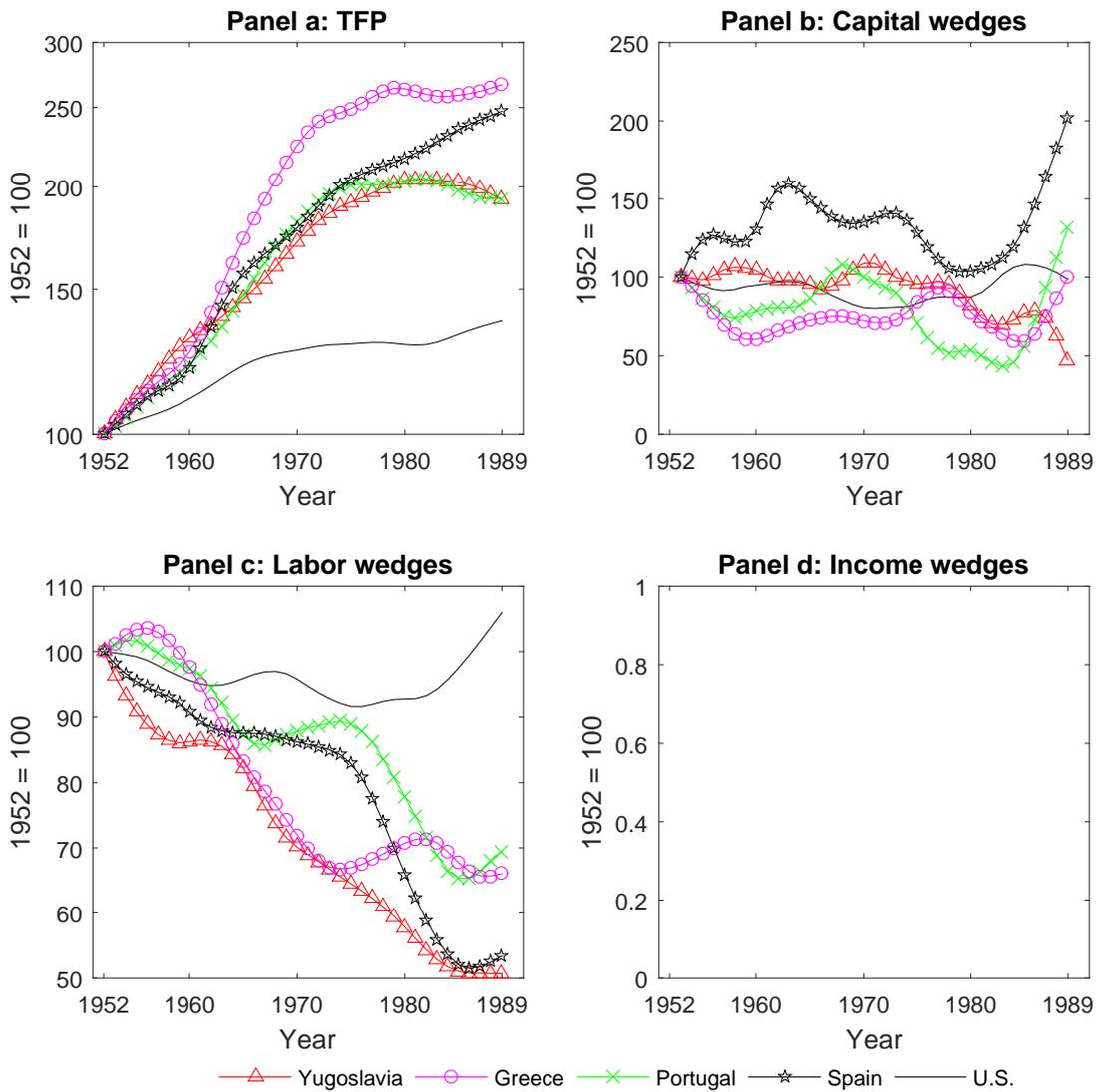


Figure 2.30: Yugoslav and sample-countries wedges, absolute levels, without income wedge, 1952-89

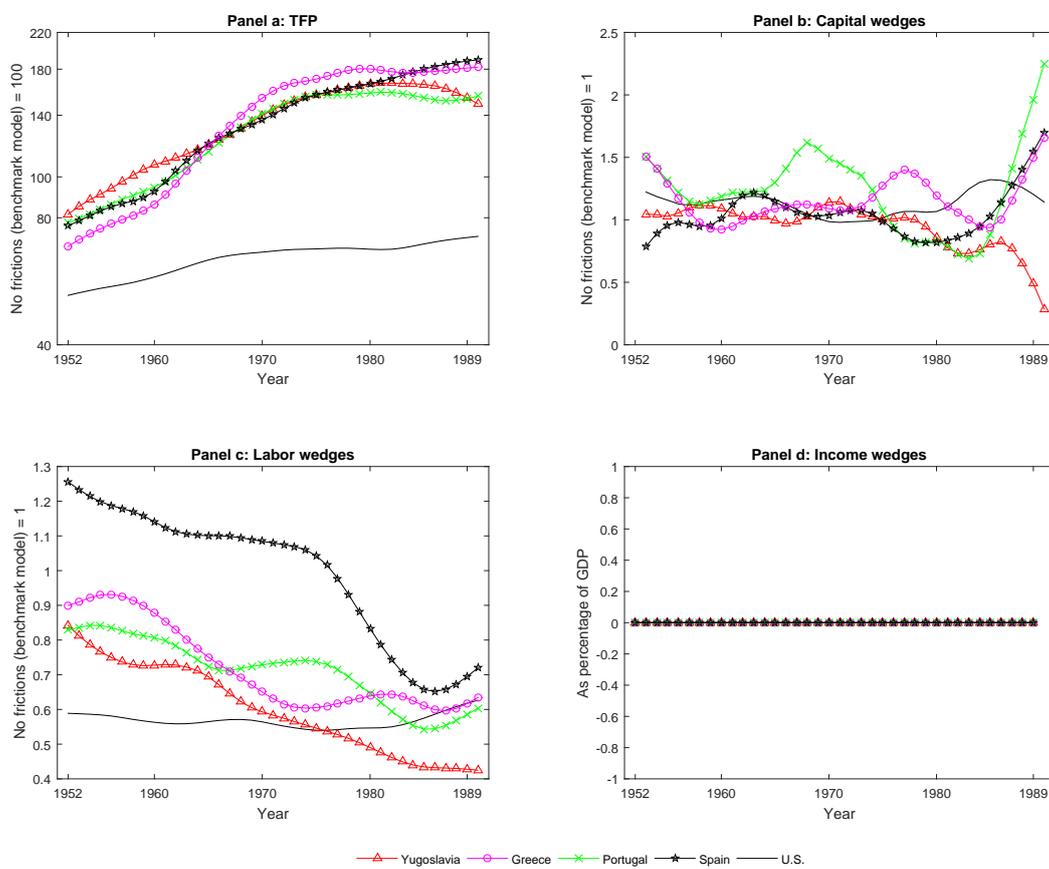


Figure 2.31: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), without income wedge, 1952-89

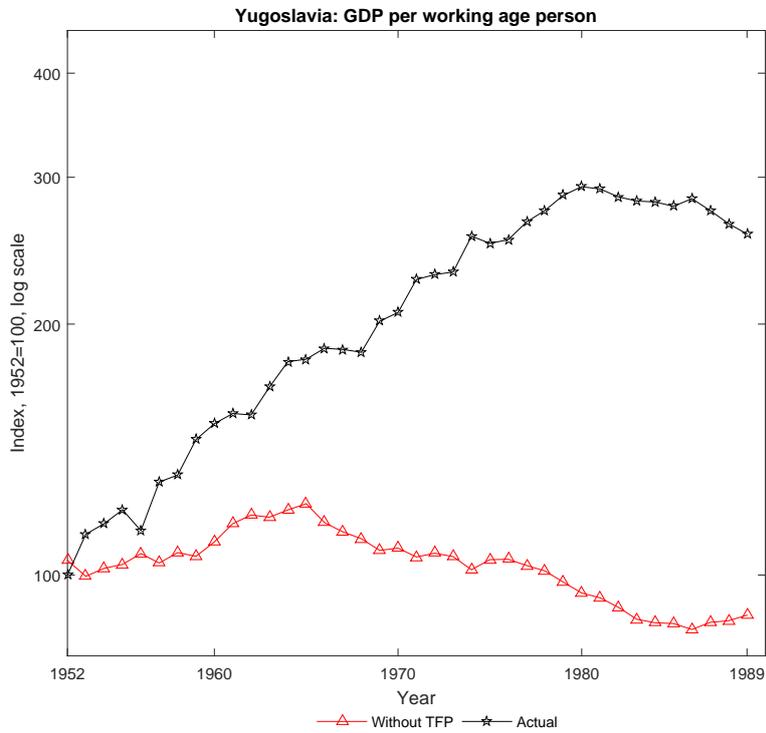


Figure 2.32: Simulations of GDP per capita versus the actual GDP per capita, without income wedge, 1952-89

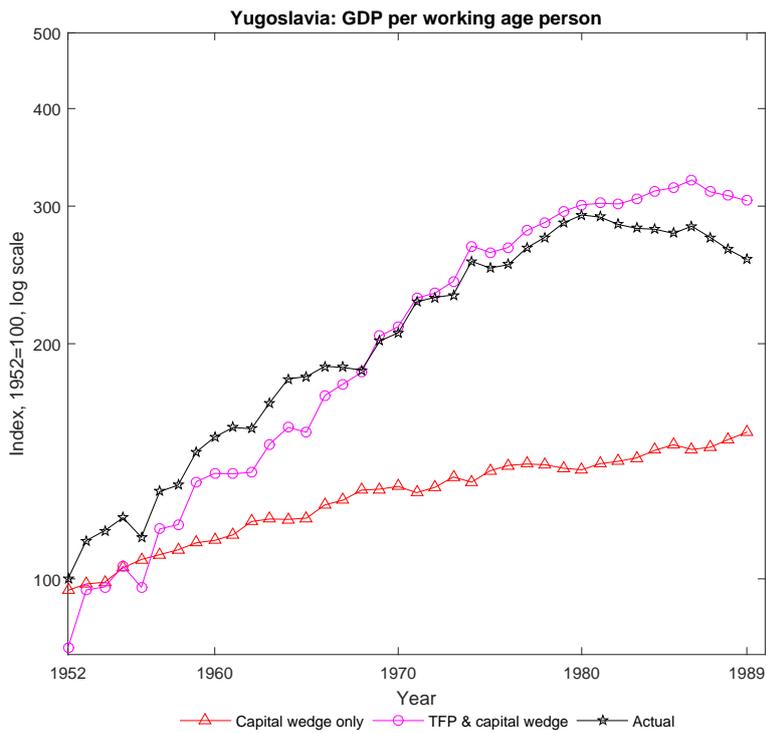


Figure 2.33: Simulations of GDP per capita versus the actual GDP capita, the contribution of each wedge, without income wedge, 1952-89

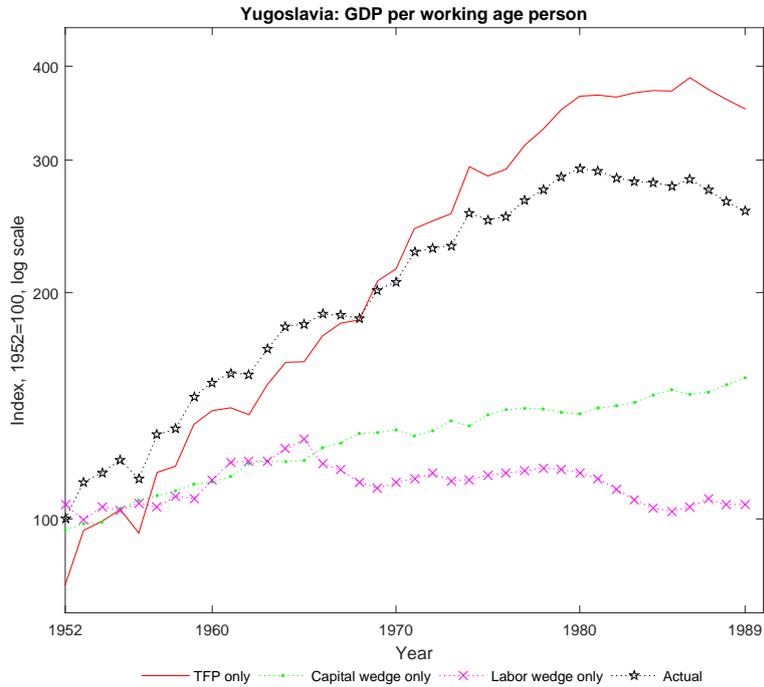


Figure 2.34: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), without trend growth rate of labour-augmenting technology, 1952-89

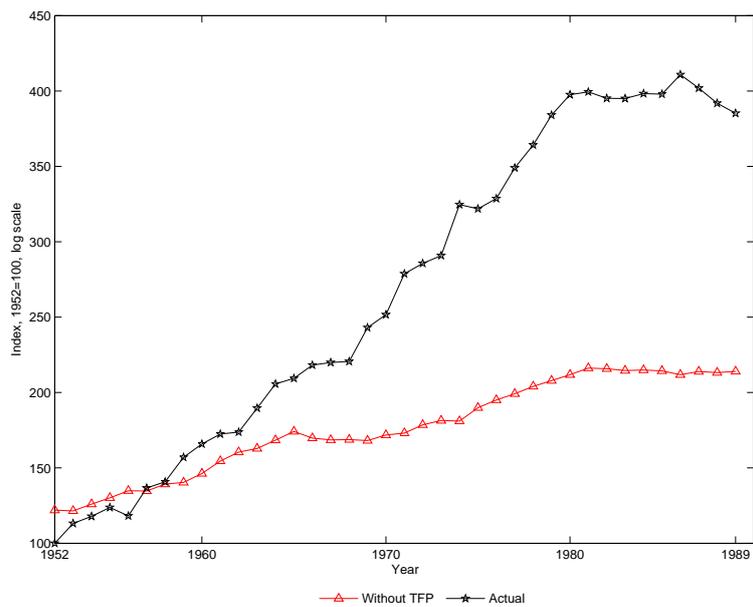


Figure 2.35: Simulations of GDP per capita versus the actual GDP per capita, without trend growth rate of labour-augmenting technology, 1952-89

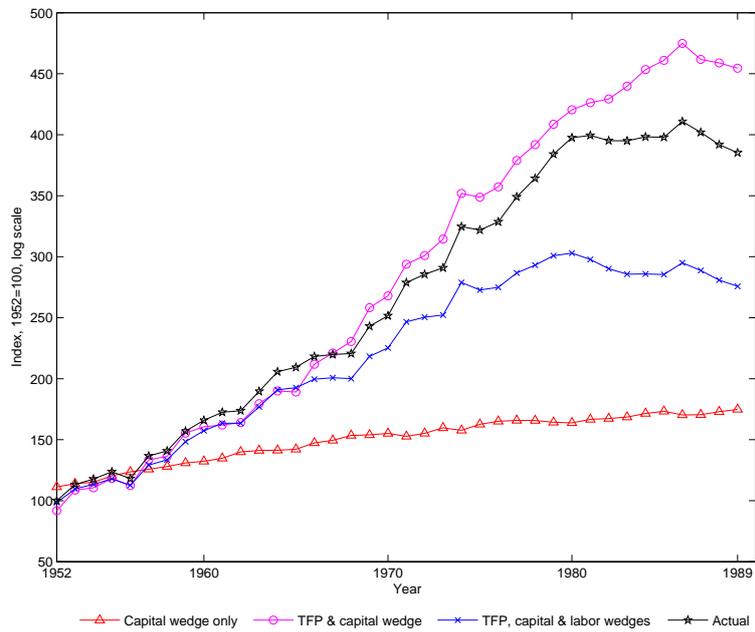


Figure 2.36: Yugoslav and sample-countries wedges, relative levels, capital share: 0.3, 1952-89

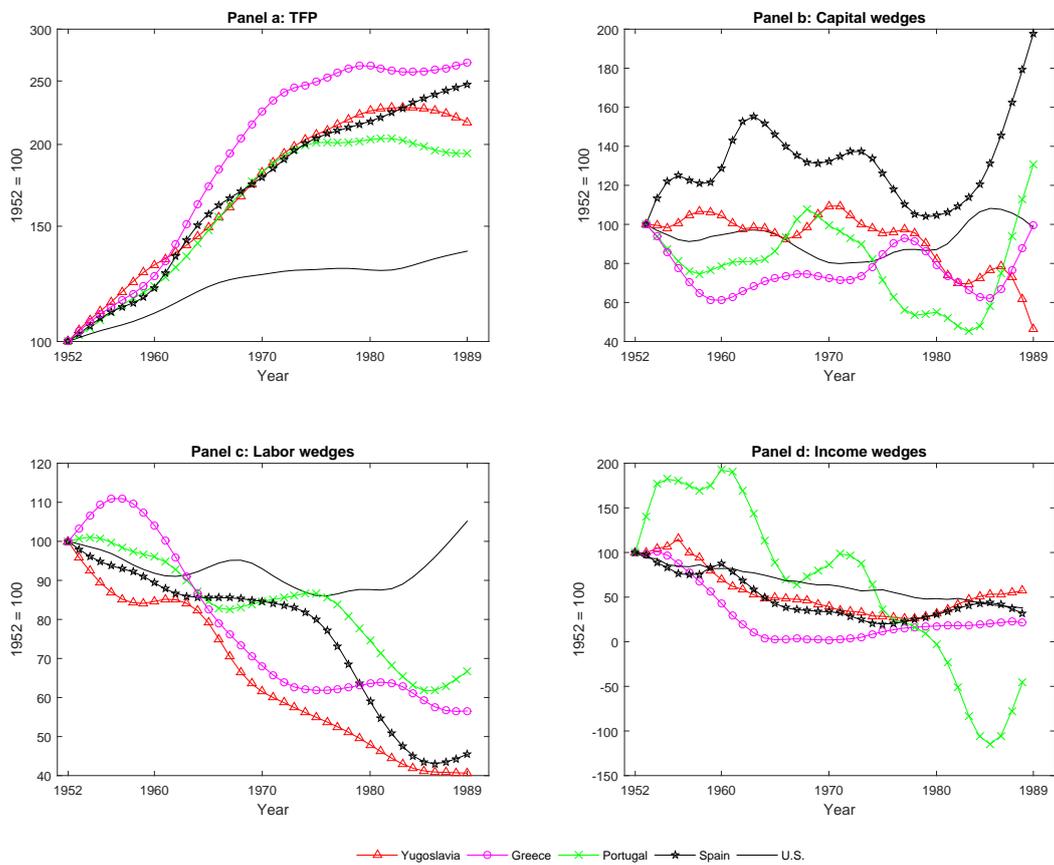


Figure 2.37: Yugoslav and sample-countries wedges, absolute levels, capital share: 0.3, 1952-89

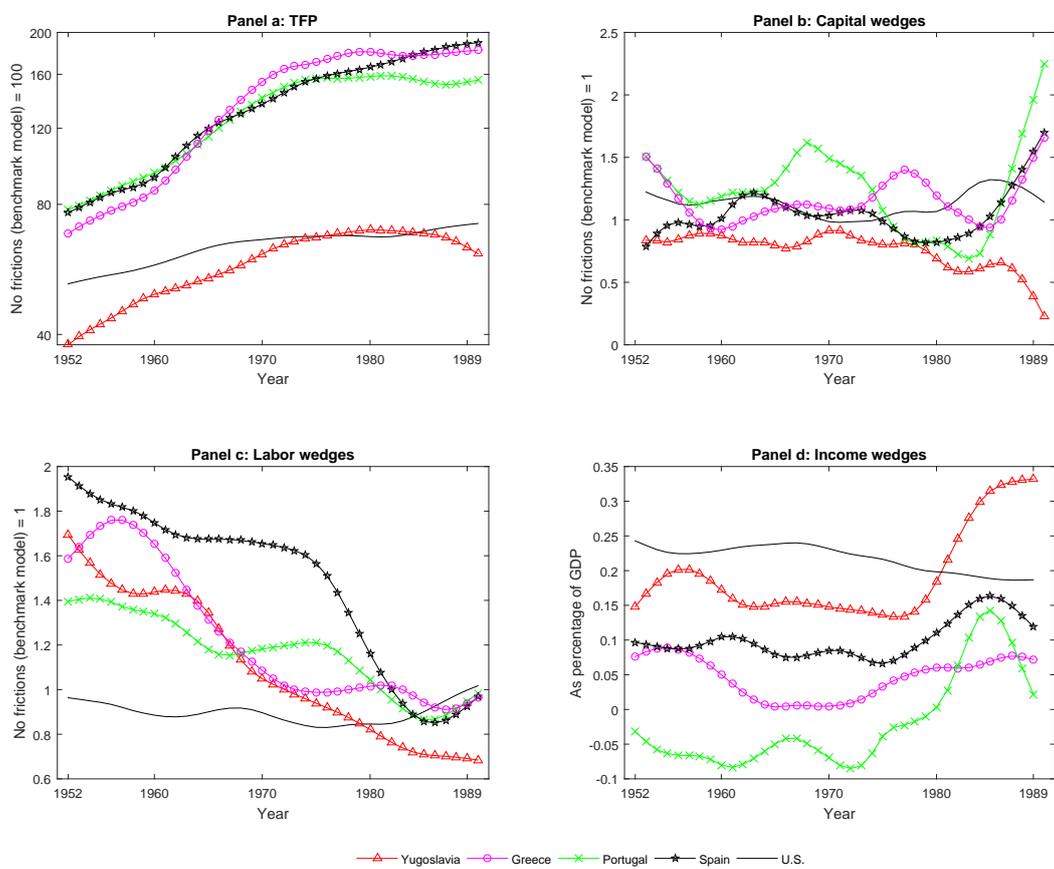


Figure 2.38: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), capital share: 0.3, 1952-89

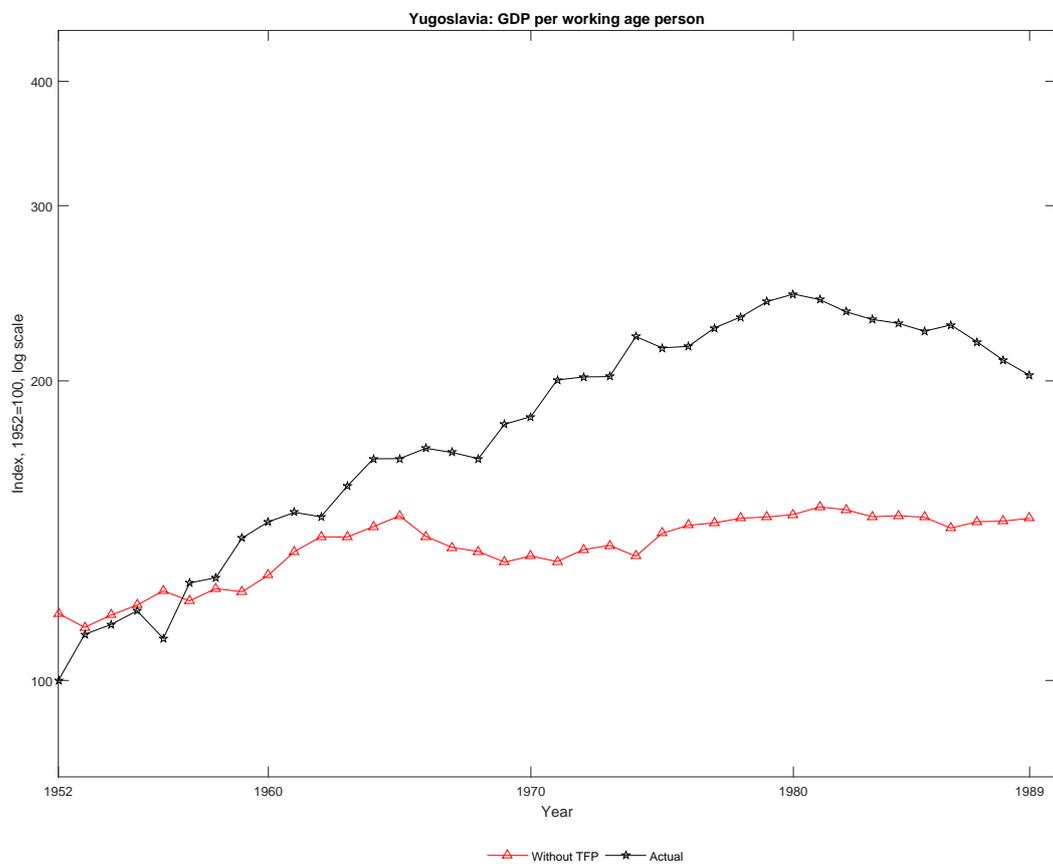


Figure 2.39: Simulations of GDP per capita versus the actual GDP per capita, capital share: 0.3, 1952-89

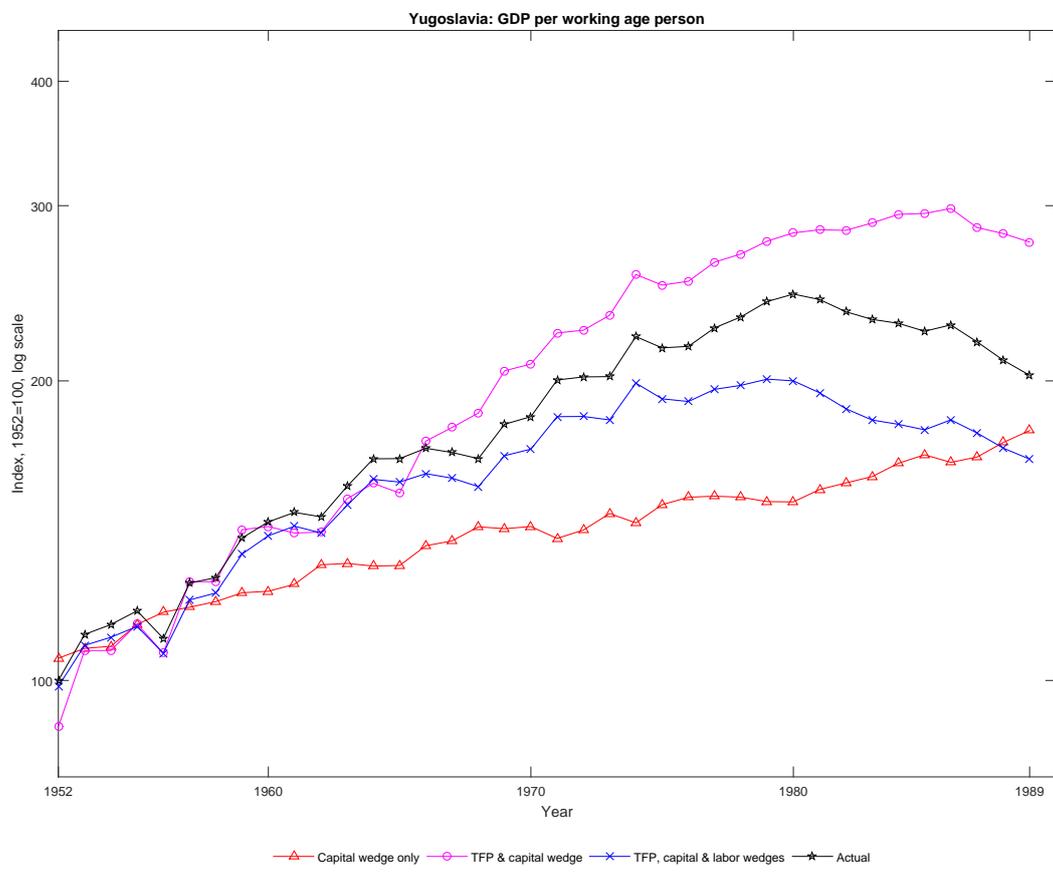


Figure 2.40: Yugoslav and sample-countries wedges, relative levels, capital share: 0.5, 1952-89

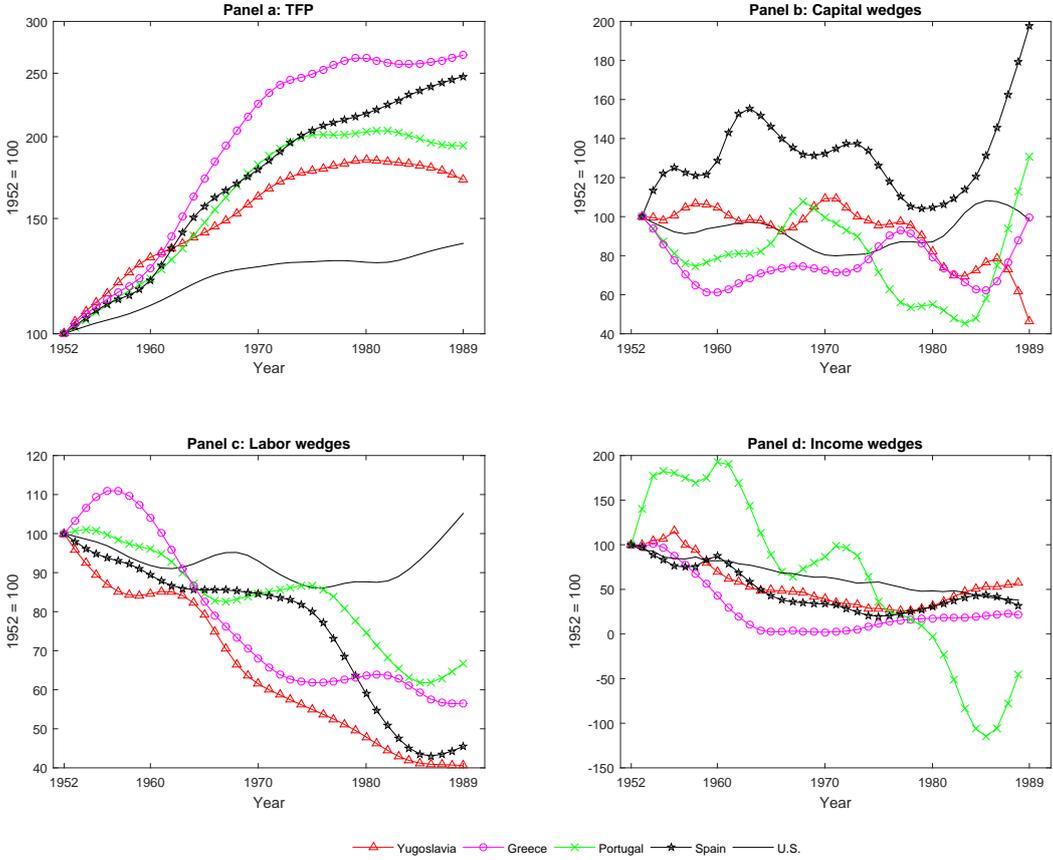


Figure 2.41: Yugoslav and sample-countries wedges, absolute levels, capital share: 0.5, 1952-89

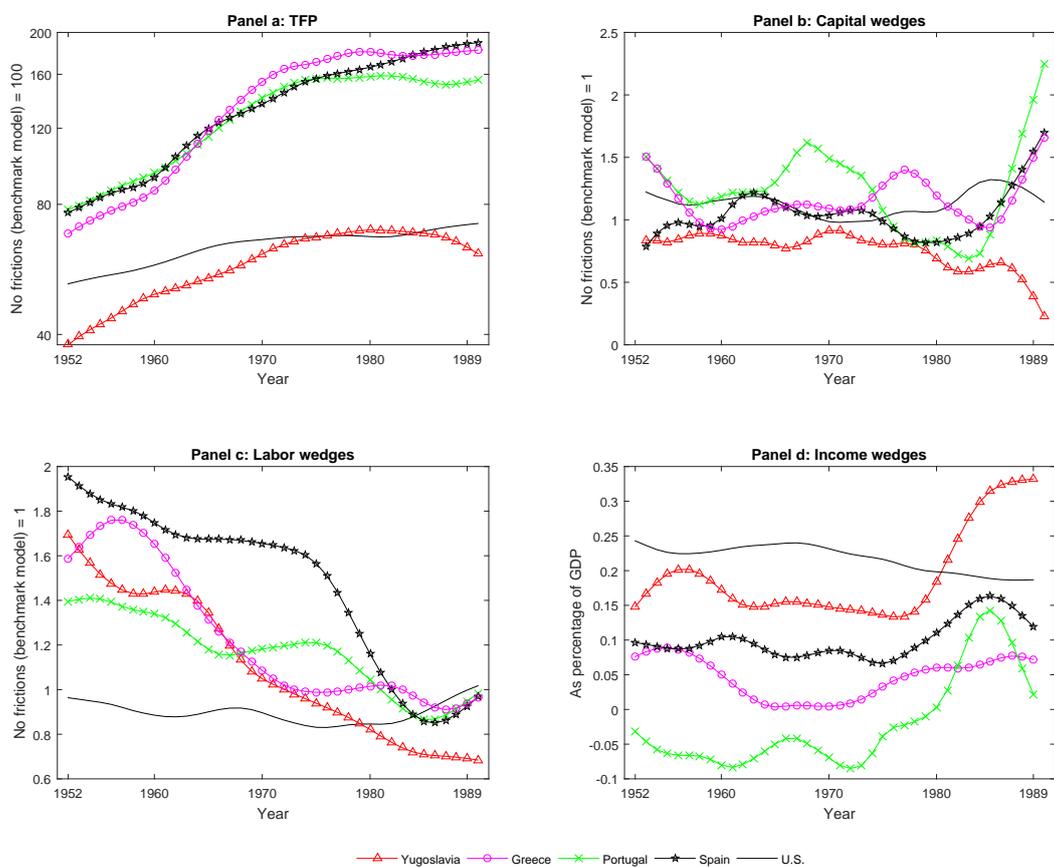


Figure 2.42: The actual evolution of GDP per capita versus the counterfactual evolution of it (without TFP), capital share: 0.5, 1952-89

