Membership, Enlargement and Deepening of Regional Integration

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Abstract

This thesis contributes in several ways to the theoretical literature that studies regionalism.

First, this thesis investigates whether there are incentives for a regional trading bloc to enlarge through further extensions of its membership, or to reject new membership requests. Chapter 2 develops a theoretical model where the incentives for a regional trading bloc to enlarge and for third countries to join are formalised, and the enlargement of the bloc is endogenously determined by the interaction between supply of, and demand for membership. Furthermore, this analytical set-up is used to assess how deeper integration among the members of a regional trading bloc affects the equilibrium size of the bloc.

Second, this thesis studies the incentives for a country to enter a regional trade agreement when a multilateral free trade agreement is available, and the implications of the choice of regionalism for the incentives to pursue subsequent multilateral trade liberalisation. Chapter 3 provides a theoretical model that formalises a country's choice between entering a regional trade agreement or a multilateral free trade agreement, depicted as alternative trade policy options. Also this analytical framework is used to assess how a country's choice to enter the regional trade agreement affects its incentives to liberalise trade multilaterally.

Third, this thesis studies the trade effects of deeper integration among the members of a regional trading bloc, and the impact of economic dissimilarities on the identified trade effects. Chapter 4 develops a general equilibrium model which formalises the trade effects of the formation of a currency union among the members of a regional trading bloc, and of the subsequent enlargement of the currency union to include an economically dissimilar country. Furthermore, this analytical framework is used to assess how economic dissimilarities between the members of the currency union and the accession country affect the magnitude of the trade effects that would follow the enlargement.

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I dedicate this thesis to my parents.

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Chapter 1

Introduction

The rapid spread of regional trade agreements, often referred to as regionalism, is one of the most relevant recent developments the global trading system.

Notably, since 1990 more than 250 regional trade agreements have been notified to the General Agreement on Trade and Tariffs and the World Trade Organization, and nearly every country in the world is currently a member of one or more regional trade agreements.

This recent spread of regionalism had a significant impact on economic research shifting the focus of the analysis from the welfare effects of regionalism to the so-called "dynamic" time-path effect of regionalism, that is whether regionalism provides an impetus to, or detract from the multilateral non-discriminatory freeing of trade.[1,2]

This thesis contributes to the theoretical literature that investigates regionalism and its dynamic time-path effect, and its focus, as suggested by its title, is threefold.[3]

[1] See Bhagwati and Panagariya (1999) for a useful survey and formal discussion of the theoretical contributions that investigated the "static" welfare effects of regional trade agreements.

[2] Bhagwati (1991) introduced the notion of the dynamic time-path of regionalism. Notably in his seminal contribution he posed the question of whether regional trading blocs are "building blocs" or "stumbling blocs" toward the multilateral freeing of trade. See also Frankel (1997), Bhagwati (1999), and Bhagwati and Panagariya (1999) for a discussion of the dynamic-time path question.

[3] In this thesis, as in most of the recent theoretical literature, the notion of regionalism, or regional trade agreements, is used as a synonymous of preferential trade agreements. In a stricter interpretation, regionalism only refers to those preferential trade agreements formed among countries belonging to a geographic "region".

First, this thesis contributes to the literature by developing a theoretical model that formalises the incentives for a regional trading bloc to enlarge, and depicts its enlargement as the endogenous outcome of the interaction between supply of, and demand for membership.

The question of whether an inherent dynamic in regional trade agreements exists which would lead to larger regional trading blocs thus promoting global free trade has dominated the recent debate on regionalism.[4]

In this regard, the literature has focused on the incentives for third countries to join a regional trading bloc showing that these incentives become greater as a regional trading blocs become larger, a phenomenon labelled as "domino" effect of regionalism.[5]

However, whether a growing demand for membership will be accompanied by regional trading blocs' willingness to admit new members has not been addressed so far in the existing literature.

Notably, theoretical contributions have so far assumed that any country asking for membership in a regional trading bloc would be admitted to it.[6]

As a main contribution to the literature, this thesis addresses in Chapter 2 the question of whether there are incentives for a regional trading bloc to enlarge through further extensions of its membership, or to reject new membership requests.

Thus, we develop a theoretical model where the incentives for a regional trading bloc to enlarge, and for third countries to join are formalized, and the enlargement of the bloc is the endogenously determined by the interaction between supply of, and demand for membership.

Our theoretical model is the first in the literature to formalize the supply of membership of a regional trading bloc by analysing the scheme of incentives that underpin members' decision on whether to accept or reject third countries' membership requests.

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[4] In this thesis, we refer to regional trade agreements and regional trading blocs as synonyms.

[5] Baldwin (1995) provided a formal analysis of the "domino" effect of regionalism. We refer the reader to Chapter 2 for a detailed discussion of Baldwin (1995).

[6] See Chapter 2 for a survey of the theoretical contributions that have investigated the enlargement of regional trading blocs.

In addition, our model is the first in the literature to portray the enlargement of a regional trading bloc as determined by the interaction of the supply of, and demand for membership.

Assuming a political economy approach à la Grossman-Helpman (1994), we show that in a regional trading bloc pro and anti-enlargement forces exist, and the policy-maker's decision on whether to enlarge the bloc or not is a political equilibrium that balances these opposing forces.

The analysis we provide in Chapter 2 points out that due to the interaction between pro- and anti-enlargement forces, a maximum size of the regional trading bloc exists beyond which it will not enlarge further, labelled as the supply-side implied maximum size of the bloc.

In fact, we show that the regional policy-maker will prevent the enlargement of the regional trading bloc beyond this maximum size to avoid a loss in the political support it receives.

In addition, our analysis emphasizes that the enlargement of a regional trading bloc endogenously arises from the interaction between the supply of, and demand for membership.

When the size of a regional trading bloc is smaller than its supply-side implied maximum size, the bloc will enlarge in the event of a request for new membership from third countries. However, once the regional trading bloc has reached the supply-side implied maximum size, the regional policy-maker will not be willing to further enlarge the bloc by admitting new members, and any request of membership from third countries will be refused.

Thus, we derive that the equilibrium size of a regional trading bloc as jointly determined by the supply of membership of the bloc, and demand for membership from third countries.

In this regard, we point out that the equilibrium size of a regional trading bloc cannot exceed the supply-side implied maximum size of the bloc since once a bloc has reached its maximum size, the supply-side of membership will be binding on further

enlargements.

We also show that the supply-side implied maximum size of a regional trading bloc might not be reached if the requests for membership from third countries are not "numerous" enough.

The equilibrium size of a regional trading bloc might then be smaller than the maximum size that the regional policy-maker would be willing to achieve if the demand-side of membership is binding on further enlargements of the regional trading bloc.

Furthermore, we investigate in Chapter 2 how deeper integration among the members of a regional trading bloc affects the equilibrium size of the bloc.

Our analysis shows that deeper integration reduces the supply-side implied maximum size of the bloc while it boosts the demand of membership from third countries.

We emphasize that the implications of deeper integration on the equilibrium size of the regional trading bloc depend on whether the supply-side or the demand-side of membership are binding in the determination of the equilibrium size of the bloc.

Second, the thesis contributes to the literature by developing a theoretical model that formalizes the incentives underpinning a country's choice to enter a regional trade agreement rather than multilateral free trade agreement, and the implications of this choice for the country' incentives to pursue subsequent multilateral trade liberalisation.

The most recent theoretical studies in the debate on whether regionalism would lead to broader multilateral trade liberalisation have focused on how entering a regional trade agreement may affect a country's incentives to liberalise trade multilaterally.[7]

As a main contribution to the literature, this thesis addresses in Chapter 3 the question of which are incentives for a country to enter a regional trade agreement when the option of entering a multilateral agreement leading to free trade is available.

Thus, we build a theoretical model in which a regional trade agreement and a multilateral free trade agreement are formalized as alternative options of trade policy, and

[7] See Chapter 3 for a survey of the theoretical contributions that have investigated the implications of regional trade agreements on multilateral trade liberalisation.

we formalise the policy-maker's choice between the two alternative trade agreements.

The analysis we develop in Chapter 3 points out that a policy-maker's decision to enter a regional trade agreement rather than a multilateral free trade agreement is a choice of political economy driven by the presence of distortions in the policy-making process.

Assuming a political economy approach à la Grossman-Helpman (1994), we show that pro- and anti-regionalism forces exist, and the policy-maker's choice is a political equilibrium that balances these contrasting forces.

Notably, taking into account the interaction between pro- and anti-regionalism forces, we derive a condition under which a political support-maximizer policy-maker chooses to enter a regional trade agreement rather than a multilateral agreement leading to free trade.

Furthermore, drawing on the developed theoretical framework, in Chapter 3 we investigate the implications of a country's initial choice to enter a regional trade agreement for the country's incentives to pursue further multilateral trade liberalization.

Our analysis shows that when a country chooses to enter a regional trade agreement, subsequent multilateral liberalisation will no longer be pursued since the incumbent policy-maker will have no incentives to move from the *status quo*.

We emphasize that in our theoretical framework where the policy-maker balances industrial interests and net aggregate social welfare in order to choose its trade policy, regionalism unambiguously undermines multilateral trade liberalization.

Third, this thesis contributes to the literature by developing a theoretical model that formalises the trade effects of deeper integration among the members of a regional trading bloc, and the impact of economic dissimilarities on the magnitude of the identified trade effects.

Regional agreements have become increasingly ambitious in terms of their depth as recently shown by the members of the European Union adopting a common currency.

Thus, we develop in Chapter 4 a general equilibrium model which formalises the trade effects of the formation of a currency union among the members of a regional

trading bloc, and of its subsequent enlargement toward an economically dissimilar country.[8]

Furthermore, we use our theoretical framework to assess the implication of economic dissimilarities between the original members of a currency union and an accession country on the magnitude of the trade effects that would follow the enlargement of the currency union.

Notably, our analysis is inspired by the formation of the European Monetary Union, and its envisaged enlargement to the economically dissimilar Eastern European accession countries.

Thus, in Chapter 4 we build a three-country intra-industry trade model in which economic dissimilarities across countries exist, and sharing a common currency affects the patterns of trade via the elimination of transaction costs due to the use of different currencies, and a general equilibrium induced effect on relative wages across countries.

We use our theoretical model to analyse the effects of the formation of a currency union between the members of a regional trading bloc on the volume of bilateral trade realised between member countries, and between any of the members and the non-member country.

Our analysis shows that the formation of the currency union affects countries' patterns of trade via the elimination of intra-bloc transaction costs thus reducing intra-bloc trade costs, and a general equilibrium induced reduction of the relative wage in the non-member country.

Thus, we prove that the formation of a currency union between the members of a regional trading bloc unambiguously increases the volume of bilateral trade between the members, and it reduces the volume of bilateral trade between any member and the non-member country.