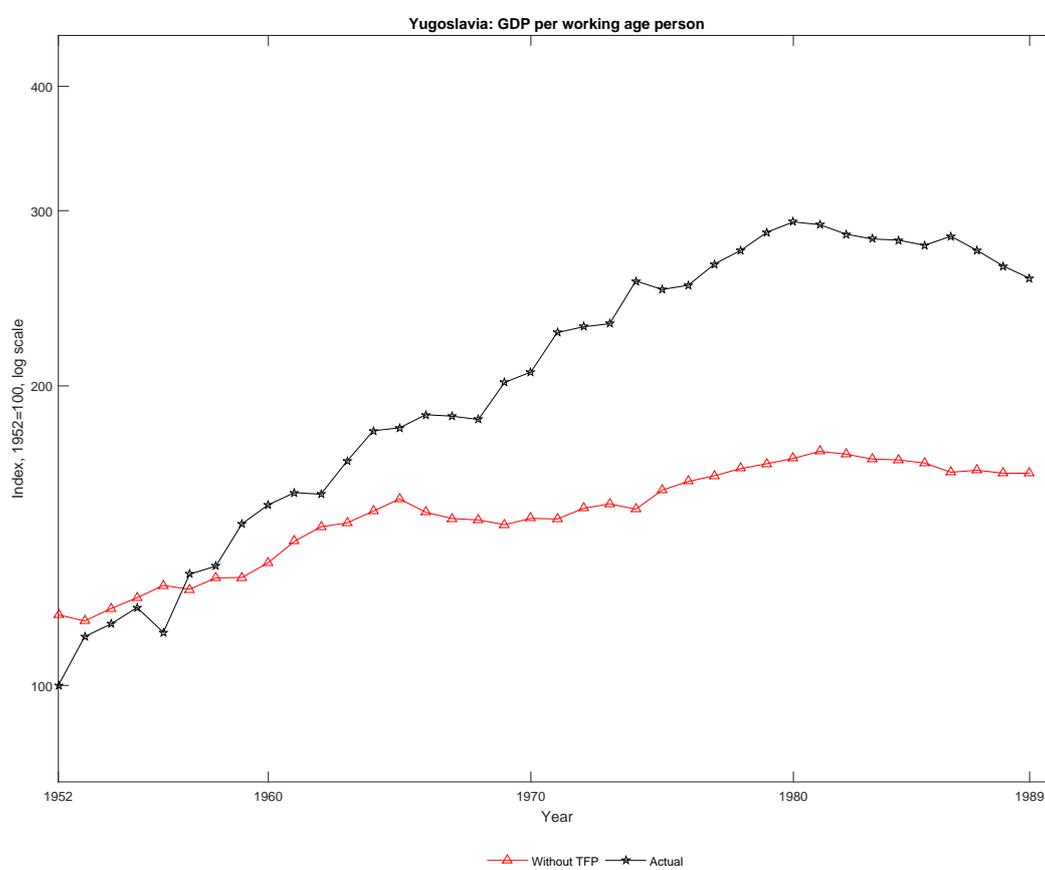
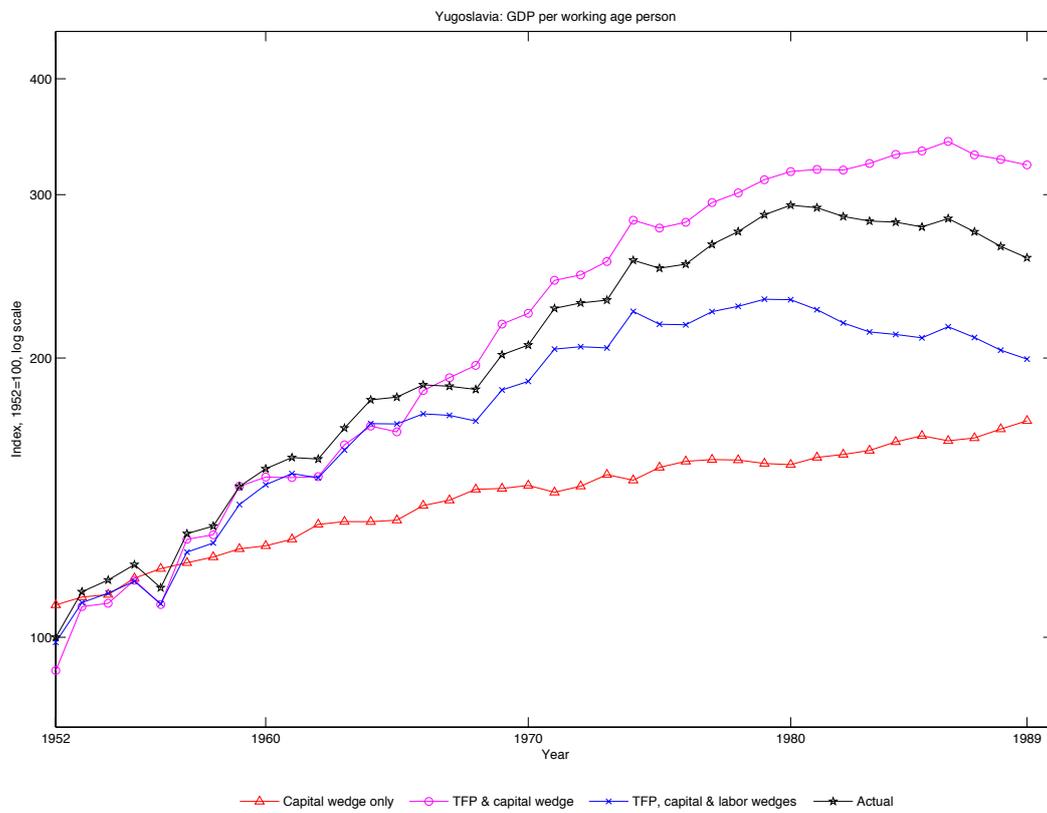


Figure 2.43: Simulations of GDP per capita versus the actual GDP per capita, capital share: 0.5, 1952-89



## Chapter 3

# Regional development under socialism: Evidence from Yugoslavia

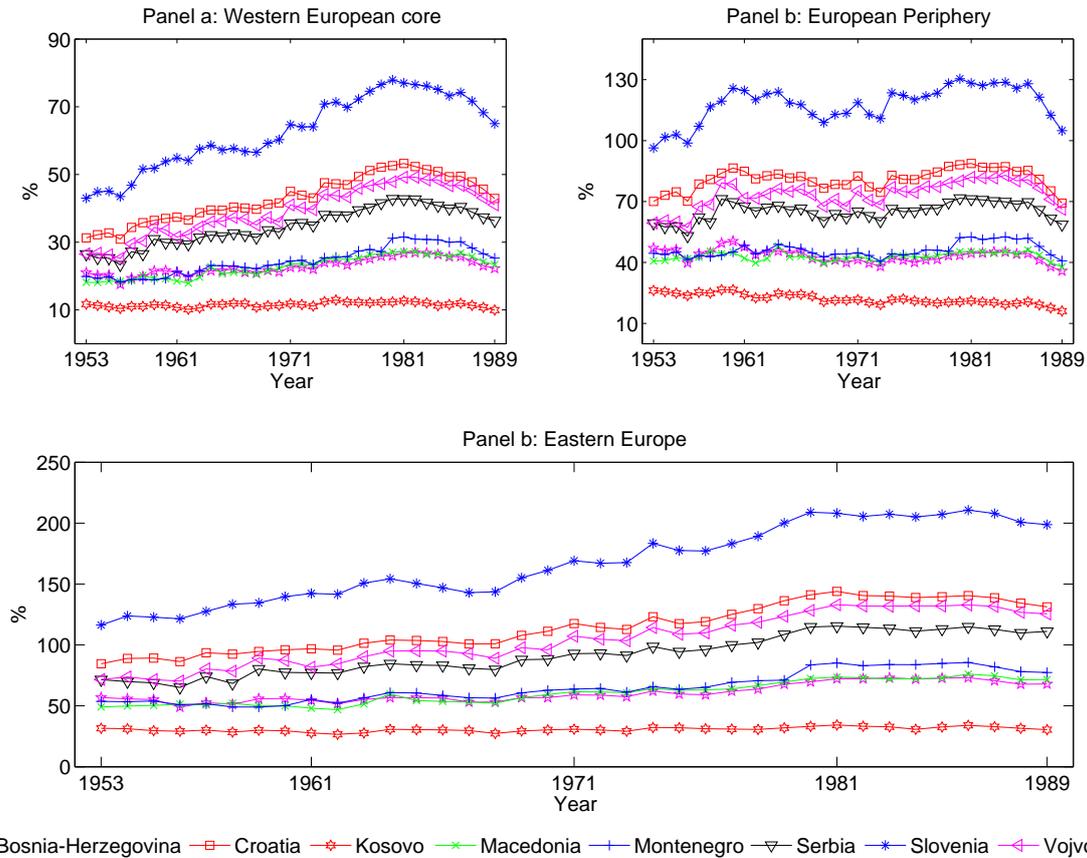
### 3.1 Introduction

Policy makers must pay attention to regional inequality because of its impact on welfare. Regional inequality contributes to overall inequality. It can undermine social cohesion and infuse political tensions (see e.g. in Belgium, Italy and Spain). This seems particularly likely in countries where labour is immobile, and where regional distribution of income coincides with the spatial distribution of ethnic groups. This was the case in socialist Yugoslavia. The country was extremely heterogeneous. It was divided into six *Republics* (Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Slovenia and Serbia) and two *Autonomous Provinces* that were part of Serbia (Kosovo and Vojvodina). These regions were divided along many lines. Yugoslavs were fond of describing their country as one with two alphabets, three religions, four languages, and five nations.

Reduction of regional inequality was a major priority of Yugoslav authorities (Bičanić, 1973; Pleština, 1992). In order to foster convergence in regional economic development and to preserve social stability, Yugoslav government 1) devolved power to its constituent Republics, 2) transferred control over prices, output, and enterprise budgets to labour-managed firms further down the aggregation level, and 3) and directed massive capital transfers from the more to the less developed regions. Yugoslavia developed the most decentralised socialist system in the world, symbolising to many a viable market socialist system (Vanek and Jovičić, 1975; Horvat, 1982).

Despite the intention of these institutional changes and policy efforts, initially more developed regions (Croatia, Slovenia and Vojvodina) grew faster than the initially less developed regions (Bosnia-Herzegovina, Kosovo, Macedonia and Montenegro) (implied by figure 3.1 within a European perspective)

Figure 3.1: GDP per capita of Yugoslav regions relative to the GDP per capita of the Western European core, the European periphery, and Eastern Europe, in %, 1953-89



Notes: GDP p.c. is in 1990 Int. GK\$. European subregions are population unweighted. They are classified as in Bolt and van Zanden (2014). Western European core countries are Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland, and the United Kingdom. Peripheral European countries are Ireland, Greece, Spain, and Portugal. Eastern European countries are Albania, Bulgaria, Czechoslovakia, Hungary, Poland, and Romania.

Sources: For Yugoslav regions see section 3.5. Otherwise, data is taken from Bolt and van Zanden (2014).

(Milanović, 1987; Bateman, Nishimizu, and Page, 1988; Kraft, 1992).<sup>1</sup> Thus, one question arises: why did the less developed regions (LDRs) grow slower than the more developed regions (MDRs), causing regional income divergence?

This paper analyses the proximate sources of growth in Yugoslavia - probably the most peculiar case from which we can learn about the economics of regional development under socialism. I utilise new estimates of output, as well as physical and human capital. I apply standard growth and development accounting methods to construct the regional development trajectories. Since Allen (2003) and Cheremukhin, Golosov, Guriev, and Tsyvinski (2015, 2017) argue that reallocation gains

<sup>1</sup>I follow the existing literature in the categorisation of the more developed and the less developed regions (Milanović, 1987; Bateman, Nishimizu, and Page, 1988; Kraft, 1992). The classification is somewhat simplistic, however, it yields the benefit of easing analytical exposition. It allows me to compare and contrast groups of regions, rather than cumbersome comparing and contrasting each region to another. Serbia is, however, an intermediate case. It closely tracked the mean and median of Yugoslavia across a range of development indicators. I thus do not treat Serbia as either the more or the less developed region.

associated with the transfer of inputs from agriculture to manufacturing were a major boon to socialist economic growth, I adjust the accounting methods so they can determine the contribution of structural modernisation to aggregate efficiency and hence economic growth.<sup>2</sup>

The analysis of proximate sources of growth provides a useful preliminary diagnostic function before engaging in deeper explorations of the ultimate sources of growth. For instance, If TFP was the main contributor to regional divergence, researchers should focus on analysing factors that distorted efficiency and the accumulation of technology in poorer regions. If, instead, inputs were the main contributor to regional divergence, researchers should focus on analysing factors that distorted the expansion of labour and capital in poorer regions.

I find that the LDRs grew slower than the MDRs because they failed to converge towards the employment rates and total factor productivities (TFP) of the MDRs. I interpret these failures as symptoms of a single underlying factor - a capital intensity bias inherent to the governing objective of labour managed firms. I base the argument on three premises. First, labour-managed firms were attempting to maximise income per worker through substituting capital for labour. Second, the capital intensity bias was particularly strong in the LDRs due to a range of factors, including capital aid and financial repression. Importantly, the bias towards capital intensity was pernicious in the LDRs because they were characterised by labour abundance. Third, substitution of capital for labour retarded employment rates in the LDRs relative to the MDRs. It furthermore caused a divergence in regional TFP trajectories through particularly retarding labour utilisation rates in the LDRs, and by stimulating firms in the LDRs to economise on the relatively abundant factor of production, i.e. labour.

The findings and interpretations of this paper contribute to the literature on economic development in socialist Europe. I provide a spatial dimension to the study of economic growth under socialism, which is otherwise neglected in the existing literature. This neglect seems unusual because egalitarianism was one of the defining features of socialism. There is, however, one practical reason for the paucity of research. There were only two countries in the region during the 20th century characterised by a comprehensive coverage of regional socio-economic indicators - the Soviet Union and Yugoslavia.<sup>3</sup>

The existing literature on economic growth under socialism focuses on analysing the relative contributions of factors of production and TFP to economic growth at the aggregate level. The general aim is to determine the sources of decline of socialist economies. One strand of literature attributes the decline to diminishing TFP growth ([Bergson, 1979, 1987a](#); [Gomulka, 1977](#); [van Ark, 1996](#); [Allen, 2003](#)),

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<sup>2</sup>More generally, reallocation gains are considered to be a major source of Europe's Golden Age of economic growth during the 1950s and the 1960s ([Temple, 2001](#); [Temin, 2002](#)). In this paper, I use the phrases "structural modernisation", "structural change", and "reallocation gains" interchangeably.

<sup>3</sup>With the notable exception of [Milanović \(1987\)](#) and [Bateman, Nishimizu, and Page \(1988\)](#), the existing research on Yugoslavia typically does not dig deeper into the underlying drivers of regional inequality, or the broader implications of increasing regional disparities. This paper makes a novel contribution to this literature by analysing the sources of regional patterns of economic growth.

while another strand of literature attributes the decline to diminishing marginal product of capital (MPK) (Weitzman, 1970; Desai, 1976; Sapir, 1980; Rusek, 1989; Easterly and Fischer, 1995). Instead, I find that regional growth accounts resist monocausal explanations. TFP was a more important source of growth in the MDRs than it was in the LDRs. The LDRs experienced declining MPK, while the MDRs did not experience declining MPK.

At a more fundamental level, the collapse of socialist economies is attributed to the embedded inefficiencies of socialism (Mises, 1922/1981; Hayek, 1945; Kornai, 1980; Ofer, 1987; Broadberry and Klein, 2011). The majority of existing studies covering socialist Europe focus on the general features of socialist systems that had no between, and especially no within country differences. Instead, I argue that a single national institution had a differential impact on regional development trajectories.

This paper also contributes to the literature on development under biased technological change. Labour-managed firms stimulated substitution of capital for labour, which can be interpreted as a capital using bias in technical change. The case of Yugoslavia depicts the limits of state-led development through the adoption of institutions unsuited to local factor endowments. Along the broadly conceived terminology of Abramovitz (1986), labour-managed firms were less technologically congruent with the local factor endowments in the LDRs than they were in the MDRs. The experience of Yugoslavia largely stands in line with Acemoglu and Zilibotti (2001) and Caselli (2016), who focus on the problems of technological adoption under incongruent factor endowments. The experience of Yugoslavia also conforms to the work of Rodrik (2007), who argues that there is no single best-practice institutional and policy regime. Instead, policies should to be tailored to local economic and political realities.

Finally, this paper also contributes to the wider debates concerning global postwar convergence patterns and the (normative) role of aid. During the postwar period, there was strong income convergence among the OECD members. Globally however, the same period was marked by income divergence (see Crafts and O'Rourke (2014) for a survey). This has fuelled the debates about the desirability of aid. In particular, if poor countries are locked in poverty traps because they lack the resources to invest in factors of productions and technology and/or have low incentives to invest because of increasing returns (Azariadis and Stachurski, 2005), aid might enable such countries to escape from poverty traps and achieve successful growth takeoffs (Sachs, 2005).

Yugoslavia is unique in the global perspective in the sense that it tried to integrate high-middle-income (Slovenia), middle-income (Croatia and Vojvodina) and lower-middle-income regions (Serbia), with backward regions (Bosnia-Herzegovina, Macedonia, Montenegro, and Kosovo).<sup>4</sup> It tried to stimulate the integrative processes through capital aid. The experience of Yugoslavia suggests a

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<sup>4</sup>Today (2017), the World Bank classifies Croatia and Slovenia as high-income economies, it classifies Bosnia-Herzegovina, Macedonia, Montenegro, and Serbia as upper-middle-income economies, and treats Kosovo as a lower-middle-income economy.

cautionary tale concerning the impact of aid flows. Increased aid flows to developing countries might indeed strongly boost convergence in capital intensities. However, if global differences in the MPK are negligible, or if MPK tends to be lower in poorer countries in the extreme case, this will need to be accompanied by financial repression, as [Caselli and Feyrer \(2007\)](#) argue. Capital outflows will need to be effectively banned in poor countries, as private investment will otherwise flow from poor to rich countries. If so, increased aid flows will be a move towards inefficiency, rather than efficiency, just like it seems it was the case in Yugoslavia. It seems unlikely this would lead to successful growth takeoffs.

The remainder of this paper is organised as follows. Section [3.2](#) provides a brief overview of decentralisation and regional development policies in Yugoslavia. Section [3.3](#) presents the patterns of regional inequality. In section [3.4](#), I sketch the theoretical predictions on regional patterns of growth and convergence, and discuss the approach used to decompose labour productivity growth. Section [3.5](#) describes the data and the newly constructed variables. Section [3.6](#) presents the results, while section [3.7](#) provides an interpretation of results based on a combination of institutional and policy-related factors. The final section [3.8](#) provides a conclusion.

## **3.2 Historical context: Decentralisation and regional development policies**

After World War II, the Communist Party seized power. Yugoslavia was reorganised into a federation. The aim was to heal Yugoslavia's ethnic and regional tensions stemming from WWII and the interwar period. Each federal unit approximated the spatial distribution of the major ethnic groups that inhabited the country. The communists adopted a form of government that promised political equalisation to the major ethnicities that formed the country.

In the initial phase of Yugoslavia's socialist experiment, the authorities pursued the standard centrally planned development model of the Soviet Union. The economic system did not differ in any meaningful sense from those that were implemented in the Soviet-dominated countries in Europe ([Horvat, 1971](#)). All investment decisions were taken by the federal centre. Regional development policies did not truly exist in this early stage of development ([Pleština, 1992](#)).

The 1948 conflict between Tito, the lifelong president of Yugoslavia, and Stalin, the leader of Soviet Union, was a pivotal moment in Yugoslavia's history.<sup>5</sup> As a consequence of the conflict, the Yugoslav communist leadership sought to distance the country from the Soviet Union and its ideology by constructing a unique version of socialism. The Yugoslav communists had to rebrand themselves. The new ideological consensus was that the state should be gradually weakened during the transition to

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<sup>5</sup>See [Rajak \(2011\)](#) for a description of the episode.

the communist utopia. It was based on the Marxist notion that the state should “wither away” (Jović, 2009). The “withering” of the Yugoslav state can be best perceived as decentralisation of economic and political power. Decentralised, or even polycentric, socialism was achieved in two ways.

First, political and economic power was transferred from the Federation to the federal units. The turning point was the 1965 socio-economic reform. The federal units obtained the means to stimulate their own economic development. This was partly motivated by the then apparent sharp increase in regional inequality (Bičanić, 1973). The 1965 reforms included the establishment of the “Federal Fund for Crediting Accelerated Development of In-Sufficiently Developed Republics and Autonomous Provinces” (Federal Fund). The Federal Fund was a vehicle which transferred capital from the MDRs to the LDRs. Funds were raised by taxation of firms in the richer regions. The tax was approximately equivalent to 1.9 per cent of their output (Bateman, Nishimizu, and Page, 1988). The recipient regions had full discretion over the allocation of capital aid. This does not mean that the LDRs did not receive federal aid before the establishment of the Federal Fund. Before 1965, capital was directly transferred from the federal investment fund to firms in poorer regions.

In addition to the Federal Fund, the federal centre transferred capital through the federal budget to the regional authorities, earmarked for the expansion of public amenities. On average, according to official statistics, federal aid was equivalent to more than 10 per cent of gross investment in Bosnia-Herzegovina since 1965.<sup>6</sup> It was approximately equivalent to 20 per cent of gross investment in Macedonia and Montenegro. In Kosovo, these transfers amounted on average to approximately 60 per cent of gross investment, reaching extremely high levels during the 1980s.

The effort to reduce the large interregional income differences has primarily consisted of capital aid. Internal trade policies to protect infant industries in the LDRs were prevented in order to stimulate national market integration. Low interregional labour mobility prevented productivity arbitration based on wage differentials (see section 3.7).

Second, further down the aggregation level, control over prices, output, and enterprise budgets, was gradually devolved to labour-managed firms. Next to ideological reasons, the aim was to eliminate bureaucratic waste and to make firms more responsive to the local environment, and hence to potentially stimulate regional equalisation of incomes through efficiency improvements (Horvat, 1971). Work councils of labour-managed firms, supposedly representing the interests of workers, could, in conjunction with the local government, hire and fire the managers of the enterprise. They could decide, to a degree, on the marketing and production processes of an enterprise. Over time, workers were granted rights over the income derived from fixed assets. Residual income, i.e. income net of depreciation allowances, interest repayments, and similar categories, could be subsequently allocated between wages and

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<sup>6</sup> *Jugoslavija 1918-1988: Statistički Godišnjak* (Savezni Zavod za Statistiku (1989)).

investment ([Estrin, 1983](#)).

Irrespective of capital aid, the establishment of labour-managed firms led to an effective ban on interregional capital flows. Firms were reluctant to invest in new ventures outside their domicile region because the returns were highly uncertain. The new venture could unilaterally proclaim itself autonomous. If so, investment made by the founding firm would be treated as a credit to be repaid at a low rate of interest. This feature derives from the nature of labour-managed firm. Labour management is impossible if decisions about the firm are to be made by an external investor.

Interregional capital immobility was the intention of federal policy makers. Next to the aforementioned feature of labour-managed firms, the Federal Fund ensured that poorer regions would be able to accumulate capital. [Bateman, Nishimizu, and Page \(1988\)](#) argue that policy makers feared that capital would otherwise flow to richer regions, buttressing regional inequality. Section 3.7 demonstrates that their fears were justified. The MPK was higher in the MDRs than it was in the LDRs. If capital was mobile, it would have flown from poorer to richer regions, due to higher returns it could have realised there.

### 3.3 Regional inequality

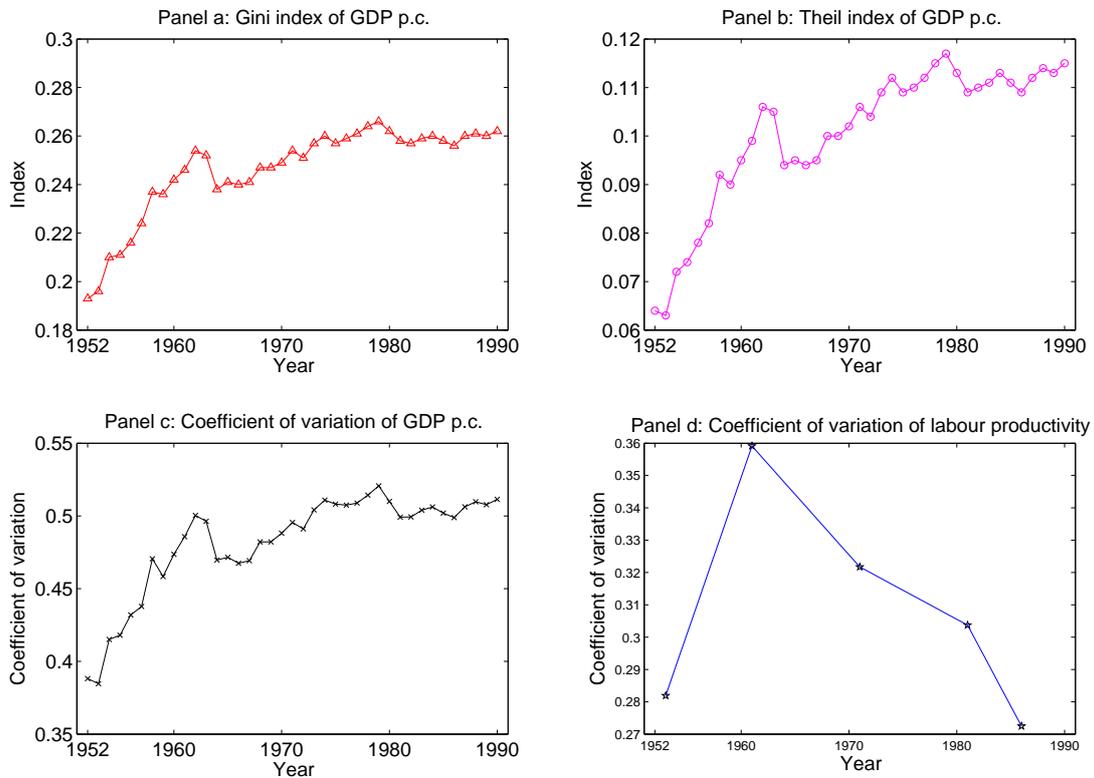
This section presents stylised facts on regional inequality. Figure 3.1 indicates that Slovenia, Croatia and Vojvodina grew strongly given their initial income levels, converging towards the core countries of Western Europe. Bosnia-Herzegovina and Kosovo, on the other hand, performed poorly. This suggests increasing regional inequality in Yugoslavia.

These growth trends indeed led to income divergence between the Yugoslav regions. Figure 3.2 displays information on the evolution of inequality through three measures - the Gini coefficient, the Theil index, and the coefficient of variation (CV). All three measures depict the same increasing trend concerning regional income p.c. inequality until the late 1970s (panels a, b, and c in figure 3.2). During the 1980s, inequality remained roughly constant because economic growth across all regions ceased.

To put Yugoslavia's experience in context; the average regional Gini coefficient for all OECD countries in 2010 stood at 0.16 ([OECD, 2013](#)). This is significantly lower than in Yugoslavia at any point in time. Furthermore, the dispersion of regional income levels in Yugoslavia was higher than the current dispersion of income levels among the member states of the European Union (EU) (see [Monfort \(2008\)](#) for data on EU).

The Yugoslav experience is instead more similar to that of regionally heterogeneous developing countries nowadays. In 2010, in China, India and Brazil, regional Gini coefficient ranged between 0.27 and 0.29 ([OECD, 2013](#)). This is similar to historic peak value of Gini coefficient in Yugoslavia in 1979 (0.26). Concerning the evolution of regional inequality in developing countries, it is difficult to find

Figure 3.2: Regional inequality as depicted by the Gini coefficient, coefficient of variation (CV) and the Theil index, Yugoslavia, 1952-89



Note: Regions are unweighted. Definitions of the Gini coefficient, Theil index and CV are in appendix 3.A.2.

Source: See section 3.5.

common patterns. Milanović (2005) studies four developing (quasi) federations since about 1980. In China, he finds that regional disparities have overall remained constant, even though inequality has fluctuated between sub-periods. In India and Indonesia he finds increasing inequality. In Brazil he finds no trend. In contrast, Azzoni (2001) studies Brazil over a longer period (1939-95), and finds overall decline.

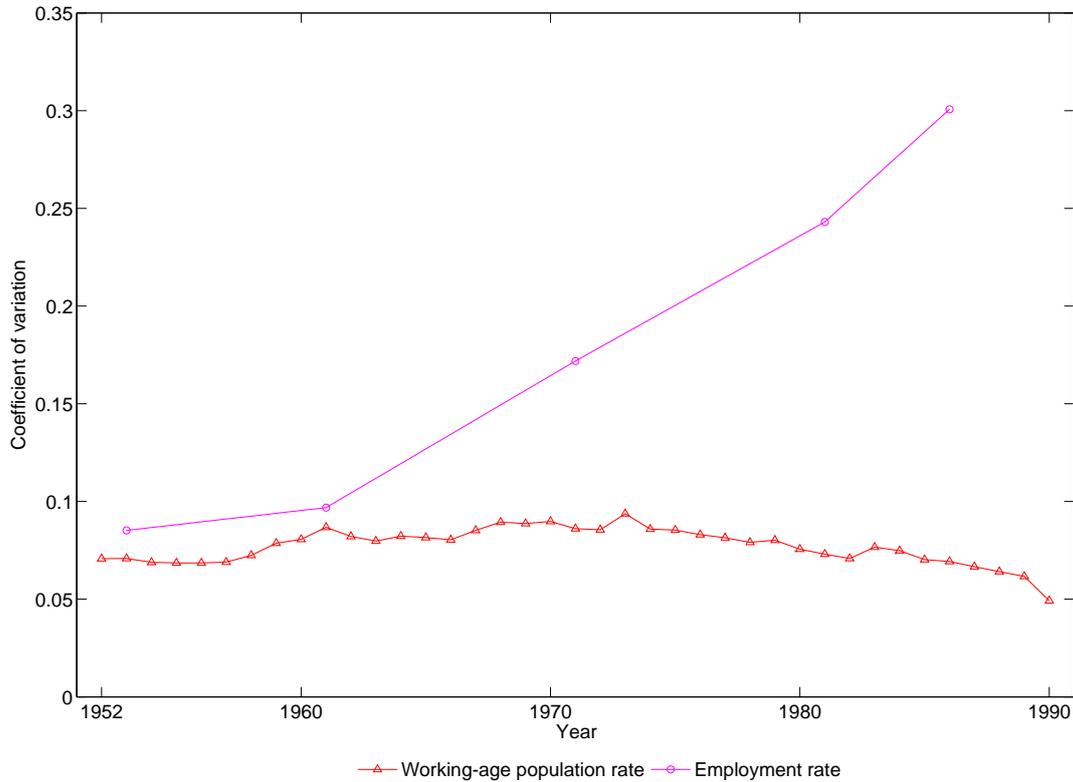
Notwithstanding these contemporary similarities and differences in regional inequality, compared to other peripheral European countries at a broadly similar level of economic development during the postwar period, like Greece, Portugal, and Spain, Yugoslavia was the only economy characterised by regional income divergence.<sup>7</sup>

Which proximate factors caused regional income divergence in Yugoslavia? There are three possible explanations: 1) labour productivity, 2) employment, and 3) demography (working-age population rate).<sup>8</sup> Concerning 1), in contrast to regional income p.c. trends, inequality of labour productivity

<sup>7</sup>See Petrakos and Saratsis (2000) for Greece, see Martínez-Galarraga, Rosés, and Tirado (2013) for Spain, and see Badia-Miró, Guilera, and Lains (2012) for Portugal.

<sup>8</sup>Following the Shapley decomposition approach, GDP p.c. can be defined as a function of labour productivity,

Figure 3.3: Regional inequality of demographic indicators, Yugoslavia, 1952-1990



Notes: Regions are unweighted. Working-age population rate is the the population aged 15-64 divided by the overall population. Employment rate is labour headcount divided by the working-age population. Sources: Population data is taken from *Vitalna Statistika* (Savezni Zavod za Statistiku, 1950-1954) and *Demografska Statistika* (Savezni Zavod za Statistiku, 1955-1989). Labour data is taken from *Popis Stanovništva* (Savezni Zavod za Statistiku, 1948, 1953, 1961, 1971, 1981).

levels remained constant (figure 3.2.d). The dispersion of labour productivity levels initially increased until 1961. During the subsequent decades, it decreased to a level similar to the one observed in 1953. Concerning 2) and 3), figure 3.3 reveals that the regional dispersion of employment rates tripled during the sample period, while dispersion of working-age population rates has slightly decreased. The divergence in regional income levels was thus caused by divergence of employment rates, and by the absence of convergence in labour productivity levels. Before assessing why was this the case, it is necessary to analyse the regional sources of labour productivity growth.

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the employment rate, and a demographic component (working-age population rate):  $\frac{\text{output}}{\text{overall population}} = \frac{\text{output}}{\text{workers}} * \frac{\text{workers}}{\text{working-age population}} * \frac{\text{working-age population}}{\text{overall population}}$ .

## 3.4 Theory and methodology

### 3.4.1 Theory

How to study regional development and convergence? Due to high interdependence among regions, this is a complex area of inquiry that involves a multitude of theoretical and empirical approaches (Breinlich, Ottaviano, and Temple, 2014). To impose structure, it is necessary to acknowledge theoretical predictions from economic growth theory. First, the textbook Solow-Swan growth model would predict growth and convergence on the basis of physical and human capital deepening. Poor regions are characterised by capital scarcity of both types, low productivity, and by extension high marginal products of factors of production. Accumulation of factors, due to higher returns, leads poorer regions to grow faster than the richer regions. In the presence of mobile factors of production, convergence is facilitated by migration of labour to rich regions (where wages are higher), and by migration of capital to poor regions (where rents are higher). These processes cause the equalisation of factor prices and factor proportions.

Second, endogenous growth models view the process of convergence as facilitated through technological catch-up by poor regions.<sup>9</sup> Third, within a framework of structural modernisation with a long tradition in development economics (Lewis, 1954), a country seizes efficiency gains as it shifts resources from low productivity sectors to high productivity sectors.<sup>10</sup> By extension, the process of regional income convergence is synonymous with the process of convergence in economic structures (Caselli and Coleman, 2001).

In order to acknowledge the first two predictions on growth and convergence, I adopt standard growth and development accounting methods. I decompose regional growth trajectories into the relative contributions of inputs, and the efficiency with which those inputs are used, i.e. TFP. Of course, I do not use an endogenous growth model *per se*. A major drawback of standard growth and development accounting methods is that they are incapable of explaining TFP. Relating the empirical findings to the existing literature on Yugoslav macroeconomic history can partially alleviate this problem.

I assess the contribution of structural modernisation to regional development trajectories by using the Vollrath (2009) dual economy model. Within a development accounting framework, Vollrath (2009) divides the economy into two sectors - agriculture and non-agriculture. I modify his model into a growth accounting exercise to account for the contribution of sectoral input reallocation to aggregate efficiency

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<sup>9</sup>The phrase “endogenous growth”, as Romer (1994) states, encapsulates a diverse body of theoretical and empirical research. The common feature of endogenous growth theory is that it seeks to explain the level and evolution of TFP among and between countries.

<sup>10</sup>Within countries, the dynamics of structural change are more complex and more difficult to estimate (Caselli and Coleman, 2001). Agricultural labour from poor regions might migrate to manufacturing and modern services in the rich regions.

and hence economic growth.<sup>11</sup> Dividing the economy into two parts is somewhat superficial. But, in case of Yugoslavia, it is appropriate to focus just on agriculture and non-agriculture. Agricultural labour formed more than 70 per cent of total labour in the immediate aftermath of WWII (*Popis Stanovništva, Savezni Zavod za Statistiku*, 1953).

### 3.4.2 Methodology

With the aim of estimating efficiency associated with the sectoral allocation of resources, aggregate labour productivity,  $\frac{Y}{L}$ , is assumed to be derived from agriculture and non-agriculture (Vollrath, 2009):

$$\frac{Y}{L} = \frac{Y_a}{L} + \frac{Y_{na}}{L} \quad (3.1)$$

where  $Y_a$  denotes agricultural output, and  $Y_{na}$  denotes non-agricultural output. Since  $Y_a$  and  $Y_{na}$  are divided by total labour,  $L$ ,  $\frac{Y_a}{L}$  and  $\frac{Y_{na}}{L}$  measure the contribution of agriculture and non-agriculture to aggregate labour productivity, respectively. Output in each sector is generated by the following Cobb-Douglas production function:

$$Y_a = A_a R_{a,t}^\gamma K_a^\beta (hL)_a^{1-\gamma-\beta} \quad (3.2)$$

and:

$$Y_{na} = A_{na} K_{na}^\alpha (hL)_{na}^{1-\alpha} \quad (3.3)$$

where  $R$  is agricultural land,  $K$  is physical capital, and  $h$  is per capita human capital of the labour force. The term  $hL$  denotes labour augmented by quality (human capital), while  $A$  denotes efficiency with which inputs are used to produce output (TFP). In agricultural production function (equation 3.2),  $\gamma$  is the elasticity of output with respect to land,  $\beta$  is the elasticity of output with respect to physical capital, and  $1 - \gamma - \beta$  is the elasticity of output with respect to human capital. The agricultural production function is consistent with a long tradition of modelling agriculture (Hayami and Ruttan, 1970).

The non-agricultural production function in equation 3.3 matches the standard formulation of aggregate production function in Hall and Jones (1999). It does not include land. Concerning output elasticities,  $\alpha$  denotes the elasticity of output with respect to physical capital, and  $1 - \alpha$  denotes the elasticity of output with respect to human labour. Both sectors are thus characterised by constant returns to scale because elasticities in each sector must sum to unity.<sup>12</sup> Assuming perfectly competitive

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<sup>11</sup>Appendix 3.A.3 provides a set of advantages the Vollrath (2009) model provides compared compared to the existing literature.

<sup>12</sup>The assumption of constant returns to scale is corroborated by empirical research. Boyd (1987) estimates the Yugoslav agricultural production function. He finds that the elasticity of agricultural output with respect to each input

markets, the elasticity of output with respect to its input is measured by the share of input compensation in output.

In order to conduct a growth accounting exercise, equation 3.1 can be rewritten as:

$$\frac{\dot{y}}{y} = \frac{\dot{y}_a}{y} + \frac{\dot{y}_{na}}{y} \quad (3.4)$$

where a lower case letter denotes a variable expressed in per worker terms, and a dot over a variable denotes its time derivative.<sup>13</sup> Equation 3.4 defines aggregate labour productivity growth as the weighted sum of agricultural and non-agricultural labour productivity growth. The existence of this aggregate production does not depend on the problematic assumption of an optimal resource allocation within an economy (Banerjee and Duflo, 2005).

To determine the weighted sectoral contribution of inputs and TFP to aggregate labour productivity growth, take the total differential of production functions in equations 3.2 and 3.3, and divide by  $Y$ . Subsequently, the first term on the right-hand side of equation 3.4 expands into:

$$\frac{\dot{y}_a}{y} = s \frac{\dot{A}_a}{A_a} + \rho \frac{\dot{r}_a}{r} + \kappa \frac{\dot{k}_a}{k} + (1 - \rho - \kappa) \frac{\dot{h}_a}{h} \quad (3.5)$$

where  $s$  is the share of agricultural output in total output,  $\rho$  is the share of agricultural land in total output,  $\kappa$  is the share of physical capital in total output, and  $1 - \rho - \kappa$  is the share of human capital in total output. The second term on the right-hand side of equation 3.4 expands into:

$$\frac{\dot{y}_{na}}{y} = (1 - s) \frac{\dot{A}_{na}}{A_{na}} + \kappa \frac{\dot{k}_{na}}{k} + (1 - \rho - \kappa) \frac{\dot{h}_{na}}{h} \quad (3.6)$$

Substituting equations 3.5 and 3.6 into equation 3.4 yields the aggregate production function similar to Temple (2001):

$$\frac{\dot{y}}{y} = \frac{\dot{A}}{A} + \rho \frac{\dot{r}_a}{r} + \kappa \frac{\dot{k}}{k} + (1 - \rho - \kappa) \frac{\dot{h}}{h} \quad (3.7)$$

where:

$$\frac{\dot{A}}{A} = s \frac{\dot{A}_a}{A_a} + (1 - s) \frac{\dot{A}_{na}}{A_{na}} \quad (3.8)$$

$$\dot{k} = \dot{k}_a + \dot{k}_{na} \quad (3.9)$$

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summed to 0.99. Sapir (1980) estimates the Yugoslav manufacturing production function. He finds that the elasticity of manufacturing output with respect to each input summed to 1.

<sup>13</sup>The growth accounting exercise is expressed in terms of continuous time to conduce clarity of exposition by reducing notational clutter. The actual calculations are performed using a standard translog production function.

and:

$$\dot{h} = \dot{h}_a + \dot{h}_{na} \quad (3.10)$$

Equation 3.7 does not explicitly incorporate efficiency gains derived from the reallocation of human and physical capital to more productive uses. Such efficiency gains are implicitly reflected in  $\dot{A}$ , and form some fraction of aggregate TFP growth. In order to explicitly estimate efficiency gains associated with the reallocation of inputs, note that first order conditions require identical marginal products,  $MP$ , of inputs,  $i$ , employed in each sector (Ngai and Pissarides, 2007; Herrendorf, Rogerson, and Valentinyi, 2014). However, in a developing country like Yugoslavia this condition likely did not hold:

$$MP_{a,i} \neq MP_{na,i} \quad (3.11)$$

An economy with a sectoral marginal product gap (equation 3.11) is characterised by an inefficient sectoral allocation of inputs. This implies that such an economy is characterised by frictions. These frictions distort the reallocation of inputs from the less productive sector to a more productive sector. In turn, a decrease of these frictions yields aggregate efficiency gains as inputs move to a more productive use in another sector. An economy can seize these efficiency gains until the sectoral marginal products are equalised. That is, until  $MP_{a,i} = MP_{na,i}$ .

To formalise these ideas, treat any efficiency  $Z$  derived from the sectoral allocation of inputs as as the ratio of actual to potential labour productivity ( $y^*$ ):

$$Z = \frac{y}{y^*} \quad (3.12)$$

where potential output is a hypothetical output level in the absence of a marginal product gap (if:  $MP_{a,i} = MP_{na,i}$ ).  $Z$  can be interpreted as measuring the fraction of potential output that an economy is actually achieving given its factor endowments and sector-specific TFP's (Vollrath, 2009). An economy will approach its potential output through decreasing the marginal product gap. At a more technical level, the derivation of potential output involves finding the share of human and physical capital in agriculture that maximises output. Since the calculus is somewhat tedious, I report the details in appendix 3.A.3, alongside a set of entailed assumptions.

Upon estimating  $Z$ , aggregate TFP,  $A$ , can be perceived as a function of efficiency derived from the sectoral allocation of resources, and other categories of efficiency,  $A_E$ . Formally, within a growth perspective, equation 3.8 can be redefined as:

$$\frac{\dot{A}}{A} = \frac{\dot{A}_E}{A_E} + \frac{\dot{Z}}{Z} \quad (3.13)$$

where the reallocation gain,  $Z$ , is measured as a change in the ratio of actual to potential income. I assume that an improvement in the ratio of actual to potential income leads to a one-to-one increase in economic growth. Substituting equation 3.13 into equation 3.7 yields the growth accounting exercise of this paper:

$$\frac{\dot{y}}{y} = \frac{\dot{A}_E}{A_E} + \frac{\dot{Z}}{Z} + \rho \frac{\dot{r}_a}{r} + \kappa \frac{\dot{k}}{k} + (1 - \rho - \kappa) \frac{\dot{h}}{h} \quad (3.14)$$

where  $A_E$  is aggregate TFP adjusted for efficiency gains associated with reallocation of physical and human capital to a more productive use in another sector. It is the TFP growth I report in section 3.6.1. It is estimated as residual growth after accounting for the contribution of reallocation gains and input growth to aggregate labour productivity growth.

## 3.5 Data

This section describes data. I primarily rely on official sources, but I make adjustments to official data where necessary. A more detailed data description is provided in appendix 3.A.1. In order to minimise measurement problems, the analysis is conducted on the basis of five benchmark years - 1953, 1961, 1971, 1981 and 1986. The first four are centred on labour data derived from population censuses. The last year is based on an employment census. I do not use the last 1991 Yugoslav census as it is incomplete for some regions. All monetary figures are converted to 1990 International Geary-Khamis dollars.

### 3.5.1 Output

Social Product (SP) was the official indicator of output in Yugoslavia. SP is the conceptual equivalent of the Gross Domestic Product (GDP). The growth rate of SP is however overestimated because of index number problems (Gerschenkron, 1947), distorted prices (Staller, 1986), hidden inflation (Nove, 1981), and possibly because of firm’s over-reporting of input requirements in order to maximise the allocation of resources within a shortage economy (see Ofer (1987) for an overview). On the other hand, SP growth rates could be partially underestimated because the rapidly growing non-market services - education, healthcare, culture, and housing - were excluded from SP. Non-market services were considered to be “non-productive” sectors which did not contribute to the value-added of a socialist economy.

Due to aforementioned issues, a group of Western scholars estimated the GDP series of socialist European countries. They did it in a set of publications entitled “Research Project on National Income in East Central Europe” (Research Project).<sup>14</sup> The Research Project estimated the GDP of Yugoslavia

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<sup>14</sup>Their publications that cover the 1945-1990 period include Alton (1970) and Alton, Badach, Bass, Bakondi, Brumar, Bombelles, Lazarcik, and Staller (1992).

and its sectors. It did not estimate the GDP of Yugoslav regions. Two issues related to SP mentioned in the above paragraph might distort the level and evolution of regional inequality.

First, price distortions could matter. Prices of agricultural goods were set below world prices, while prices of industrial goods were set above world prices. This implies that official data assigns a greater share of Yugoslav output to the more industrial regions than it corresponded to the actual state, magnifying the level of regional inequality.

Second, since the MDRs were likely characterised by a larger share of non-market services in their total output than the LDRs were, the official level of regional inequality might be underestimated. The net impact of these two biases on the level of regional inequality is ambiguous. The impact of these two biases on the evolution of regional inequality is, however, unambiguous. If the LDRs converged towards the sectoral structure of the MDRs, official data overestimates the true extent of regional income divergence.<sup>15</sup>

I assess whether price distortions and the excluded non-market services bias relative regional growth trajectories by re-estimating regional sectoral outputs. I do it in two steps. First, to eliminate price distortions, I apply international prices to the agricultural and non-agricultural sectors. In the second step, I estimate the output of non-market services through the size of regional non-market service wage bills.<sup>16</sup> The regional GDPs are anchored by the Yugoslav aggregate and sectoral output estimated by the Research Project. I thus keep the value of Yugoslavia's aggregate and sector-specific GDP as estimated by the Research Project, but provide new regional GDPs.

Table 3.1 compares the official and alternative output growth rates. On average, it seems that government statisticians overestimated the average annual growth rate of the MDRs (8 per cent for the average of Croatia, Slovenia and Vojvodina) to a larger extent than the average annual growth rate of the LDRs (6 per cent for the average of Bosnia-Herzegovina, Kosovo, Macedonia, and Montenegro). However, the dynamics of output growth overestimation are more complex at the level of individual regions. In sum, it does seem that official data overestimates the extent of regional income divergence, but to a small and potentially negligible extent. In appendix 3.A.4.4, I conduct growth and development accounting exercises with official output data. The results are qualitatively identical to the baseline case where I use the newly constructed output data.

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<sup>15</sup>Of course, it could also be the case that other statistical biases distort the evolution of regional inequality. For instance, official evolution of regional inequality will be distorted if firms in some regions over reported input requirements to a larger extent than firms in other regions. Unfortunately, it is impossible to speculate about the significance of such effects in the absence of research.

<sup>16</sup>I estimate the output of non-market services through the factor cost method, which the Research Project used as well. My methodology is thus internally consistent with that of the Research Project. Unfortunately, I do not account for capital income. It is not possible to account for interregional cross subsidisation and taxation of capital, which would be necessary to do when estimating output derived from capital at factor cost.

Table 3.1: Compound annual growth rate of real output, Yugoslav regions, 1952-89, in %

	Official data	Alternative data	Ratio of alternative to official data
Yugoslavia	5.11	4.75	0.93
Bosnia-Herzegovina	4.70	4.55	0.97
Croatia	4.95	4.59	0.93
Kosovo	5.17	5.11	0.99
Macedonia	5.38	4.96	0.92
Montenegro	5.06	4.55	0.90
Serbia	5.12	4.68	0.91
Slovenia	5.33	4.97	0.93
Vojvodina	5.65	5.10	0.90

Note: Official data is expressed in 1972 dinars. Alternative data is expressed in 1990 Int. GK\$.  
Sources: See appendix 3.A.1.1.

### 3.5.2 Inputs

I use official data on gross investment.<sup>17</sup> But, I exclude a category called “other”. I omit this category because it includes expenditure on product research and training of personnel, which is not part of physical capital. Moreover, it includes changes in the value of inventory. This is problematic because Madžar (1985) reports that value of inventory has been substantially overestimated during the inflationary environment of the 1970 and the 1980s. The exclusion of the category “other” decreases total investment by approximately 10 per cent across Yugoslavia during the 1953-86 period.

Physical capital is composed of four asset categories: residential structures (dwellings), non-residential structures, equipment, and livestock. Non-agricultural capital includes the first three assets, while agricultural capital consists of the last three assets. Annual net capital stock is estimated using the perpetual inventory method with geometric depreciation:

$$K_{i,t} = K_{i,t-1}(1 - \delta_i) + I_{i,t} \quad (3.15)$$

where  $K$  denotes capital stock in period  $t$  of type  $i$ .  $I$  denotes gross investment and  $\delta$  denotes the depreciation rate. Depreciation rate for each asset is taken from Hulten and Wykoff (1981).<sup>18</sup> I rely on Vinski (1959) to initialise the 1953 capital stock series by type. After constructing the time series for each asset type, I sum these into an unweighted aggregate. The capital stock is therefore not adjusted for quality. In the absence of a capital market, it is not possible to estimate the returns to capital by

<sup>17</sup> *Investicije u Osnovna Sredstva SFR Jugoslavije, Socijalističkih Republika i Socijalističkih Autonomnih Pokrajina 1952-1981, u Cenama 1972.* (Savezni Zavod za Statistiku, 1983a) and *Investicije* (Savezni Zavod za Statistiku, 1982-1989).

<sup>18</sup> I take an unweighted average of the assets likely to be found within each sector-specific capital input. This approach yields depreciation rates of 15.1 and 3.7 per cent for non-agricultural machinery and non-residential structures, respectively. It yields depreciation rates of 17.1 and 2.4 per cent for agricultural machinery and non-residential structures, respectively. Depreciation rate for residential structures is assumed to be 1.3 per cent like in Hsieh (2002). In appendix 3.A.4.2 I experiment with alternative depreciation rates. The results remain qualitatively very similar to the baseline findings in section ??.

type, with which different assets could be otherwise weighted and adjusted for quality.

The value of agricultural land is initialised through [Vinski \(1959\)](#) as well. The evolution of agricultural land is projected through the volume of land provided in official statistics.<sup>19</sup>

Labour data is taken from official sources and is adjusted for hours worked.<sup>20</sup> Labour is augmented by quality through the mincerian approach, following [Hall and Jones \(1999\)](#). Average years of schooling for sector-specific labour are constructed from official sources.<sup>21</sup> Average years of schooling are turned into mincerian human capital by adjusting for the returns to education relative to labour without education. Returns to education are assumed to be piecewise linear. Following [Hall and Jones \(1999\)](#), I assume that the return to education under 4 years of schooling is 13.4 per cent, between 4 and 8 years of schooling it is 10.1 per cent, and above 8 years of schooling it is 6.8 per cent.<sup>22</sup>

Figure 3.4 reports some of the newly constructed macroeconomic aggregates. It suggests that LDRs strongly converged towards the physical and human capital intensities of the MDRs (panels b and c). It seems that their economic structures have strongly converged as well (panel a). Indeed, figure 3.5 shows that the CV of the percentage share of non-agricultural employment in total employment, the capital to labour ratio, and the average years of schooling, has strongly decreased.

### 3.5.3 Factor shares

The sector-specific income compensation of labour and capital is estimated from the national accounts.<sup>23</sup> I assume that regional factors shares are identical because it is not possible to estimate factor shares at a regional level.<sup>24</sup> In non-agriculture, the estimated average output share of capital is 0.43. This is similar to the often estimated capital share in socialist countries for the aggregate economy ([Easterly and Fischer, 1995](#)). In agriculture, the estimated average output share of capital in agriculture is 0.19. Given the data availability of Yugoslav national accounts, it is not possible to estimate the land share of agricultural output. Instead, I take the land share from [Boyd \(1987\)](#). He reports that the land share of agricultural output in Yugoslavia was 0.24. Given these factors shares, the labour share in both sectors is identical (0.57). For the aggregate economy, factor shares are imputed as the weighted

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<sup>19</sup>*Statistički Godišnjak SFR Jugoslavije* ([Savezni Zavod za Statistiku, 1952-1991](#)).

<sup>20</sup>Headcount of labour is taken from *Popis Stanovništva* ([Savezni Zavod za Statistiku, 1948, 1953, 1961, 1971, 1981](#)), *Statistički Godišnjak SFR Jugoslavije* ([Savezni Zavod za Statistiku, 1987](#)), and ILO (online). Average annual hours worked are derived from *Statistički Godišnjak SFR Jugoslavije* ([Savezni Zavod za Statistiku, various years](#)).

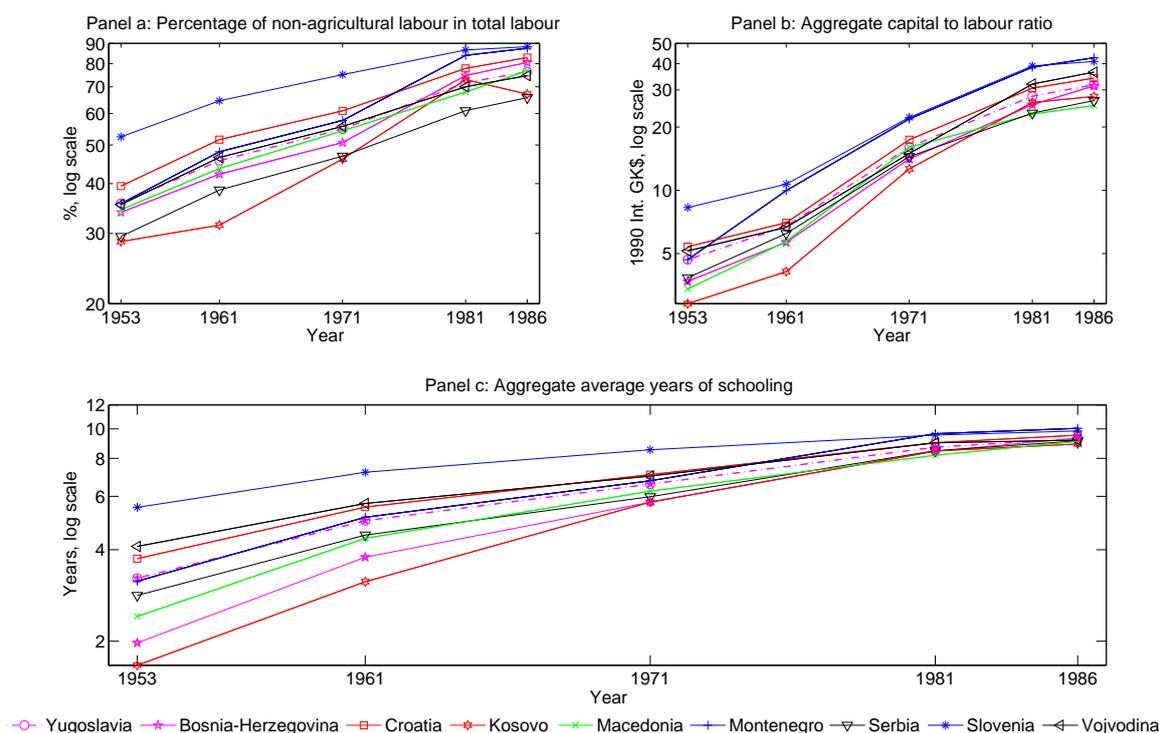
<sup>21</sup>*Popis Stanovništva* ([Savezni Zavod za Statistiku, 1948, 1953, 1961, 1971, 1981](#)) and *Statistički Godišnjak SFR Jugoslavije* ([Savezni Zavod za Statistiku, 1991](#)).

<sup>22</sup>I assume that the returns to education are identical in agriculture and non-agriculture. There is remarkably little evidence on returns to education in agriculture. In appendix 3.A.4.3 I experiment with alternative returns to years of schooling. The results remain qualitatively very similar to the baseline findings in section ??.

<sup>23</sup>*Statistički Godišnjak SFR Jugoslavije* ([Savezni Zavod za Statistiku, 1952-1991](#)).

<sup>24</sup>This seems justified. After accounting for income derived from self-employment, [Gollin \(2002\)](#) finds that labour shares are approximately constant in international cross-section data. Nevertheless, in appendix 3.A.4.1 I experiment with alternative labour shares. I attach different labour shares to LDRs and the MDRs. The results remain qualitatively very similar to baseline findings in section 3.6.

Figure 3.4: Regional macroeconomic data, Yugoslavia, 1953-86



Notes: Labour is total hours worked.

Sources: See text.

average of the corresponding factor shares in agricultural and non-agricultural output. Labour share in aggregate output is thus 0.57, capital share is 0.38, and land share is 0.05. These estimations are very similar to the aggregate output shares of labour, capital and land Bergson (1961) finds for the Soviet Union.

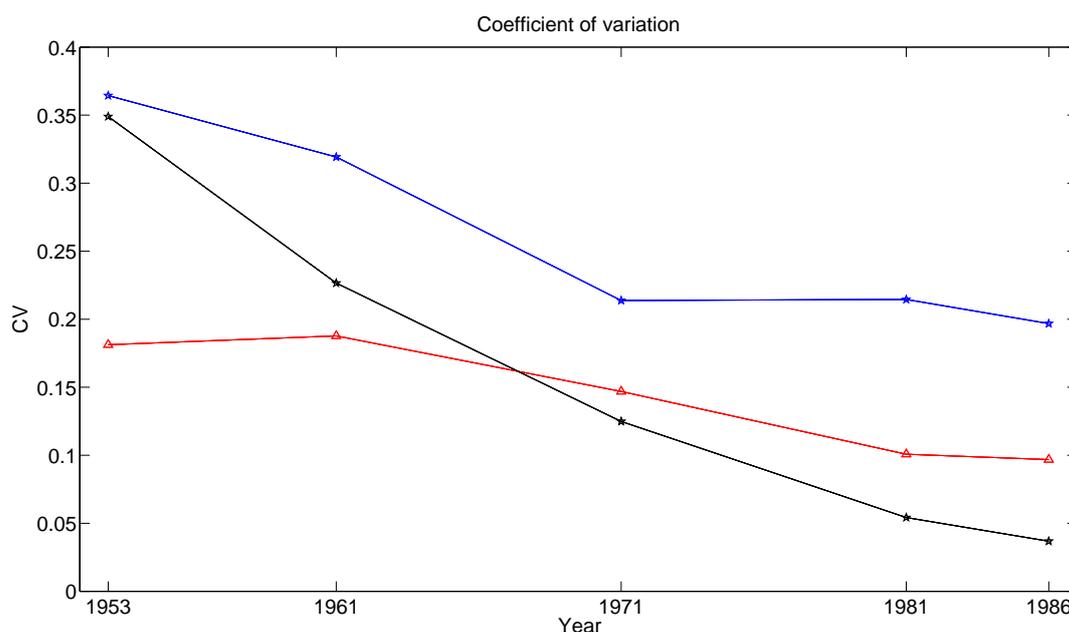
## 3.6 Results

### 3.6.1 Growth accounting

Figure 3.6 depicts the sources of cumulative labour productivity growth over the benchmark of five years. Table 3.2 shows the sources of aggregate economic growth in Yugoslavia during the overall 1953-86 period in greater detail. I ignore the sectoral contribution to aggregate labour productivity growth because the contribution of agriculture was negligible. According to table 3.2, of the annual 5 per cent growth in aggregate output for Yugoslavia, the growth in labour productivity contributed 5.4 per cent. The remainder was due to negative growth of the labour supply. Within a European post-war perspective, average annual labour productivity growth rate of 5.4 per cent over more than thirty years is very high (see table 12.7 in Crafts and Toniolo (2010)).

Table 3.2 decomposes the sources of labour productivity growth into contributions of physical and

Figure 3.5: CV of regional macroeconomic data, Yugoslavia, 1953-86



—△— Percentage of non-agricultural labour in total labour —★— Aggregate capital to labour ratio —★— Aggregate average years of schooling

Sources: See text.

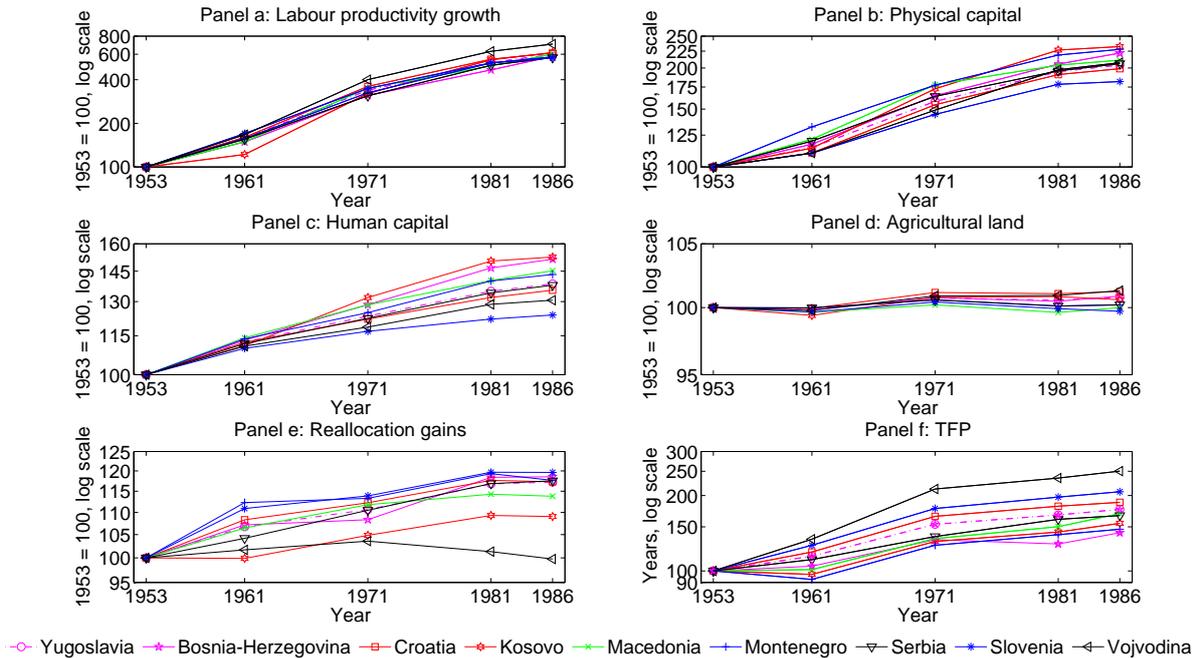
human capital, reallocation gains associated with a more efficient sectoral allocation of human and physical capital, and TFP. The last column depicts the variance of a variable. A high variance on a source of growth indicates that a large fraction of differences in growth performance across regions can be explained by that source of growth.

The main source of growth in all regions, except in Slovenia and Vojvodina, was physical capital deepening. As indicated before by figures 3.4 and 3.5, the LDRs experienced a much greater contribution of physical capital to labour productivity growth than the MDRs did, suggesting that physical capital deepening contributed towards regional convergence.

The accumulation of human capital followed a similar pattern as the accumulation of physical capital. The expansion of human capital was a significant source of growth across all regions. Suggestively, it was an important source of labour productivity convergence too. The highest annual contribution of human capital deepening to labour productivity growth among the MDRs was 0.9 per cent in Croatia, while the lowest annual contribution of human capital among the LDRs was 1.1 per cent in Montenegro. The contribution of land was generally irrelevant. Land supply was fairly fixed across Yugoslavia.

Reallocation gains were a less important source of growth than human capital, but they were nevertheless substantial. I am able to eliminate on average one quarter of conventionally measured TFP growth by accounting for reallocation gains. In Bosnia-Herzegovina, Croatia, Macedonia, Serbia, and Slovenia, reallocation gains significantly boosted labour productivity growth. It seems that reallocation

Figure 3.6: Sources of cumulative growth, Yugoslav regions, 1953-86, 1953=100



gains contributed towards labour productivity convergence as well, but only slightly. On average, annual reallocation gains among the LDRs were 0.42 per cent, while among the MDRs they were 0.34 per cent.

Finally, the variance of TFP growth rates was big. The variance of TFP growth was highest among all the sources of growth by a significant margin (last column of table 3.2). In Slovenia, TFP was the main source of growth. In all other regions it was of second-order or third-order importance. The results strongly suggest that differential TFP gains diminished regional labour productivity convergence. The lowest annual growth rate of TFP among the MDRs was 1.9 per cent in Croatia, while the highest annual TFP growth rate among the LDRs was 1.6 per cent in Macedonia.

Across all regions except Slovenia, the growth of labour productivity growth was mostly caused by factor accumulation. This mirrors the general finding in the economic growth literature that most of output growth across countries can be accounted for by input growth (for a literature survey, see Hsieh and Klenow (2010)). Nevertheless, there was strong regional variation to it. In Kosovo as a maximum, factor accumulation accounted for 71 per cent of labour productivity growth. In Slovenia as a minimum, factor accumulation counted for 47 per cent of labour productivity growth.

### 3.6.2 Development Accounting

Since TFP grew faster in the MDRs than in the LDRs, while factors accumulated and reallocated faster in the LDRs, TFP likely mitigated regional labour productivity convergence. In this section, I

Table 3.2: Sources of growth, Yugoslav regions, 1953-86, in %, average compound annual growth rate

	YUG	BIH	CRO	KOS	MK	ME	SRB	SLO	VOJ	$\sigma^2$
Aggregate output	5.02	4.85	4.82	5.39	5.30	5.25	4.90	5.39	5.19	0.05
Aggregate labour	-0.41	-0.49	-0.67	-0.12	-0.15	-0.06	-0.37	0.14	-0.73	0.08
Labour productivity	5.43	5.33	5.49	5.51	5.45	5.31	5.27	5.26	5.92	0.04
<i>Of which:</i>										
Physical capital	2.19	2.45	2.11	2.60	2.30	2.53	2.22	1.83	2.24	0.05
Human capital	0.99	1.26	0.92	1.29	1.14	1.10	0.98	0.65	0.81	0.04
Land	0.02	0.03	0.04	0.02	0.00	0.01	0.02	-0.01	0.04	0.00
Reallocation gains	0.48	0.52	0.49	0.26	0.39	0.50	0.49	0.55	-0.01	0.03
TFP	1.73	1.08	1.93	1.34	1.62	1.18	1.56	2.24	2.83	0.31
<i>Percentage of labour productivity growth due to:</i>										
Factors of production	59.13	70.11	55.95	70.82	63.10	68.44	61.15	47.05	52.26	66.94
Reallocation gains	8.90	9.70	8.83	4.79	7.22	9.33	9.32	10.38	-0.12	10.89
TFP	31.97	20.19	35.22	24.40	29.68	22.22	29.53	42.57	47.86	84.47

Notes: YU = Yugoslavia, BIH = Bosnia-Herzegovina, CRO = Croatia, KOS = Kosovo, MK = Macedonia, ME = Montenegro, SRB = Serbia, SLO = Slovenia, VOJ = Vojvodina, and  $\sigma^2$  = variance.

determine the percentage of regional variation in labour productivity levels that can be explained by TFP. To get a sense of convergence dynamics, I do this over a span of five benchmark years.

I perform two development accounting exercises. In the first one, I establish a hypothetical labour productivity level,  $y^{**}$ , a region  $i$  would have if it had a) Slovenian sector-specific TFP's (productivity leader), and b) maximised its labour productivity over the sectoral allocation of resources. Similar to Caselli (2005) and Vollrath (2009), the development accounting exercise is conducted as:

$$Raw\ TFP = 1 - \frac{var(\ln y_i^{**})}{var(\ln y_i)} \quad (3.16)$$

where the ratio "raw TFP" estimates how much of the total variation in labour productivity levels can be accounted by TFP. The higher is the ratio, the higher is the variation in labour productivity that can be accounted by raw TFP. I call this ratio raw TFP because it incorporates a subset of income variation caused by a sectoral (mis)allocation of resources. This ratio corresponds to TFP measure  $A$  in section 3.4.2. The results are presented in column 1 of table 3.3. In 1953, raw TFP accounted for 30 per cent of regional variation in labour productivity levels. The importance of TFP in accounting for regional productivity differentials increased over time. By 1971, raw TFP accounted for more than 80 per cent of labour productivity variation.

The second development accounting exercise is similar to the first one. However, I subtract from raw TFP ratio a variation in labour productivity caused by the sectoral allocation of human and physical capital:

$$Adjusted\ TFP = Raw\ TFP - \left(1 - \frac{var(\ln y_i^*)}{var(\ln y_i)}\right) \quad (3.17)$$

Table 3.3: TFP as a source of regional labour productivity level differentials, Yugoslavia, 1953-1986, in %

	(1)	(2)
	Raw TFP	Adjusted TFP
1953	30.6	52.1
1961	68.8	67.2
1971	83.4	82.0
1981	84.9	86.1
1986	84.9	89.5

where  $y^*$  is potential labour productivity level a region would have if it maximised its labour productivity over the sectoral allocation of resources, just like in section 3.4.2. Ratio “adjusted TFP” corresponds to TFP measure  $A_E$  in section 3.4.2, which is TFP after accounting for reallocation gains. The result of this development accounting exercise are presented in column 2 of table 3.3. In 1953, adjusted TFP accounted for 52 per cent of regional variation in labour productivity levels. This is a larger magnitude compared to results in column 1. This means that labour productivity inequality would have been higher than in the actual state if all regions maximised labour productivity over their sectoral allocation of resources. Just like for raw TFP, the importance of adjusted TFP in accounting for regional productivity differentials substantially increased over time. Adjusted TFP accounted for more than 80 per cent of labour productivity variation by 1971.

The role of TFP in accounting for income difference across Yugoslavia after the 1950s is much higher than what cross-country development accounting exercises typically find at a global level. For example, [Klenow and Rodriguez-Clare \(1997\)](#); [Hall and Jones \(1999\)](#); [Caselli \(2005\)](#) and [Vollrath \(2009\)](#) find that TFP accounts for about 50 per cent of cross-country income differences.

### 3.6.3 Robustness checks

In appendix 3.A.4, I provide a detailed description of the sensitivity of my results to alternative labour shares, depreciation rates, returns to years of schooling, and data. I design the sensitivity tests to go against my baseline findings. I design them so as to increase TFP in the LDRs relative to TFP in the MDRs. Although the exact quantitative significance of TFP in determining the sources of growth rates and the variation in labour productivity levels changes, the impact of TFP under different settings remains qualitatively identical or very similar to the baseline setting. Under a variety of alternative settings, 1) MDRs experience higher TFP growth rates than the LDRs, and 2) TFP gradually accounts for a larger fraction of income differences in Yugoslavia. In appendix 3.A.4, I also provide a detailed description of how some assumptions affect my results, like constant returns to scale, unit elasticity of substitution between capital and labour, and other assumptions related to the estimation of reallocation

gains. I further rationalise the justification of these assumptions for Yugoslavia. Deviations from some of these assumptions would strengthen my baseline findings.

## 3.7 Interpretation of results

To summarise the results: regional income divergence in Yugoslavia was caused by the inability of the LDRs to converge towards the employment rates and TFP levels of the MDRs. This section provides an interpretation of these findings. I argue that the evolution of TFP and the employment rate was intrinsically linked. These two factors in the LDRs were retarded by a single underlying problem: a capital intensity bias inherent to the governing objective of labour-managed firms.

### 3.7.1 Capital intensity bias

Ward (1958); Vanek (1970) and Meade (1972) argue that labour-managed firms maximised income per worker. That objective was achieved in two complementary ways. First, work councils of labour-managed firms were incentivised to accumulate capital in an environment characterised by a low rental rate of capital. Capital accumulation, facilitated by cheap capital, caused income generation. It therefore led to a larger income for the members of labour-managed firms.