We analyse, then, the impact of the enlargement of the currency union toward an economically dissimilar country on the volume of bilateral trade realised between any

[8] See Chapter 4 for a detailed survey of the studies that have investigated the impact of sharing a common currency on trade.

original member and the accession country, and between the original members.

In this regard, we show that the enlargement of the currency union affects on the patterns of trade through the elimination of extra-bloc transaction costs thus reducing extra-bloc trade costs, and a general equilibrium induced increase in the relative wage in the accession country.

Our analysis proves that the enlargement of the currency union toward an economically dissimilar country unambiguously increases the volume of bilateral trade between the original members and the accession country, and reduces the volume of bilateral trade between the original member countries.

Furthermore, in Chapter 4 we draw on our theoretical framework to investigate how greater economic dissimilarities between the members of the currency union and the accession country affect the magnitude of the trade effects fostered by the enlargement of the currency union.

Simulating our model, we show that the more economically dissimilar is the accession country compared to the original members, the lower is the gain in the volume of bilateral trade between any original member and the accession country following the enlargement.

Chapter 2

Will a Regional Bloc Expand?

2.1 Introduction

The new wave of regionalism experienced since the 1990s and the growing number of regional trade agreements clearly indicate that countries are inclined to liberalize within a subset of countries thus leading to regional trade agreements.[1]

This unprecedented and worldwide spread of regionalism had a significant impact on economic research, stimulating a buoyant debate which concentrated on the analysis of whether regionalism would build in favour of, or operate against the goal of multilateralism.[2]

This chapter contributes to the literature by addressing the question of whether there are incentives for a regional trading bloc to expand through further extensions of its membership, or to keep stagnant in terms of its size by rejecting new membership requests.[3]

This issue is crucial for the ongoing "regionalism versus multilateralism" debate since a regional trading bloc which enlarges through further extensions of its member-

[1] Since 1990 more than 250 new regional trade agreements are reported to have been notified to the General Agreement on Trade and Tariffs and the World Trade Organization.

[2] See Winters (1996), and Baldwin and Venables (1997) for useful surveys of the literature in the "regionalism versus multilateralism" debate.

[3] We refer to the number of countries that are members of the regional trading bloc as the "size" of the bloc.

ship may be thought as contributing toward the multilateral freeing of trade.

On the other hand a regional trading bloc which does not expand, and remains stagnant in terms of size, may be conceived as leading to the fragmentation of the worldwide economy.

The theoretical contributions that have investigated the enlargement of regional trading blocs have adopted two fundamentally different approaches.

One strand of the literature has depicted the expansion of a regional trading bloc as exogenously determined focusing on the implications of the enlargement on social welfare. Thus, in his seminal contribution Krugman (1991) showed that in a world divided into symmetric trading blocs, a symmetric exogenous increase in the absolute size of the blocs may reduce the world welfare. Later, Bond and Syropolus (1996), generalizing Krugman (1991) taking into account the existence of comparative advantages, showed that an exogenous increase in the size of trading blocs may increase world welfare.

A second strand of the literature has instead modelled the enlargement of a regional trading bloc as endogenously determined. In this context, the main contribution is Baldwin (1995) who focused on the demand-side of the enlargement process, and provided a formal analysis of the incentives of non-members countries to join a regional trading bloc.[4]

A major shortcoming of Baldwin (1995) is that while the incentives of non-members countries to enter a regional bloc are formalised, the supply of membership of a regional trading bloc is assumed to be perfectly elastic.

As a result, Baldwin (1995) formalises the enlargement of a regional trading bloc as uniquely demand-determined since any country asking for membership would be admitted to the bloc.

This seems strongly counter factual since regional blocs appear to be "closed clubs" in which member countries decide whether or not a new country should be admitted,

[4]Recently, Alesina *et al.* (2005) investigated the related but different issue of the enlargement of an international political union modelled as a group of countries deciding together the provision of certain public goods and policies because of spillovers.

as pointed out by the recent experience of the enlargement of the European Union.

We propose a model in which both the incentives for a regional trading bloc to enlarge, and for third countries to join, are formalized such that the enlargement of the bloc endogenously arises from the process of interaction between the supply of, and the demand for membership.

We emphasize that our analysis is the first theoretical contribution to model the supply-side of membership of a regional trading bloc by formalising the scheme of incentives that underpin members' decisions to accept or reject third countries' membership requests.

Our work is also the first contribution to formalise the enlargement of a regional trading bloc as endogenously determined by the interaction of the supply of, and demand for membership.

Assuming a political economy approach à la Grossman-Helpman (1994), we show that pro and anti-enlargement forces operate in a regional trading bloc such that the final decision of the regional policy-maker is a political equilibrium that balances these contrasting forces.

Focusing on the supply of membership of the regional trading bloc, we emphasise that a maximum size of the bloc exists due to the interaction between pro and anti-enlargement forces, as well as the existence of distortions in the policy-making process.

In fact, the regional policy-maker will prevent the enlargement of the regional trading bloc beyond this maximum size to avoid a loss in the political support it receives.

In addition, we show that the enlargement of the regional trading bloc is the endogenous outcome of the interaction between the supply of membership arising from the bloc and the demand for membership arising from third countries.

Thus, if the size of the regional trading bloc is smaller than the supply-side implied maximum size, the bloc will enlarge in the event of a request for membership from third countries.

However, once the regional trading bloc has reached the supply-side implied maxi-

mum size, the regional policy-maker will not be willing to further enlarge the bloc such that any eventual request of membership from third countries will not be accepted.

As a result, we show that the equilibrium size of the regional trading bloc is jointly determined by the supply of and demand for membership such that it can not exceed but could be smaller than the supply-side implied maximum size of the bloc.

First, we show that the equilibrium size of the regional trading bloc can not exceed the supply-side maximum size since once this size has been reached, the supply-side of membership will be binding on further enlargements in case of a request for membership from third countries.

However, while the supply-side determines the existence of a maximum size beyond which the regional trading bloc will not further enlarge, the demand-side implies that the maximum size of the bloc might not be reached in the equilibrium.

In fact, we show that the equilibrium size of the bloc might be smaller than the maximum size that the regional policy-maker would be willing to achieve if the requests for membership are not "numerous" enough. Thus, the demand-side of membership might be binding on further enlargements of the regional trading bloc, preventing it from reaching the maximum size that the regional policy-maker would be willing to achieve.

Finally, we use our theoretical framework to investigate how deeper integration among the members of a regional trading bloc affects the equilibrium size of the bloc.

Our analysis shows that deeper integration contracts the supply of membership reducing the maximum size of the bloc that the regional policy-maker is willing to achieve, while it boosts the demand of membership from third countries through a "domino" effect à la Baldwin (1995).

We show that the implications of deeper integration on the equilibrium size of a regional trading bloc are, in general, ambiguous and crucially depend on whether the supply-side or the demand-side are binding in the determination of the equilibrium size of the bloc.

We note that our results on the implications of deeper integration on the equilibrium

size of a regional trading bloc differ from Baldwin (1995) where deeper integration unambiguously lead to wider integration by boosting the requests for membership in the bloc.

In fact, in our framework where the supply-side of membership is formalised, deeper integration among the members of a regional trading bloc affects both the supply of, and the demand for membership in regional bloc.

2.2 The basic model

We consider that the world economy is constituted by g countries, h of which are members of a regional trading bloc.[5]

In order to simplify our framework to investigate whether a regional trading bloc would enlarge or not, we assume that the regional trading bloc is unique in the world economy, and we rule out the possibility of formation of other regional trading blocs.

Therefore, we consider that the countries which are not members of the bloc, labelled as third countries, may ask for membership in the regional trading bloc but can not organize in any alternative form of preferential trade agreement.

We assume that all countries are symmetric, and each country is characterized by the existence of a manufacturing sector and an agricultural sector.

The manufacturing sector is characterized by differentiated products, increasing returns to scale and imperfect competition, while in the agricultural sector a homogenous product, constant returns to scale and perfect competition exist.

In order to capture a feature of real economies, we consider that in each country

[5] In this chapter we aim to investigate the enlargement of a regional trading bloc as the endogenous outcome of the interaction between the supply of, and the demand for membership, as well as the equilibrium size of the bloc. However, the theoretical framework we develop in this chapter can also be used to formalise the formation of the regional trading bloc in the first place, once we consider that none of the countries is initially in the regional trading bloc, that is $h = 0$. At this regard, please also see footnote 32.

there are two different classes of agents, that is labourers and firm owners, whose preferences, labelled as U^L and U^F, respectively, are given by:

$$U^L = C_A^{(1-\lambda)} C_M^{\lambda} \tag{2.1}$$

$$U^F = C_A^{(1-\phi)} C_M^{\phi} \tag{2.2}$$

where

$$C_M = \left[\sum_i c_i^{(\sigma-1)/\sigma} \right]^{\frac{\sigma}{(\sigma-1)}}$$

Thus, we consider that consumers have a love for variety, and c_i indicates the consumption of variety i of manufactured good.

The elasticity of substitution between any two manufactured varieties is represented by σ and is greater than one while the preference parameters are such that $0 \leq \lambda \leq 1$ and $0 \leq \phi \leq 1$.[6]

Specifically we consider that labourers' incomes derive from the labour they provide to firms while firm owners' incomes only derive from firms profits.

Focusing on technology, we assume that in the manufacturing sector the labor input requirement for a typical manufactured variety is given by:

$$l_i = \alpha + \beta x_i \qquad \text{with } \alpha \text{ and } \beta > 0 \tag{2.3}$$

where x_i is the output of variety i and α is a fixed cost.

We consider that the number of active firms operating in the manufacturing sector of any country is given and equal to k such that new entry is ruled out, and each manufacturing firm is sufficiently small in the market to treat market aggregates as

[6]The assumption of different parameters in labourers' and firm owners' utility functions allows to capture the real world's feature that different groups of agents show different tastes over the same range of available goods. However, we note that our final results would not be affected if we assumed the same parameters in labourers' and firm owners' utility functions.

exogenous.[7,8]

In order to simplify our framework we consider that there is no possibility of relocation for manufacturing firms and that each firm is wholly owned by the residents of the country in which it is located.

We also assume that in the agricultural sector the production function is linearly homogenous, the market structure is perfectly competitive and units of the agricultural good are chosen such that the unit labour coefficient is unity.

Finally, focusing on international flows of goods, we assume that trade in manufactured varieties is costly while trade in the agricultural good is costless.[9]

We consider that "iceberg" trade costs exist such that shipping manufactured varieties between any two countries melts a fraction of the shipment. However, no trade costs are assumed to apply on domestic sales of manufactured varieties.

We point out that the crucial aspect of trade costs is that they are assumed to be lower for flows of manufactured varieties arising between countries that are members of the regional trading bloc rather than for all other trade in manufactured goods.