Three factors decreased the rental rate of capital, stimulating capital accumulation. First, the cost of capital was decreased through setting interest rates to very low or even negative levels (Horvat, 1971; Uvalić, 1992). Second, and related to the previous point, labour-managed firms were implicitly subsidised through the redistributive effects of holding financial assets and liabilities in an inflationary environment. Financial claims were generally not inflation-indexed, while assets generally were (Kraft and Vodopivec, 1992), boosting the equity position of companies. Third, the state revenue structure relied on labour income taxation that decreased the cost of capital relative to the cost of labour (Bateman, Nishimizu, and Page, 1988).

Work councils also maximised income per worker by restricting labour entry. They thereby increased average incomes of the firms existing members due to declining marginal product of labour. Through expanding capital and restricting labour entry labour-managed firms thus substituted capital for labour (Vanek, 1977; Sapir, 1980). Given that workers were appropriating capital income (Vanek and Jovičić, 1975), a logical consequence of income maximisation would be the existence of large disparities in income levels of workers with similar characteristics among firms that differed in their capital to labour ratios. Indeed, these disparities are well documented (Estrin, 1991).

The capital intensity bias was intensified in the LDRs through four means. First, the regional development policy consisted of capital aid. Capital aid made capital less scarce than otherwise, further decreasing the cost of capital in the LDRs.

Second, the literature reports that capital aid was primarily channeled into heavy industries characterised by intrinsically high capital intensities (Lydall, 1989; Dyker, 1990; Lampe, 2000), magnifying the capital intensity bias within the LDRs.<sup>25</sup> Dyker (1990) argues that that political structures in the poorer regions were acutely afflicted by the “investment good fetishism” - a tendency to envisage economic development in terms of spectacular capital intensive projects (e.g. steelworks). Alternatively, but not mutually exclusive, political structures in the LDRs perhaps attempted to develop high-margin heavy industries for rent-extraction purposes, just like Young (2000) argues is the case with regional political elites in China.

Third, irrespective of capital aid, Kraft and Vodopivec (1992) find that LDRs received more (quasi) subsidies than the MDRs concerning capital accumulation. The most important subsidy took the form of gains on money - repayment of liabilities at negative real interest rates.

Finally, and perhaps most importantly, the substitution of capital for labour was particularly anomalous in the LDRs because they were characterised by a relative abundance of labour. As shown by panel a in figure 3.4, the LDRs were characterised by very high agricultural employment shares, and potentially surplus labour. Furthermore, the LDRs were characterised by much higher unemployment rates than the MDRs were. For example, from the mid-1960s, the unemployment rate in Kosovo was higher than 20 per cent, while the unemployment rate in Slovenia ranged between 1 to 4 per cent.<sup>26</sup>

### 3.7.2 Hypothesised impact on employment and TFP

How is the capital intensity bias related to the regional divergence in employment rates and TFP? The hypothesised impact on employment is clear-cut. Labour-managed firms maximised income per worker through substituting capital for labour. This particularly retarded employment rates in the LDRs (figure 3.3) because the capital intensity bias was stronger there. The hypothesised impact of the capital intensity bias on TFP is slightly more subtle. It had a two-fold impact. Both impacts are extended effects of the impact of the capital intensity bias on the employment rate.

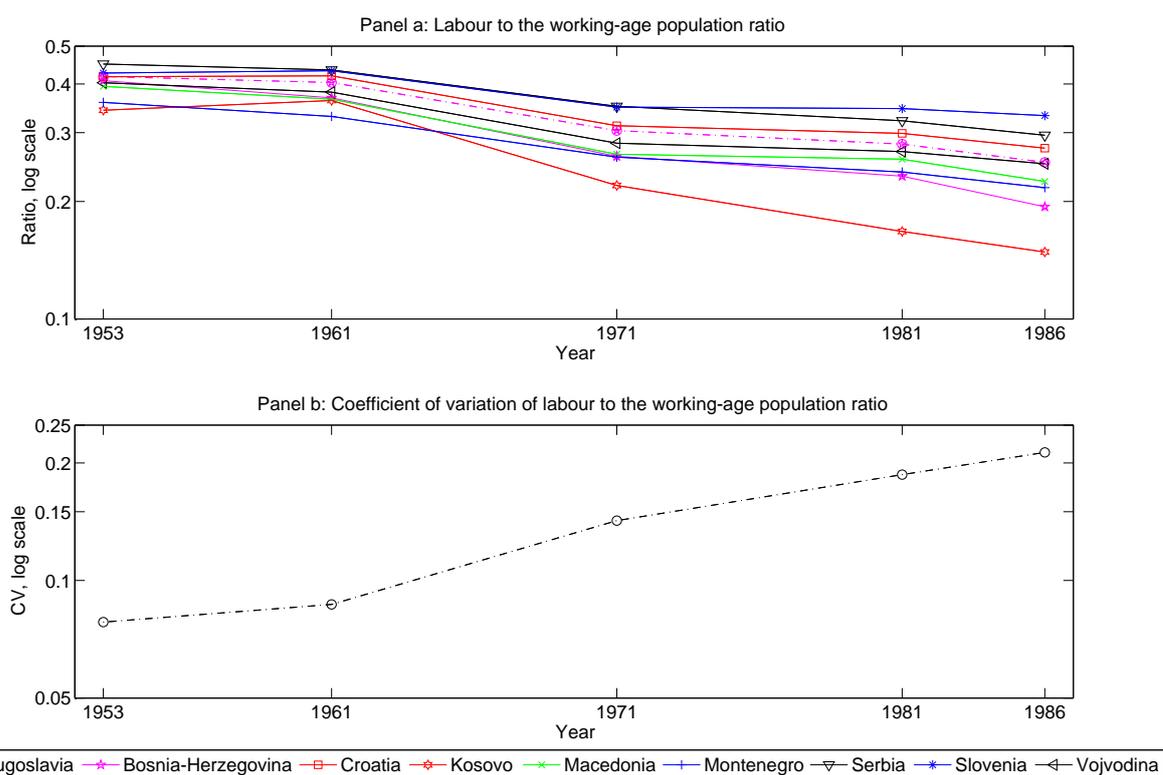
First, the capital intensity bias likely caused a low and possibly declining labour utilisation rate. If not accounted for, utilisation rate is reflected in TFP (Burnside, Eichenbaum, and Rebelo, 1993; Paquet and Robidoux, 2001). Low labour utilisation rate seems pernicious in socialist economies because they were characterised by disguised unemployment. While Yugoslavia is unique among the socialist economies in the sense it was characterised by open unemployment, disguised unemployment was still an acute issue (Mencinger, 1988). This is derived from the nature of a labour-managed economy. Labour held to an extent traditional managerial prerogatives. When faced with cost-cutting requirements,

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<sup>25</sup>As anecdotal evidence, see the case study of Kosovo’s Trepča mining enterprise in Palaret (2003).

<sup>26</sup>*Jugoslavija 1918-1988: Statistički Godišnjak* (Savezni Zavod za Statistiku (1989)). Of course, high unemployment rates in the LDRs are themselves supportive of the hypothesis that the LDRs were particularly afflicted by the capital intensity bias.

Figure 3.7: Labour to the working-age population ratio, Yugoslav regions, 1953-86



Notes: Labour is total hours worked. As in business cycle research, annual labour (total hours worked) is de-trended by 3600 hours. People spend a portion of time satisfying biological necessities (like sleeping), and can not work. Otherwise, panel b is similar to figure 3.3.

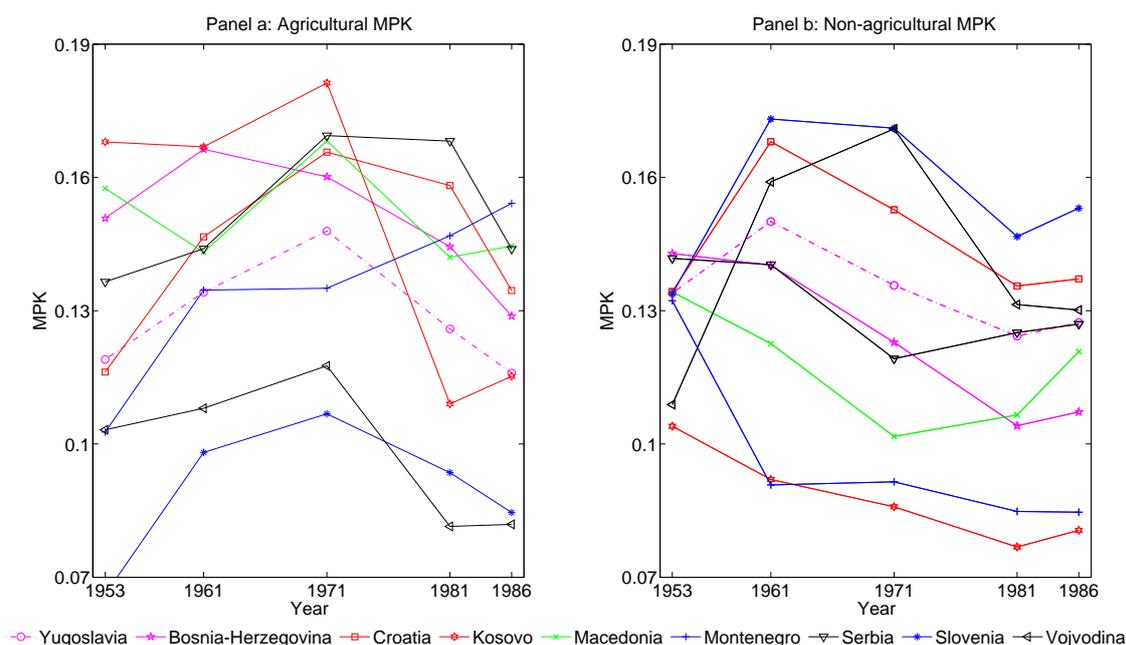
workers were presumably reluctant to dismiss themselves or their colleagues.

It is impossible to directly observe labour utilisation rate, particularly real effort. As such, existing (business cycle) research typically measures labour utilisation by dividing labour by the working-age population (Burnside, Eichenbaum, and Rebelo, 1993). I follow the example in figure 3.7. The figure suggests that labour utilisation rate has consistently decreased across the regions (panel a). However, labour utilisation rate has decreased more in the LDRs (reflected in increasing CV in panel b of figure 3.7), suggesting that the LDRs suffered more from declining labour utilisation than the MDRs did. By extension, the evolution of TFP in the LDRs was retarded relative to the evolution of TFP among the MDRs.

Second, the capital intensity was debilitating in the LDRs because they were characterised by labour abundance. Capital intensity bias thus skewed production away from the use of the relatively abundant factor of production, i.e. labour. This likely caused inefficiency in the LDRs, which should be reflected in the divergence of regional TFPs.

Is the hypothesised relationship between the capital intensity bias, employment rate, and TFP, explicitly visible in the data? MPK should encapsulate these relationships. It may seem obvious that

Figure 3.8: Evolution of MPK, Yugoslav regions, 1953-86



regional MPKs must have strongly converged given the strong convergence in capital to labour ratios. However, as Lucas (1990) points in a seminal article, poor regions might have lower endowments of factors complementary to physical capital and lower TFP.<sup>27</sup> Strong convergence in capital to labour ratios might thus coexist with large differences in the MPK. This implies that inputs are inefficiently used (Caselli and Feyrer, 2007).

In particular, if the capital intensity bias retarded the evolution of employment rate and TFP in the LDRs relative to the MDRs, one would expect that the LDRs had a lower MPK than the MDRs did in non-agriculture, but not necessarily in agriculture. Non-agriculture was characterised by a much larger fraction of labour-managed firms than agriculture was. Agriculture largely consisted of private, profit-maximising, firms, unaffected by the capital-intensity bias.

Indeed, perversely enough, panel b in figure 3.8 shows that since 1961 non-agricultural MPK among the MDRs was systematically higher than non-agricultural MPK among the LDRs. Regional differences in the evolution of non-agricultural MPK are striking. Among the MDRs, non-agricultural MPK has increased over the whole sample period, while non-agricultural MPK among the LDRs has decreased over the whole sample. In agriculture, the trends are different. As one would normally expect, the poorer regions had a higher level of MPK than the richer regions (Slovenia and Vojvodina), with the notable exception of Croatia.

<sup>27</sup>Lucas (1990) also lays out the option that international capital markets are distorted, mitigating the flow of capital from rich to poor countries. In Yugoslavia, labour-managed firms, next to other factors, distorted the capital market. Capital market did not exist in a meaningful sense. If capital market operated in Yugoslavia, capital would have flown from poor to rich regions, given that the richer regions were typically characterised by a higher MPK (figure 3.8). The experience of Yugoslavia can be perceived as a twist to the proposition of Lucas (1990).

Table 3.4: Correlation between labour productivity and the marginal product of physical capital (MPK), Yugoslav regions, 1953-86

	Non-agriculture	Agriculture
1953	0.66	-0.51
1961	0.72	-0.91
1971	0.79	-0.70
1981	0.91	-0.73
1986	0.87	-0.56

Furthermore, table 3.4 demonstrates that there is no evidence of a negative correlation between labour productivity and the MPK in non-agriculture. The correlations are, perversely, positive, indicating gross inefficiency in the LDRs.<sup>28</sup> Furthermore, the correlations have increased over time (implied by figure 3.8). In agriculture, where labour-managed firms were not as concentrated, the correlations are negative as one would normally expect given the predictions of the Solow growth model.

In the long-run, such perverse relationships would diminish or disappear. Labour would move to firms, or establish firms, where it could realise a higher marginal product, arbitraging productivity differentials. Alternatively, labour could move to regions where it could realise a higher marginal product, diminishing productivity differentials. These forces are conditional on free entry of labour into existing firms, free establishment of new firms, and interregional labour mobility. All three conditions did not hold in Yugoslavia.<sup>29</sup>

Entry of workers into firms was not free. Existing workers of labour-managed firms were discouraged from employing new workers. They would have to share income within a larger group, diluting their wages due to declining marginal product of labour. This behaviour resembles insider-outsider models of labour markets characterised by strong trade unions.

The tendency of labour-managed firms to restrict employment is theoretically well grounded (Ward, 1958; Meade, 1972). Free establishment of firms could have alleviated this distortion. Entry of firms was not free though. Local government decided whether to allow an establishment of a firm within its administrative boundaries (Horvat, 1971). Furthermore, labour had poor incentive to create new firms since these had to be socially owned Estrin (1991).

Yugoslav interregional migration was low compared to the OECD countries (table 3.5). Low interregional labour mobility was caused by three factors. First, low interregional labour mobility was, of course, itself a symptom of intrinsic barriers to new labour entry into existing labour-managed firms.

Second, the incentive to migrate from poorer to richer regions was additionally distorted because the interregional differences in wages were compressed for egalitarian reasons, and therefore did not

<sup>28</sup>Similar to physical capital, there was a strong positive correlation between the marginal product of human capital and labour productivity. Over the set of five benchmark years, the correlation was larger than 0.9.

<sup>29</sup>Of course, capital could have arbitraged productivity differentials, too. But, private interregional capital flows were effectively banned for reasons espoused in section 3.2.

Table 3.5: Interregional migration in Yugoslavia and a selected group of OECD countries (migrants as percent of total population)

<i>Yugoslavia (1989)</i>	0.25
Bosnia-Herzegovina	0.5
Croatia	0.17
Kosovo	0.19
Macedonia	0.12
Montenegro	0.43
Slovenia	0.18
Vojvodina	0.26
<i>Selected OECD countries (1987)</i>	2
Australia	1.6
Canada	1.5
Finland	1.6
France	1.3
Germany	1.1
Italy	0.5
Japan	2.6
Norway	2.6
Sweden	3.9
United States	2.8

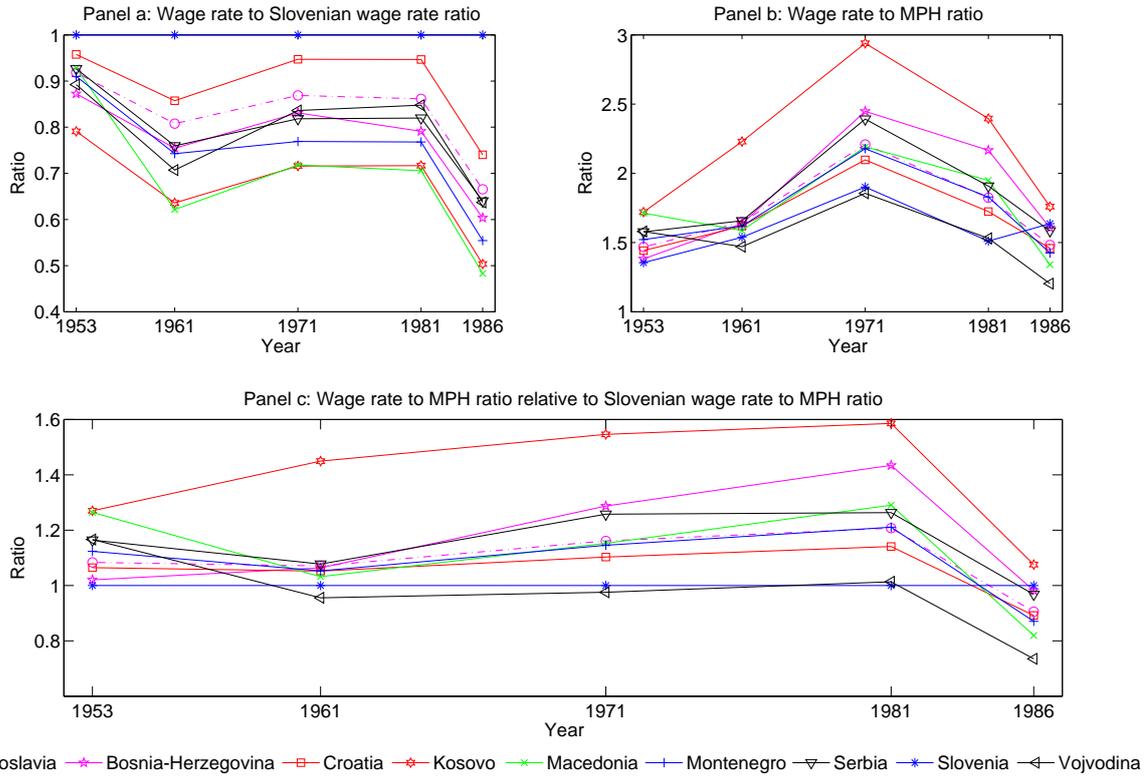
Notes: Serbia is not reported in the used source. OECD average is unweighted.

Source: [Cviki, Kraft, and Vodopivec \(1993\)](#).

fully reflect interregional differences in productivity. Given their marginal products, labour in the LDRs earned higher wages than labour in the MDRs, distorting their incentive to move to richer regions and thus arbitrage productivity differentials. Figure 3.9 demonstrates this. Labour in all regions earned lower wages than labour in Slovenia, the regional productivity leader (panel a of figure 3.9). However, regional differences in the wage rate should have been higher given the regional differences in the marginal product of human capital (MPH). Panel b in figure 3.9 shows that the return to human capital was typically more detached from its marginal product in the LDRs than it was in the MDRs. That is, labour augmented by quality earned a wage that was higher than implied by its marginal product in all regions, but typically more so in the LDRs. Moreover, it seems that the incentive to migrate from poorer to richer regions has deteriorated over time. This is implied by panel c in figure 3.9; the wage rate to MPH ratio has typically increased in the LDRs relative to the same ratio in Slovenia until 1981.

Third, with the elimination of travel restrictions during the mid-1960s, approximately 10 per cent of the Yugoslav labour force migrated to Western Europe - primarily to (western) Germany as “guest workers” ([Lampe, 2000](#)). Arguably, when faced with a choice of whether to migrate to Yugoslav another

Figure 3.9: Wage rate and the marginal product of human capital (MPH), Yugoslav regions, 1953-86



Notes: Wage rate is hourly wage. Human capital is labour augmented by quality.

region or another Western European country, a prospective Yugoslav migrant opted for the latter. She could seize higher pecuniary benefits abroad. Strong cultural differences among the Yugoslav regions certainly lowered the relative physical costs of migrating to another western European country, as opposed to migrating to another Yugoslav region.

### 3.8 Conclusion

Yugoslavia is often perceived as a unique success story among the socialist economies, exhibiting rapid catch-up growth until the late 1970s (Balassa and Bertrand, 1970; Sapir, 1980). But, very little is known about economic development at the regional level both within Yugoslavia and in socialist Europe at large. This paper fills an important gap in the literature on post-war growth in Europe with a detailed quantitative study of regional patterns of growth in Yugoslavia, probably the most heterogeneous country in post-1918 Europe, besides the Soviet Union.

The falling behind of the least developed regions of Yugoslavia was caused by their inability to converge towards the TFP levels and employment rates of the more developed regions. I interpret these failures as symptoms of a single underlying problem: a capital intensity bias inherent to the governing

objective of the labour-managed firms.

Responsibility over regional development was devolved to the regions. Further down the aggregation level, control over production, marketing, and investment, was devolved to the labour-managed firms. Socialist Yugoslavia moved from having one central plan, to having many mutually competitive plans. While on aggregate this may have created a net positive productivity outcome, witnessed by Yugoslavia's impressive productivity performance compared to other socialist economies, it created unique distortions. The decentralisation policies were implemented with the aim of stimulating regional equalisation of incomes and maintaining social stability. They led, however, to exactly opposite outcomes.

## 3.A Appendix

### 3.A.1 Data

#### 3.A.1.1 Output

SP is the conceptual equivalent of GDP in the sense that SP, just like GDP, measures the value of all final goods produced domestically. SP and GDP are, however, calculated differently and yield different levels of output. Even though they are conceptual equivalents, they are only approximately comparable. SP was calculated only for the “productive sector”. The “non-productive sector” that was excluded from SP consisted of a section of services, primarily non-market services - government administration, defence, healthcare, education, culture, and housing.

Over time, productive segments of the non-productive sector were incorporated into the SP. For example, publishing activity which was part of the education sector was added to the SP. However, the Yugoslav statistical bureau, *Savezni Zavod za Statistiku* (SZS), did not estimate the output of such (minor) sub-sectors for the whole period. In effect, when SZS expanded coverage of the SP, it concluded that all of the newly discovered value-added occurred in the year in which the new sub-sector was incorporated into the SP, magnifying output growth rate at the moment of inclusion of a new sub-sector.

A more troublesome feature of the Yugoslav version of national accounts is its inconsistency in the application of the *Material Planning System*, the socialist equivalent of the *System of National Accounts*. In Yugoslavia, as in all internally consistent national accounts, the reported output by value-added and the reported output by expenditure yield the same level. But, on closer inspection, it is conceptually impossible that the two would yield the same level of output. Output by value-added excluded the non-productive sector, while output by expenditure included gross investment incurred in the non-productive sector.

Furthermore, SP was calculated by subtracting from gross production of the productive sector only the “material” or “productive” costs, including depreciation, while the inputs from the excluded service sectors were not subtracted. So, as [Alton, Badach, Bass, Bakondi, Brumaru, Bombelles, Lazarcik, and Staller \(1992\)](#) (pp. 6-7) argue, SP was not a “clean” value-added measure.

On net, the aforementioned statistical peculiarities of SP yield a lower level of output than GDP. [Miljković \(1992\)](#), working within SZS on Yugoslavia’s internationally comparable GDP during 1985-1991 as part of the European Comparison Programme funded by the UN and the World Bank, provides the most systematic quantitative comparison between GDP and SP levels. For the 1985 benchmark year, he finds that SP provides a 11.6 per cent lower level of output than GDP.

Irrespective of SP underestimating the level of output, Yugoslavia was alongside other socialist

countries criticised by Western scholars that it overestimated the growth rate of output (see [Ofer \(1987\)](#) for a literature survey). To elaborate some of the issues reported in section 3.5, SZS, for instance, used the Paasche index to deflate industrial production. [Staller \(1986\)](#) argues that this index underestimates inflation in Yugoslavia, hence overestimating real economic growth. He reports that SZS, upon introducing new or changed products into the index of industrial production, used prices prevailing in the second year of production which still reflected costs of development. As such products were typically rapidly growing, the greater weight they were assigned by prices of the initial period inflated the growth rate of total industrial production.

Socialist countries also distorted the value of industrial and agricultural production. Prices were distorted by setting the prices of industrial goods above world prices, while prices of agricultural goods were set below world prices. The intention of socialist planners was to change the terms of trade between the two sectors which would be conducive to the development of industry. This development strategy was formulated in the early years of the Soviet Union by Yevgeni Preobrazhensky. It was based on the concept of “primitive socialist accumulation”. Primitive socialist accumulation creates three statistical biases. First, economic growth is overestimated since the rapidly growing manufacturing output is assigned a greater share in total output than it corresponds to the actual state. Second, price distortions overestimate the marginal product of industry and underestimate the marginal product of agriculture. By extension, price distortions also overestimate the efficiency gains associated with structural modernisation as estimated in this paper. Finally, as discussed in section 3.5, price distortions bias the evolution of regional inequality. The final issue was explicitly recognised by Yugoslav statisticians. In 1954, in SZS’s *Metodološki Materijali, Broj 61: Metodologija za Obračun Narodnog Dohotka* ([Savezni Zavod za Statistiku \(1955\)](#)), pp. 22-23 (methodological materials), the head of SZS wrote:

“As a consequence of a certain economic policy, prices of our industrial goods are above global market prices, and prices of agricultural goods are below this average... We cannot know the true contribution of industry and agriculture to income of the country, as long as we do not eliminate differences in levels of prices... this is inevitably reflected in income of each republic, due to differences in their economic structures. Industrially more developed republics are contributing to the income of the country with a greater share than it corresponds to the actual state.”<sup>30</sup>

The most recent rendition of the Maddison Project in [Bolt and van Zanden \(2014\)](#) includes the GDP series of Yugoslav successor states made by Branko Milanović. His aim was to produce internationally comparable long-run GDP levels of the successor states of Yugoslavia. He has used the World Bank’s GDP estimate of Slovenia in 1990 as an anchor to estimate the GDP of the other Yugoslav regions. He

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<sup>30</sup>Translated by the author.

has anchored Yugoslav regions around the Slovenian 1990 GDP level by their 1990 income differences estimated by the SZS. Subsequently, he has projected their historical growth rates using official data (information obtained through personal correspondence). Thus, even though Milanović has made more realistic output levels of Yugoslav regions compared to SZS, regional inequality remains plausibly problematic, and regional economic growth rates remain overestimated.

As such, I re-estimate the GDP series of Yugoslav regions. As mentioned in section 3.5, official data might bias the level and evolution of regional income inequality through price distortions and through excluding non-market services from the estimate of output. I eliminate these two possible distortions in two steps.

In the first step, I apply international prices to the agricultural and non-agricultural sectors of Yugoslav regions. I therefore eliminate price distortions that might bias the level and evolution of regional income inequality. More formally, I multiply the official share of a region's sectoral SP in the total sectoral SP by the total sectoral GDP estimated by the Research Project.<sup>31</sup> Thus:

$$Y_i = Y_{YUG,A,RP} * \frac{Y_{i,A,SZS}}{Y_{YUG,A,SZS}} + Y_{YUG,NA,RP} * \frac{Y_{i,NA,SZS}}{Y_{YUG,NA,SZS}} \quad (3.18)$$

where aggregate output ( $Y$ ) of region  $i$  is a sum of output derived from agriculture ( $A$ ) and non-agriculture ( $NA$ ).<sup>32</sup> Subscripts  $SZS$  and  $RP$  denote sources of data.  $RP$  means that data is taken from the Research Project.  $SZS$  denotes official data. In equation 3.18, I assume that a region's share in the total  $A$  and  $NA$  SP is the same as its share in the total Yugoslav ( $YUG$ )  $A$  and  $NA$  GDP. Since I anchor regional  $A$  and  $NA$  output by the  $A$  and  $NA$  GDP of Yugoslavia estimated by the Research Project, I allow each region a different size of  $A$  and  $NA$  output compared to official data. But, I keep the share of each region in the  $A$  and  $NA$  output of Yugoslavia identical to official data. In other words, I keep the value of Yugoslavia's aggregate and sector-specific GDP as estimated by the Research Project, but provide new regional GDPs. Since the Research Project used international prices (US dollars) to estimate the GDP of Yugoslavia's agricultural and non-agricultural sector, equation 3.18 allows me to eliminate price distortions between agriculture and non-agriculture that might bias regional inequality. By this method, however, I can not eliminate price distortions operating within agriculture and non-agriculture, if they were present. I can only eliminate price distortions between broadly conceived agriculture and non-agriculture.

In the second step, I eliminate possible distortions caused by the non-market services that were

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<sup>31</sup>Official output data is taken from *Jugoslavija 1918-1988: Statistički Godišnjak* (Savezni Zavod za Statistiku, 1989) and *Statistički Godišnjak SFR Jugoslavije* (Savezni Zavod za Statistiku, 1991). Alternative aggregate GDP of Yugoslavia is taken from Maddison (online). He has used the the Research Project's GDP estimates of Yugoslavia, and expressed them in 1990 Int. GK\$. Alternative Yugoslav GDP sectoral data is taken from the publications of the Research Project, because they are not reported by Maddison (online) - Alton (1970) and Alton, Badach, Bass, Bakondi, Brumar, Bombelles, Lazarcik, and Staller (1992).

<sup>32</sup>To reduce notational clutter, I ignore a subscript for time.

excluded from the SP. The MDRs were likely characterised by a larger share of non-market services in their *NA* output than the LDRs were, which *SZS* does not account for. In other words, a region's share in the total *NA* SP was certainly not the same as its share in the total *NA* GDP. In the second step, I adjust for non-market services by dividing *NA* into two parts - the productive (*PNA*) and the non-productive (*NPNA*) part (non-market services) of non-agriculture. For *PNA*, just like in the first step, I multiply the official share of a region's *PNA* SP in the total *PNA* SP by the total *PNA* GDP of Yugoslavia estimated by the Research Project. Like in the first step, I assume that a region's share in the productive part of the non-agricultural SP is the same as its share in the total productive part of non-agricultural GDP.

For the non-productive sector, or non-market services, I take a different approach. I impute regional *NPNA* GDP levels through factor cost. This is consistent with the methodology of the Research Project. The Research Project used the method of [Bergson \(1953\)](#) to estimate Soviet national income at factor cost. They relied on official sectoral volumes of factors of production that they transformed into sectoral GDP by estimating the returns to factors of production.

More explicitly, I estimate the share of a region's *NPNA* wage bill (*W*) in the total *NPNA* wage bill. Then, I multiply the share of a region's *NPNA* wage bill (*W*) in the total *NPNA* wage bill by the Yugoslav *NPNA* GDP estimated by the Research Project. Thus, I decompose the second term in equation [3.18](#) as follows:

$$\begin{aligned}
 Y_{YUG,NA,RP} * \frac{Y_{i,NA,SZS}}{Y_{YUG,NA,SZS}} &= Y_{YUG,PNA,RP} * \frac{Y_{i,PNA,SZS}}{Y_{YUG,PNA,SZS}} \\
 + Y_{YUG,NPNA,RP} * \frac{W_{i,NPNA,SZS}}{W_{YUG,NPNA,SZS}} &
 \end{aligned}
 \tag{3.19}$$

Note that I do not adjust for capital income. It is impossible to estimate capital returns by region. Importantly, it is not possible to estimate the imputed rent of housing, which is by far the most significant category of the aggregate capital stock of non-market services. Most importantly, it is not possible to account for cross-regional subsidisation of capital.

Estimating GDP through factor cost involves adding taxes and subtracting subsidies. This can be difficult to do at a regional level. In case of Yugoslavia, the workers in the MDRs were subsidising the wages of workers in the LDRs. The Federal Fund that channeled capital to the LDRs was financed through taxing the income of firms in the MDRs. This is reflected in the wages of workers employed in the labour-managed firms. [Vanek and Jovičić \(1975\)](#) argue that workers of labour-managed firms were appropriating capital income. By extension, workers in the LDRs appropriated more capital income than they would have been able in the absence of capital transfers, given their marginal products. If interregional taxation and subsidisation is unaccounted for, GDP measured through factor cost

will underestimate the output levels of MDRs. I attempt to account for interregional taxation and subsidisation by using 1990 wage data.<sup>33</sup> By 1990, the Yugoslav market disintegrated (Lampe, 2000). The MDRs stopped paying taxes to the federation, and the Federal Fund dissolved. By extension, the workers in the MDRs stopped subsidising the workers in the LDRs, and the relative wages of workers in the LDRs strongly decreased. Thus, 1990 wages should reflect implicit interregional taxation and subsidisation. Alternatively, 1990 wages should at least reflect to a larger extent implicit taxes and subsidies than wages in the earlier years. For example, the ratio of the average Slovenian wage rate in non-market services to the average Kosovar wage rate in non-market services in 1990 was 2.6, while in 1972 for example, the same ratio was 1.5 (*Statistički Godišnjak SFR Jugoslavije* (Savezni Zavod za Statistiku, 1991)).

To finalise this section, I estimate regional GDPs through substituting equation 3.19 into equation 3.18:

$$Y_i = Y_{YUG,A,RP} * \frac{Y_{i,A,SZS}}{Y_{YUG,A,SZS}} + Y_{YUG,PNA,RP} * \frac{Y_{i,PNA,SZS}}{Y_{YUG,PNA,SZS}} + Y_{YUG,NPNA,RP} * \frac{W_{i,NPNA,SZS}}{W_{YUG,NPNA,SZS}} \quad (3.20)$$

Table 3.6 presents the results. Column 2 presents the results of step 1 (equation 3.18), that is, if I eliminate price distortions between agriculture and non-agriculture, but do not adjust for non-market services. This exercise decreases GDP growth across Yugoslav regions by a very similar magnitude compared to official estimates (column 3 of table 3.6). Thus, price distortions do not seem to distort official regional inequality trends significantly.<sup>34</sup> This might be explained by the 1972 prices that government statisticians used to estimate historic real output growth rates.<sup>35</sup> By 1972 the most egregious price distortions were eliminated. Prices were substantially liberalised during the mid 1960s as a requirement for Yugoslavia's 1966 accession into the General Agreement on Tariffs and Trade (Horvat, 1971). When I estimate GDP through equation 3.20, where I adjust for both price distortions and non-market services, which is the final data I use, then the difference in the decrease of average output growth rate across the regions is larger (final column of table 3.6). It thus appears that exclusion of non-market services from SP is more problematic than price distortions concerning the evolution of regional inequality as estimated by the SZS.

<sup>33</sup>*Statistički Godišnjak SFR Jugoslavije* (Savezni Zavod za Statistiku, 1991)

<sup>34</sup>I can not isolate through equation 3.18 the impact of price distortions on relative regional growth trajectories from other biases related to SP, like official indexes overestimating economic growth. Such impacts are reflected jointly with price distortions in column 2 of table 3.6. In effect, by equation 3.18, I assume that, index number problems for example, impacted all Yugoslav regions identically, inflating regional growth rates by the same extent.

<sup>35</sup>SZS used 1972 prices until the end of Yugoslavia to project the real evolution of economic data, like GDP, investment, and consumption.

Table 3.6: Compound annual growth rate of real output, detailed, Yugoslav regions, 1952-89, in %

	Alternative data, accounting for:				
	Official	Price distortions		Price distortions and non-market services	
		Alternative	Comparison, fraction	Alternative	Comparison, fraction
Yugoslavia	5.11	4.75	0.93	4.75	0.93
Bosnia-Herzegovina	4.70	4.33	0.92	4.55	0.97
Croatia	4.95	4.58	0.92	4.59	0.93
Kosovo	5.17	4.84	0.94	5.11	0.99
Macedonia	5.38	5.03	0.94	4.96	0.92
Montenegro	5.06	4.71	0.93	4.55	0.90
Serbia	5.12	4.76	0.93	4.68	0.91
Slovenia	5.33	4.94	0.93	4.97	0.93
Vojvodina	5.65	5.32	0.94	5.10	0.90

Note: Official data is expressed in 1972 dinars. Alternative data is expressed in 1990 Int. GK\$.  
Sources: See text.

### 3.A.1.2 Inputs

The data on gross investment is the most problematic among the data series required for the analysis. Similar to output, gross investment was likely overestimated because of index number problems, price distortions, and perhaps because of outright fabrication from enterprises. While alternative output series have been produced in response to the criticism of official series, there are no existing alternative investment series for Yugoslavia. As such, I embrace official data on investment. But, I make an important adjustment using their own data. As mentioned in section 3.5, I deduct the gross investment category “other” from total gross investment.

Aggregate physical capital consists of four asset types: residential structures (dwellings), non-residential structures, equipment, and livestock. Non-agricultural capital stock consists of the first three asset types, while agricultural capital stock consists of the last three asset types. I rely on [Vinski \(1959\)](#) to initialise sector-specific asset type. [Vinski \(1959\)](#) relies on an official survey of physical capital stock conducted in 1953 for the productive sector. The contribution of [Vinski \(1959\)](#) lies in estimating the value of dwellings and fixed capital of the non-productive sector (e.g. education, healthcare and culture). Moreover, he has estimated the value of capital stock in private agriculture and in public transport, which the official wealth survey did not cover. For the subsectors of non-agriculture however, [Vinski \(1959\)](#) typically does not offer estimates for each asset type. For example, for manufacturing, he reports the overall value of capital, but does not report the share of equipment and the share of structures in the total value of capital. To impute the value of each asset type in the non-agricultural sector, I multiply the official share of equipment and structures in the total value of capital by the total amount of capital in [Vinski \(1959\)](#).<sup>36</sup> I do this for the value of equipment and non-residential structures only, because [Vinski \(1959\)](#) provides the value of residential structures.

<sup>36</sup>Official data is taken from *Osnovna Sredstva Privrede Društvenog Sektora SFR Jugoslavije, Socijalističkih Republika i Socijalističkih Autonomnih Pokrajina, 1952-1981, u cenama 1972 (Savezni Zavod za Statistiku, 1983b)*.

Table 3.7: Compound annual growth rate of real capital stock, Yugoslav regions, 1953-86, in %

	Official data	Alternative data	Difference
Yugoslavia	6.21	4.81	-1.40
Bosnia-Herzegovina	6.51	5.35	-1.17
Croatia	5.96	4.39	-1.57
Kosovo	7.62	6.02	-1.59
Macedonia	7.11	5.30	-1.81
Montenegro	9.76	5.92	-3.84
Serbia	5.96	4.91	-1.04
Slovenia	5.73	4.45	-1.29
Vojvodina	6.54	4.64	-1.90

Notes: Official data is denoted in 1972 prices. Alternative data is expressed in 1990 Int. GK\$.

Sources: Official data is taken from *Statistički Godišnjak SFR Jugoslavije* (Savezni Zavod za Statistiku, 1991). See text for the alternative data.

Except for livestock, capital stock categories are extended for the remaining years of the analysis via the perpetual inventory method. I extend the 1953 [Vinski \(1959\)](#) estimate of livestock value by the volume of livestock provided in the *Statistički Godišnjak SFR Jugoslavije* (Savezni Zavod za Statistiku, 1954, 1962, 1972, 1983, 1987). Following international accounting standards, livestock that forms agricultural capital consists of cattle that is not used for slaughter, e.g. for draught power and breeding.

Upon estimating individual time-series of various asset types, I sum them into a single capital stock series. I do this because it is not possible to estimate the share of capital subinputs in output.

Table 3.7 presents the newly estimated aggregate capital stock series in Yugoslavia. It reveals a significantly higher growth rate of physical capital stock in the LDRs than in the MDRs. Compared to the official data, the growth rate of physical capital is on average 1.4 percentage points lower per annum between 1953 and 1986. There are, however, significant differences among the regions.

The large difference between the official and alternative capital stock growth can be attributed to at least three factors. First, I exclude the gross investment category “other”. Second, the coverage of my capital stock data is significantly wider. I include the value of fixed capital of non-market services, public transport, private agriculture and livestock, which the official data does not include. Third, official data measures the gross value of physical capital, while I measure the net value of physical capital.

Agricultural land consists of land used for cultivation of crops, grazing, and forestry. Following international accounting standards, agricultural land excludes assets whose growth is the result of human cultivation, such as orchards, vineyards and timber. I include such assets in non-residential structures. To initialise the value of land, I again rely on [Vinski \(1959\)](#). He estimates the value of

agricultural land in 1953 by capitalising land rent. In earlier work, [Vinski \(1957\)](#) estimated the value of agricultural land by prices of freely exchanged land. For Yugoslavia as a whole, [Vinski \(1959\)](#) reports that capitalising land rent yields a 5 per cent higher value of agricultural land than by estimating it through the prices of freely exchanged land. I use his more recent work ([Vinski, 1959](#)) because there he estimates the value of agricultural land at a regional level. In earlier work, [Vinski \(1957\)](#) estimated the value of agricultural land only for Yugoslavia as a whole.

As mentioned in the main text, I extend the [Vinski \(1959\)](#) estimate of the value of agricultural land for the remaining years of the analysis by the evolution of the volume of agricultural land available in official sources.

Moving to labour data, the 1986 headcount of agricultural labour working in private capacity is not reported in official publications. I estimate agricultural labour through a linear interpolation between the 1981 and 1991 census years.

I adjust labour for hours worked. I take effective hours worked which exclude sick leave, vacation leave and maternal leave, but include overtime and similar categories. For non-agriculture, effective hours worked are taken from SZS as reported in section 3.5. Average hours worked are reported only for Yugoslavia. They are not reported for regions. I estimate regional average hours worked in non-agriculture by their industrial composition. That is, I multiply the ratio of industry-specific regional labour to total regional labour by the industry-specific hours worked in Yugoslavia on average. I then take the summation of this exercise to impute the regional hours worked in non-agriculture. Hours worked in private agriculture are not reported in official publications. I derive these from the work of [Gollin, Lagakos, and Waugh \(2014\)](#). They find that, on an average global scale, agricultural workers tend to work 10 per cent less hours per annum than non-agricultural workers. I assume the same was the case in Yugoslavia.

Table 3.8 reports labour growth in Yugoslavia. Given the negative expansion of labour, the data implies that labour productivity in Yugoslavia grew faster than aggregate output. This stands in conflict with the common claim that socialist growth was driven by the expansion of capital and labour ([Krugman, 1994](#)). Labour input was at best stagnant because of two reasons. First, between 1953 and 1986, the amount of yearly hours an average labourer spent working decreased by approximately 25 per cent. Second, as further elaborated in section 3.7, a significant fraction of Yugoslav labour moved to Western Europe in search for higher wages, draining the domestic supply of labour.

Average years of schooling that agricultural labour obtained by 1981 and 1986 is not reported in official publications. I estimate average years of schooling of agricultural labour for these two years by assuming that agricultural labour continued converging, but at a linearly decreasing rate, towards the educational attainment of non-agricultural labour. In 1953, average agricultural labourer attained 60

Table 3.8: Growth of labour, Yugoslav regions, 1953-1986, 1953=100

	Headcount	Total hours worked
Yugoslavia	106.1	86.9
Bosnia-Herzegovina	102.9	85.1
Croatia	97.2	80.0
Kosovo	117.6	96.1
Macedonia	116.3	95.4
Montenegro	117.5	98.2
Serbia	108.7	88.4
Slovenia	128.1	104.5
Vojvodina	96.6	78.4

Sources: See text.

per cent less years of education than an average non-agricultural labourer. By 1971, the gap decreased to 52 per cent. I assume that by 1986 the average sectoral gap in educational attainment decreased further to 46 per cent. I estimate these gaps at a region-specific level.

### 3.A.1.3 Factor shares

For the purpose of measuring income shares, value added is measured from the perspective of the producer. This involves removing indirect taxes on the value of output (e.g. sales taxes). Labour compensation includes all wages, salaries, supplements and employer contributions towards social insurance. Agricultural labour compensation also includes the value of natural consumption, i.e. the value of agricultural products produced and consumed at farm. Assuming constant returns to scale, capital share in non-agriculture is calculated as one minus the estimated labour share. In agriculture, capital share is estimated as one minus the estimated labour and land shares.

As mentioned in section 3.5, I estimate aggregate factor compensation as a weighted average of agricultural and non-agricultural factor compensation. Since I find that the labour share in agriculture and non-agriculture is identical (0.57), aggregate labour share is also the same (0.57). For capital this is not the case, while land is employed only in agriculture. More formally, I thus estimate aggregate capital and land share as:

$$\kappa = s\beta + (1 - s)\alpha \quad (3.21)$$

$$\rho = s\gamma \quad (3.22)$$

where, as before,  $\kappa$  is the capital share of aggregate output,  $\beta$  is the capital share of agricultural output,  $\alpha$  is the capital share of non-agricultural output,  $\rho$  is the land share of aggregate output,  $\gamma$  is the land

share of agricultural output, and  $s$  is agricultural share of aggregate output.

### 3.A.2 Regional inequality measures

The Gini coefficient,  $G$ , is defined as:

$$G = \frac{1}{\bar{y}} \frac{1}{n(n-1)} \sum_i^n \sum_j^n [y_i - y_j] \quad (3.23)$$

where  $y_i$  and  $y_j$  denote output per capita of observation  $i$  and observation  $j$ , respectively.  $n$  denotes the amount of observations, and  $\bar{y}$  is the unweighted mean output per capita.

The coefficient of variation,  $CV$ , is defined as:

$$CV = \frac{\sigma}{\mu} \quad (3.24)$$

where  $\sigma$  denotes standard deviation, and  $\mu$  is mean.

The Theil index,  $T$ , is defined as:

$$T = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right) \quad (3.25)$$

where  $y_i$  denotes output per unit of observation  $i$ ,  $\bar{y}$  is the unweighted mean output per unit of  $n$  amount of observations.

### 3.A.3 Vollrath (2009) dual economy model

#### 3.A.3.1 Overview and existing literature

The main advantage of the [Vollrath \(2009\)](#) dual economy model is that it explicitly analyses the marginal product gap between agriculture and non-agriculture. By doing so, the model acknowledges potential distortions that might hamper the reallocation of resources between sectors. In turn, elimination of these distortions decreases the sectoral marginal product gap, yielding efficiency gains as inputs migrate to a more productive use.

The existing literature has, broadly speaking, followed two approaches in estimating the gains associated with structural modernisation. The first employs some variant of regressing output on an indicator of agricultural (over)employment (e.g. [Temin \(2002\)](#)). The second strategy involves choosing a functional form for the relationship between output and structural modernisation ([Stiroh, 2002](#)). Within this approach, at least in economic history research, shift-share analysis is widely used ([Broadberry, 1998](#); [Timmer and de Vries, 2009](#)).

Both strands of research typically rely on unrealistic identification assumptions. Such research typically does not make a distinction between average and marginal products, or either implicitly or explicitly assume that the change in sectoral marginal product gap mirrors the change in the sectoral average product gap. This is misleading, because an average product gap can indicate efficiency, rather than inefficiency. Productivity gains stemming from a better allocation of resources can be brought about only through a narrowing of the difference in the marginal product gap between sectors, not due to a narrowing of the difference in their average products (Herrendorf, Rogerson, and Valentinyi, 2014).

### 3.A.3.2 The model

The aim of dividing the economy into two parts is to identify reallocation gains associated with a transfer of factors from agriculture to non-agriculture. Stated and subsequent assumptions about production functions and technological parameters serve to identify and then to remove the sectoral gap in marginal products of physical and human capital. With these aims in sight, equations 3.2 and 3.3 in the main text can be expressed in per worker terms by dividing them by aggregate labour:

$$\frac{Y_a}{L} = A_a \left(\frac{R}{L}\right)^\gamma \left(\frac{K}{L}\right)^\beta \left(\frac{(hL)}{L}\right)^{1-\gamma-\beta} k_a^\beta q_a^{1-\gamma-\beta} \quad (3.26)$$

$$\frac{Y_{na}}{L} = A_{na} \left(\frac{K}{L}\right)^\alpha \left(\frac{(hL)}{L}\right)^{1-\alpha} (1-k_a)^\alpha (1-q_a)^{1-\alpha} \quad (3.27)$$

where  $k_a$  is the share of total physical capital employed in agriculture, and  $q_a$  is the share of total human capital employed in agriculture. Note that equations 3.26 and 3.27 concern themselves with the share of human capital employed in agriculture,  $(hL)_a/(hL)_t$ , rather than the share of labour engaged in agriculture,  $L_a/L_t$ . It is important to stress this distinction because the gap in the sectoral marginal product of labour may not reflect inefficiency if agriculture and non-agriculture differ in endowments of human capital (Vollrath, 2009).

With sector-specific production functions established, the static problem is to calculate a hypothetical aggregate level of income per worker,  $y^*$ , that is maximised over the share of physical and human capital employed in agriculture,  $y^* = \max_{k_a q_a}(y)$ . Given equations 3.26 and 3.27, the identity  $y^* = \max_{k_a q_a}(y)$  can be expanded into:

$$y^* = \max_{k_a q_a} [\Omega_a k_a^\beta q_a^{1-\gamma-\beta} + \Omega_{na} (1-k_a)^\alpha (1-q_a)^{1-\alpha}] \quad (3.28)$$

where for notational simplicity:

$$\Omega_a = A_a \left(\frac{R}{L}\right)^\gamma \left(\frac{K}{L}\right)^\beta \left(\frac{(hL)}{L}\right)^{1-\gamma-\beta} \quad (3.29)$$

and:

$$\Omega_{na} = A_{na} \left( \frac{K}{L} \right)^\alpha \left( \frac{(hL)}{L} \right)^{1-\alpha} \quad (3.30)$$

First order conditions of equation 3.28 require identical marginal productivity of human and physical capital in agriculture and non-agriculture. Differentiating sector specific output with respect to human capital employment share in both sectors yields:

$$(1 - \gamma - \beta)\Omega_a k_a^\beta q_a^{-\gamma-\beta} = (1 - \alpha)\Omega_{na} (1 - k_a)^\alpha (1 - q_a)^{-\alpha} \quad (3.31)$$

For physical capital:

$$\beta\Omega_a k_a^{\beta-1} q_a^{1-\gamma-\beta} = \alpha\Omega_{na} (1 - k_a)^{\alpha-1} (1 - q_a)^{1-\alpha} \quad (3.32)$$

Assuming that  $1 - \alpha - \beta$  is equal to  $1 - \alpha$ , i.e. that the labour share of output is identical in the two sectors, equation 3.31 can be solved for the share of human capital engaged in agriculture that maximises aggregate income per worker,  $q_a^*$ :

$$q_a^* = \frac{1}{1 - \left( \frac{\Omega_{na}(1-k_a)^\alpha}{\Omega_a k_a^\beta} \right)^{\frac{1}{\alpha}}} \quad (3.33)$$

Any increase in non-agricultural TFP to agricultural TFP (embedded respectively in  $\Omega_{na}$  and  $\Omega_a$ ) implies a shift of human capital out of agriculture. The same holds for the employment share of physical capital. Furthermore, and more implicit, under the assumption that  $\alpha$  (non-agricultural physical capital share) is greater than  $\beta$  (agricultural physical capital share), any increase in aggregate physical capital stock implies a shift of human capital out of agriculture.

The income maximising share of physical capital employed in agriculture,  $k_a^*$ , is found by substituting equation 3.33 into equation 3.32:

$$k_a^* = \left( \frac{\beta}{\alpha} \right)^{\frac{\alpha}{\alpha-\beta}} \left( \frac{\Omega_a}{\Omega_{na}} \right)^{\frac{1}{\alpha-\beta}} \quad (3.34)$$

Holding factor shares constant, income maximising share of physical capital employed in agriculture depends on the ratio of, broadly conceived, agricultural to non-agricultural productivity ( $\Omega_a$  and  $\Omega_{na}$ ). Given factor shares, equation 3.28 can now be solved to obtain the potential income per worker in each region at each point in time, holding constant the aggregate levels of human and physical capital, the value of land, and sector-specific TFP's.

### 3.A.4 Robustness checks

In this section, I test the sensitivity of my baseline results. Namely, that 1) MDRs experienced higher TFP growth rates than the LDRs, and that 2) TFP gradually accounted for a larger fraction of income differences in Yugoslavia. The baseline results remain qualitatively unchanged or similar to alternative technological parameters, depreciation rates, returns to years of schooling, and data. But, of course, the exact quantitative significance of results changes. I also provide a descriptive analysis of how the assumption of unit elasticity of factor substitution, constant returns to scale, and other assumptions related to the estimation of reallocation gains, might affect my baseline findings.

#### 3.A.4.1 Alternative labour shares

The assumption of perfectly competitive markets is rigid for a socialist economy. Yugoslavia was certainly characterised by markets that were imperfectly competitive. As such, factor shares do not necessarily reflect the elasticity of output with respect to each input. The technological parameters might be mismeasured. In particular, to the extent that monopoly profits are reflected in capital income, the elasticity of output with respect to capital will be overestimated. In regards to labour, to the extent that socialist regimes suppressed wages to fund investment, the elasticity of output with respect to labour will be underestimated.

The elasticity of output with respect to each input serves as weight. The larger the elasticity on, say, human capital, the larger will be the impact of human capital on the growth rate and level of output. Under constant returns to scale however, these elasticities sum to one. Increasing the explanatory power of human capital also means lowering the explanatory power of physical capital and land. Given that in Yugoslavia human capital grew slower than physical capital, one would expect that increasing the elasticity of output with respect to human capital at the expense of physical capital would increase the importance of TFP in accounting for the differences in the growth rate and the level of output.

Here, I test the sensitivity of my results to the elasticity on human capital. I find that changing the elasticity on human capital uniformly across regions keeps my baseline findings qualitatively identical.<sup>37</sup> I therefore prefer to present here a much more aggressive robustness check which is designed to go strongly against my baseline findings. From the benchmark level of 0.57 for the aggregate economy, I increase the elasticity of output with respect to human capital in the LDRs and Serbia to an upper bound of plausibility of 0.67.<sup>38</sup> I decrease the same elasticity in the MDRs to a lower

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<sup>37</sup>I ran two scenarios. From the baseline elasticity on human capital of 0.57 for the aggregate economy, I pushed it first to a lower bound of plausibility of 0.47 - a decrease of 0.10 points. In the second scenario, I pushed the elasticity to an upper bound of plausibility of 0.67, i.e. I increased the elasticity on human capital by 0.10 points compared to the baseline scenario. In both cases, the results are qualitatively identical to the baseline findings.

<sup>38</sup>Increasing the elasticity on human capital in Serbia further goes against my results. It will decrease the fraction of regional productivity differentials that can be attributed to TFP.

Table 3.9: Sources of growth, Yugoslav regions, with alternative labour shares, 1953-86, in %, average compound annual growth rate

	YUG	BIH	CRO	KOS	MK	ME	SRB	SLO	VOJ	$\sigma^2$
Aggregate output	5.02	4.85	4.82	5.39	5.30	5.25	4.90	5.39	5.19	0.05
Aggregate labour	-0.41	-0.49	-0.67	-0.12	-0.15	-0.06	-0.37	0.14	-0.73	0.08
Labour productivity	5.43	5.33	5.49	5.51	5.45	5.31	5.27	5.26	5.92	0.04
<i>Of which:</i>										
Physical capital	1.67	1.87	2.61	1.98	1.76	1.93	1.70	2.26	2.77	0.14
Human capital	1.17	1.49	0.76	1.52	1.34	1.29	1.15	0.54	0.67	0.13
Land	0.02	0.02	0.04	0.01	0.00	0.00	0.02	-0.01	0.05	0.00
Reallocation gains	0.65	0.70	0.36	0.41	0.56	0.76	0.66	0.44	0.00	0.05
TFP	1.92	1.25	1.72	1.59	1.80	1.32	1.75	2.03	2.44	0.13
<i>Percentage of labour productivity growth due to:</i>										
Factors of production	52.72	63.34	62.21	63.74	56.81	60.80	54.38	53.06	58.91	14.51
Reallocation gains	11.90	13.14	6.47	7.46	10.20	14.32	12.43	8.30	-0.03	18.69
TFP	35.38	23.52	31.32	28.80	32.99	24.89	33.19	38.64	41.12	32.83

Notes: YU = Yugoslavia, BIH = Bosnia-Herzegovina, CRO = Croatia, KOS = Kosovo, MK = Macedonia, ME = Montenegro, SRB = Serbia, SLO = Slovenia, VOJ = Vojvodina, and  $\sigma^2$  = variance.

bound of plausibility of 0.47. The difference in the elasticity on human capital between the two regional groupings is therefore 0.2. Attaching a higher elasticity on human capital in the LDRs serves to increase their TFP growth rates and TFP levels, while attaching a lower elasticity on human capital in the MDRs serves to decrease their TFP growth rates and TFP levels. This exercise should, therefore, substantially reduce the TFP gap between the LDRs and the MDRs.

Before presenting the results of this exercise, it is important to note that is generally conceived that poorer countries tend to have a lower elasticity on human capital than richer countries. But, such conceptions are based on estimations prone to measurement error. Upon accounting for self-employment income, Gollin (2002) finds that labour shares are approximately constant across countries, irrespective of their development levels. Thus, in Yugoslavia, it seems extremely unlikely that there were such larger differences in regional technology parameters as I assume here (0.2). Moreover, if anything, one would expect that MDRs were characterised by a higher elasticity on human capital than the LDRs, contrary to the assumption of this exercise. If so, this would strengthen the baseline findings. Nevertheless, it remains interesting to the test whether the baseline findings remain robust even under assumptions that are arguably implausible.

Tables 3.9 and 3.10 show the results when using alternative labour shares. Table 3.9 recreates the growth accounting exercise of the baseline case depicted in table 3.2 of the main text. As expected, TFP growth among the LDRs is now higher, while TFP growth among the MDRs is now lower. The baseline result that MDRs experienced a faster growth rate of TFP than the LDRs generally holds. The exception is Croatia, which now has a lower TFP growth rate than Macedonia (and Serbia). The results are therefore quantitatively different to the baseline case, but qualitatively similar.

Table 3.10: TFP as a source of regional labour productivity level differentials, Yugoslavia, with alternative labour shares, 1953-1986, in %

	(1)	(2)
	Raw TFP	Adjusted TFP
1953	3.8	3.5
1961	67.7	54.7
1971	83.6	73.5
1981	81.1	80.9
1986	72.5	75.4

In table 3.10 I repeat the development accounting exercise of the baseline case depicted in table 3.3 of the main text to get a better sense of TFP divergence dynamics. The results are qualitatively similar to the baseline case: TFP accounted for a larger fraction of productivity differentials in Yugoslavia over time. It eventually accounted for more than 70 per cent of the variation in regional productivity levels. However, the importance of raw TFP in accounting for regional differentials now peaks in 1971. It subsequently gradually declines by 1981, and then embarks on a steeper decline until 1986. The importance of adjusted TFP in accounting for the variation in regional productivity levels peaks in 1981. These results are different to the findings of the baseline case. There, both measures of TFP systematically increased over time, with no reversal of trend. Nevertheless, this robustness check produces results that are qualitatively similar to the baseline case - the importance of TFP in accounting for regional productivity differentials dramatically increased over time. For that matter, in table 3.10, more dramatically so than in the baseline case.

### 3.A.4.2 Alternative depreciation rates

Varying the depreciation rate in the perpetual inventory method changes the relative weight of old and new investment. A higher depreciation rate increases the relative capital stock of regions that experienced a higher investment rate towards the end of the sample period. In Yugoslavia, the LDRs experienced a higher investment rate than the MDRs, converging towards their factor intensities. However, I find that changing depreciation rates uniformly across regions affects my results minimally.<sup>39</sup> For this reason, I rather present here a much more aggressive robustness check. As in the previous robustness check, it is designed to go strongly against my baseline findings. I assign a greater weight to capital stock growth in the MDRs, while assigning a lower weight to capital stock growth in the LDRs. I commensurately increase the relative weight of TFP in the LDRs at the expense of TFP in the MDRs. I increase the depreciation rate in the LDRs and Serbia for each asset type by 50 per cent compared to

<sup>39</sup>I ran two scenarios. In the first one, I doubled the depreciation rates. In the second one, I halved the depreciation rates. The results of the baseline case are qualitatively identical. The quantitative results of the baseline development account exercise remain virtually identical.

Table 3.11: Sources of growth, Yugoslav regions, with alternative depreciation rates, 1953-86, in %, average compound annual growth rate

	YUG	BIH	CRO	KOS	MK	ME	SRB	SLO	VOJ	$\sigma^2$
Aggregate output	5.02	4.85	4.82	5.39	5.30	5.25	4.90	5.39	5.19	0.05
Aggregate output	5.02	4.85	4.82	5.39	5.30	5.25	4.90	5.39	5.19	0.05
Aggregate labour	-0.41	-0.49	-0.67	-0.12	-0.15	-0.06	-0.37	0.14	-0.73	0.08
Labour productivity	5.43	5.33	5.49	5.51	5.45	5.31	5.27	5.26	5.92	0.04
<i>Of which:</i>										
Physical capital	2.24	2.25	2.38	2.40	2.08	2.31	2.01	2.10	2.55	0.03
Human capital	0.99	1.26	0.92	1.29	1.14	1.10	0.98	0.65	0.81	0.04
Land	0.02	0.03	0.04	0.02	0.00	0.01	0.02	-0.01	0.04	0.00
Reallocation gains	0.48	0.52	0.49	0.26	0.39	0.49	0.49	0.55	-0.01	0.03
TFP	1.68	1.27	1.66	1.54	1.84	1.40	1.77	1.97	2.53	0.13
<i>Percentage of labour productivity growth due to:</i>										
Factors of production	60.10	66.46	60.86	67.30	59.00	64.38	57.20	52.19	57.45	23.53
Reallocation gains	8.85	9.71	8.84	4.81	7.22	9.31	9.31	10.37	-0.10	10.82
TFP	31.05	23.84	30.29	27.89	33.78	26.32	33.49	37.44	42.65	33.39

Notes: YU = Yugoslavia, BIH = Bosnia-Herzegovina, CRO = Croatia, KOS = Kosovo, MK = Macedonia, ME = Montenegro, SRB = Serbia, SLO = Slovenia, VOJ = Vojvodina, and  $\sigma^2$  = variance.

Table 3.12: TFP as a source of regional labour productivity level differentials, Yugoslavia, with alternative labour shares, 1953-1986, in %

	(1)	(2)
	Raw TFP	Adjusted TFP
1953	30.6	52.1
1961	59.7	57.6
1971	71.0	69.7
1981	66.7	67.9
1986	58.9	63.5

the baseline case. For the MDRs on the other hand, I decrease the depreciation rate of each asset type by 50 per cent. The LDRs and Serbia therefore have 300 per cent higher depreciation rates than the MDRs in this setting. Before I present the results, note that if I instead gave higher depreciation rates to the MDRs, and lower depreciation rates to the LDRs, this would strengthen my baseline findings.

Tables 3.11 and 3.12 show the findings when using alternative depreciation rates. Table 3.11 recreates the growth accounting exercise of the baseline case depicted in table 3.2 of the main text. As expected, TFP growth among the LDRs is now higher, while TFP growth among the MDRs is now lower. The results are overall very similar to the previous robustness check. The MDRs generally experienced a faster growth rate of TFP than the LDRs did. As in the previous robustness check where I use alternative labour shares, the exception is Croatia. That region now has a lower TFP growth rate than Macedonia (and Serbia). The results are therefore quantitatively different to the baseline case, but qualitatively reasonably similar.

In table 3.12 I repeat the development accounting exercise of the baseline case depicted in table

3.3. The results are qualitatively similar to the baseline case - TFP accounted for a larger fraction of productivity differentials in Yugoslavia over time. However, the importance of TFP is now quantitatively smaller. The importance of raw TFP in accounting for regional differentials peaks in 1971. This finding is identical to the previous robustness check that uses alternative labour shares. The importance of adjusted TFP in accounting for regional productivity differentials peaks in 1971, too. Nevertheless, the importance of TFP in accounting for the variation in productivity differentials increases substantially over time.

#### 3.A.4.3 Alternative returns to years of schooling

In this section, I assess the sensitivity of my results to returns to years of schooling. Returns to years of schooling effectively serve as a weights on human capital as a source of output in relation to TFP. For example, by assuming higher returns to years of schooling, I would attach a greater weight to human capital as a source of labour productivity growth at the expense of TFP. However, [Bevc \(1993\)](#) finds that returns to years of schooling in Yugoslavia were very similar to returns to years of schooling in other intermediately developed countries in [Psacharopoulos \(1985\)](#), on whose later work [Hall and Jones \(1999\)](#) rely on. Thus, the assumption in the baseline setting that returns to years of schooling in Yugoslavia were identical to those in [Hall and Jones \(1999\)](#) is a reasonable approximation. Nevertheless, it remains interesting to assess the sensitivity of my baseline results to returns to years of schooling. Similar to previous robustness checks, I find that either increasing or decreasing the returns to years of schooling uniformly across regions affects my results minimally. As in the previous robustness checks, I therefore present here a more aggressive robustness check which is designed to go against my baseline findings. I increase the returns to years of schooling in the MDRs at each level of educational attainment by 20 per cent compared to the baseline levels. In the LDRs and Serbia, I decrease the returns to years of schooling at each level of educational attainment by 20 per cent compared to the baseline setting. The LDRs therefore have a 50 per cent lower returns to years of schooling than the MDRs. By this setting, I increase the relative weight of TFP in the LDRs at the expense of TFP in the MDRs.

Before I present the results, note that it is extremely unlikely that the LDRs had lower returns to years of schooling than the MDRs. [Bevc \(1993\)](#) finds that returns to years of schooling in the LDRs were typically higher than in the MDRs. Indeed, this is implied by figure 3.9 in main text. Wage rate in the LDRs exceeded the MPH to a larger extent than the wage rate in the MDRs. It seems more likely that returns to years of schooling were actually higher in the LDRs. If so, this would strengthen my baseline findings. TFP growth rates and levels in the MDRs would increase relative to TFP growth rates and levels in the LDRs. Nevertheless, it remains interesting to test whether the baseline

Table 3.13: Sources of growth, Yugoslav regions, with alternative returns to schooling, 1953-86, in %, average compound annual growth rate

	YUG	BIH	CRO	KOS	MK	ME	SRB	SLO	VOJ	$\sigma^2$
Aggregate output	5.02	4.85	4.82	5.39	5.30	5.25	4.90	5.39	5.19	0.05
Aggregate labour	-0.41	-0.49	-0.67	-0.12	-0.15	-0.06	-0.37	0.14	-0.73	0.08
Labour productivity	5.43	5.33	5.49	5.51	5.45	5.31	5.27	5.26	5.92	0.04
<i>Of which:</i>										
Physical capital	2.19	2.45	2.11	2.60	2.30	2.53	2.22	1.83	2.24	0.05
Human capital	0.80	1.02	1.10	1.03	0.91	0.88	0.78	0.57	0.74	0.03
Land	0.02	0.03	0.04	0.02	0.00	0.01	0.02	-0.01	0.04	0.00
Reallocation gains	0.56	0.61	0.40	0.33	0.48	0.60	0.57	0.55	0.06	0.03
TFP	1.85	1.24	1.84	1.54	1.76	1.29	1.68	2.32	2.84	0.25
<i>Percentage of labour productivity growth due to:</i>										
Factors of production	55.54	65.44	59.22	66.16	58.96	64.41	57.47	45.42	51.04	46.27
Reallocation gains	10.30	11.36	7.37	5.99	8.74	11.29	10.73	10.44	1.04	10.98
TFP	34.16	23.20	33.41	27.85	32.31	24.30	31.81	44.13	47.92	68.33

Notes: YU = Yugoslavia, BIH = Bosnia-Herzegovina, CRO = Croatia, KOS = Kosovo, MK = Macedonia, ME = Montenegro, SRB = Serbia, SLO = Slovenia, VOJ = Vojvodina, and  $\sigma^2$  = variance.

Table 3.14: TFP as a source of regional labour productivity level differentials, Yugoslavia, with alternative returns to schooling, 1953-1986, in %

	(1)	(2)
	Raw TFP	Adjusted TFP
1953	6.6	23.7
1961	57.1	53.6
1971	68.5	65.8
1981	65.5	67.6
1986	62.2	67.5

findings remain robust even under assumptions that are arguably implausible.

Tables 3.13 and 3.14 show the results when using alternative returns to years of schooling. Table 3.13 recreates the growth accounting exercise of the baseline setting depicted in table 3.2. As expected, TFP growth among the LDRs is now higher, while TFP growth among the MDRs is now lower. But, as in the baseline case, MDRs experienced higher TFP growth rates than the LDRs did. The results are therefore qualitatively identical to the baseline setting.

In table 3.14 I repeat the development accounting exercise of the baseline case depicted in table 3.3. The results are qualitatively very similar to the baseline case - TFP accounted for a larger fraction of productivity differentials in Yugoslavia over time. The increase of the explanatory power of TFP in accounting for the variation in labour productivity levels over the benchmark years is larger than in the baseline setting, although the explanatory power of TFP is quantitatively smaller at each measured point in time.

Table 3.15: Sources of growth, Yugoslav regions, with official output data, 1953-86, in %, average compound annual growth rate

	YUG	BIH	CRO	KOS	MK	ME	SRB	SLO	VOJ	$\sigma^2$
Aggregate output	5.37	5.04	5.17	5.35	5.69	5.72	5.30	5.87	5.51	0.07
Aggregate labour	-0.67	-0.76	-0.95	-0.55	-0.41	-0.36	-0.59	-0.07	-1.02	0.09
Labour productivity	6.04	5.79	6.13	5.90	6.10	6.08	5.89	5.94	6.53	0.05
<i>Of which:</i>										
Physical capital	2.36	2.46	2.27	3.07	2.53	2.90	2.42	1.94	2.59	0.11
Human capital	1.00	1.27	0.94	1.28	1.15	1.13	0.98	0.67	0.82	0.04
Land	0.03	0.04	0.04	0.05	0.01	0.01	0.04	0.01	0.04	0.00
Reallocation gains	0.36	0.49	0.45	0.16	0.32	0.68	0.27	0.50	-0.04	0.04
TFP	2.28	1.54	2.44	1.34	2.10	1.35	2.18	2.82	3.12	0.39
<i>Percentage of labour productivity growth due to:</i>										
Factors of production	56.31	65.02	52.85	74.59	60.39	66.63	58.44	44.06	52.84	79.75
Reallocation gains	5.93	8.46	7.34	2.67	5.18	11.18	4.58	8.44	-0.64	12.30
TFP	37.76	26.52	39.81	22.74	34.43	22.19	36.99	47.51	47.80	91.69

Notes: YU = Yugoslavia, BIH = Bosnia-Herzegovina, CRO = Croatia, KOS = Kosovo, MK = Macedonia, ME = Montenegro, SRB = Serbia, SLO = Slovenia, VOJ = Vojvodina, and  $\sigma^2$  = variance.

#### 3.A.4.4 Alternative data: Official output

In this section, I assess the sensitivity of my baseline findings to the GDP data I constructed for this paper. I assess it by using official output data. In order to make the sectoral coverage of capital and labour data identical to that of official output, I subtract the non-productive sectors from the capital and labour data. To the extent that official data overestimates the growth rate of actual output, I expect this exercise to increase the growth rate of output that can be attributed to TFP, given that TFP is estimated as residual growth after accounting for the growth rate of inputs and the reallocation gains. Of course, now the capital and labour data is also different. Potential differences in the findings under this setting and the baseline setting can not be attributed solely to alternative output data. Adjusted capital and labour data impacts the results as well.