Thus, we consider that all international trade in manufactured varieties that arises between countries within the regional trading bloc requires $\mu > 1$ units to be shipped for every unit sold.

On the other hand, all international trade in manufactured varieties that does not arise within the regional trading bloc is assumed to require $\tau > 1$ units to be shipped for every unit sold, where $\tau > \mu$.

Therefore, in our framework the main advantage for a country to be a member of the regional trading bloc consists in having access to lower trade costs on trade in

[7] Market behavior in the manufacturing sector is then like monopolistic competition but without free entry. See Baldwin (1995), and Desrouelle and Richardson (1997) for a similar approach.

[8] Ruling out new entry in the manufacturing sector guarantees that firms have positive profits that can be used in lobbying activities. Alternatively, we could use a framework with free entry and the existence of specific factor of production owned by firm owners. In this case even if firms' profits would be zero, firm owners would have a positive income to be used in lobbying activities.

[9] See the seminal work of Krugman (1979) for a formal analysis in which international trade in manufactured goods is explained by the existence of increasing returns to scale and product differentiation.

manufacturing goods with other member countries.

2.3 The equilibrium

In order to derive the equilibrium for the representative member country and the representative third country, we first focus on two generic countries j and i.

Due to the assumption of costless trade in the agricultural good, the equilibrium wage in all countries will be equalized as long as the agricultural good is produced in any country, which is assumed henceforth.[10]

Taking labour as the numeraire, the wage perceived by labourers in any of the g countries will be equal to unity. Since we assumed that labourers' incomes only derive from the labour provided to firms, carefully choosing the units with which to measure national workforce, the aggregate income of labourers located in country j, labelled as E_j^L, is:

$$E_j^L = 1 \tag{2.4}$$

Furthermore, given the assumption that firms' owners income derive only from firm profits and that k manufacturing firms operate in any country, the aggregate income of firm owners located in country j, labelled as E_j^F, is:

$$E_j^F = k\Pi_j \tag{2.5}$$

where Π_j indicates the profits earned by a typical manufacturing firm located in country j.

Given that all varieties enter consumers' demand symmetrically, and assuming the

[10] The non-full-specialisation (NFS) condition requires that no country has enough labour to satisfy the world demand for the agricultural good, i.e. that the world spending on this good is larger than the maximum value of its production that is possible in any of the countries. Given that the g countries are assumed to be economically symmetric, the NFS condition requires that $g \cdot \left[(1-\lambda) \cdot E^L + (1-\phi) \cdot E^F\right] > p_A \cdot L$, which is assumed to hold henceforth.

cost of introducing a new manufactured variety to be zero, no two firms will produce the same variety.

As a result, in equilibrium there will be only one firm in any country that produces a given manufactured variety, and no duplication will arise across countries with each country specialised in the production of its own range of varieties.

In addition, having assumed the same manufacturing technology across firms and across countries, all varieties produced will be symmetric and have the same equilibrium price.

Since we assumed that when manufactured goods are shipped between different countries they will incur iceberg trade costs, we denote the mill or f.o.b price of a typical manufactured variety produced in country j as p_j.

We label as T_{ji} the amount dispatched per unit received if a manufactured variety is shipped from country j to country i, with $T_{ji} > 1$.

The iceberg transport technology implies that if the manufactured variety produced in country j is sold at price p_j, the delivered or c.i.f. price at the consumption location i is given by:

$$p_{ji} = p_j \cdot T_{ji}$$

Given that k symmetric manufactured varieties are produced in any country, the manufactured composite price index faced by consumers located in country i is:

$$P_i = \left[\sum_{j=1}^{g} k \cdot (p_j \cdot T_{ji})^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}} \tag{2.6}$$

Notably, due to the asymmetric nature of the trade costs, the manufacturing composite price index may assume different values in different countries.

Focusing on consumers' utility maximization, in order to simplify the computations of the equilibrium demand patterns, we assume ϕ to be zero and λ to be strictly between

unity and zero.[11]

Therefore, given the shape of preferences, and the unitary nature of labourers' income, the equilibrium consumption demand in country i for any manufactured variety produced in country j is given by:

$$c_i = \frac{\lambda \cdot (p_j \cdot T_{ji})^{(-\sigma)}}{P_i^{(1-\sigma)}} \tag{2.7}$$

Thus, the aggregate demand of the manufacturing composite good in country i is:

$$C_i^M = \frac{\lambda}{P_i} \tag{2.8}$$

Finally, given the shape of preferences and the income of labourers and firms owners', the aggregate demand for the agricultural good in country i is:

$$C_i^A = \frac{(1-\lambda) + k\Pi_i}{p_A} \tag{2.9}$$

where p_A is the price of the agricultural good A, and Π_i indicates the profits earned by a typical manufacturing firm in country i.

Turning to the supply, we firstly observe that since the agricultural sector is assumed to be perfectly competitive, the price of the agricultural good will reflect its marginal cost.

Since we chose units of good A such that the labor input coefficient is unitary, and we took labour as numeraire, the price of the agricultural good A in any country is:

$$p_A = 1$$

Focusing on the manufacturing sector, the typical profit-maximising firm located in country j faces an isoelastic demand curve expressed in equation (2.7).

However, if equation (2.7) expresses the consumption demand in country i for any manufactured variety produced in country j, due to the existence of trade costs, in

[11] Our final results would not change if we assumed ϕ to be strictly between zero and one.

order to supply this amount of consumption, T_{ji} times this amount has to be shipped.

Thus, if we sum up across countries in which manufactured varieties produced in country j is sold, the total sales of the typical manufacturing firm located in country j, denoted by x_j, is:

$$x_j = \sum_{i=1}^{g} \frac{\lambda \cdot (p_j \cdot T_{ji})^{(-\sigma)} \cdot T_{ji}}{P_i^{(1-\sigma)}} \tag{2.10}$$

Assuming that each profit-maximising manufacturing firm sets its price taking the price index P_i as given, the equilibrium mill or f.o.b. price for any variety produced in country j is a constant mark-up over the marginal cost given by:

$$p_j = \frac{\sigma}{\sigma - 1} \cdot \beta \tag{2.11}$$

We note that in any of the g countries, profit-maximising manufacturing firms will charge the same f.o.b. price, expressed in equation (2.11), for all sales regardless of destination.

Furthermore, assuming that the manufactured goods are measured in units chosen so that the unit input coefficient β just equals $\sigma/(\sigma - 1)$, in the equilibrium all manufacturing firms will charge the same unitary price.

We observe that, given the constant demand elasticity and the equilibrium f.o.b. price, the equilibrium profits (gross of fixed costs) of any manufacturing firm are equal to $1/\sigma$ times sales.

Thus, given equations (2.10) and (2.11), the equilibrium profits of the typical manufacturing firm located in country j are:

$$\Pi_j = \frac{\lambda}{\sigma} \cdot \sum_{i=1}^{g} \frac{(T_{ji})^{(1-\sigma)}}{P_i^{(1-\sigma)}} \tag{2.12}$$

Taking into account the asymmetric nature of trade costs on trade in manufactured goods, we can derive the equilibrium for the representative country member of the regional trading bloc and the representative third country.

First, we note that delivered prices or c.i.f. prices paid by consumers for manufacturing varieties will vary depending on consumers' location.

Thus, consumers located in the representative member country will pay a price μ for any unit of manufactured variety produced in the regional trading bloc, and a price τ for any unit of manufactured variety produced in any of the third countries.

On the other hand, consumers located in the representative third country will pay a price τ for any unit of manufactured variety produced in any other country, either member or third country.

Given equation (2.6), the manufacturing composite index price faced by consumers located in the representative member country and in the representative third country, labelled as P_R and P_N, respectively, are:

$$P_R = \left[k + k \cdot (h-1) \cdot \mu^{(1-\sigma)} + k \cdot (g-h) \cdot \tau^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{2.13}$$

$$P_N = \left[k + k \cdot (g-1) \cdot \tau^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{2.14}$$

It follows that, given equations (2.8), (2.13) and (2.14), the equilibrium aggregate consumption of the manufacturing composite good in the representative member country and in the representative third country, labelled as C_R^M and C_N^M, respectively, are:

$$C_R^M = \frac{\lambda}{P_R} \tag{2.15}$$

$$C_N^M = \frac{\lambda}{P_N} \tag{2.16}$$

Given equations (2.9), (2.13) and (2.14), the aggregate demand for the agricultural good in the representative member country and in the representative third country, labelled as C_R^A and C_N^A, respectively, are:

$$C_R^A = (1-\lambda) + k\Pi_R \tag{2.17}$$

$$C_N^A = (1-\lambda) + k\Pi_N \tag{2.18}$$

Finally, given equations (2.12), (2.13) and (2.14), the equilibrium profits earned by any manufacturing firm located in representative member country and in the representative third country, labelled as Π_R and Π_N, respectively, are:

$$\Pi_R = \frac{\lambda}{\sigma} \cdot \left[P_R^{(\sigma-1)} + (h-1) \cdot \mu^{(1-\sigma)} \cdot P_R^{(\sigma-1)} + (g-h) \cdot \tau^{(1-\sigma)} \cdot P_N^{(\sigma-1)} \right] \tag{2.19}$$

$$\Pi_N = \frac{\lambda}{\sigma} \cdot \left[P_N^{(\sigma-1)} + h \cdot \tau^{(1-\sigma)} \cdot P_R^{(\sigma-1)} + (g-h-1) \cdot \tau^{(1-\sigma)} \cdot P_N^{(\sigma-1)} \right] \tag{2.20}$$

2.4 The supply-side of membership

In this section we formalise the regional trading bloc's supply of membership focusing on the scheme of incentives underpinning the regional policy-maker's choice between accepting or rejecting third countries' membership requests.

Notably, we analyse the supply of membership of the regional trading bloc under the simplifying assumption that the regional policy-maker considers the demand for membership from third countries as perfectly elastic, that is as if any third country is willing to enter the bloc.

The assumption of a perfectly elastic demand of membership will be then relaxed in section 2.6 where we will formalise the interaction between the supply-side and demand-side of membership in determining the equilibrium size of the regional trading bloc, and show how the demand-side of membership might be binding on further enlargements of the bloc.

To date the main contribution on the analysis of the endogenously determined enlargement of regional trading blocs is Baldwin (1995) who assumed that the supply of membership of a regional trading bloc is perfectly elastic.

However, Baldwin's assumption that any country that asks for membership of a regional trading bloc will be admitted appears to be counter factual. In fact, regional trading blocs seem to be "closed clubs" in which member countries decide whether or not a new country should be admitted as shown by the recent experience of the enlargement of the European Union.

Thus, we propose a more realistic framework where in the event of a third country's request for membership, the regional trading bloc chooses whether to admit it or not.[12]

At this regard, we assume that decisions are centralized in the regional trading bloc such that a regional policy-maker exists.[13]

We consider that two different trade policy options are open to the regional policy-maker, that is to enlarge the bloc by admitting a third country or not to enlarge thus refusing the new membership request.

Notably, we investigate the decision of the regional policy-maker regarding a "marginal" enlargement of the regional trading bloc, that is an enlargement that would increase the size of the regional bloc by one additional member country.[14]

Relying on the pressure group model by Grossman and Helpman (1994), we consider that the regional policy-maker shapes its trade policy taking into account not only regional aggregate well-being but also the political contributions provided by an organised interest group which participates in the political process in order to influence policy outcomes.[15]

[12] We assume that the eventual choice of the regional policy-maker to admit a country in the bloc is irreversible such that once a third country is admitted into the regional trading bloc it can not be forced to leave it later on.

[13] This modelling choice is suggested by the existence of centralised political organs in the European Union.

[14] Our theoretical framework could be extended to investigate the choice of the regional policy-maker to enlarge the regional trading bloc by admitting more than one new member.

[15] Grossman and Helpman (1994) investigated the structure of protection that emerges when many interest groups simultaneously attempt to "buy" protection by offering political contributions to an incumbent policy-maker's in order to influence his choice of trade policy. Recently, a number of

Thus, we assume that the regional policy-maker trades off the political contributions that would come from heeding the lobby's interests against the reduction in regional aggregate social welfare that would follow the implementation of a socially costly trade policy.[16]

We assume that all manufacturing firms located in the regional trading bloc are organized in a unique interest group or lobby group that offers a schedule of contingent (implicit) donations to the regional policy-maker to affect its choice of trade policy.[17]

Thus, the organized industrial lobby specifies donation contracts or "contribution schedules" that stipulate how large a donation will be made for each of the two possible stances of trade policy open to the regional policy-maker.

Notably, the organised interest group tailors its contribution schedule to maximise the total welfare of its members, net of contributions.

The game is in two stages: in the first stage, donation contracts are announced by the organized interest group to the policy-maker while in the second stage the policy-maker sets the trade policy and collects the donations.

Political contributions paid by the organized interest group to the policy-maker are then *ex-post,* that is they are paid after the policy-maker has chosen whether to enlarge or not.

The incumbent regional policy-maker will decide whether to enlarge the regional trading bloc or not with the aim of maximizing the political support it will receive.[18]

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studies have provided empirical evidence in support of the Grossman and Helpman's political economy approach to the formation of trade policy. At this regard see Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Mitra *et al.* (2002), Eicher and Osang (2002), McCalman (2004), and Gawande and Krishna (2005).

[16] Grossman and Helpman (1994) noted that an incumbent policy-maker may make trade policy choices while being aware that its decisions may affect its chances for re-election. Thus, a policy-maker may value political contributions since they can be used to finance campaign spending, and aggregate social welfare since voters are more likely to reelect a government which has delivered a high standard of living. In this chapter, as in Grossman and Helpman (1994), we do not explicitly formalise the existence of an electoral process. At this regard, see Grossman and Helpman (1996) for a model with electoral competition where interest groups may use campaign contributions to influence the outcome of the election, and the competing parties' platforms.

[17] We rule out the possibility for the interest group to offer donations to third countries' governments.

[18] See Grossman and Helpman (2002) for a detailed survey of alternative political economy ap-

We consider that the political support received by the regional policy-maker depends positively on the amount of political contributions received from the organized interest group.[19]

In addition, the political support received by the incumbent regional policy-maker depends positively on the level of the aggregate social welfare, net of contributions, achieved in the regional trading bloc as a whole.[20]

We define the objective function of the regional policy-maker as the weighted sum of the total amount of political contributions received from the organized interest group and the aggregate social welfare reached in the regional trading bloc, net of contributions.

Labelling as D the political contribution that the regional policy-maker receives from the lobby group, and as W the net aggregate social welfare reached in the regional trading bloc, the objective function of the regional policy-maker may be expressed as:

$$G = a \cdot D + (1 - a) \cdot W \tag{2.21}$$

where a is a parameter that lies in the range $[0, 1]$, and measures the extent of the political distortion in the policy-making process in the regional trading bloc.

Thus, when the parameter a is equal to zero the regional policy-maker will behave like a social welfare maximiser. On the other hand, the closer is the value of the parameter a to one, the greater is the degree of political distortion since the greater is the weight that the interests of manufacturing firms receive in the policy-making process.

The regional policy-maker will achieve different levels of political support depending on whether it decides to enlarge the regional trading bloc or not since the amount of political contributions received and the level of regional aggregate social welfare will depend on the chosen stance of trade policy.

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proaches to the formation of trade policy.

[19] We assume that consumers are not organised in any form of interest group.

[20] We rule out the possibility of side-payments paid to the regional policy-maker by organised interest groups located in the third countries.

In the following we investigate the implications of the two alternative options of trade policy open to the policy-maker on the amount of political contributions it would receive, and on the level of net aggregate social welfare that would be reached in the regional trading bloc.

2.4.1 Lobbying: pro or anti-enlargement force?

First, we focus on the organized interest group and we investigate whether the industrial lobbying activity constitutes a pro or anti-enlargement force.

We emphasized previously that the organized industrial lobby specifies a contribution schedule which stipulates how large a donation will be made for each of the two possible stances of trade policy open to the regional policy-maker.[21]

The interest group's contribution schedule will then comprise two items, D_{ENL} and D_{NON}, which are the political contributions associated with the regional policy-maker's choice to marginally enlarge the bloc or not to enlarge, respectively.

Notably, it will never be optimal for the interest group to specify a positive contribution for both policy outcomes since then it could cut back equally on both of its offers without affecting the regional policy-maker's decision, and also since it will not wish to give the policy-maker an incentive to choose the trade policy outcome that it is contrary to the lobby's interests.

Following Grossman-Helpman (1994) we restrict the contribution schedule specified by the organized interest group to be "truthful" in the Bernheim-Whinston (1986) specification such that the contribution schedule everywhere reflects the true preferences of the interest group.

The assumption of "truthful" donation contracts implies that the contingent contribution schedule specified by the interest group will assume a specific form.

The interest group will, in fact, pay to the regional policy-maker for any trade policy

[21] In our analysis we rule out the possibility for the interest group to offer contributions to foreign governments. See Grossman and Helpman (1994), and Grossman and Helpman (1995) for a similar approach.

the excess, if any, of the lobby's gross welfare, reached under the specified stance of trade policy, relative to some optimally chosen base level of welfare.

Having assumed that the organized interest group is constituted by firm owners located within the regional trading bloc, the gross aggregate welfare of the group, labelled as $\widetilde{V^F}$, is the sum of the gross indirect utility reached by firms owners located in the regional trading bloc.

Thus, restricting political contributions to be non-negative, a truthful contribution function can be formally expressed as:

$$D = \max\left[0, \widetilde{V^F} - B\right]$$

where the organised interest group will choose B as such as to satisfy the voluntary participation constraint of the regional policy-maker.

The truthful contribution function evidences that the organised interest group's net welfare will be equal to B whenever the group makes a positive contribution to the regional policy-maker. The interest group will then wish to make B as large as possible but without inducing the regional policy-maker to choose a policy outcome which is damaging to the group's interests.

Since only one organised interest group operates in the bloc, the interaction between the regional policy-maker and the industrial lobby configures as a principal-agent problem such that the regional policy-maker's voluntary participation constraint can be used to derive the lobby's choice of B in equilibrium.[22]

The interest group will choose B in order to make the regional policy-maker just indifferent between heeding the lobby's interests regarding whether to enlarge or not, and the policy outcome that the regional policy-maker would implement in absence of any contributions, that is the socially optimal choice of trade policy.

Since the interest group will lobby for the stance of trade policy that implies the

[22] See Grossman and Helpman (1994) for the derivation of the lobby's choice of B in equilibrium when different organised interest groups compete for protection in a common agency framework.

greater level of the group's gross welfare, we compare the gross welfare that interest group will achieve if the regional policy-maker decided to marginally enlarge the bloc or, alternatively, not to.

The gross aggregate welfare that the organised interest group would achieve if the policy-maker decided to marginally enlarge the regional trading bloc or not to, labelled as $\widetilde{V^F_{ENL}}$ and $\widetilde{V^F_{NON}}$, respectively, are[23]:

$$\widetilde{V^F_{ENL}} = kh\Pi_{ENL} \tag{2.22}$$

$$\widetilde{V^F_{NON}} = kh\Pi_{NON} \tag{2.23}$$

where Π_{ENL} and Π_{NON} indicate, respectively, the profits that would be earned by any manufacturing firm in the bloc if the policy-maker decided to enlarge the bloc or not to enlarge.

Having assumed the contribution schedule to be truthful, and given equations (2.22) and (2.23), it follows that the political contributions that the interest group would offer to the regional policy-maker for the two alternative stances of trade policy can be expressed as:

$$D_{ENL} = \max\left[0,\ kh\Pi_{ENL} - B\right] \tag{2.24}$$

$$D_{NON} = \max\left[0,\ kh\Pi_{NON} - B\right] \tag{2.25}$$

As pointed out by equations (2.22) and (2.23), the organised interest group will lobby in favour of the stance of trade policy that implies the greater level of aggregate profits earned by manufacturing firms located in the regional trading bloc.

Thus, given the symmetric nature of manufacturing firms, to evaluate whether the organized interest group constitutes a pro or anti-enlargement force in the policy-

[23] Having assumed that ϕ is equal to zero, firm owners will only consume the agricultural good in the equilibrium.

making process, we compare the profits that would be earned by a typical manufacturing firm located in the regional trading bloc under the two alternative stances of trade policy.

The profits that would be earned by any manufacturing firm located in the regional trading bloc if the regional policy-maker chose to marginally enlarge or not to, respectively, are:

$$\Pi_{ENL} = \frac{\lambda}{\sigma} \cdot \left[P_{ENL}^{\sigma-1} + h\mu^{(1-\sigma)} \cdot P_{ENL}^{\sigma-1} + (g-h-1) \cdot P_N^{\sigma-1} \tau^{(1-\sigma)} \right] \tag{2.26}$$

$$\Pi_{NON} = \frac{\lambda}{\sigma} \cdot \left[P_R^{\sigma-1} + (h-1)\, \mu^{(1-\sigma)} \cdot P_R^{\sigma-1} + (g-h)\, P_N^{\sigma-1} \tau^{(1-\sigma)} \right] \tag{2.27}$$

where P_N is expressed in equation (2.14) and P_{ENL} is given by:

$$P_{ENL} = \left[k + k \cdot h \cdot \mu^{(1-\sigma)} + k \cdot (g-h-1) \cdot \tau^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}} \tag{2.28}$$

If the regional policy-maker chooses to marginally enlarge, a manufacturing firm located in the regional trading bloc would face different effects in the three markets where it operates, that is the local market, the regional bloc market, and the third countries' market.