Tables 3.15 and 3.16 show the findings when using alternative data. Table 3.15 recreates the growth accounting exercise of the baseline case depicted in table 3.2. TFP growth rates are now generally higher, as expected. Kosovo is an exception. Its rate of TFP growth faces is identical to the baseline case. Overall, the findings are very similar to the baseline case. TFP growth was higher among the MDRs than among the LDRs. For growth accounting purposes, official output data therefore does not distort the baseline qualitative findings.

In table 3.16 I repeat the development accounting exercise of the baseline case depicted in table 3.3. The results are qualitatively identical to the baseline case - TFP accounted for a larger fraction of the variation in productivity levels over time. The importance of TFP is now quantitatively smaller at each benchmark year, as official data compresses the true extent of the variation in labour productivity

Table 3.16: TFP as a source of regional labour productivity level differentials, Yugoslavia, with official output data, 1953-86, in %

	(1)	(2)
	Raw TFP	Adjusted TFP
1953	11.9	45.0
1961	65.5	63.8
1971	83.8	78.7
1981	77.6	80.5
1986	78.4	81.4

levels. However, the initial divergence in TFP levels between 1961 and 1953 is larger in this setting than in the baseline setting.

### 3.A.4.5 Other issues

**3.A.4.5.1 Unit elasticity of substitution between capital and labour** The Cobb-Douglas assumption of unit substitution between capital and labour might be wrong. In an seminal paper, [Weitzman \(1970\)](#) argues that the Soviet economy is better represented by constant elasticity of substitution (CES) between capital and labour that is (significantly) below one. [Easterly and Fischer \(1995\)](#) later argue the same using updated data. [Sapir \(1980\)](#) makes the same argument for Yugoslavia.

Elasticity of factor substitution below unity could provide an elegant explanation for both the success and failure episodes of Yugoslavia. An economy characterized by it should run into acute diminishing returns on capital as labour becomes increasingly scarce, leading to a sharp slowdown in economic growth. Under this line of argumentation, Cobb-Douglas production function overestimates the contribution of capital deepening to growth because it fails to register the true extent of diminishing MPK. It commensurately underestimates the contribution of TFP growth. More explicitly, if Yugoslavia was characterised by CES below one, I underestimate TFP growth. Regionally, TFP growth in the LDRs would be underestimated to a larger extent than TFP growth in the MDRs because the LDRs experienced a faster growth of physical capital.

The above conclusion must be strongly qualified however. It is based on the unlikely assumption of Hicks neutrality of technological change assumed in the CES estimates. If the capital intensity bias mattered, which can be interpreted as a capital using bias in technological change, MPK decline under CES estimates would be mitigated. The estimations would then resemble more closely the findings under the baseline setting that rest on the Cobb-Douglas production function.

Irrespective of these technical considerations, there are, however, at least three reasons that go against the hypothesis that elasticity of factor substitution was lower than one. First, Yugoslavia relied on importing Western technology. This was largely caused by Yugoslavia's isolation from the

Soviet Bloc in the late 1940s and the early 1950s. It seems unclear why the country would then face a fundamentally different production function compared to OECD countries, which are largely considered to be characterised by Cobb-Douglas production functions. Second, all Yugoslav regions stagnated in the 1980s, notwithstanding the differences in their economic structures and unemployment levels, or levels of idle labour. Third, the estimation of CES depends on the underlying quality of data. While existing research typically uses revised output data, it relies on official investment. This is problematic. [Vonyó \(2017\)](#) argues that investment data was substantially overestimated by government statisticians as well. The existing research, by relying on official investment data, systematically overestimates the role of capital accumulation. This creates a downward bias in the estimation of elasticity of factor substitution in econometric exercises.

**3.A.4.5.2 Constant returns to scale** The assumption of constant returns to scale might poorly describe agriculture or non-agriculture, or both. The premise of New Economic Geography is based on increasing returns to scale. If, for example, non-agriculture was characterised by increasing returns to scale, perhaps due to externalities among physical and human capital, I would overestimate TFP. TFP would capture externalities brought about by factor accumulation. Conversely, if agriculture was characterised by decreasing returns to scale, the decomposition exercises would underestimate TFP. Nevertheless, the assumption that both agriculture and non-agriculture in Yugoslavia were characterised by constant returns to scale is corroborated by empirical research. [Boyd \(1987\)](#) estimates the Yugoslav agricultural production function. He finds that the elasticity of agricultural output with respect to each input summed to 0.99. [Sapir \(1980\)](#) estimates the Yugoslav manufacturing production function. He finds that the elasticity of manufacturing output with respect to each input summed to 1.

Even if, say, non-agriculture was rather characterised by increasing returns to scale, this would strengthen my findings. The LDRs experienced a faster growth rate of physical and human capital than the MDRs. Externality effects would therefore be higher in the LDRs than in the MDRs. TFP growth in the LDRs would decrease to a larger extent than TFP growth in the MDRs, reinforcing my baseline findings.

**3.A.4.5.3 Estimation of reallocation gains: Static vs. dynamic environment, demand effects, and welfare implications** Reallocation gains are estimated within a static environment. In the model, there is no dynamic interaction between sector-specific physical and human capital. For example, in a static setting, the transfer of human capital from agriculture to non-agriculture decreases the marginal product gap by increasing the marginal product of human capital in agriculture, while decreasing it in non-agriculture. This process causes an increase in aggregate efficiency. In a dynamic setting, physical capital would follow human capital in response to a more efficient allocation of human

capital, reinforcing the impact on aggregate efficiency. Thus, within a dynamic setting, reallocation gains would likely be higher than within a static setting. It therefore seems likely that this paper underestimates actual reallocation gains and hence overestimates TFP growth.

As a reminder, reallocation gains are determined as a ratio of actual to potential income, where potential income is simulated. Estimated potential income does not reflect potential changes in relative prices arising from demand effects. A shift of factors from agriculture would decrease agricultural production, leading to an increase in agricultural prices, which would increase the marginal product of the remaining factors. Neglecting demand effects thus overestimates reallocation gains. Nevertheless, [Vollrath \(2009\)](#) reports that simulated changes in relative prices have a minor impact on measured reallocation gains. Furthermore, this appears to be an unlikely issue within a socialist system where prices were largely administered.

Finally, the model neglects costs that are associated with migration. For example, next to pecuniary costs, labour migration involves physic costs. Nevertheless, it is important to distinguish efficiency gains from the perspective of aggregate economy, and welfare implications at individual or societal level. While structural modernisation certainly has strong, more broader, welfare implications, this paper exclusively focuses on productivity implications.

## Chapter 4

# The last Yugoslavs: Ethnic diversity, national identity, and civil war

### 4.1 Introduction

Nation-building is often proposed as a device for integration and conflict reduction in ethnically divided societies (Tilly, 1975; Gellner, 1983; Hobsbawm, 1991). But, the determinants and implications of national self-identification are not well understood beyond the qualitative work of Anderson (1983); Gellner (1983); Horowitz (1985) and Hobsbawm (1991). The primary aim of this paper is to determine the causal impact of one socio-economic factor - ethnic diversity - on the strength of national sentiment. The secondary aim is to uncover the relationship between identification with a nation and ethnic conflict.

This paper focuses on Yugoslavia as a unique historical setting to study the determinants and implications of national identification for two reasons. First, the formation of Yugoslav identity obviously failed because the country dissolved. However, there were people who felt Yugoslav, or chose to identify with a nation rather than with an ethnicity. This is empirically useful because it allows me to exploit the variation in national identification. Second, the country was extremely heterogeneous. Yugoslavs were fond of describing their country as one with two alphabets, three religions, four languages, and five nations (Horvat, 1971). Indeed, according to the ethnic fractionalisation ranking lists created by Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg (2003), and Montalvo and Reynal-Querol (2005b), Yugoslavia was the most ethnically heterogeneous country in Europe, and one of the most heterogeneous countries in the world. This is empirically useful as well, because it allows me to exploit the variation in socio-economic conditions.

Yugoslav identity was different to an ethnic-centred identity. Scholars studying the topic argue that Yugoslav identity provided a “broader” national identity category for those who rejected the

“narrower” ethnic identity category (Ramet, 1992; Wachtel, 1998; Sekulić, 2004). Yugoslav identity was multicultural and pan-national. It was based on the understanding of a nation as a cluster of “close” ethnic and cultural groups, contrasting the mutually antagonistic identities of the ethnicities that formed the country (Sekulić, 2004).<sup>1</sup> The distinction between Yugoslav identity and, say, Slovene identity, was thus comparatively similar to the current distinction between British and English identity.<sup>2</sup>

How is ethnic diversity related to national identification in ethnically divided societies? Sociologists argue that ethnic diversity stimulates identification with a nation rather than with an ethnicity because ethnic boundaries are porous in the presence of interethnic contact (Allport, 1958; Bélanger and Pinard, 1991). I explore this hypothesis at municipal level. Due to the decentralised nature of Yugoslavia, official statistics provide a wealth of socio-economic indicators at local level. The analysis is focused on the last population census that was conducted in 1991, just before the disintegration of the country and the outbreak of violence. The strength of Yugoslav identification is measured by the fraction of people who answered “Yugoslav” to the open-ended nationality question of the census. Ethnic diversity is measured by the commonly used ethnic fractionalisation index.

Figure 4.1 suggests that more ethnically diverse municipalities were associated with a greater share of people that identified themselves as Yugoslavs. To establish causality, a plausible source of exogenous variation in ethnic fractionalisation is required. I instrument ethnic diversity with the amount of states or political entities a municipality has belonged to during the premodern and early modern era (1421-1878). The argument concerning the plausibility of the instrument is based on three premises. First, there is a great deal of variation among the Yugoslav municipalities concerning state changes. Second, historians argue that state changes caused shocks to the ethnic composition of the areas that later formed Yugoslavia. Third, the impact of past shocks to ethnic composition persisted to the period of socialist Yugoslavia. I discuss the hypotheses at length, and provide historical evidence in section 4.5.1.

Two-stage least-squares (2SLS) estimates of the impact of ethnic fractionalisation on Yugoslav identification are positive, statistically significant, and substantial. In the baseline case, an increase in ethnic fractionalisation index by one unit (going from perfect ethnic homogeneity to perfect ethnic heterogeneity) leads to an increase in the population share of Yugoslavs by 12.4 percentage points. The effect is large, given that the mean percentage share of Yugoslavs was 2.3.<sup>3</sup> The estimations are

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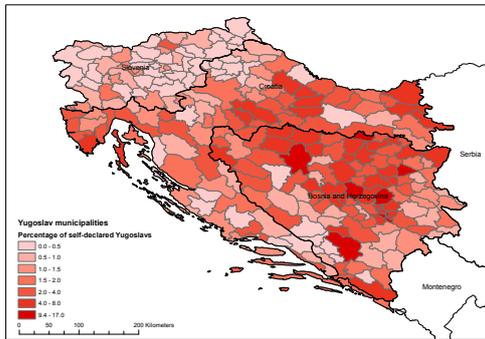
<sup>1</sup>Sekulić (2004) relates Yugoslav identification to civic identity, which is based on equal rights for members of a nation, irrespective of their ethnic background. He contrasts this to ethnic identity, which is usually based on the idea of perceived common descent and destiny of a group of people who perceive themselves as one folk.

<sup>2</sup>English identity is considered to be a more narrow identity category than the broader and more “cosmopolitan” British identity (see, for example, Colley (1992) for a historical analysis). More recently, the rise of English identity at the expense of British identity is often related to Euroscepticism and the outcome of the 2016 Brexit referendum.

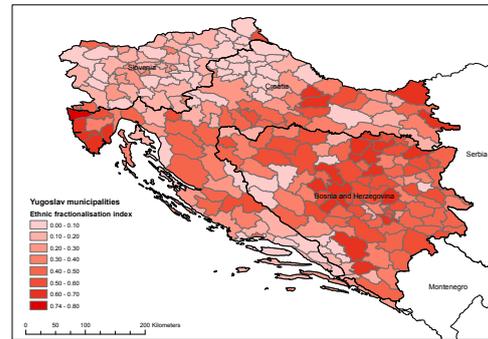
<sup>3</sup>This is likely a lower bound estimate. If ethnic polarisation (a measure of a bipolar ethnic population distribution) is included in the ordinary least square (OLS) regression analysis, the impact of ethnic fractionalisation is at least twice as large. The impact of ethnic polarisation on Yugoslav sentiment is much weaker in comparison, or even negative. Diversity

Figure 4.1: Population share of self-declared Yugoslavs and ethnic fractionalisation in Yugoslav municipalities, 1991

(a) Population share of self-declared Yugoslavs



(b) Ethnic fractionalisation index



Notes: The correlation coefficient between the share of Yugoslavs and ethnic fractionalisation is 0.61. Macedonia, Montenegro and Serbia, i.e. some regions that formed the country, are excluded from the analysis due to data issues. Serbian Albanians boycotted the 1991 population census due to ethnic tensions. Furthermore, the Macedonian, Montenegrin, and Serbian 1991 population censuses were incomplete. Data sources, and explicit definition of the ethnic fractionalisation index, are provided later in the text.

contingent on the validity of the exclusion restriction. The exclusion restriction that the instrumental variable (IV) regressions rely upon is that, conditional on the included controls, state changes had no effect on Yugoslav identification other than through their impact on ethnic diversity. If other factors correlated with state changes affect national identification, then the validity of the exclusion restriction is called into question. To address possible endogeneity concerns, I test whether ethnic diversity has comparable effects on Yugoslav identification upon accounting for a large set of factors that may be correlated with both state changes and national identity. I present the analysis in section 4.5.3. Ethnic diversity remains important.

Although it is not possible to completely rule out ethnic diversity effects operating through additional channels, the analysis reveals that the key channel linking ethnic diversity and Yugoslav identification is ethnic intermarriage. More ethnically diverse communities were characterised by a higher incidence of intermarriage. In turn, higher incidence of intermarriage caused a higher fraction of people to identify with a nation rather than with an ethnicity. My interpretation is that the hybrid and somewhat ambiguous Yugoslav identity provided an alternative to forcing a single category to intermarried individuals and their children.

The second part of the paper analyses some of the wider economic implications of national identity. I find that municipalities that contained a larger fraction of self-declared Yugoslavs were negatively associated with the population fraction of deaths during the Bosnian War of 1992-1995. While it is difficult to establish causality, it is plausible that individuals with a multicultural and pan-national

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matters.

sentiment were less likely to engage in an ethnic-based conflict, and die. Although Yugoslavs died less, they lost their country.

This paper contributes to a nascent literature within economics that analyses the social and economic implications of identity. In an influential set of articles, [Akerlof and Kranton \(2000, 2002, 2005\)](#) and [Akerlof \(2007\)](#) incorporate identity, a person's sense of self, into economic analysis. They propose that identity matters in an economic sense because deviating from the prescribed behaviour of an assigned social category is costly. They take these insights from sociology and social psychology. Both theoretical research ([Bénabou and Tirole, 2011](#); [Bisin, Patacchini, Verdier, and Zenou, 2011](#)) and empirical research ([Chen and Li, 2009](#); [Casey and Dustmann, 2010](#); [Manning and Roy, 2010](#); [Chen and Chen, 2011](#); [Bertrand, Kamenica, and Pan, 2015](#)) has followed the work of Rachel Kranton and George Akerlof.

The empirical literature that studies the determinants of identity, and national identity in particular, remains limited. [Antman and Duncan \(2015\)](#) argue that racial self-identification responds to economic incentives. [Clots-Figueras and Masella \(2013\)](#) argue that educational policy matters - individuals who have been exposed for a longer time to teaching in Catalan have a stronger Catalan sentiment. In a closely related article to this one, [Masella \(2013\)](#) finds no evidence of a lower intensity of national identification in more ethnically fragmented countries. This paper makes a contribution to the literature by isolating a particular socio-economic factor that has an impact on a component of the overall identity of individuals, i.e. national identity.<sup>4</sup> The paper makes a further contribution to the literature by uncovering a mechanism that connects ethnic diversity and national identity.

This paper is furthermore related to a large literature that studies the relationship between ethnic diversity and economic outcomes. Ethnic diversity might have an impact on economic growth and productivity ([Easterly and Levine, 1997](#); [Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg, 2003](#); [Alesina and La Ferrara, 2005](#); [Montalvo and Reynal-Querol, 2005a](#); [Ottaviano and Peri, 2006](#)), institutional quality ([La Porta, de Silanes, Shleifer, and Vishny, 1999](#)), and conflict ([Montalvo and Reynal-Querol, 2005b](#); [Esteban, Mayoral, and Ray, 2012](#)).<sup>5</sup> The contribution of the paper to this literature is twofold. First, it reveals one of the origins of ethnic diversity. In that sense, this paper is highly related to [Ahlerup and Olsson \(2012\)](#); [Michalopoulos \(2012\)](#), and [Ashraf and Galor \(2013\)](#).<sup>6</sup> Second, if identity is part of utility function, this paper reveals additional economic importance of ethnic diversity.

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<sup>4</sup>The caveat is that the analysis is conducted at a municipal level. It would be ideal to conduct the analysis at an individual level.

<sup>5</sup>Ethnic fragmentation might have further economic effects. [Schulze and Wolf \(2009, 2012\)](#) argue that border effects and market integration within the Austro-Hungarian Empire emerged along ethno-linguistic lines, respectively. [Greif \(1993\)](#) argues that premodern merchants were able to solve commitment problems, and hence facilitate trade, through membership in ethnic-centred groups.

<sup>6</sup>Ethnic diversity, globally, might have its roots in the duration of human settlement and the distance from the equator ([Ahlerup and Olsson, 2012](#)), geographic diversity ([Michalopoulos, 2012](#)), and genetic diversity ([Ashraf and Galor, 2013](#)).

The paper is also related to panoply of research about the dissolution of Yugoslavia. A large body of literature argues that increasing ethnic nationalism broke the country asunder (see [Jović \(2009\)](#) for literature survey). However, the determinants and implications of the flip side of ethnic nationalism, i.e. Yugoslav identity, are barely researched, exceptions being [Burg and Berbaum \(1989\)](#); [Hodson, Massey, and Sekulić \(1994b,a\)](#) and [Wachtel \(1998\)](#).

[Sekulić \(2004\)](#) offers a literature survey that studies the formation of Yugoslav identity. He argues that there were several routes towards Yugoslav identification beyond ethnic diversity - minorities accepting Yugoslavism to uplift them from their minority status, loyalty and political support for the regime, and the general process of modernisation. I make a contribution through an analysis which suggests that ethnic diversity is a dominant explanation underpinning the strength of Yugoslav national cohesion.

This paper is organised as follows. Section [4.2](#) describes the evolution of the idea of a Yugoslav nation. Section [4.3](#) provides a theoretical model that describes which individuals, and under which circumstances, might adopt Yugoslav identity. Section [4.4](#) provides a first set of noncasual findings (OLS regressions). Section [4.5](#) establishes the causal impact of ethnic diversity on Yugoslav sentiment by using an IV approach. The plausibility of state changes as an instrument for ethnic diversity is extensively discussed. In section [4.6](#), I present evidence that intermarriage is the key channel connecting ethnic diversity and Yugoslav identification. In section [4.7](#), I test the relationship between national identification and ethnic conflict. Finally, in section [4.8](#), I provide a conclusion with policy implications.

## 4.2 Historical background: Yugoslav identity

The idea of a Yugoslav nation emerged in the South Slav lands under the Habsburg rule during the early 19th century. The idea was formulated by the Illyrian Movement - a group of Croatian intellectuals. It was a branch of Pan-Slavism inspired by the ideals of national awakening of Romanticism and the French Revolution. “Yugoslavism” was based on the common cultural and linguistic characteristics of, primarily, the Croats, Serbs, and the Slovenes. The construct of Yugoslav identity emerged simultaneously with the development of Croatian, Serbian, and Slovenian identities ([Lampe, 2000](#)). Due to cultural similarities, proponents of the Yugoslav idea believed that South Slavs belonged to a single Yugoslav nation. They believed that Croats, Serbs and the Slovenes were three tribes of one nation.

[Wachtel \(1998\)](#) argues that, in addition to cultural factors, political factors contributed to the attraction of a national synthesis. It seemed unlikely that any of these ethnicities could achieve autonomy within the Habsburg Empire on their own. Even if they managed to achieve political independence, it seemed very unlikely they could maintain it in the presence of neighbouring empires. For these reasons, cultural unity was the main aim of the movement. Possible political unification was

left to an idealised distant future.

The distant future arrived sooner than anticipated. It was delivered by the collapse of the Austro-Hungarian Empire in the wake of WWI. The geopolitical conjectures allowed the creation of a South Slavic state. The newly merged Kingdoms of Serbia and Montenegro joined together with most of the South Slavic lands under the Habsburg rule to form a Kingdom of Serbs, Croats, and Slovenes (in 1929 renamed to Yugoslavia). The common state was initially perceived as an instrument of gradual amalgamation of the various Slavic ethnicities, without the domination of any particular ethnicity. The utopian pre-war ideals of national unity were soon confronted with reality. There were significant cultural, social, and economic differences among the ethnicities that formed Yugoslavia (Lampe, 2000).

Political fault lines were characterised by a struggle between the supporters of a unitary state and a federation. Political tensions transformed into ethnic tensions, and the two became synonymous, because the supporters of the unitary state were mostly Serbs, while the supporters of a federation were mostly non-Serbs, primarily Croats. Since the supporters of the unitary state prevailed, Kingdom of Yugoslavia was perceived by the non-Serbs as an extension of the pre-WWI Serbian Kingdom (Banac, 1984; Jović, 2009). This had strong implications concerning the national identity formation process. Serbian domination contributed to the consolidation of identities of the non-Serb ethnic groups. It hampered the development of Yugoslav national unity. For instance, Sekulić (2004) argues that Croatian national identity became widely entrenched during the interwar period with the political mobilisation of the Croatian peasantry against central government by the Croat Peasant Party.

Although various attempts of compromise were achieved, particularly at the very end of the 1930s, Yugoslavia was unable to achieve real stability. A weak sense of common identity contributed to the fast collapse of the country under the German invasion of 1941 (Wachtel, 1998).

The communists, and their leader Tito, seized power in 1945. Legitimised by the fight against the Axis powers and their domestic collaborators, they were backed, to an extent, by genuine popular support (Lampe, 2000). The communists were firmly committed to the reconstruction of Yugoslavia. They reorganised the country into a federation. Each federal republic approximated the areas inhabited by the major Slavic ethnic groups in an attempt to placate the ethnicities that formed the country.<sup>7</sup> Communist authorities attempted to reduce political and ethnic divisions, and distance themselves from the unitary interwar Yugoslavia.

The communists did not pursue nation-building policies. To Edvard Kardelj, the main ideologist of Yugoslavia's Communist Party, the idea of a Yugoslav nation was a product of capitalism and nationalism (Kardelj, 1979). The socialist state should not make nor deny nations, like "bourgeoisie"

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<sup>7</sup>Ordered by their size, these ethnic groups were Serbs, Croats, Slovenes, Bosniaks (referred to as Muslims during the existence of the country), Macedonians, and Montenegrins. The two largest non-Slavic groups were Albanians, which were concentrated in the Serb province of Kosovo, and Hungarians.

states do. Instead, Tito and the federal leadership hoped that industrialisation and modernisation would erode ethnic divisions, and create support for a common state (Sekulić, 2004). By this ambivalent attitude towards Yugoslav feeling, the communists sought to distance themselves from the unitary interwar Yugoslavia where ethnic boundaries were suppressed by central authorities (Banac, 1984).

There is another reason for the absence of nation-building policies. The ideological consensus among the communist elite was that the state should be gradually weakened during the transition process towards the communist utopia. It was based on the Marxist notion that the state should “wither away” (Jović, 2009). This ideological consensus was reached after the Tito-Stalin split in 1948, and the desire of Yugoslav communists to distance themselves from the Soviet-style planned economy. The “withering” of the Yugoslav state involved the establishment of labour-managed firms and the devolution of political power to federal units. Kardelj believed that these “socialist” features were the main unifying force of the country, rather than ethnic features (Jović, 2009).

“Yugoslav” was not an easy answer to give in response to the open-ended census question “What is your nationality?”. The communist elites were disinclined to place Yugoslav identification on an equal footing with ethnic identification (Burg and Berbaum, 1989; Ramet, 1992; Hodson, Massey, and Sekulić, 1994b; Wachtel, 1998).<sup>8</sup> The scepticism towards Yugoslav identification was reflected in population censuses. Those that declared themselves as Yugoslavs were placed under the category “Yugoslav - no national affiliation”. The implication was that Yugoslav identification was legitimate, although by this the citizen did not declare membership in an existing nation. The tendency to view Yugoslav identification as something lesser to ethnic identification stands in sharp contrast to the preceding Kingdom of Yugoslavia. During the interwar Yugoslavia, population censuses did not include a nationality question. Each individual was considered to be a member of a single Yugoslav nation.

For these reasons, it was all the more surprising that the share of population that declared themselves as Yugoslavs increased over time in population censuses. The first time the category Yugoslav appeared in population census was in 1961. Then, 1.7 per cent of the population declared themselves as Yugoslavs. 87 per cent of that figure was composed by Bosniaks of Bosnia and Herzegovina (Bosnian Muslims). Bosniaks opted for the “neutral” Yugoslav category because they were not formally recognised as an ethnicity during the 1961 census (Mrđen, 2002). By 1971, the percentage of Yugoslavs decreased slightly to 1.3. The aggregate decrease was driven by the formal recognition of Bosniaks as an ethnic category during the 1971 census. A large fraction of Bosniaks opted for the ethnic category that was previously unavailable (Mrđen, 2002). In all the other republics, the population share of Yugoslavs increased between the 1961 and 1971 censuses. In the 1981 census, the percentage of Yugoslavs increased to 5.4. Of all the Yugoslav republics, Croatia contained the largest amount of Yugoslavs in its population, 8.2

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<sup>8</sup>Political and politically influential positions were allocated according to ethnic criteria, especially at the federal level. An individual lost access to these positions by publicly declaring herself as a Yugoslav.

per cent.

Republican leaderships were highly concerned about the increase of Yugoslav sentiment. They perceived it as the deliberate attempt by the federal authorities, or other republics, to shift the popular loyalties of their citizens, and erode their power base. Serbian nationalists often interpreted Yugoslav identification as the deliberate attempt by the Croatian leadership to decrease the Serb minority in their republic (Tomašević, 1975). Croatian nationalists made the same arguments on behalf of Croats in Serbia (Bilandžić, 1985).

Sociological surveys indicate that Yugoslav identification increased further during the 1980s (Hodson, Massey, and Sekulić, 1994b,a). With the rise of ethnic nationalism, the population share of Yugoslavs in the 1991 census reverted to the level reported in the 1971 census. Those were the last Yugoslavs that believed in a common nation.

### 4.3 Theoretical framework

This section provides a simple model to describe which individuals, and under which circumstances, might adopt a Yugoslav identity. It is based on identity models of Akerlof and Kranton (2000, 2002). It draws further insights from Manning and Roy (2010) and Caselli and Coleman (2013).

Assume that there are two types of national categories, Yugoslavs,  $Y$ , and non-Yugoslavs,  $N$ . A non-Yugoslav identity corresponds to the ethnic roots of an individual. The ideal non-Yugoslav has attributes  $a_n$ , while the ideal Yugoslav has attributes  $a_y$ . The attributes are both ascriptive and non-ascriptive. The identity pay-off a non-Yugoslav incurs depends on her self-image,  $I_n$ , and the extent to which her attributes,  $a$ , correspond to her category's ideal attributes,  $t_n(a_y - a)$ . An individual incurs a loss if her attributes do not correspond to the ideal attributes of her category.<sup>9</sup> Equivalent to the non-Yugoslav, the identity pay-off a Yugoslav incurs depends on her self-image,  $I_y$ , and the extent to which her attributes correspond to her category's ideal attributes,  $t_y(a_y - a)$ . Similar to Akerlof and Kranton (2002), the parameter  $t$  measures how difficult it is for individuals with different characteristics to fit in a national category. Assume that  $t_n \neq t_y$ . It is likely that  $t_n > t_y$ , since Yugoslav identity was not well defined, and was more porous than ethnic identities (Djokić, 2003). If so, a Yugoslav would be less sensitive to a given deviation of her attributes from the ideal attributes of her category than a non-Yugoslav would be.

An individual can choose how Yugoslav they feel,  $y$ , which is treated as a continuous variable on a unit interval. By choosing to be a Yugoslav, an individual reduces the weight on the overall identity pay-off associated with her ethnic roots. An individual can thus have multiple identities and can choose the intensity of specific identity feeling. If an individual chooses Yugoslav identity, she will incur costs,

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<sup>9</sup>In order to keep the model as simple as possible, I ignore the effects of effort and behaviour.

$\beta$ , which are proportional to the intensity of Yugoslav feeling. The costs of becoming a Yugoslav can be perceived as costs of identity switching (Caselli and Coleman, 2013), or as costs of “betraying” one’s ethnic roots (Manning and Roy, 2010). Along the lines of Caselli and Coleman (2013), the costs can take the form of direct monetary (opportunity) costs, like lost access to jobs allocated by ethnic criteria. They can also take the form of physic costs, like ostracism from an ethnic-based community.

An individual thus maximises her identity pay-off by choosing how Yugoslav she feels:

$$V(y) = (1 - y)(I_n - t_n(a_n - a)) + y(I_y - t_y(a_y - a) - \beta y) \quad (4.1)$$

If an individual does not feel as a Yugoslav at all, i.e. if  $y = 0$ , she will derive identity pay-off solely from her ethnic roots. Equation 4.1 will collapse to:

$$V_n = I_n - t_n(a_n - a) \quad (4.2)$$

Such individuals could be interpreted as having no belief whatsoever in the Yugoslav nation. If so, they could be further characterised as ethnic nationalists. Equivalently, if  $y = 1$ , an individual does not feel attached to her ethnic roots at all. Instead, she firmly identifies with the Yugoslav nation. Her identity pay-off will collapse to:

$$V_y = I_y - t_y(a_y - a) - \beta \quad (4.3)$$

Why would ethnic diversity matter? Ethnic diversity could have both direct and indirect effects on the overall identity pay-off. It could have a direct impact on the identity pay-off associated with Yugoslav sentiment through affecting the cost of betraying one’s ethnic roots. A higher ethnic diversity could decrease this cost, and hence stimulate Yugoslav feeling, through two channels. First, by decreasing the amount of resources an ethnic group could mobilise to punish its defecting member. Second, by decreasing the amount of ethnic-specific connections a defecting individual would sever, which would otherwise involve a physic loss. Intuitively, an individual in an ethnically diverse community will be penalised less if she decides to become a Yugoslav. There are less individuals of her ethnicity that could potentially punish her.

Formally, the cost of betraying one’s ethnic roots depends negatively on ethnic diversity,  $e$ , and a vector of variables,  $z$ :

$$\beta = \beta(e, z) \quad (4.4)$$

Ethnic diversity could have an indirect effect on the overall identity pay-off through affecting the characteristics or ethnic markers of an individual. Such ethnic markers could, for instance, take the form of the ethnic background of the spouse or partner of an individual, or the ethnic background

of individual's parents. To focus on the former case, suppose that an ideal member of an ethnicity should marry or be in relationship with a member of the same ethnicity. For instance, an ideal Croat should marry another Croat, rather than say a Serb or a Slovene. In contrast, suppose that for an ideal Yugoslav the ethnicity of her spouse or partner is irrelevant.<sup>10</sup>

To formalise these ideas, define  $c = a_n - a$ , and  $d = a_y - a$ . Suppose that  $c$  is an increasing function of ethnic intermarriage,  $i$ , while  $d$  is independent of ethnic intermarriage. Suppose that intermarriage in turns depends on ethnic diversity, and a vector of variables,  $x$ . Finally, assume further that both  $c$  and  $d$  depend, for simplicity, on an identical vector of other variables,  $f$ :

$$c(i, f) = c(i(e, x), f) \tag{4.5}$$

$$d = d(f) \tag{4.6}$$

Intuitively, intermarriage depends on the existence of possible matches between ethnically heterogeneous individuals, which is a supply-side issue. Intermarriage is impossible if there are no ethnically heterogeneous individuals in a society. All else given, an increase in ethnic diversity will increase the incidence of intermarriage. Even if an individual has a strong preference towards endogamy, in the extreme case of perfect ethnic heterogeneity, an individual will have to marry a member of another ethnicity unless that individual is willing to rather remain unmarried. Intermarriage will in turn increase the mismatch between the individual's attributes and the ideal attributes of a non-Yugoslav. An increase in ethnic diversity will thus increase the identity loss associated with a non-Yugoslav identity relative to a Yugoslav identity, stimulating Yugoslav sentiment.<sup>11</sup>

In order to derive what determines Yugoslav sentiment, substitute equations 4.4, 4.5, and 4.6 into equation 4.1, and maximise equation 4.1 with respect to  $y$ :

$$y = \frac{I_y - I_n + t_n c(i(e, x), f) - t_y d(f)}{2\beta(e, z)} \tag{4.7}$$

For the maximisation problem to have a non-negative solution on a continuous unit interval, auxiliary assumptions require that the numerator is larger than zero, and that the denominator is equal to or larger than the numerator. With these assumptions, Yugoslav identification depends negatively on the cost of becoming a Yugoslav, and the deviation from the ideal attributes of a Yugoslav. It

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<sup>10</sup>Yugoslav identity, as discussed in the previous section, was not based on ethnic markers. Of course, it was initially based on the idea of South Slav unity. However, it evolved over time to be even more inclusive than that (Djokić, 2003).

<sup>11</sup>These implications will hold as long as Yugoslavs cared less about the ethnicity of their spouse or partner relative to non-Yugoslavs. Of course, it is also possible to imagine that Yugoslavs valued intermarriage as an attribute. The effect would then be even more pronounced.

depends positively on the difference between  $I_y$  and  $I_n$ , and the deviation from the ideal attributes of a non-Yugoslav.

Ethnic diversity has an impact on Yugoslav identification through affecting the cost of becoming a Yugoslav. An increase in ethnic diversity will reduce the cost of becoming a Yugoslav, and hence stimulate Yugoslav identification. Ethnic diversity has a further impact on Yugoslav feeling through impacting the incidence of intermarriage. Subject to cost, some individuals will reject an ethnic-centred identity because they do not fit in. Instead, they will gravitate towards an identity that is not based on ethnic markers. Such individuals will identify with the wider nation rather than with a specific ethnicity.

The theoretical framework provides testable hypotheses. It also implies a role for policy. [Akerlof and Kranton \(2002\)](#) argue that the parameter  $t$  can be lowered through a policy of creating a sense of community. If so, a government could affect an individual’s sense of belonging to an ethnic-based community, or the wider nation. The parameter  $t$  can likely be affected by a range of other socio-economic factors as well.<sup>12</sup> Whilst acknowledging that other factors have an impact on national identification as well, the aim of the subsequent empirical analysis is to investigate the impact of ethnic diversity on Yugoslav identification.

## 4.4 OLS results: Yugoslav identity and ethnic diversity

### 4.4.1 Data

Due to the decentralised nature of socialist Yugoslavia, official statistics provide a wealth of socio-economic data at municipal level. Although I rely on a variety of data sources, I primarily use data transcribed from the 1991 population census (which was published by the statistical offices of the Yugoslav successor states), as well as statistical yearbooks. The data I use is described in detail with their sources in appendix [4.A.1](#).