First, if the regional trading bloc marginally enlarged, the manufacturing firm would face greater competition in its local market since the price local consumers would pay for any manufactured varieties produced in the new member country would decrease from τ to μ.

Thus, due to a substitution effect, local consumers would reduce their consumption of the locally produced manufactured varieties such that any manufacturing firm would experience an unambiguous reduction in profits on its local market.

Focusing on the regional bloc market, we note that the manufacturing firm would

experience greater competition since the price consumers located in the original member countries would face for any variety produced in the new member country would be reduced from τ to μ.

On the other hand, since the size of the regional bloc market would increase from $(h-1)$ to h, the manufacturing firm would enjoy an enlarged regional bloc market. As a result, the price paid for the firm's own variety by consumers located in the new member country would decrease from τ to μ such that they will increase their consumption of the firm's own variety.

We emphasize that the outlined effects would have opposing implications on the profits earned by the manufacturing firm on the regional bloc market since, while the competition-effect would reduce firm's profit, the market-size effect would increase it.

Finally, the manufacturing firm would experience an unambiguous reduction in the amount of profits earned in the third countries' market since the size of this market would contract from $(g-h)$ to $(g-h-1)$.

Taking into account the profit implications on the three different markets where the manufacturing firm operates, we can investigate the effect of the policy-maker's eventual choice of marginally enlarging the regional trading bloc on the firm's overall amount of profits.

At this regard, we can state the following proposition:

Proposition 1 *A size of the regional trading bloc, labelled as $\widehat{h}$, exists that maximizes the profits earned by any manufacturing firm located in the regional trading bloc.*

Proof. See Mathematical Appendix for proof. ■

Thus a marginal enlargement of the regional trading bloc could be either profit-enhancing or profit-reducing for firms located within the bloc depending on the initial size of the bloc.

If the initial size of the bloc is smaller than the size that maximizes manufacturing firms' profits, the policy-maker's choice of marginally enlarging the bloc would imply

a greater amount of aggregate profits for manufacturing firms located in the bloc than the alternative choice of not to enlarge.

On the other hand, if the initial size of the bloc is greater than or equal to the size that maximizes manufacturing firms' profits, the policy-maker's choice of enlarging the bloc would imply a lower amount of aggregate manufacturing profits than the choice of not to enlarge.

We can then draw some important conclusions concerning the lobbying activity realised by the organised interest group, and state the following corollary:

Corollary 2 *The organized interest group is a pro-enlargement force if the size of the regional trading bloc is such that* $h < \widehat{h}$ *while it is an anti-enlargment force if* $h \geq \widehat{h}$.

We underline that the organized industrial interest group may act either as a pro-enlargement or anti-enlargement force in the policy-making process depending on the initial size of the bloc.

When the size of the bloc is lower than $\widehat{h}$, the interest group represents a pro-enlargement force since this choice of trade policy would imply a greater level of the group's gross welfare.

However, the organised interest group will effectively contribute in equilibrium only if its own interests are in conflict with the trade policy outcome that the regional policy-maker's would choose in absence of any political contributions.

Thus, for any size of the bloc lower than $\widehat{h}$, since the lobby's preferred policy outcome coincides with the socially optimal outcome, the interest group will then contribute nothing in equilibrium, and the trade policy outcome would be as if firm owners were politically unorganized.

On the other hand, when the initial size of the regional bloc is equal to or higher than $\widehat{h}$, the organized interest group constitutes an anti-enlargement force, since this choice of trade policy would imply a greater level of the group's gross welfare.

It follows that, for any size of the bloc equal to or higher than $\widehat{h}$, insofar as the lobby's interests are in conflict with the socially optimal policy outcome, the organised

interest group will offer a positive contribution to the regional policy-maker if it chooses not to enlarge, and a zero contribution otherwise.

2.4.2 Aggregate welfare: a pro-enlargement force

In this section we investigate the implications of the regional policy-maker's choice on the level of aggregate welfare, net of contributions, reached in the regional trading bloc as a whole.

Thus, we compare the level of net aggregate social welfare that would be reached under the two alternative stance of trade policy open to the regional policy-maker.

We define the net aggregate social welfare at the regional level as the gross aggregate welfare reached in the regional trading bloc as a whole less the amount of donations that the organized interest group pays to the regional policy-maker.

The gross aggregate social welfare in the regional trading bloc as a whole is defined as the sum of the gross aggregate social welfare reached in any of the member countries.

Notably, the gross aggregate welfare in any member country is defined in a "utilitarian" way, that is as the sum of the indirect utilities reached by the different agents in the economy.

Since we assumed that in any country two different groups of agents exist, the gross aggregate social welfare in any member country is given by the sum of the aggregate indirect utility of labourers and the aggregate indirect utility, gross of contributions, of firm owners.

We recall that equations (2.22) and (2.23) express the gross indirect utility that would be reached by firm owners' located in regional trading bloc under the two alternative stances of trade policy open to the regional policy-maker.

Furthermore, as shown in the Mathematical Appendix, the indirect utility that labourers would reach if the policy-maker decided to marginally enlarge the regional trading bloc or not to, labelled as $V^L_{R,ENL}$ and $V^L_{R,NON}$, respectively, are:

$$V^L_{R,ENL} = (1-\lambda)^{(1-\lambda)} \cdot \lambda^{\lambda} \cdot P^{-\lambda}_{ENL}$$

$$V_{R,NON}^{L} = (1-\lambda)^{(1-\lambda)} \cdot \lambda^{\lambda} \cdot P_R^{-\lambda}$$

As shown in the Mathematical Appendix, the gross aggregate social welfare that would be achieved in the regional trading bloc if the regional policy-maker decided to marginally enlarge or, alternatively, not to enlarge, labelled as $\widetilde{W}_{ENL}$ and $\widetilde{W}_{NON}$, respectively, are:

$$\widetilde{W}_{ENL} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{ENL}^{(-\lambda)} + kh\Pi_{ENL} \tag{2.29}$$

$$\widetilde{W}_{NON} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{R}^{(-\lambda)} + kh\Pi_{NON} \tag{2.30}$$

Thus, given equations (2.24), (2.25), (2.29), and (2.30), the net aggregate social welfare that would be reached in the regional bloc if the regional policy-maker decides to marginally enlarge or not to, labelled as W_{ENL} and W_{NON}, respectively, are:

$$W_{ENL} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{ENL}^{(-\lambda)} + kh\Pi_{ENL} - D_{ENL}$$

$$W_{NON} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{R}^{(-\lambda)} + kh\Pi_{NON} - D_{NON}$$

Comparing the levels of net aggregate social welfare that would be reached at the regional level under the two alternative trade policies, we can state the following proposition:

Proposition 3 *The net aggregate social welfare reached in the regional trading bloc would be greater if the policy-maker choose to marginally enlarge rather than not to enlarge.*

Proof. See Mathematical Appendix for proof. ■

We emphasize that when the regional policy-maker chooses to marginally enlarge the bloc, consumers located within the regional trading bloc will experience a reduction,

from τ to μ, in the price paid for any manufactured varieties produced in the new member country.

Consumers located in the regional trading bloc will then increase their consumption of manufactured varieties produced in the new member country thus reaching a higher level of indirect utility.

Therefore, for any initial size of the regional trading bloc the policy-maker's choice of marginally enlarging the bloc would imply a higher net aggregate social welfare than the alternative choice of not enlarging.

However, as shown in the Mathematical Appendix, the gain in terms of regional aggregate social welfare that the policy-maker could achieve if it decided to marginally enlarge the bloc rather than not to enlarge, will be decreasing in the size of the bloc.

In fact, the greater the size of the bloc, the wider is the range of manufactured varieties available to consumers located in the regional bloc at a lower price before the enlargement.

As a result, the smaller will be the increase in their utility once the manufactured varieties produced in the new member country will become available at lower price due to the enlargement.

2.4.3 The supply-side condition

We formalise the regional trading bloc's supply of membership by analysing the regional policy-maker's choice between enlarging by admitting a new member country, and not enlarging under the simplifying assumption that the demand of membership is perfectly elastic.

The regional policy-maker will achieve a different level of political support depending on which of the two stances of trade policy it chooses to implement.

As shown in the previous section, the choice of trade policy will affect the components of the policy-maker's objective function, that is the actual amount of political contributions the policy-maker receives and the net aggregate social welfare achieved in the regional trading bloc.

Given equation (2.21), if the regional policy-maker decided to marginally enlarge the regional trading bloc, the value of its objective function, which expresses the level of political support received, would be:

$$G_{ENL} = a \cdot D_{ENL} + (1 - a) \cdot W_{ENL} \tag{2.31}$$

Alternatively, if the regional policy-maker decided not to enlarge the regional trading bloc thus refusing any request for membership, the value of its objective function would be:

$$G_{NON} = a \cdot D_{NON} + (1 - a) \cdot W_{NON} \tag{2.32}$$

Given equations (2.31) and (2.32), since we assumed that the regional policy-maker is a political support maximiser, the problem of the regional policy-maker may be expressed as choosing η in order to maximize:

$$\eta \left[a \cdot D_{ENL} + (1 - a) \cdot W_{ENL} \right] + (1 - \eta) \left[a \cdot D_{NON} + (1 - a) \cdot W_{N} \right]$$

where the variable η captures the policy-maker's choice and will be equal to one if the policy-maker decides to marginally enlarge the regional trading bloc and zero otherwise.

We can then state the following proposition:

Proposition 4 *The regional policy-maker will decide to marginally enlarge the regional bloc if and only if the following condition is satisfied:*

$$a \cdot (D_{ENL} - D_{NON}) + (1 - a) \cdot (W_{ENL} - W_{NON}) \geq 0 \tag{2.33}$$

We label the above condition as the "supply-side" condition since when it holds the regional policy-maker will choose to marginally enlarge the regional trading bloc

since this stance of trade policy guarantees the greater level of political support. [24]

Thus, when the supply-side condition is verified a positive supply of membership from the regional trading bloc arises since the regional policy-maker will be willing to further enlarge.

However, when the supply-side condition is not verified the regional policy-maker will choose not to marginally enlarge since this stance of trade policy guarantees the greater level of political support.

In this last case, the supply of membership from the regional trading bloc will then be nil such that any request for new membership from third countries will be refused.

We emphasize that the regional policy-maker's choice on whether to marginally enlarge or not to enlarge is a political equilibrium that balances pro and anti-enlargement forces.

We previously showed that the organized industrial interest group may act as a pro or anti-enlargement force in the policy-making process depending on whether the initial size of the bloc is greater than or smaller than the size of the bloc that maximizes aggregate firms' profits.

If the size of the regional trading bloc is lower than the size that maximizes manufacturing firms' profits, that is $h < \widehat{h}$, the organised interest group acts as a pro-enlargement force, and it offers the policy-maker a higher donation if it decides to enlarge rather than not to.

However, if the size of the regional trading bloc is equal to or greater than the size that maximizes manufacturing firms' profits, that is $h \geq \widehat{h}$, the interest group constitutes an anti-enlargement force offering a higher donation to the policy-maker if it decides not to enlarge.

Furthermore, we noted that the net aggregate social welfare reached in the regional

[24] Alesina *et al.* (2005) assuming that an international political union's policy is decided on majority voting basis, showed that the union will accept a new member only if the change in the median after the entry is small enough.

trading bloc is greater if the policy-maker decides to marginally enlarge the bloc rather than not to.

As a consequence the greater level of net aggregate social welfare that could be achieved when enlarging the bloc operates as a pro-enlargement force in the policy-making process.

Thus, we note that if the initial size of the regional trading bloc is smaller than the size that maximizes firms' profits, both the organized interest group and the aggregate social welfare will operate as pro-enlargement forces.

In this case the regional policy-maker will face no trade-off in its choice of trade policy since enlarging the regional trading bloc will imply both a greater amount of political contributions received and a higher level of net aggregate social welfare achieved in the regional bloc.

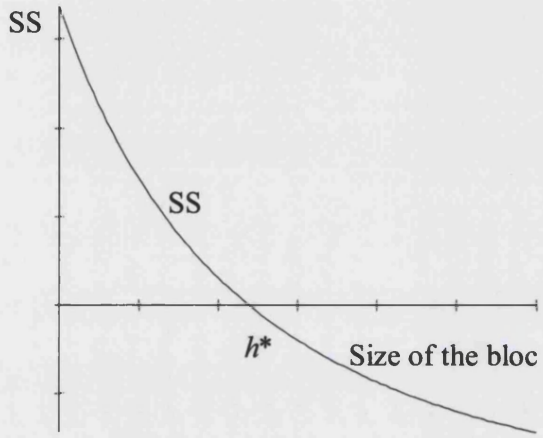
However, when the initial size of the regional trading bloc is greater or equal to the size that maximizes manufacturing firms' profits, the policy-maker will face a trade-off between the greater political contributions that it could achieve if it decided not to enlarge and the greater net aggregate social welfare it would reach if decides to marginally enlarge the bloc.

In this regard, the supply-side condition in equation (2.35) evidences that the regional policy-maker will decide to marginally enlarge if the weighted sum of the donation differential and the welfare differential is at least positive, that is if the weighted gain in net aggregate social welfare at least compensates for the eventual loss in political contributions.

Notably, the degree of political distortion plays a crucial role in the regional policy-maker's choice since the higher is the degree of political distortion, the greater is the weight that the policy-maker attributes to the eventual loss in political contributions while the lower is the weight it attaches to the gain in the level of aggregate social welfare at the regional level.

In the following, we derive the political equilibrium of the supply of membership from the regional bloc with the use of graphical analysis.

Figure 2-1: The supply-side political equilibrium



In Figure 2-1, the locus SS plots the right-hand side of the supply-side condition that is the gain in political support that the regional policy-maker would receive if it chooses to marginally enlarge the regional trading bloc rather than not to, as a function of the size of the bloc.

As shown in the Mathematical Appendix, since the profit and the welfare differential are decreasing in the size of the regional trading bloc, the locus SS is downward sloping.

Our graphical analysis shows that, depending on the initial size of the regional trading bloc, the gain in political support that might be obtained by the regional policy-maker if it decides to marginally enlarge rather than not to may assume both positive or negative values.

The policy-maker's choice to marginally enlarge the bloc rather than no to may lead to a gain or a loss in the level of political support received by the policy-maker depending on the initial size of the regional trading bloc.

Notably, the balance between pro- and anti-enlargement forces will vary with the

size of the bloc since the gain in the regional aggregate social welfare that would follow a marginal enlargement of the regional trading bloc reduces with the size of the bloc while the eventual loss in campaign contributions increases with the size of the bloc.

As shown in Figure 2-1, corresponding with the size of the regional trading bloc where the locus SS and the horizontal axis intersect, labelled as h^*, a further marginal enlargement of the bloc would imply a loss in the level of political support received by the policy-maker.

Thus, we can be define h^* as the equilibrium size that the regional trading bloc would reach if the demand of membership arising from third country was perfectly elastic.[25]

In fact, h^* represents the maximum size the regional policy-maker would be willing to enlarge the regional trading bloc to given that further enlarging beyond h^* would imply a loss in political support it would receive.

Notably, when the size of the regional trading bloc is smaller than h^*, the regional policy-maker will choose to marginally enlarge the bloc to obtain a greater level of political support since the weighted gain in net aggregate social welfare would more than compensate for the eventual weighted loss in political contributions.

On the other hand, when the size of the regional trading bloc has reached h^*, the regional policy-maker will choose not to marginally enlarge to avoid a loss in the political support since the weighted loss in net aggregate social welfare would be more than compensated by the weighted gain in political contributions.

2.5 The demand-side of membership

In this section we analyse the demand-side of membership focusing on the scheme of incentives underpinning the choice of the incumbent policy-maker in any third country

[25] More precisely, respecting the integer constraint, the equilibrium size of the regional trading bloc under the assumption of a perfectly elastic demand of membership is the highest integer that is lower than h^*.

between joining the regional trading bloc or not.[26]

Notably, the analysis of the demand of membership arising from third countries is developed under the simplifying assumption that the policy-maker in any third country considers the supply of membership of the regional trading bloc as perfectly elastic, that is as if any country asking for membership would be admitted the regional trading bloc.

The assumption of a perfectly elastic supply of membership will be then be relaxed in section 2.6 where we will formalise the interaction between the supply-side and demand-side of membership in determining the equilibrium size of the regional trading bloc, and show how the supply-side of membership might be binding on further enlargements of the bloc.

Thus, we consider that the incumbent policy-maker in any of the third countries faces two options of trade policy, that is whether to join the regional trading bloc or not to.[27]

Relying on the Grossman-Helpman (1993) lobbying group model, we assume that the incumbent policy-maker in any third country chooses between alternative options of trade policy with the final aim of maximizing the political support it receives.

We consider that the political support received by the policy-maker in any third country depends on three different variables.

First, we assume that the political support received by the incumbent policy-maker depends positively on the political contributions received by the organized interest group.

In fact, we consider that in any third country, all manufacturing firms are organized in a lobby group that offers a schedule of contingent (implicit) donations to the incumbent policy-maker to affect its choice of trade policy.[28]

[26] In modelling the demand for membership in the regional trading bloc, we follow Baldwin (1995).

[27] We assume that the choice to enter the regional trading bloc is irreversible such that once a country enters the regional trading bloc it can not decide to leave it later on.

[28] We rule out the possibility for the interest group to offer contributions to the incumbent policy-maker in the regional trading bloc. In addition, we assume that consumers located in any of the third countries are not organised in any form of interest group.

Second, the political support received by the incumbent policy-maker depends positively on the level of aggregate welfare, net of contributions, reached in the third country.

Third, we consider that the political support received by the incumbent policy-maker depends on the support of those groups that oppose or, alternatively, sustain joining the regional bloc on non-economic grounds.

While countries are assumed to be symmetric from an economic point of view, we consider that the resistance to membership on non-economic grounds varies across countries.

Notably, we assume that some countries are characterized by a resistance to enter the regional trading bloc on non-economic grounds while others are characterized by a willingness to enter the regional trading bloc on non-economic grounds.[29,30]

2.5.1 The policy-maker's choice in a third country

In the representative third country, the organized industrial lobby specifies a donation contract or contribution schedule that stipulates how large a donation will be made for each of the two stances of trade policy open to the incumbent policy-maker.

Thus, we label as D_{IN} and D_{OUT}, respectively, the political contributions that the policy-maker would receive if it chose to join the regional trading bloc or, alternatively, not to.

In addition, the net aggregate social welfare reached in the representative third country will depend on the policy-maker's choice between the alternative stances of trade policy.

[29] We assume that the resistance to membership on non-economic grounds influences the policy-making process in order to capture real world political concerns and to depict an equilibrium where some third countries will choose to enter the regional trading bloc while others will not.

[30] We could have introduced the existence of resistance or willingness to enlarge the regional trading bloc on non-economic grounds on the supply-side of membership but it would have only rescaled the relative strength of pro- and anti-enlargement forces.

We label as W_{IN} and W_{OUT}, respectively, the net aggregate social welfare that would be reached in the representative third country if the incumbent policy-maker decided to join the bloc or, alternatively, not to.

Labelling as R, the support that the incumbent policy-maker receives from those groups that oppose or, alternatively, sustain joining the regional bloc on non-economic grounds, we note that it may assume both positive and negative values.

We capture the choice of the incumbent policy-maker in the representative third country through the variable φ which equals one if the policy-maker chooses to join the regional trading bloc and zero if it decides not to join.

Thus, the problem of the policy-maker can be expressed as choosing φ in order to maximize:

$$\varphi\left[b \cdot D_{IN} + (1-b) \cdot W_{IN}\right] + (1-\varphi)\left[b \cdot D_{OUT} + (1-b) \cdot W_{OUT} + R\right] \qquad (2.34)$$

where b is a parameter which measures the extent of political distortions in the policy-making process, with $0 \leq b \leq 1$.

Thus if b equals zero the incumbent policy-maker will act as a social welfare maximizer, while the greater is the value of b, the higher will be the degree of political distortion since the interests of manufacturing firms receive a greater weight in the policy-making process.

Focusing on the donations received by the policy-maker in the typical third country, we restrict the contribution schedule specified by the organized interest group to be "truthful" in the Bernheim-Whinston (1986) specification.

The assumption of truthful donations contract implies that the organised interest group will offer the policy-maker the excess, if any, of the group's gross welfare reached under the chosen stance of trade policy relative to some optimally chosen base level of welfare.

Having assumed that the organized interest group is constituted by the firm owners

located in the representative third country, the group's gross aggregate welfare is given by the sum of the gross indirect utilities reached by firm owners.

It follows that the political contributions that would be collected by the policy-maker if it decided to join the regional trading bloc or not to join are:

$$D_{IN} = \max\left[0, k\Pi_{IN} - C\right] \tag{2.35}$$

$$D_{OUT} = \max\left[0, k\Pi_{OUT} - C\right] \tag{2.36}$$

where C is chosen such that to satisfy the voluntary participation constraint of the incumbent policy-maker.[31]

Notably, in equations (2.37) and (2.38), we label as Π_{IN} and Π_{OUT}, respectively, the profits that any manufacturing firm located in the representative third country would earn if the incumbent policy-maker decided to join the regional trading bloc, or, alternatively, not to join.