The dependent variable is the fraction of population that answered “Yugoslav” to the open-ended nationality question of the census. Within the theoretical framework outlined earlier, people that answered Yugoslav to the nationality question of the census can be perceived as those that felt more Yugoslav than, for example, Slovenian, or where  $y > 0.5$ , if  $y$  is measured on a continuous unit interval. The independent variable of interest is ethnic diversity. It is measured by the commonly used ethnic fractionalisation index,  $e$ :

$$e = 1 - \sum_{i=1}^M s_i^2 \quad (4.8)$$

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<sup>12</sup>It could perhaps be affected by ethnic diversity as well. For instance, if interethnic contact *per se* facilitates pan-nationalist identification.

where  $s$  is the percentage share of an ethnicity in the population of municipality  $i$ . The index measures the probability that two randomly drawn individuals from a population belong to two different ethnic groups (Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg, 2003; Montalvo and Reynal-Querol, 2005b,a). Its maximum is reached when each person in a given population belongs to different ethnic groups (value of one). I exclude people that declared themselves as Yugoslavs from the ethnic fractionalisation index because the econometric exercises would otherwise suffer from reverse causality.

#### 4.4.2 OLS regressions

This empirical section uses ordinary least-squares (OLS) regressions to test the relationship between Yugoslav identification and ethnic diversity. The linear regressions are of the following form:

$$y_i = \alpha + \beta e_i + \gamma X_i + \epsilon_i \quad (4.9)$$

where  $y_i$  is the fraction of Yugoslavs in population of municipality  $i$ ,  $e_i$  is ethnic fractionalisation,  $X_i$  is a set of controls, and  $\epsilon_i$  is a random error term. The coefficient of interest is  $\beta$ , the effect of ethnic diversity on Yugoslav sentiment.

Table 4.1 reports the OLS regressions of the fraction of Yugoslavs against ethnic fractionalisation for a variety of specifications.<sup>13</sup> Column 1 indicates that there is positive correlation between ethnic fractionalisation and Yugoslav sentiment. The impact is significant at the 1 per cent level. Municipalities that were more ethnically diverse tended to have a greater fraction of self-declared Yugoslavs. The size of the coefficient implies that going from perfect ethnic homogeneity to perfect ethnic heterogeneity is associated with an increase in the population percentage share of Yugoslavs by almost 8 percentage points. The association is economically substantial because the mean population percentage share of Yugoslavs was 2.3.

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<sup>13</sup>In appendix 4.A.2 I experiment with alternative estimators - a quasi-likelihood general linear model (GLM) and the Poisson pseudo-maximum-likelihood (PPML) model. The GLM and PPML estimators imply an almost identical marginal association between ethnic diversity and Yugoslav identification as the OLS estimator does. I thus prefer to use OLS because the interpretation of coefficients is easier.

Table 4.1: OLS regressions, dependent variable: fraction of Yugoslavs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Ethnic fractionalisation	0.0795*** (0.008)	0.0796*** (0.008)	0.0770*** (0.007)	0.0860*** (0.008)	0.0768*** (0.007)	0.0749*** (0.007)	0.0800*** (0.007)	0.0795*** (0.008)	0.0797*** (0.008)	0.0724*** (0.006)	0.0727*** (0.006)	0.0674*** (0.007)	0.0545*** (0.006)
Output p.c.		0.0001 (0.000)											0.0002 (0.000)
Population density			0.0000 (0.000)										0.0000*** (0.000)
Avg. years of schooling				0.0067*** (0.002)									0.0103*** (0.002)
Social sector labour					0.0002*** (0.000)								0.0001*** (0.000)
Partisan-controlled territories						0.0045 (0.003)							0.0007 (0.003)
Partisan war crimes							0.0152** (0.007)						0.0059 (0.004)
Public goods exp. p.c.								0.0001 (0.000)					-0.0013*** (0.000)
Federal aid									0.0020 (0.003)				-0.0004 (0.002)
1980's generation										0.2308*** (0.077)			0.0129 (0.058)
Army presence p.c.											0.0033*** (0.001)		0.0003 (0.001)
Regions	No	Yes	Yes										
Observations	273	273	273	273	273	273	273	273	273	273	273	273	273
R-squared	0.369	0.369	0.440	0.439	0.447	0.374	0.396	0.369	0.370	0.397	0.473	0.390	0.657

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Columns 2-12 add covariates that might have impacted Yugoslav identification. The covariates are added sequentially in order to assess the stability of the coefficient on ethnic diversity and hence a possible presence of multicollinearity.

Social scientists argue that the formation of nation-states is historically associated with modernisation and economic development (Anderson, 1983; Gellner, 1983; Hobsbawm, 1991). For that matter, as stated in section 4.2, the communist elite of Yugoslavia hoped that economic development would diminish the salience of ethnic identities as a shared prosperous community would emerge. To control for economic development, column 2 adds output per capita, column 3 adds population density as a proxy for the urbanisation rate, and column 4 adds average years of schooling.

Symbolic representations of a new state, rituals of history, and images of shared destiny, are often promoted to support national identity (Anderson, 1983; Gellner, 1983; Horowitz, 1985; Hobsbawm, 1991). One of the symbolic representations of the new socialist Yugoslav society was the labour-managed firm. This workplace organisation was a unique institutional feature of Yugoslavia (Horvat, 1971), which could have promoted Yugoslav sentiment (Burg, 1983). To control for this factor, in column 5 I include the fraction of labour that was employed in labour-managed firms, or in the so-called “social sector”.

Yugoslav identification could have been inspired further by images or memory of a shared past. Connor (1984) argues that the revolutionary communist struggle during WWII, and the memory of it, inspired a sense of belonging to Yugoslavia. In column 6, I control for the partisan-controlled municipalities during the first session of the Anti-Fascist Council for the National Liberation of Yugoslavia (AVNOJ). The partisan leaders of Yugoslavia convened the first AVNOJ meeting on November 1942. They laid the foundation for the socialist Yugoslavia in that session. The intention of this variable is to capture the length of exposure to the revolutionary struggle, particularly at the time when it was unclear whether it would succeed. In column 7, I add sites of partisan executions of the Croatian fascists (“Ustaše” in Croatian) at the very end of WWII, or even after the official end of it (summer of 1945). The Croatian fascists were firmly against the existence of any form of Yugoslavia. I expect the execution sites of fascists to be positively correlated with the intensity of Yugoslav sentiment. All else given, the executions increased the fraction of people who felt Yugoslav, as a fraction of those who did not feel Yugoslav was executed.

In columns 8 and 9, I assess whether economic policies might be related to Yugoslav feeling. In column 8, I add expenditure on public goods per capita, which was locally funded and provided. In column 9, I add a dummy variable whether a municipality was recipient of federal aid.

Ramet (1992) argues that Yugoslav sentiment during the late 1970s and the 1980s was promoted by the emergence of a strong pan-Yugoslav rock scene oriented towards the youth. In column 10 I include

the fraction of population that was young during the early 1980s, when the rock scene was particularly vibrant (Ramet, 1992).

Burg and Berbaum (1989) argue that Yugoslav identification signified political integration and regime support. The Yugoslav army, as the largest beneficiary of federal expenditure, had a strong interest in the existence of Yugoslavia. Dimitrijević (2001) argues that loyalty to Yugoslavia was strongly promoted in the army life. In column 11, I control for army presence (amount of battalions and divisions, army bases, and facilities) per capita.

So far, the coefficient on ethnic diversity remains stable with the sequential inclusion of covariates. Finally, in column 12 I include a region dummy variable to control for region-specific unobservables. For instance, the dummy variable could capture the impact of educational policies, which were region-specific (Sekulić, 2004). Of all the covariates, the inclusion of this one changes the coefficient on ethnic fractionalisation by the largest magnitude. This implies that covariates in columns 2-11 are unable to capture some important regional factors that are related to Yugoslav identification.

Column 13 includes all the previously considered controls. The coefficient on ethnic fractionalisation decreases by approximately 30 per cent compared to the initial estimation in column 1, to 0.055. The coefficients on population density, educational attainment and the fraction of social sector employment are positive and statistically significant. This suggests that economic development and exposure to the new socialist society (labour-managed firm) was positively associated with Yugoslav identification. The coefficient on public goods expenditure p.c. is negative and statistically significant. This is expected. Public goods were largely provided by the municipalities and regional units. The recipients presumably associated the provision of public goods with regional units, rather than with Yugoslavia *per se*.

To test further the interpretation of Yugoslav identification as an indicator of the support and loyalty to the socialist regime, in table 4.2 I include two previously unconsidered controls. The analysis is restricted to Croatia because the two controls are unavailable for other regions. In column 1 of table 4.2, I control for the population percentage of the Communist Party members. The coefficient on Communist Party members is substantial and statistically significant. In column 2, I control for the population fraction of WWII partisan veterans because they fought for socialist Yugoslavia. The coefficient on WWII partisan veterans is insignificant. In both columns, the coefficient on ethnic fractionalisation remains significant. In column 3 of table 4.2, I include all the controls that were considered in this section. Neither the coefficient on Communist Party members or WWII partisan veterans is now significant. The coefficient on ethnic diversity, however, remains significant, and is remarkably similar to that in column 13 of table 4.1, despite the analysis being restricted to Croatia.<sup>14</sup>

In sum, table 4.1 and table 4.2 findings display a strong positive correlation between ethnic

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<sup>14</sup>This does not imply that Croatia is driving the results of the OLS regressions. If I exclude Croatia from the OLS regression of column 13 in table 4.1, the coefficient on ethnic fractionalisation decreases by about 15 per cent, to 0.045.

Table 4.2: OLS regressions, additional controls, dependent variable: fraction of Yugoslavs

	(1)	(2)	(3)
Ethnic fractionalisation	0.0537*** (0.008)	0.0578*** (0.008)	0.0567*** (0.008)
Communist Party members	0.1630*** (0.058)		0.0985 (0.083)
WWII partisan veterans		0.0088 (0.015)	-0.0176 (0.021)
Output p.c.			-0.0002 (0.000)
Population density			-0.0000 (0.000)
Avg. years of schooling			0.0071*** (0.002)
Social sector labour			0.0019 (0.001)
Partisan-controlled territories			0.0011 (0.004)
Partisan war crimes			-0.0003 (0.004)
Public goods exp. p.c.			-0.0036* (0.002)
Federal aid			0.0019 (0.002)
1980's generation			-0.0371 (0.051)
Army presence p.c.			0.0004 (0.001)
Observations	102	102	102
R-squared	0.529	0.504	0.606

Notes: The analysis is restricted to Croatia because the data on Communist Party members and WWII partisan veterans is unavailable for other regions. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

fractionalisation and the fraction of Yugoslavs.<sup>15</sup> There are three reasons why this relationship should not be interpreted as casual. First, there is a problem of reverse causality: Yugoslavs might have conglomerated to ethnically diverse areas, which tend to be more multicultural and tolerant. Second, even though I control for a range of factors, there are omitted factors that are correlated with both ethnic fractionalisation and Yugoslav identification like, perhaps, exposure to the idea of Yugoslav identity. These problems should positively bias the OLS estimates. Third, if ethnic fractionalisation index is noisy, and does not correspond well to ethnic diversity and interethnic contact, then the OLS estimates might be negatively biased. For instance, ethnic fractionalisation index will underestimate the impact of ethnic diversity if municipalities were ethnically segregated. To address these problems,

<sup>15</sup>In appendix 4.A.3 I experiment with ethnic polarisation as an alternative measure of ethnic diversity, and as an additional control. With the inclusion of ethnic polarisation, the positive association between ethnic fractionalisation and Yugoslav sentiment is almost three times as large. It seems likely that, if ethnic polarisation is not controlled for, the positive association between ethnic fractionalisation and Yugoslav identification in table 4.1 is a lower-bound estimate.

a plausible instrument for ethnic diversity is required. The instrument should be associated with the variation in ethnic diversity. It should have no direct impact on Yugoslav sentiment. I use state changes as a plausible source of exogenous variation in ethnic diversity.

## 4.5 IV analysis: Yugoslav identity and ethnic diversity

### 4.5.1 Background: State changes

There is a great deal of variation among Yugoslav municipalities concerning state changes. Areas of former Yugoslavia were previously divided by the Bosnian, Hungarian, Habsburg, Italian, Napoleonic, Ottoman, Serbian, and Venetian rule. Scholars studying the region argue that state changes caused shocks to the ethnic composition of communities, primarily because they affected ethnic migration patterns (Valentić, 1990; Žerjavić, 1993; Jurković, 2005; Dugački, 2009). Of course, until the 19th century, ethnicities in the modern sense did not exist in the area of former Yugoslavia (Wachtel, 1998). However, state changes affected religious and linguistic diversity. State changes implicitly affected ethnic diversity because ethnic identities emerged along religious and/or linguistic lines. Thus, for instance, the correlation coefficient between ethnic and religious fractionalisation index in Yugoslavia was 0.87.

Consider some historical examples as (anecdotal) evidence. Because of the Ottoman invasion of modern-day Croatia during the 16th century, a significant fraction of the local population fled to modern-day Austria and Italy (Valentić, 1990). The emigrants were Slavic Catholics that today are considered to be Croats. The descendants of these emigrants still maintain a strong Croatian identity. They are known as *Burgenland* Croats in Austria, and as *Molise* Croats in Italy. Following Habsburg's reconquest of eastern Croatia from the Ottoman Empire in the 17th century, the Habsburgs established a military border as a bulwark against the Ottoman Empire. They colonised the area with Orthodox Christians (now Serbs) from the area of modern-day Bosnia. The immigrants were offered some economic freedoms in exchange for service in the Imperial Army (Rothenberg, 1966). Furthermore, the landlords of some of the reconquered areas invited ethnicities from other parts of the Habsburg Empire to reinvigorate the depopulated areas, like Czech and German speakers (Dugački, 2009).

To take another example, the recurrent wars between Venice and the Habsburg Empire led to frequent border changes in Istria and Dalmatia. Žerjavić (1993) argues that both the Venetians and the Habsburgs attempted to inhabit the depopulated villages and towns with new people. He reports that both rulers attempted to attract migrants by offering land, and fiscal and labour allowances. Naturally, under the Venetian rule, the migrants came from modern-day Italy. Under the Habsburg rule, the migrants came from various parts of the multi-ethnic Habsburg Empire.

As a final example, consider Bosnia-Herzegovina. Before Ottoman invasions, it was inhabited by Slavic Catholics (now Croats) and Slavic Orthodox Christians (now Serbs). The long Ottoman rule of Bosnia-Herzegovina (from mid-15th to late 19th century) stimulated a large fraction of the local Slavs to convert to Islam (Lampe, 2000). The converts eventually formed a distinct Bosniak identity, causing a change in the ethnic diversity of the region.

The aforementioned historical episodes depict examples where state changes caused positive shocks to the ethnic composition of communities. Although I expect the relationship between state changes and ethnic diversity to be overall positive, I do not imply by the above selection of examples that this relationship should necessarily be positive across time and space: it could be negative in some sub-periods or regions. The rationale of the instrument rests on the observation that state changes caused a change in ethnic diversity, whether positive or negative. For instance, a sizeable Ottoman Muslim population fled Serbia as the country gained independence from the Ottoman Empire in the 19th century (Pavlović, 2015). Consider another example, during WWII, Jews were largely exterminated, while the Italian and German minorities were pressured to leave Yugoslavia following the end of hostilities. In these particular cases, state changes are thus negatively associated with ethnic diversity. Nevertheless, even areas characterised by such cases should on average depict a positive relationship between state changes and ethnic diversity over a longer period as long as the negative shocks to ethnic diversity were insufficiently strong. For example, although Istria in modern-day Croatia and Slovenia was once characterised by a much larger fraction of Italians given its history of being part of the Venetian Republic and Kingdom of Italy, it remains highly ethnically diverse as not all Italians fled to Italy after WWII.

The exclusion restriction that the 2SLS regressions rely upon is that, conditional on the included controls, state changes had no effect on Yugoslav identification other than through their impact on ethnic diversity. There are two plausible problems concerning the validity of the instrument. First, it is natural to wonder whether state changes were endogenous to ethnic diversity. For instance, the Adriatic city of Rijeka in modern-day Croatia became a Free State of Fiume in the aftermath of WWI. Due to its ethnic diversity, but also strategic location, various neighbouring powers laid ownership claims on Rijeka. Given the political standstill, the League of Nations promoted Rijeka to a status of an independent state, as a sort of a compromise solution. The independent status of Rijeka was short-lived. It was formally annexed by Italy in 1924.

To improve the plausibility of the instrumental variable approach, I measure state changes during 1421-1878. The starting year is taken before the Ottoman invasion of the West Balkans. The end year is chosen in order to include the Habsburg occupation of Bosnia-Herzegovina. Since national and ethnic identities are modern phenomena (Gellner, 1983; Hobsbawm, 1991), it is unlikely that state changes

were endogenous to ethnic diversity during the premodern and early modern era. Note, however, that, in an econometric sense, the instrument finishes effectively with 1816, which marks the end of Napoleonic rule of some areas. The instrument's end year is effectively 1816 because the econometric exercises exploit within regional variation of variables, given the inclusion of regional dummy variables. Within regional variation in state changes is unaffected because Bosnia's whole modern-day territory was occupied by the Austro-Hungarian Empire in 1878, while other regions were not characterised by any state changes during 1816-1878.

Moreover, it is unlikely that premodern and early moderns state changes were endogenous to some cultural, religious or linguistic factors along which ethnic identities subsequently formed. The three most important political entities driving the variation of state changes - the Habsburg and the Ottoman Empire, and the Venetian Republic - were all multicultural and multi-ethnic expansionist empires. Historians argue that these empires were not conquering areas according to some religious or linguistic criteria. [Murphey \(1996\)](#) argues that Ottoman conquests were largely driven by material factors because soldiers and their commanders were entitled to booty. The material factor seems especially important in the Balkans. The largely autonomous *Bosnia Eyalet* led westward Ottoman conquests. It relied on irregular forces and mercenaries, which were particularly motivated by the prospect of booty. Venetian conquests were driven by economic considerations, too. The Venetians targeted strategic coastal areas in order to protect their naval trade routes ([Lane, 1973](#)).

A second problem with the instrument is that it is impossible to completely rule out the possibility that state changes had a direct impact on Yugoslav identification. To test this possibility, section [4.5.3](#) controls for a range of factors that may be correlated with both state changes and Yugoslav sentiment.

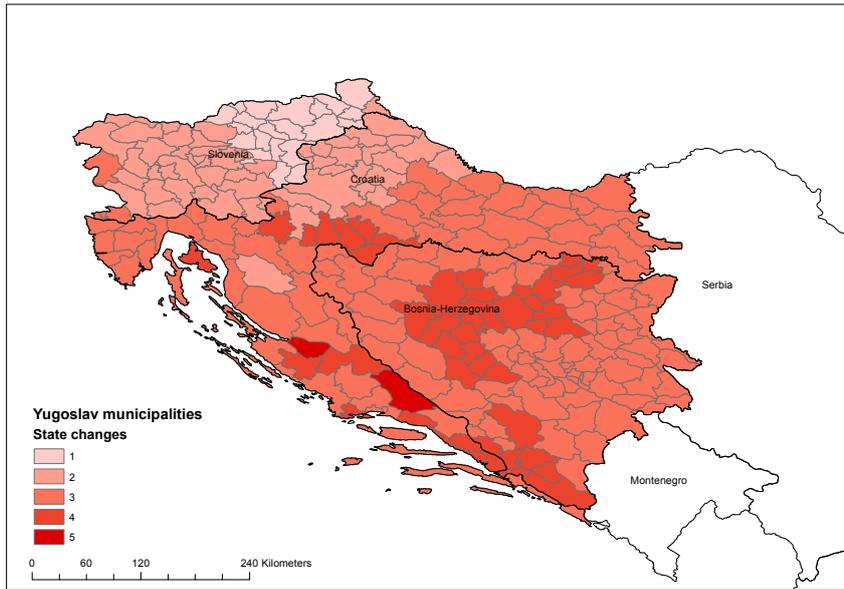
The instrument, state changes, is defined as the amount of political entities a municipality had belonged to between 1421 and 1878. The instrument is derived from the *Povijesni Atlas Hrvatske* (Historical Atlas of Croatia) ([Regan and Kaniški, 2003](#)). The atlas provides 250 maps depicting the historical development of Croatia and surrounding areas (including Bosnia-Herzegovina and Slovenia). I have identified state changes for 273 municipalities over approximately 30 maps. Figure [4.2](#) depicts state changes among Yugoslav municipalities. Figure [4.3](#) plots the (OLS) relationship between ethnic fractionalisation and state changes. The relationship is overall positive as expected.

## 4.5.2 IV estimation results

Table [4.3](#) shows the results of the two-stage least square (2SLS) estimates of equation [4.9](#). I treat ethnic fractionalisation,  $e_i$ , as endogenous, and estimate the following equation:

$$e_i = \lambda + \zeta s_i + \eta X_i + \nu_i \tag{4.10}$$

Figure 4.2: The amount of state changes in Yugoslav municipalities, 1421-1878

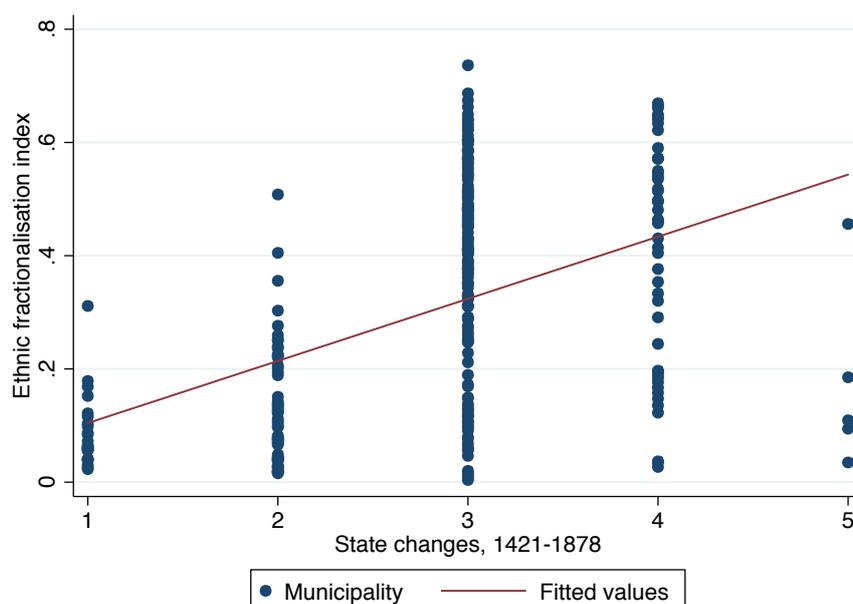


where  $s_i$  is state changes during 1421-1878. The exclusion restriction is that  $s_i$  does not appear in equation 4.9. In the IV analysis presented in table 4.3, panel A presents the first stage estimate of  $\zeta$ , the coefficient on state changes in equation 4.10. Panel B presents the second stage estimate of  $\beta$ , the coefficient on ethnic fractionalisation in equation 4.9. In column 1, I include all the controls as in table 4.1. To reduce notational clutter, I do not show the coefficient estimates of controls. The first stage estimate suggests that an additional state change leads to an increase in the ethnic fractionalisation index by 0.036 units. The impact is statistically significant at the 1 per cent level. It is also economically substantial, given that the mean ethnic fractionalisation index was 0.3. The 2SLS estimate of the impact of ethnic fractionalisation on the fraction of Yugoslavs is 0.124.<sup>16</sup> The impact is significant at the 1 per cent level. The size of the coefficient implies that a unit increase in ethnic fractionalisation would have increased the amount of Yugoslavs by 5 times its actual size. To put it in percentage terms, the size of the coefficient implies that a 100 per cent increase in the average degree of ethnic diversity would have increased the average fraction of Yugoslavs by about 160 per cent.

In column 2 of table 4.3, I use two additional controls (Communist party members and WWII partisan veterans), and restrict the analysis to Croatia. The coefficient on ethnic diversity is lower, but remains statistically significant.

<sup>16</sup>The 2SLS coefficient on ethnic diversity is about twice as high as the corresponding OLS estimate in column 13 of table 4.1. This suggests that the problem of measuring ethnic diversity dominates the issue of reverse causality and/or omitted factors.

Figure 4.3: (OLS) Relationship between ethnic fractionalisation and state changes



Note: The correlation coefficient between ethnic fractionalisation and state changes is 0.46.

### 4.5.3 Robustness

The results presented in table 4.3 are contingent on the validity of the exclusion restriction. If other factors correlated with state changes affect identification with the nation, then the validity of the exclusion restriction is called into question. To address possible endogeneity concerns, I test whether ethnic diversity has comparable effects on Yugoslav identification upon accounting for a large set of factors that may be correlated with both state changes and Yugoslav sentiment. While this exercise cannot totally rule out endogeneity concerns, the key results are robust to the inclusion of additional controls.

Sekulić (2004) argues that minorities used Yugoslav identification to uplift them from their minority status. In column 1 of table 4.4, I control for the fraction of the Serb minority which is, of course, itself related to the amount of state changes. I explicitly focus on the Serb minority since Serbian nationalists, as mentioned in section 4.2, often made the argument that the increase of Yugoslavs in non-Serbia was due to the pressure on the Serb minority to reject their Serbian identity.<sup>17</sup> The coefficient on the Serb minority is insignificant. The coefficient on ethnic diversity remains robust. Conditional on ethnic diversity, there is no evidence that minorities were more inclined to identify with the Yugoslav nation.<sup>18</sup>

It may be that historical affiliation to a particular political entity had a direct impact on Yugoslav

<sup>17</sup>Another reason I use Serb minority is because Serbia is excluded from the analysis due to data limitations.

<sup>18</sup>I find the same result if I use the fraction of minorities, irrespective of their exact ethnicity.

Table 4.3: 2SLS regression analysis

	(1)	(2)
Panel A: first stage outcome - ethnic fractionalisation		
State changes, 1421-1878	0.0357 ***	0.0476***
	(0.008)	(0.014)
Communist Party members	No	Yes
WWII partisan veterans	No	Yes
Baseline controls	Yes	Yes
R-squared	0.443	0.320
Panel B: second stage outcome - fraction of Yugoslavs		
Ethnic fractionalisation	0.1245***	0.0779***
	(0.024)	(0.018)
Communist Party members	No	Yes
WWII partisan veterans	No	Yes
Baseline controls	Yes	Yes
Observations	273	102
Centered R-squared	0.482	0.556
Sanderson-Windmeijer first stage F-test	19.17***	10.87***

Notes: Baseline controls are output p.c, population density, average years of schooling, fraction of social sector employment, partisan-controlled territories during Nov. 1942, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

sentiment. [Becker, Boeckh, Hainz, and Woessmann \(2016\)](#) find that historical Habsburg affiliation improves current trust in local public services, and reduces corruption in courts and police. Furthermore, [Grosjean \(2011\)](#) finds that longer historical empire affiliation improves cultural integration in Central, Eastern, and South Eastern Europe. The historical memory of belonging to the multi-ethnic and multicultural Habsburg and Ottoman Empires might have made people more susceptible to identify with the multi-ethnic and multicultural Yugoslav nation. Column 1 of table 4.4 adds duration of Habsburg rule, while column 2 controls for the duration of Ottoman rule. The two variables are correlated to the instrument and each other. The key finding for ethnic diversity remains robust in both columns.

Table 4.4: Robustness checks for the 2SLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: first stage outcome - ethnic fractionalisation									
State changes, 1421-1878	0.0317*** (0.009)	0.0343*** (0.008)	0.0346*** (0.008)	0.0357*** (0.008)	0.0355*** (0.008)	0.0358*** (0.008)	0.0164** (0.006)	0.0286*** (0.008)	0.0148** (0.007)
Serb minority	0.0771 (0.066)								0.0419 (0.044)
Duration of Habsburg rule		-0.0002* (0.000)							-0.0001 (0.000)
Duration of Ottoman rule			0.0002 (0.000)						0.0001 (0.000)
Capital				0.0079 (0.035)					-0.0303 (0.030)
Agricultural (wheat) suitability					-0.0000*** (0.000)				-0.0000*** (0.000)
Coast						-0.0270 (0.042)			-0.1043*** (0.037)
Ethnic fractionalisation of neighbours							0.9463*** (0.076)		1.0756*** (0.082)
Yugoslav neighbours								3.4044*** (0.809)	-1.8715*** (0.674)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.449	0.451	0.447	0.443	0.445	0.445	0.690	0.485	0.714
Panel B: second stage outcome - fraction of Yugoslavs									
Ethnic fractionalisation	0.1206*** (0.028)	0.1324*** (0.026)	0.1246*** (0.025)	0.1231*** (0.023)	0.1263*** (0.024)	0.1263*** (0.023)	0.2183*** (0.073)	0.1057*** (0.028)	0.1495*** (0.052)
Serb minority	0.0027 (0.007)								0.0068 (0.006)
Duration of Habsburg rule		0.0000*** (0.000)							0.0000 (0.000)
Duration of Ottoman rule			-0.0000 (0.000)						-0.0000 (0.000)
Capital				-0.0103 (0.009)					-0.0164** (0.007)
Agricultural (wheat) suitability					0.0000*** (0.000)				0.0000** (0.000)
Coast						-0.0137*** (0.005)			-0.0005 (0.007)
Ethnic fractionalisation of neighbours							-0.1642** (0.079)		-0.1563*** (0.059)
Yugoslav neighbours								0.3231** (0.136)	0.9579*** (0.130)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	273	273	273	273	273	273	274	275	273
Centered R-squared	0.502	0.459	0.482	0.493	0.482	0.491	0.162	0.586	0.637
Sanderson-Windmeijer first stage F-test	12.67***	17.63***	17.81***	19.07***	18.86***	19.13***	6.37**	12.80***	4.66**

Notes: Baseline controls are output p.c., population density, average years of schooling, fraction of social sector employment, partisan-controlled territories during Nov. 1942, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Strategically and economically valuable areas - like regional capitals, areas with high agricultural suitability, and coastal areas - are naturally prone to military operations (Keegan, 1993). Such areas might have an advantage in trade and income generation (for coastal areas see Redding and Venables (2004)), perhaps exposing them to a greater degree of interethnic contact, and affecting Yugoslav identification. Columns 3, 4, and 5 control for strategically and economically important areas. Respectively, I control for regional capital's, agricultural (wheat) suitability, and coastal areas.<sup>19</sup> The coefficient on ethnic fractionalisation remains robust.

Neglecting spatially correlated outcomes can lead to biased regression results (for overviews, see Gibbons and Overman (2012) and Gibbons, Overman, and Patacchini (2015)). In column 7 I control for spatial lag - the mean ethnic fractionalisation of neighbouring municipalities. State changes, ethnic fractionalisation, and the spatial lag, are all highly correlated. The coefficient on spatial lag is negative and statistically significant, but ethnic fractionalisation coefficient remains robust. In column 8 I control for spatial autocorrelation - the mean fraction of Yugoslavs in neighbouring municipalities. The coefficient on spatial autocorrelation is positive and statistically significant. The coefficient on ethnic diversity remains important.

Finally, in column 9, I include all the previously considered controls. The coefficient on ethnic diversity increases to 0.15, and remains statistically significant at a 1 per cent level. The addition of new controls cannot completely exclude the possibility of endogeneity. However, the inclusion of new controls reinforces the claim that premodern and early modern state changes are plausibly exogenous.

As a final robustness check, in table 4.5 I experiment with religious fractionalisation. Although it seems highly unlikely (section 4.5.1), it might be the case that political entities conquered areas according to some religious criteria. Religious diversity might have in turn stimulated people to identify with the multi-cultural Yugoslav nation. Column 1 shows that the coefficient on ethnic fractionalisation loses statistical significance upon the inclusion of religious fractionalisation, whose coefficient is statistically insignificant as well. These results are expected. Religious and ethnic diversity in Yugoslavia was highly correlated (0.87), and column 1 estimation thus suffers from multicollinearity. In a way, religious diversity can be understood as a very good proxy for ethnic diversity in Yugoslavia, or vice versa, since the two types of diversity are largely indistinguishable. As stated in section 4.5.1, ethnic identities in Yugoslavia emerged along religious and linguistic cleavages.

To examine the above made claims on ethnic and religious diversity, in columns 2 (including baseline controls) and 3 (including baseline and robustness controls) of table 4.5, I substitute religious diversity for ethnic diversity. Religious diversity is instrumented by state changes, just like ethnic diversity was before. The coefficient on religious fractionalisation in columns 2 and 3 is almost identical to the

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<sup>19</sup>I use wheat suitability since it was the main taxable cash-crop in the area, and thus a more attractive target for conquest. Also, areas that are suitable for wheat cultivation tend to be more flat, and hence easier to conquer.

Table 4.5: Additional robustness checks, religious fractionalisation and the 2SLS regressions

	(1)	(2)	(3)
	Dependent variable: Ethnic fractionalisation	Dependent variable: Religious fractionalisation	Dependent variable: Religious fractionalisation
Panel B: first stage outcome			
State changes, 1421-1878	0.0051 (0.004)	0.0376*** (0.008)	0.0197** (0.008)
Religious fractionalisation	0.8129*** (0.051)		
Robustness controls	No	No	Yes
Baseline controls	Yes	Yes	Yes
R-squared	0.787	0.479	0.620
Panel B: second stage outcome - fraction of Yugoslavs			
Ethnic fractionalisation	0.5106 (0.387)		
Religious fractionalisation	-0.3661 (0.328)	0.1181*** (0.021)	0.1124*** (0.037)
Robustness controls	No	No	Yes
Baseline controls	Yes	Yes	Yes
Observations	273	273	273
R-squared	-2.221	0.527	0.653
Sanderson-Windmeijer first stage F-test	1.63	20.47***	6.25**

Notes: Baseline controls are output p.c., population density, average years of schooling, fraction of social sector employment, sites of WWII partisan military operations, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robustness controls are identical to those considered in this section, summed in column 9 of table 4.4. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

corresponding coefficient on ethnic fractionalisation in tables 4.3 and 4.4.<sup>20</sup> Although it is not possible to exclude the possibility that religious diversity had a direct impact on Yugoslav identification, I interpret this finding to mean that religious and ethnic diversity was indeed to a large extent one and the same in Yugoslavia.<sup>21</sup>

## 4.6 Channel: Intermarriage

This section isolates a channel through which ethnic diversity had an impact on Yugoslav self-identification. Sociologists have long perceived intermarriage as a central issue in ethnic relations. Ethnic intermarriage matters for two reasons. First, it weakens the delineation of ethnic boundaries, and thereby decreases the salience of ethnic identities (Davis, 1991; Qian and Lichter, 2007). Second, intermarried individuals, and especially their children, are less likely to identify with a single ethnicity (Waters, 1990; Xie and Goyette, 1997). Both of these two factors suggest that identification with the more hybrid Yugoslav identity provided an alternative to forcing a single ethnic choice to intermarried

<sup>20</sup>Note that there is a difference between the size of the coefficient on ethnic fractionalisation in column 9 of table 4.4 and the corresponding coefficient on religious diversity in column 3 of table 4.5. This, however, is driven by the robustness control of mean ethnic diversity of neighbouring municipalities (spatial lag). If I replace that variable by mean religious diversity of neighbouring municipalities in table 4.5, I find that the coefficients on ethnic and religious diversity are largely identical.

<sup>21</sup>I find identical results if I experiment with linguistic diversity instead of religious diversity. These results, however, are based on a sample that excludes Slovenia. Slovenian statistical office did not publish data on linguistic diversity.

individuals and their children.