Focusing on the net aggregate social welfare, we note that the gross aggregate social welfare reached in the typical third country is defined in a "utilitarian" way, that is as the sum of the indirect utilities reached by labourers and firm owners located in the country.

Thus, the gross aggregate social welfare that would be reached if the policy-maker chose to join the regional trading bloc or not to join it, labelled as $\widetilde{W}_{IN}$ and $\widetilde{W}_{OUT}$, respectively, are:

$$\widetilde{W}_{IN} = \lambda^{\lambda} \cdot (1-\lambda)^{(1-\lambda)} \cdot P_R^{(-\lambda)} + k\Pi_{IN} \tag{2.37}$$

$$\widetilde{W}_{OUT} = \lambda^{\lambda} \cdot (1-\lambda)^{(1-\lambda)} \cdot P_N^{(-\lambda)} + k\Pi_{OUT} \tag{2.38}$$

We define the net aggregate social welfare that would be reached under the two

[31] See Bernheim and Whinston (1986) for a complete derivation of the equilibrium truthful contingent donations.

alternative stances of trade policy as the gross aggregate welfare less the amount of donations that would be paid by the organized interest group to the incumbent policy-maker.

Given equations (2.37), (2.38), (2.39), and (2.40), the net aggregate social welfare that would be reached in the representative third country if the policy-maker decided to join the regional trading bloc or not to, labelled as W_{IN} and W_{OUT}, respectively, are:

$$W_{IN} = \lambda^{\lambda} \cdot (1-\lambda)^{(1-\lambda)} \cdot P_R^{(-\lambda)} + C$$

$$W_{NON} = \lambda^{\lambda} \cdot (1-\lambda)^{(1-\lambda)} \cdot P_N^{(-\lambda)} + C$$

2.5.2 The demand-side condition

Following Baldwin (1995), we can derive a condition under which the policy-maker in the representative third country will decide to join the regional trading bloc.

Notably, the policy-maker will choose to join the regional trading bloc if the political support it would receive is greater under this stance of trade policy is greater or at least equal to the political support it would receive if it decided not to join.

Formally, the policy-maker in the representative third country will decide to join the regional bloc if the following condition is verified:

$$b \cdot (D_{IN} - D_{OUT}) + (1-b) \cdot (W_{IN} - W_{OUT}) \geq R \qquad (2.39)$$

We label the above condition as the "demand-side" condition since when it holds the policy-maker in the third country will choose to join the regional trading bloc as this stance of trade policy implies the greater level of political support.[32]

[32] Having assumed that some countries are characterized by a willingness to enter the regional trading bloc on non-economic grounds implies that for some countries the demand-side condition will be always verified, irrespectively of the size of the regional trading bloc. In turn, this guarantees that the regional trading bloc will be formed in the first place.

Notably, the policy-maker will decide to join the regional trading bloc if the weighted sum of the donation differential and the net aggregate social welfare differential is greater or equal to the non-economic resistance to join the bloc.

If the demand-side condition is satisfied a positive demand for membership arises from the third country since the incumbent policy-maker will choose to join the regional trading bloc.

On the other hand, if the demand-side condition is not satisfied the policy-maker will choose not to join the regional trading bloc such that the demand for membership of the representative third country will be nil.

Focusing on the political contributions offered under the alternative stances of trade policy, we note that the organized interest group will lobby in favour of the trade policy choice that implies the higher level of group's gross welfare, that is by implying the higher level of aggregate manufacturing profits.

Thus, in order to evaluate whether the industrial lobbying activity in the representative third country constitutes a pro-, or anti-membership force in the policy-making process, we compare the profits that a manufacturing firm located in the country would earn if the policy-maker decided to join the bloc and if it decided not to.

The profit differential, that is the difference between the profits that a manufacturing firm located in the representative third country would earn if the policy-maker decided to join the bloc or not to join, is:

$$\Pi_{IN} - \Pi_{OUT} = \frac{\lambda}{\sigma}\left[\left(P_R^{\sigma-1} - P_N^{\sigma-1}\right) + h \cdot \left(\mu^{(1-\sigma)} - \tau^{(1-\sigma)}\right) P_{ENL}^{\sigma-1}\right] \tag{2.40}$$

If the policy-maker decided to join the regional trading bloc, the manufacturing firm located in the third country would face different effects in the three different markets where it operates, that is the local market, the regional bloc market and the third countries' market.

The first term in equation (2.44) represents the difference in the amount of profits that a manufacturing firm located in the representative third country would experience in its local market if the policy-maker decided to join the bloc rather than not to join.

The manufacturing firm would earn lower profits on the local market if the country joined the regional trading bloc since the firm would face greater competition in its local market.

If the representative third country joined the regional trading bloc, varieties produced in the bloc would be available to consumers located in the third country at a price μ lower than the price τ that they would have paid if the country had not joined the bloc.

Thus, due to a substitution effect, consumers located in the representative third country would reduce their consumption of the locally produced varieties such that the manufacturing firm would experience an unambiguous reduction in profits on its local market.

The second term in equation (2.44) represents, instead, the difference in the amount of profits that any manufacturing firm located in the representative third country would experience in the regional market if the policy-maker decided to join the bloc rather than not to join.

We note that the profits that a manufacturing firm would earn in the regional bloc market will be higher if the policy-maker chose to join the regional bloc rather than not join.

In fact, if the representative third country joined the bloc, the firm's own variety would be available to consumers located in regional bloc at a price μ lower than the price τ that they would paid for if the firm had been located outside the regional trading bloc.

As a result, consumers located in the regional trading bloc would increase their consumption of the firm's own variety leading to greater profits earned in the regional bloc market.

Finally, the profit earned by the manufacturing firm in the third countries' market

will be unchanged whether or not the country joins the regional trading bloc.

Notably, the reduction in profits that the manufacturing firm would experience in its local market will be more than compensated by the increase in profits in the regional bloc market such that the profits differential will have a positive sign for any size of the regional trading bloc. We conclude that since it is profit-enhancing for any manufacturing firm located in the representative third country if the policy-maker chooses to join the regional trading bloc, the organized interest group constitutes a pro-membership force in the policy-making process.

Thus, the organised interest group constitutes a pro-joining force in the policy-making process since joining the regional trading bloc constitutes the trade policy choice that would imply the greater level of the group's gross welfare.

We note that the organised interest group in the representative third country will actually contribute in equilibrium when its own interests are in conflict with the trade policy outcome that the incumbent policy-maker's would implement in absence of any political contributions.

The organised interest group will then offer a positive contribution to the incumbent policy-maker in order to join the regional trading bloc insofar as the non-economic resistance to join would dominate economic considerations to join in absence of political contributions.

We now focus on the welfare differential, that is the difference between the level of net aggregate social welfare that would be reached in the representative third country if the policy-maker decided to join the regional trading bloc and if it decided not to join.

Given equations (2.41) and (2.42), the welfare differential may be expressed as:

$$W_{IN} - W_{OUT} = \lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot \left(P_R^{(-\lambda)} - P_N^{(-\lambda)}\right) \tag{2.41}$$

We emphasize that the net aggregate social welfare reached in the representative third country will be greater if the policy-maker decides to join the regional trading

bloc rather than not to join.

If the country entered the regional trading bloc, local consumers would experience a reduction, from τ to μ, in the price paid for any manufactured varieties produced in the bloc. Consumers located in the typical third country would then increase their consumption of manufactured varieties produced in the bloc reaching a higher level of indirect utility.

Thus, the greater level of net aggregate social welfare that would be reached in the typical third country if the policy-maker decided to join the regional trading bloc constitutes a pro-membership force in the policy-making process.

Notably, since both the donation differential and the welfare differential are positive for any size of the regional trading bloc, the left-hand side of the demand-side condition will be positive.

However, the right-hand side of the demand-side condition will assume a positive value for those countries that have a resistance to join the regional trading bloc on non-economic grounds, and negative value for those countries that, instead, have a willingness or a "negative resistance" to join the regional trading bloc.

We conclude that in those third countries characterized by a non-economic willingness to join the regional trading bloc, the policy-maker will choose to join the regional trading bloc.

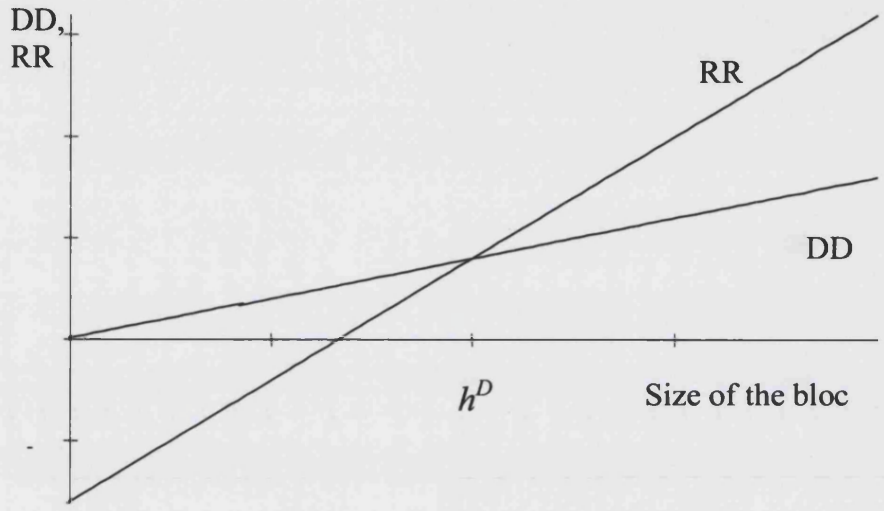
On the other hand, in those third countries that present a non economic resistance to membership, the policy-maker will decide to enter the regional trading bloc if the weighted sum of the gain in the amount of political contributions received and in aggregate social welfare is at least equal to the non-economic resistance to join the regional bloc.[33]

We use graphical analysis to derive the political equilibrium of the demand-side of membership.

In Figure 2-2 we plot the right-hand side of the demand side condition, that is the

[33]Since the interest group and the aggregate social welfare are pro-membership forces in the policy-making process, if we had not considered the existence of a non-economic resistance to membership, in the equilibrium all countries would have rather joined the regional trading bloc.

Figure 2-2: The demand-side political equilibrium



weighted sum of the gain in donations and in net social aggregate welfare that would be achieved if the policy-maker decided to join the regional trading bloc as function of the size of the bloc.

Notably, since both the profit differential and the welfare differential are increasing in the size of the regional trading bloc, the locus DD is upward sloping.