In table 4.6 I test whether the relationship between ethnic diversity and Yugoslav feeling operated through the channel of intermarriage. I use 2SLS regression analysis and treat ethnic fractionalisation as exogenous to the incidence of intermarriage (ratio of intermarried people to total married people). Panel A reports the first stage estimate of the impact of ethnic fractionalisation on the incidence of intermarriage. In column 1, ethnic fractionalisation has a positive and a statistically significant impact on intermarriage. Intuitively, all else given, higher ethnic diversity increased the incidence of intermarriage through increasing the amount of possible interethnic matches. Ethnic diversity likely served as a supply-side constraint, although it is possible it also changed preferences towards exogamy.

In panel B, the size of the coefficient on intermarriage implies that if every individual had intermarried, half of the population would have adopted a Yugoslav identity. Of course, it is questionable whether ethnic diversity is exogenous to the incidence of intermarriage. In appendix 4.A.4 I use three-stage least square (3SLS) regression analysis, and instrument ethnic diversity with state changes. The results remain robust.

Furthermore, it could also be the case that ethnic diversity had a direct impact on Yugoslav identification. Ethnic diversity effects could have operated through channels I do not control for. I test this possibility in column 2, albeit imperfectly, by including spatial lag as a proxy for alternative ethnic diversity effects. The rationale for using spatial lag is that the correlation coefficient between ethnic fractionalisation and the mean ethnic fractionalisation of neighbouring municipalities is high (0.8). The coefficient on intermarriage remains robust, while the coefficient on spatial lag is insignificant. Results presented in column 2 thus suggest that intermarriage is the key channel connecting ethnic diversity and national feeling.

Is it the intermarried individuals that were prone to identify with the Yugoslav nation, or rather their children? Sociologists tend to focus on the children of intermarried individuals as being particularly inclined to reject a single ethnic category and opt for the wider national category, if it is available (Xie and Goyette, 1997). The data allows me to distinguish between intermarried couples with children and without children. In appendix 4.A.4, I replicate table 4.6 with both types of intermarried couples, I find that their associated coefficients are almost identical. This suggests that intermarried individuals were *per se* inclined to identify with the Yugoslav nation.

#### 4.6.1 Measurement issues

There are three potential measurement issues that go against my results. The first issue is whether Yugoslav category in the population census was a residual category. It might be the case that unrecognised and/or stigmatised minorities, like Roma or Jews, choose Yugoslav identification out of

Table 4.6: 2SLS regression analysis, testing the intermarriage channel

	(1)	(2)
Panel A: first stage outcome - intermarriage		
Ethnic fractionalisation	0.1056*** (0.025)	0.0844*** (0.030)
Ethnic fractionalisation of neighbours		0.0450 (0.043)
Baseline controls	Yes	Yes
R-squared	0.700	0.704
Panel B: second stage outcome - fraction of Yugoslavs		
Intermarriage	0.5159*** (0.039)	0.4587*** (0.085)
Ethnic fractionalisation of neighbours		0.0128 (0.014)
Baseline controls	Yes	Yes
Observations	109	109
Centered R-squared	0.920	0.921
Sanderson-Windmeijer first stage F-test	18.28***	7.89***

Notes: The analysis is restricted to Bosnia-Herzegovina since the intermarriage data is unavailable for other regions. Controls are output p.c., population density, average years of schooling, fraction of social sector employment, partisan-controlled territories during Nov. 1942, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

sheer necessity or in order to avoid stigmatisation. If so, Yugoslav identification, as measured by the population census, would not reflect genuine identification with the Yugoslav nation. This, however, seems very unlikely for two reasons. First, it is unclear why to a, say, Slovenian Jew, saying “Yugoslav” to the nationality question of the census taker would have been more convenient to, for example, avoid stigmatisation, than saying “Slovenian”. Second, the Yugoslav population census was egalitarian and inclusive (Markowitz, 2007). Census takers were obliged to accept a wide range of potential answers for the nationality question of the census, including some that were only remotely related to ethnic identity. The population census reported 25 “ethnic” categories, including Jews, Roma, and “others”. It even reported regional identification as legitimate ethnic identification, e.g. Dalmatian.

The second issue is whether Yugoslav identification reflected ignorance and confusion. In light of intermarriage serving as a key channel through which ethnic diversity had an impact on Yugoslav sentiment, it might be argued that, for instance, people of mixed ethnic background opted for Yugoslav identification to denote their mixed background, rather than to express identification with the Yugoslav

nation. This, however, is very unlikely for two reasons. First, schooling is positively correlated with Yugoslav feeling (see tables 4.1 and 4.2). It is unlikely that people that identified themselves as Yugoslav were ignorant of the connotations of Yugoslav identity. Second, the population census allowed people to choose the “nationally undeclared” category. This category might have been a more obvious choice to people who wished to denote their mixed ethnic background, without choosing a specific identity category, alongside the associated connotations.

Finally, and perhaps most importantly, it is natural to wonder whether Yugoslav identity was based on substantive ideals and norms. If not, it might be the case that people that identified themselves as Yugoslavs have done so for reasons that were detached from expressing identification with the Yugoslav nation. Similar to any other national identity, it is indeed difficult to establish what Yugoslav feeling meant, what norms and ideals it involved. Yugoslav identity was weakly defined. It was open to a variety of interpretations (Djokić, 2003). However, this does not mean that Yugoslav identity was an “empty” identity category. On the contrary, it was infused with content, as I demonstrate in the introduction to the thesis.

## 4.7 Yugoslav identity and the Bosnian War of 1992-1995

In this section, I examine the economic significance of Yugoslav identification. The causes and economic consequences of civil conflict are extensively researched (see Blattman and Miguel (2010) for a literature survey). Recent research argues that ethnic divisions increase the incidence of civil wars (Montalvo and Reynal-Querol, 2005b,a; Esteban, Mayoral, and Ray, 2012). The corollary is that identification with a nation should reduce the likelihood and intensity of civil war. In order to examine this corollary, I analyse the noncasual relationship between Yugoslav identification and the intensity of conflict during the Bosnian War of 1992-1995.

The results are presented in table 4.7. The dependent variable is the ratio of war casualties to the population. The controls follow the specification of Montalvo and Reynal-Querol (2005b). Output per capita is included as a proxy for the opportunity cost of engaging in conflict. Population is included as a proxy for the number of soldiers that can be recruited. Expenditure on public goods p.c. is included as a proxy for the benefits of conflict, since it indicates possible revenue extraction. Population density is included as a proxy for terrain roughness. Such terrain can provide a safe heaven for military factions in hostile territory. The fraction of labour employed in labour-managed firms is included as a proxy for local (work-place) democracy. Finally, I control for the Yugoslav National Army presence per capita, which was “hijacked” by the Serbian military forces.

The first column shows that municipalities characterised by a larger fraction of self-declared Yugoslavs were characterised by a lower intensity of conflict. The effect is statistically significant at the

Table 4.7: OLS regressions, Yugoslav identity and civil war in Bosnia-Herzegovina (1992-1995), dependent variable: population share of war casualties

	(1)	(2)	(3)	(4)
Fraction of Yugoslavs	-0.2786** (0.117)	-0.3891*** (0.115)	-0.3387*** (0.112)	-0.2018** (0.078)
Ethnic fractionalisation		0.0467*** (0.009)		-0.0975** (0.039)
Ethnic polarisation			0.0359*** (0.006)	0.0918*** (0.025)
Controls	Yes	Yes	Yes	Yes
Observations	109	109	109	109
R-squared	0.084	0.164	0.214	0.248

Notes: See text for controls. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

1 per cent level. Even though this relationship is noncasual, it is plausible that people that identified with the wider nation were less likely to be an object and subject of an ethnic-based conflict.

Montalvo and Reynal-Querol (2005b,a) argue that the ethnic polarisation index is a better measure of potential conflict in an ethnically fragmented society than the ethnic fractionalisation index.<sup>22</sup> In columns 2, 3, and 4, I examine the significance of these two measures of ethnic diversity. In column 2, I include the ethnic fractionalisation index. The coefficient on the fraction of Yugoslavs remains negative, while the coefficient on ethnic fractionalisation is positive. Both variables are statistically significant. In column 3, instead of ethnic fractionalisation, I include the ethnic polarisation index. The results are similar to those in column 2. Finally, in column 4, I include both the ethnic fractionalisation and the ethnic polarisation index. The coefficient on the fraction of Yugoslavs decreases compared to previous estimations, but remains negative. Now, the coefficient on ethnic fractionalisation is negative, while the coefficient on ethnic polarisation is positive, while both are statistically significant. Thus, even when conditioned by ethnic fractionalisation and ethnic polarisation, Yugoslav identification remains negatively correlated with the intensity of conflict. That ethnic polarisation rather than ethnic fractionalisation is positively associated with the incidence of conflict mirrors the result of Montalvo and Reynal-Querol (2005b,a).

## 4.8 Concluding remarks

This paper isolates the impact of ethnic diversity on identification with the Yugoslav nation. I find that ethnically diverse municipalities were conducive towards the formation of Yugoslav identity because

<sup>22</sup>Ethnic polarisation index measures how far a population distribution is from a bipolar ethnic distribution. It is formally defined in appendix 4.A.3.

they stimulated ethnic intermarriage. Intermarried individuals, and their children, opted for the more hybrid Yugoslav identity that provided an alternative to forcing a single choice to people with conflicting ethnic identities.

Did the formation of Yugoslav identity have any economic significance? Aligned with the notion that nation-building can reduce the incidence of ethnic conflict, I find that municipalities that were characterised by a larger fraction of people that felt Yugoslav experienced a lower population fraction of deaths during the Bosnian War of 1992-1995. Ultimately, there were not enough Yugoslavs to preserve the country, and avoid the civil war.

Ethnic diversity matters. However, nation-building policies matter as well, and probably much more. Such policies were not attempted in Yugoslavia. The overwhelming fraction of population could not identify with a Yugoslav nation. The formation of Yugoslav identity was a failure.

It is natural to ponder whether the findings of this article can inform policy-making. They can. The recent influx of refugees and migrants into Europe that began in 2015 has renewed the perennial concerns about the integration of migrants into the national cultures of their hosts. To mitigate the risk of ethnic tension and conflict, the empirical results of the article imply a role for policy. One such policy is the promotion of ethnic intermarriage. The surest path to a world without ethnic hatred and conflict is a world without ethnicities.

## 4.A Appendix

### 4.A.1 Data

**Population and ethnic diversity** - Population and ethnicity data for municipalities is taken from the 1991 population census books of the successor states of Yugoslavia. For Bosnia-Herzegovina: *Popis Stanovništva 1991: Nacionalni Sastav Stanovništva po Naseljenim Mjestima* (Federalni Zavod za Statistiku, 1998a). For Croatia: *Popis Stanovništva 1991: Stanovništvo Prema Narodnosti po Naseljima* (Državni Zavod za Statistiku, 1992a). For Slovenia: *Popis Prebivalstva 1991: Prebivalstvo po Narodnostni Pripadnosti* (Statistični Urad Republike Slovenije, 1994b).

**Religious diversity** - Data on religious structure of municipalities is taken from the 1991 population census books of the successor states of Yugoslavia. For Bosnia-Herzegovina: *Popis Stanovništva 1991: Etnička Obilježlja Stanovništva, Rezultati za Republiku i po Opštinama* (Federalni Zavod za Statistiku, 1993). For Croatia: *Popis Stanovništva 1991: Stanovništvo Prema Vjeroispovijesti i Materinskom Jeziku, po Naseljima* (Državni Zavod za Statistiku, 1993). For Slovenia: *Popis Prebivalstva 1991: Prebivalstvo po Veroizpovedi* (Statistični Urad Republike Slovenije, 1994d).

**Output p.c.** - Municipality output data is taken from the 1991 Yugoslav Statistical Yearbook: *Statistički Godišnjak SFR Jugoslavije 1991* (Savezni Zavod za Statistiku, 1991). Output data is reported for 1989. The successor states of Yugoslavia had stopped estimating output at municipal level afterwards. Thus, the final year for which output has been estimated is the year 1989. As in other socialist countries, Yugoslav statisticians excluded some services from the value of output - education, healthcare, and housing. Output is normalised by the 1991 population.

**Population density** - Population density of municipalities is constructed by dividing population by the administrative area ( $km^2$ ). Data on administrative areas is taken from the *Statistički Godišnjak SFR Jugoslavije 1991* (Savezni Zavod za Statistiku, 1991).

**Average years of schooling** - Educational attainment for each municipality is estimated for the population aged 15 and above. Average years of schooling for the population of each municipality is constructed from the 1991 population census books of the successor states of Yugoslavia. For Bosnia-Herzegovina: *Popis Stanovništva 1991: Usporedni Podaci 1971, 1981, 1991* (Federalni Zavod za Statistiku, 1998c). For Croatia: *Popis Stanovništva 1991: Stanovništvo Prema Školskoj Spremi, Pismenosti i Spolu po Naseljima* (Državni Zavod za Statistiku, 1992b). For Slovenia: *Popis Prebivalstva 1991: Prebivalstvo, Staro 15 Let ali vec, po Spolu, Izobrazbi in Pismenosti* (Statistični Urad Republike Slovenije, 1994e).

**Social sector labour** - Municipality data for social sector employment as a fraction of total labour is taken from the 1991 population census books of the successor states of Yugoslavia. For

Bosnia-Herzegovina: *Popis Stanovništva 1991: Uporedni Podaci 1971, 1981, 1991* (Federalni Zavod za Statistiku, 1998c). For Croatia: *Popis Stanovništva 1991: Aktivno Stanovništvo u Zemlji koje Obavlja Zanimanje, Prema Području Djelatnosti, po Naseljima* (Državni Zavod za Statistiku, 1994a). For Slovenia: *Popis Prebivalstva 1991: Aktivno Prebivalstvo, ki Pravlja Poklic, po Dejavnosti (brez Oseb, ki Delajo v Tujini in Družinskih Članov, ki z Njimi Živijo v Tujini)* (Statistični Urad Republike Slovenije, 1994a).

**WWII Partisan-controlled territories** - In order to examine the effect of exposure to the revolutionary partisan struggle, I include Partisan controlled municipalities during the first session of the Anti-Fascist Council for the National Liberation of Yugoslavia (AVNOJ) (dummy variable). The partisan leaders of Yugoslavia convened the first AVNOJ meeting on November 1942, and laid the foundation for the postwar Socialist Yugoslavia in that session. The data on municipalities controlled by the partisans during November 1942 is taken from the *Istorijski Atlas Oslobodilačkog Rata Naroda Jugoslavije* (Geografski Institut JNA, 1952).

**Partisan war crimes** - This is a dummy variable capturing whether a municipality was a site of partisan executions, or containing the mass graves, of the Croatian fascist collaborators during their retreat towards the Austrian border in the summer of 1945. The data is taken from the *Hrvatski Povijesni Atlas* (Regan and Kaniški, 2003).

**Public goods exp. p.c.** - Expenditure on public goods includes education, healthcare and social care. Municipality data is taken from the *Statistički Godišnjak SFR Jugoslavije 1991* (Savezni Zavod za Statistiku, 1991) for 1989 (the last reported year). Expenditure on public goods is normalised by the 1991 population.

**Federal Aid** - This is a dummy variable capturing whether a municipality was a recipient of federal aid. I can determine whether a municipality was a recipient aid only until 1963. Afterwards, the statistical yearbooks, or other official publications, stopped reporting this information. The data on the 1963 recipients of federal aid is taken from the *Statistički Godišnjak SFR Jugoslavije 1964* (Savezni Zavod za Statistiku, 1964).

**1980's generation** - I define the early 1980s youth as the fraction of population in 1991 that was between 25 and 39 years. The data for municipalities is taken from the 1991 population census books of the successor states of Yugoslavia. For Bosnia-Herzegovina: *Popis Stanovništva 1991: Stanovništvo Prema Starosti i Spolu po Naseljenim Mjestima* (Federalni Zavod za Statistiku, 1998b). For Croatia: *Popis Stanovništva 1991: Stanovništvo Prema Spolu i Starosti, po Naseljima* (Državni Zavod za Statistiku, 1994b). For Slovenia: *Popis Prebivalstva 1991: Prebivalstvo po Starosti in Spolu* (Statistični Urad Republike Slovenije, 1994c).

**Army presence p.c.** - *Yugoslav National Army* presence in municipalities is measured for 1990.

It includes the amount of battalions, divisions, army headquarters, naval bases, airports, academies, training centres, and research facilities. The data is taken from [Dragoner](#) (online). Army presence is normalised by the 1991 population.

**Communist Party members** - I have gathered data on Communist Party members per municipality from the internal documentation of the [Centralni Komitet Saveza Komunističke Hrvatske](#) (Central Committee of the League of Communists of Croatia). The documentation can be accessed in the Croatian State Archives. The data comes from the membership reports that municipal branches of the Party were sending to their headquarters in Zagreb. The population fraction of Party's members is reported for 1962. I have not been able to access or find data for any later year. Municipality membership reports have been removed from the documentation of the later years. The amount of Party members is normalised by the 1961 population. Data on 1961 population at the level of municipalities is taken from the same internal documentation.

**WWII partisan veterans** - I have gathered data on partisan veterans per municipality from the internal documentation of the [Savez Udruženja Boraca Narodnooslobodilačkog Rata SR Hrvatske](#) (The Allied Association of the Fighters of the National Liberation War of SR Croatia) (SUBNORH) - the association of partisan veterans. I have accessed this documentation in the Croatian State Archives. SUBNORH had produced an internal report documenting their membership per municipal branches for 1970. It seems they did not produce any statistics on the membership of municipal branches for the later years. The number of partisan veterans is normalised by the 1971 population from the *Popis Stanovništva 1991: Stanovništvo Prema Narodnosti po Naseljima* ([Državni Zavod za Statistiku, 1992a](#)).

**Duration of Habsburg and Ottoman Rule** - Data on the duration of the historic affiliation of a municipality with a particular political entity is derived from [Regan and Kaniški \(2003\)](#).

**Agricultural (wheat) suitability** - Data on the land suitability for wheat production is taken from the [Food and Agriculture Organization](#) (FAO) of the United Nations. FAO provides a set of (ArcGIS) maps covering the agro-ecological environment at the global level. The maps provide a sufficiently high resolution to examine the average quality of land in the municipalities of Yugoslavia.

**Intermarriage** - Municipal data on the stock ratio of ethnic intermarriages to total marriages is taken from the 1991 population census of Bosnia-Herzegovina (*Popis Stanovništva 1991: Porodice u Republici Bosni i Hercegovini, Rezultati za Republiku i po Opštinama/Općinama*, [Federalni Zavod za Statistiku \(1994\)](#)). Unfortunately, other Yugoslav republics did not gather data on the stock of intermarriages at municipal level. The fraction of intermarried couples is multiplied by two in order to derive a fraction of intermarried people.

**War Casualties** - This variable is the amount of people that died in the area of a municipality during the Bosnian Civil War of 1992-1995. It is normalised by the 1991 population. These war

casualties did not necessarily hold permanent residence at the location of their death. In 2012, the nongovernmental organisation (NGO) *Istraživačko Dokumentacioni Centar Sarajevo* (Research and Documentation Center Sarajevo), with the assistance of other NGO's, published the Bosnian Book of the Dead (BBD) (Tokača, 2012). The book's four hardback volumes list almost 100,000 dead, civilian and military, by their name, their ethnicity, and when and where they died. In an early stage report before the findings were released, an international team of independent experts evaluated the project: "...the overall conclusion of our project is that the level of incompleteness and deficiency in the BBD Database is low and fairly acceptable. The database is a remarkable achievement of all those who have worked on this project" (Ball, Tabeau, and Verwimp (2007), p. 7).

#### 4.A.2 Alternative estimators: GLM and PPML

OLS estimates might not be appropriate for two reasons. First, the relationship between ethnic fractionalisation and Yugoslav self-identification is not necessarily monotonic. Second, my estimates predict negative values of the population share of Yugoslavs. Even though the aim of the analysis is to describe, rather than to forecast, this still creates an inconvenient problem. There are two estimators that can be employed to assess the extent to which these two problems might bias the OLS estimates. First, Papke and Wooldridge (1996) propose a quasi-likelihood general linear model (GLM) for regression models with a fractional dependent variable. The model is flexible in dealing with alternative functional forms. Second, the Poisson pseudo-maximum-likelihood (PPML) estimation technique can be used for regression models characterised by non-linearities, and that use a fractional dependent variable (Silva and Tenreyro, 2006).

This section report the GLM and PPML estimators that replicate the table 4.1, column 13 model. The GLM coefficient on ethnic diversity in column 1 of table 4.8 implies that a unit increase in ethnic fractionalisation is associated with an increase in the fraction of Yugoslavs by 0.0556 units. The PPML coefficient on ethnic diversity in column 2 of table 4.8 implies that a unit increase in ethnic fractionalisation is associated with an increase in the fraction of Yugoslavs by 0.0565 units. The alternative estimators imply marginal coefficients on ethnic diversity that are almost identical to the coefficient on ethnic diversity provided by the OLS estimator. As such, I prefer to use OLS throughout this paper because the interpretation of OLS coefficients is easier.

#### 4.A.3 Alternative measure of ethnic diversity: Ethnic polarisation

In table 4.9, I examine the impact of ethnic polarisation on Yugoslav sentiment. Ethnic polarisation measures how far the distribution of ethnic groups is from a bipolar distribution, which represents the highest level of polarisation. Following Montalvo and Reynal-Querol (2005b,a), ethnic polarisation,  $p$ ,

Table 4.8: GLM and PPML regressions, dependent variable: fraction of Yugoslavs

	(1)	(2)
	GLM	PPML
Ethnic fractionalisation	2.5011*** (0.260)	2.4209*** (0.253)
Output p.c.	-0.0007 (0.003)	-0.0009 (0.003)
Population density	0.0001 (0.000)	0.0001 (0.000)
Avg. years of schooling	0.3888*** (0.060)	0.3718*** (0.057)
Social sector labour	-0.0001 (0.000)	-0.0001 (0.000)
Partisan-controlled territories	-0.0255 (0.115)	-0.0241 (0.110)
Partisan war crimes	0.1715 (0.123)	0.1519 (0.120)
Public goods exp. p.c.	-0.0050 (0.005)	-0.0031 (0.005)
Federal aid	-0.0954 (0.089)	-0.0923 (0.086)
1980's generation	2.0203 (2.202)	2.0228 (2.150)
Army presence p.c.	-0.0089 (0.014)	-0.0089 (0.013)
Regions	Yes	Yes
Observations	273	273
R-squared	n.a.	0.722

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

is measured as an index:

$$p = 4 \sum_{i=1}^M s_i^2 (1 - s_i). \quad (4.11)$$

where  $s_i$  is the percentage share of an ethnicity in the population of municipality  $i$ . [Montalvo and Reynal-Querol \(2005b,a\)](#) argue that ethnic fractionalisation and ethnic polarisation are closely correlated, but not perfectly. They argue that ethnic polarisation index is a better theoretical and empirical measure of possible ethnic tensions than the ethnic fractionalisation index. Indeed, the literature that seeks to determine the impact of ethnicity on conflict tends to find that ethnic polarisation index dominates the effect of the ethnic fractionalisation index ([Montalvo and Reynal-Querol, 2005b,a](#); [Esteban, Mayoral, and Ray, 2012](#)). This finding suggests that individuals in ethnically polarised communities should be more inclined to identify with an ethnic category than individuals in ethnically diverse communities. If

Table 4.9: OLS regressions with ethnic polarisation, dependent variable: fraction of Yugoslavs

	(1)	(2)	(3)
Ethnic polarisation	0.0438*** (0.005)	-0.0787*** (0.022)	-0.0656*** (0.018)
Ethnic fractionalisation		0.1959*** (0.039)	0.1484*** (0.030)
Output p.c.			0.0001 (0.000)
Population density			0.0000*** (0.000)
Avg. years of schooling			0.0081*** (0.002)
Social sector labour			0.0001*** (0.000)
Partisan-controlled territories			0.0025 (0.003)
Partisan war crimes			0.0067* (0.004)
Public goods exp. p.c.			-0.0011*** (0.000)
Federal aid			-0.0001 (0.002)
1980's generation			-0.0086 (0.054)
Army presence p.c.			0.0006 (0.001)
Regions	No	No	Yes
Observations	273	273	273
R-squared	0.265	0.433	0.691

Robust standard errors in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

positive, the relationship between ethnic polarisation and Yugoslav sentiment should thus be weaker than the relationship between ethnic fractionalisation and Yugoslav sentiment.

This indeed seems to be the case. In column 1 of table 4.9, which excludes controls, the coefficient on ethnic polarisation is statistically significant, but of smaller size than the coefficient(s) on ethnic diversity in the baseline OLS table 4.1. Column 2 in table 4.9 adds ethnic fractionalisation. Now, the coefficient on ethnic polarisation is negative, while the magnitude of the coefficient on ethnic fractionalisation increases by more than two times as compared to the estimated coefficient(s) in table 4.1. Both coefficients are statistically significant, and economically substantial. In column 3 of table 4.9, I add all the covariates that were considered in table 4.1. The findings imply that individuals in ethnically polarised communities are less likely to have faith in a shared nation than individuals in ethnically diverse communities. Conditional on ethnic diversity, ethnically polarised communities seem to reinforce the salience of ethnic identities.

#### 4.A.4 Estimating the channel of intermarriage

It is natural to wonder whether ethnic diversity is truly exogenous to ethnic intermarriage. There might be a problem of reverse causality. Intermarriage might affect the degree of ethnic diversity if some ethnicities in Yugoslavia were more likely to intermarry and switch their ethnic identity. This would affect the relative proportion of any ethnicity in the population, and hence the value of the ethnic fractionalisation index.

I deal with this potential problem by using 3SLS regression analysis, where ethnic fractionalisation is instrumented by state changes, as in section 4.5. Table 4.10 present the results. In panel A, state changes have a positive and a statistically significant impact on ethnic fractionalisation at the five per cent level. In turn, in panel B, ethnic diversity has a positive and statistically significant impact on intermarriage, while intermarriage has a positive and a statistically significant impact on Yugoslav identification in panel C. The size of the coefficient is very similar the baseline 2SLS coefficient in section 4.6: if the whole population would have intermarried, about half of the population would have felt Yugoslav.

In table 4.11, I experiment with two categories of intermarried individuals - those with children and those without children. The aim is to asses whether it was intermarried individuals that were prone to identify with the Yugoslav nation, or rather their children. In column 1, I include only the intermarried people without children, while in column 2 I include only intermarried people with children. The size of the coefficient on two types of intermarried people is almost identical. While it is difficult to identify the impact of the two types of intermarried individuals, as areas characterised by a higher fraction of intermarried individuals with children were also characterised by a higher fraction of intermarried individuals without children, I interpret this finding to mean that intermarried individuals were *per se* inclined to feel Yugoslav.

Table 4.10: 3SLS regression analysis, testing the channel of intermarriage

(1)	
Panel A: first stage outcome - ethnic fractionalisation	
State changes, 1421-1878	0.0233** (0.010)
Baseline controls	Yes
R-squared	0.191
Panel B: second stage outcome - incidence of intermarriage	
Ethnic fractionalisation	0.416** (0.165)
Baseline controls	Yes
R-squared	0.016
Panel C: third stage outcome - fraction of Yugoslavs	
Intermarriage	0.5421*** (0.066)
Baseline controls	Yes
Observations	109
R-squared	0.918

Notes: The analysis is restricted to Bosnia-Herzegovina since the intermarriage data is not available for other regions. Baseline controls are output p.c, population density, average years of schooling, fraction of social sector employment, partisan-controlled territories during Nov. 1942, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 4.11: 2SLS regression analysis, distinguishing between intermarried people with and without children

	(1)	(2)
	Without children	With children
Panel A: first stage outcome - intermarriage		
Ethnic fractionalisation	0.1019*** (0.029)	0.1088*** (0.025)
Baseline controls	Yes	Yes
R-squared	0.688	0.667
Panel B: second stage outcome - fraction of Yugoslavs		
Intermarriage, without children	0.5346*** (0.080)	
Intermarriage, with children		0.5006*** (0.043)
Baseline controls	Yes	Yes
Observations	109	109
Centered R-squared	0.790	0.910
Sanderson-Windmeijer first stage F-test	12.78***	18.39***

Notes: The analysis is restricted to Bosnia-Herzegovina since the intermarriage data is not available for other regions. Baseline controls are output p.c, population density, average years of schooling, fraction of social sector employment, partisan-controlled territories during Nov. 1942, sites of partisan war crimes, public goods expenditure p.c., federal aid, population percentage of the early 1980's generation, army presence p.c., and region dummy. These controls are identical to those in column 13 of table 4.1. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## Chapter 5

# Conclusions

In the first paper of the thesis (chapter 2), I have defined the drivers of Yugoslavia's economic growth and demise. I have demonstrated that these drivers produced regional income divergence within the federation in the second paper of the thesis (chapter 3). This divergence, in turn, presumably undermined Yugoslav sentiment, and thus the political legitimacy of Yugoslavia, leading to its rapid disintegration, which is somewhat implied by the final paper of the thesis (chapter 4). Methodologically, the thesis has also followed a logical sequence: it proceeded from a national-level, to a regional-level and, finally, to a local-level analysis.

After pressing through dozens of pages of often dry analysis, it seems fitting to reward the reader with a free ranging exposition of the wider lessons the thesis might hold. The thesis, first and foremost, contains lessons for the literature on economic history and development, particularly concerning the global post-war growth patterns. Although these patterns are well established, their sources are not unequivocally agreed upon. From the 1950s to the 1970s, there was strong convergence between Western market economies. By contrast, the same period was marked by divergence at a global scale, as high and high-middle income countries grew faster than most less developed regions. Economic historians and development economists offered explanations for this conundrum.

Economic historians tend to agree with [Abramovitz \(1986\)](#) that convergence was conditional upon adequate social capabilities and technological congruence between the converging economies. The argument maintains that most European countries realised their catch-up potential because they were characterised by such conditions after WWII. This explanation, on the other hand, implies that less developed countries had inadequate social capabilities and were characterised by conditions which were incongruent with technologies developed at the global frontier. Many development economists instead interpreted the growth failure of poor countries as a consequence of poverty traps. Given their very low income, poor countries lacked the resources to invest in the capital and know-how necessary to achieve successful growth take-off's. The logical extension of the argument maintains that aid provision would

have enabled poor countries to escape from poverty traps and instigate economic growth.

Yugoslavia emerges as a special case as it encapsulated these global post-war trends. It was a unique experiment that tried to integrate middle-income (Croatia and Vojvodina) and high-middle income (Slovenia) economies, with backward developing regions (Bosnia, Montenegro, Kosovo and Macedonia). Whether this experiment improved the growth capabilities of the poor regions contains great historical and theoretical importance, as well as policy relevance.

The results of the thesis largely conform to the idea that institutions and policies need to be tailored to local conditions. What works well in one region may not necessarily work well in another region. It is thus difficult to maintain the existence of a universal set of best practice social capabilities. These are instead contingent on the wider social, political and economic environment. While the Yugoslav socialist system may have yielded a net positive growth outcome compared to other socialist economies and the majority of developing countries, it created unique distortions, which were concentrated in the poor regions. Yugoslav socialist system might have thus improved the growth capabilities of the poor regions, but not as much as it had improved the growth capabilities of the rich regions.

The experience of Yugoslavia also provides a cautionary lesson concerning the notion that aid provision would enable poor countries to escape from poverty traps. The findings of the thesis imply that investment aid, coupled with financial repression, was a move towards aggregate inefficiency in Yugoslavia. Poor regions had a lower marginal product of capital than the rich regions did, and investment aid presumably magnified this gap over time. This implies that capital was increasingly misallocated between regions, causing aggregate inefficiency. In other words, aggregate efficiency would have been higher in the absence of investment aid.

The thesis also contains lessons for the literature on state-led development strategies, and in particular concerning the process of gradual market reform. The existing literature usually highlights one critical potential pitfall in the process of partial market reform: opposition might mobilise and capture a drawn-out reform process. My thesis points to another potential pitfall of the gradual reform process. Agents that are freed from administrative control can create new distortions along the process of reform by exploiting rents implicit in the unreformed parts of the economy. Such agents derail the reform process into unexpected directions, creating new distortions as old ones are eliminated. If this interpretation is correct, one is left with taking a leap of faith in the ability of policy-makers to recognise and avoid the full range of possible pitfalls of the gradual market reform process.

Finally, the thesis also contains lessons for nation-building strategies. The results of the thesis suggest that nation building strategies in ethnically divided societies could be particularly effective and efficient in ethnically diverse areas. To frame it differently, the thesis suggests that a unit investment in nation-building, e.g. through education, would bring a higher return in ethnically heterogeneous

areas than it would in ethnically homogeneous areas, as ethnically heterogeneous areas tend to be more susceptible to the idea of a common nation.

As it is nearing its end, it is fitting to lay out the option of judging the thesis in two ways. If one falls within the pessimistic spectrum, the thesis can be perceived as raising many unresolved issues. If one instead falls within the optimistic spectrum, the thesis can be perceived as lending itself to research extension along multiple strands. Here I mention three possible research extensions which are determined by my subjective interests. First, Yugoslav system of self-management presumably made the local economic development depended on local institutional capacity and human capital, both of which, at least in the immediate aftermath of WWII, differed greatly among the regions due to historical path-dependence. My analytical focus on a few regions precluded exploration of these issues via econometric tests because of a limited range of observations. However, it is possible to explicitly analyse these factors at municipal level due to extensive data coverage induced by the decentralised nature of the country. This line of research would not only contribute to our understanding of the economic history of Yugoslavia, but also to a central issue in economic development literature, namely concerning the impact of institutions on economic growth.

Second, the findings of the thesis imply that, until the late 1970s, the comparatively impressive productivity performance of Yugoslavia was driven by Croatia, Slovenia and Vojvodina. Efficiency gains realised in these regions might be indicative of larger issues related to scale or specialisation economies (which are not accounted for in a constant-returns framework), agglomeration dynamics due to industrial clustering, and market potential. In the context of the gradual integration of Yugoslavia into the global economy, studies that account for both Heckscher-Ohlin type (factor endowments) and New Economic Geography type (market access) interactions between region and industry characteristics would offer a promising explanatory framework for understanding the aggregate economic performance of Yugoslavia.

Finally, Yugoslav authorities attempted to substitute a socialist identity for a national identity. That is, although authorities did not attempt to create a “Yugoslav man”, they did attempt to create a “socialist man” (Duda, 2017). It might be interesting to assess whether policies aimed at creating socialist identity stimulated interethnic ties of mutual acceptance, superseding old ethnic animosities, and hence reducing the incidence of ethnic conflict during the 1990s. It would be additionally possible to include a time dimension by testing the persistence of ethnic conflict between WWII and the 1990s and, contingent on that, test whether policies aimed at creating a new socialist citizen mitigated ethnic conflict during the 1990s. This line of research would contribute to the “persistence papers”, which are, by now, a staple in economic research.

To summarise: the experience of Yugoslavia demonstrates potential insights concerning the interac-

tions between regional and national development. Until the 1970s, it seems that the comparatively impressive productivity performance of Yugoslavia was driven by the efficiency gains realised in the more developed regions. If labour distortions were instrumental in causing the labour productivity slowdown of Yugoslavia, it seems these distortions were acute in the less developed regions. Ultimately, the last paper implies that, despite its formation, pan-Yugoslav sentiment was not strong enough to stem the violent disintegration of the country that followed. Yugoslav decentralisation policies were implemented with the aim of enhancing regional cohesion and social stability. They led, however, to exactly opposite outcomes, inflaming ethnic nationalism that culminated in the dissolution of the country.

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