In addition, arranging countries in order of increasing resistance to membership on non-economic grounds, locus RR plots the resistance to membership of each country.[34]

We note that the size of the bloc at which the two loci DD and RR intersect, labelled as h^D, represents the number of countries that would choose to enter the regional trading bloc, if the supply of membership of the regional trading bloc was perfectly elastic.[35]

[34] We can think that there is a continuum of countries, or we can interpret the locus RR as the line that connects individual countries' resistance to membership on non-economic grounds.

[35] More precisely in order to respect the integer constraint, the equilibrium number of countries that will ask for membership in the regional trading bloc, given a perfectly elastic supply of membership,

In fact, for all countries on the left of h^D, the demand side condition will be verified since the weighted sum of the profit differential and the welfare differential, offsets the political resistance to membership on non-economic grounds.

On the other hand for all countries on the right of h^D, the demand side condition will not be verified since the weighted sum of the profit differential and the welfare differential is lower than the non-economic resistance to membership.

As a result, h^D can be seen as the equilibrium size that the regional trading bloc would reach if the supply of membership of the regional bloc was perfectly elastic.

2.6 The equilibrium size of the regional trading bloc

We have has so far formalised the supply of membership of the regional trading bloc, and the demand for membership arising from third countries.

In this section we allow for the interaction between the supply of membership of the regional trading bloc, and the demand for membership arising from third countries, and formalise the equilibrium size of the regional trading bloc.

We define the equilibrium size of the regional trading bloc as that size of the bloc in correspondence of which no further enlargements of the bloc will take place.

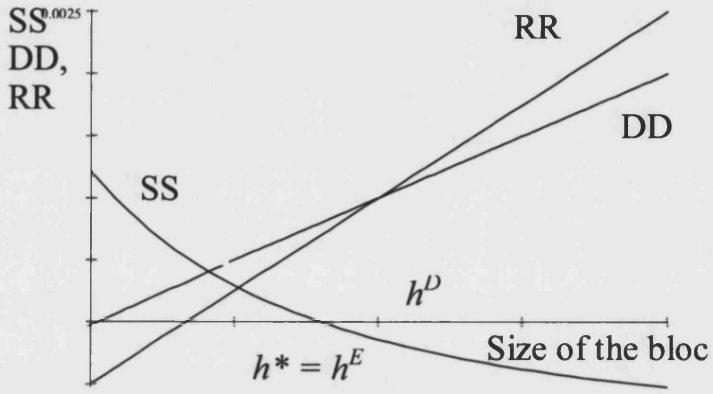
Once the supply-side and the demand-side of membership interact, an enlargement of the regional trading bloc will arise if and only if the supply-side condition for the regional trading bloc in equation (2.33) is verified, and the demand-side condition in equation (2.39) holds for at least one of the third countries.

The equilibrium size of the regional trading bloc will then be reached when either the regional policy-maker is not willing to further enlarge such that any eventual request of membership from third countries is refused, or none of the third countries is willing to join although the regional policy-maker might be willing to further enlarge.

In the following, we use graphical analysis to derive the equilibrium size of the regional trading bloc, and show that the regional trading bloc will no further enlarge

is the highest integer less than h^D.

Figure 2-3: The equilibrium size of the regional bloc: binding supply-side



when either the supply of, or the demand for membership are binding.[36]

Notably, we show due to the interaction between the supply of and the demand for membership, the equilibrium size of the regional trading bloc will not exceed but could be smaller than the supply-side implied maximum size of the bloc, that is the equilibrium size that the bloc would have reached if the demand of membership arising from third countries had been perfectly elastic.

Thus, in Figure 2-3 we plot the political equilibrium of the supply-side of membership, and the political equilibrium of the demand-side of membership.

We note that h^D, at the intersection between the loci DD and RR, represents the number of countries that would like to join the regional trading bloc if the supply of membership of the regional trading bloc was perfectly elastic.

On the other hand h^*, at the intersection between the locus SS and the horizontal

[36] See Alesina *et al.* (2005) for a model where the equilibrium size of an international political union is endogenously determined by the trade-off between the benefits of coordination and the degree of heterogeneity across countries.

axis, represents the supply-side implied maximum size of the regional bloc given that the regional policy-maker will not be willing to further enlarge the bloc beyond it to avoid a loss in political support received.

Our graphical analysis points out that the number of countries that would rather join the regional trading bloc if the supply of membership was perfectly elastic exceeds the supply-side implied maximum size of the bloc, that is $h^D > h^*$.

However, following the interaction between the supply of, and demand for membership, the equilibrium size of the regional trading bloc can not exceed the supply-side implied maximum size since the regional policy-maker will not be willing to further enlarge the bloc beyond h^*.

Thus, in the case depicted in Figure 2-3, due to the interaction between the supply of and demand for membership, the equilibrium size of the regional trading bloc, labelled as h^E, coincides with the supply-side implied maximum size of the bloc, that is $h^E = h^*$.

In the case depicted in Figure 2-3 then the supply-side of membership is binding in the determination of the equilibrium size of the regional trading bloc.[37]

It follows that the number of countries that in equilibrium are in the regional trading bloc is then smaller than the number of countries that would have entered the bloc if the supply of membership had been perfectly elastic, that is $h^E < h^D$.

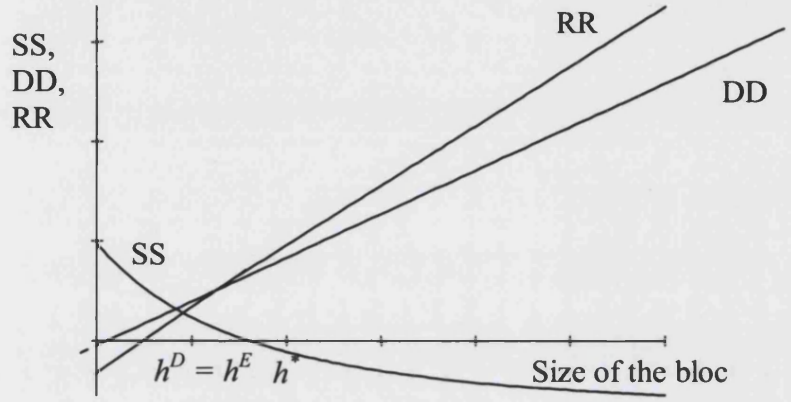
While the supply-side of membership implies that a maximum size beyond which the regional trading bloc will no further enlarge exists, the demand-side of membership might imply that the supply-side implied maximum size is not reached in equilibrium.

In fact, as shown in Figure 2-4, in the event the requests for membership are not "numerous" enough, the equilibrium size of the bloc will be smaller than the maximum size that the regional policy-maker would have been willing to achieve.

Our graphical analysis shows that the number of countries that are willing to join the regional trading bloc is lower than the maximum size that the regional policy-maker

[37] If we had assumed a perfectly elastic supply of membership as in Baldwin (1995), the equilibrium size of the regional trading bloc would have been in h^D.

Figure 2-4: The equilibrium size of the regional bloc: binding demand-side



would have been willing to achieve if the demand of membership had been perfectly elastic, that is $h^D < h^*$.

Thus, due to the interaction between the supply of and demand for membership, the equilibrium size of the regional trading bloc is smaller than the supply-side implied maximum size of the bloc, and it coincides with the number of third countries that would like to join the bloc, that is $h^E = h^D$.

In the case depicted in Figure 2-4 the demand-side of membership is then binding in the determination of the equilibrium size of the regional trading bloc such that, due to the lack of requests of membership, the supply-side implied maximum size will not be achieved.

2.7 Does deeper integration mean wider integration?

In this section we investigate the implications of the implementation of deeper integration among the members of the regional trading bloc on the equilibrium size of the

bloc, and assess whether it will lead to wider integration or not.[38]

Notably, we model deeper integration among the members of the regional trading bloc as a reduction in level of intra-bloc trade costs from an initial level μ_0 to μ_1, with $\mu_0 > \mu_1 > 1$, and we assess the implications of this reduction on the equilibrium size of the regional trading bloc.

Since the equilibrium size of the regional trading bloc is the endogenous outcome of the interaction between the supply of, and the demand for membership, we first analyse how deeper integration affects the political equilibrium on the supply-side and demand-side of membership, and we then assess the overall impact on the equilibrium size of the bloc.

2.7.1 Implications for the supply-side of membership

In order to assess the implications of deeper integration among member countries on the supply-side of membership, we focus on the two components of the supply-side condition expressed in equation (2.33), that is the welfare differential and the donations differential.

First, as shown in the Mathematical Appendix, the derivative of the welfare differential with respect to the level of intra-bloc trade costs is positive for any size of the regional trading bloc.

Thus, deeper integration among members reduces the gain in net aggregate social welfare that would be achieved in the regional trading bloc if the regional policy-maker decided to marginally enlarge rather than not to.

Notably, the lower intra-bloc trade costs are, the greater is the indirect utility of consumers located in the regional trading bloc before the marginal enlargement since the greater is their consumption of varieties produced within the regional bloc due to their relatively lower price.

As a result, the smaller would be the increase in consumers' indirect utility once

[38] In our analysis we consider that wider integration arises when the equilibrium size of the regional trading bloc increases.

the manufactured varieties produced in the new member country will be available at a lower price following a marginal enlargement of the regional trading bloc.

Second, as shown in the Mathematical Appendix, the derivative of the profit differential with respect to intra-bloc trade costs is positive for any size of the regional trading bloc.

We previously noted that a marginal enlargement of the regional trading bloc has opposing effects on the profits earned by manufacturing firms located in the regional trading bloc.

Thus, a profit-enhancing market-size effect would operate in the regional bloc market while a profit-reducing competition-effect would arise in both the local market and the regional bloc market, and a profit-reducing market-size effect would arise in the third countries' market.

Notably, the lower intra-bloc trade costs are, the lower would be the price paid by consumers located in the regional trading bloc for manufactured varieties produced in the new member country following a marginal enlargement of the regional trading bloc.

Manufacturing firms located in the regional trading bloc would then experience a greater profit-reducing competition-effect on the local and regional bloc markets for the same profit-enhancing market size effect in the regional bloc market.

As a result, if the size of the regional trading bloc is lower than the size of the bloc that would maximise the profits of manufacturing firms located in the bloc, deeper integration would reduce the gain in profits that firms would obtain following a marginal enlargement of the bloc. Thus, deeper integration would reduce the gain in donations that the regional policy-maker would receive if it chooses to marginally enlarge the bloc rather than not to.

On the other hand, if the size of the regional trading bloc is equal to or greater than the size that would maximise the profits of manufacturing firms located in the bloc, deeper integration increases the loss in profits that firms would experience following a marginal enlargement.

In this case, then, deeper integration would increase the loss in donations that the regional policy-maker would experience if it chooses to marginally enlarge the bloc rather than not to.

We conclude that deeper integration among member countries affects the supply-side political equilibrium by strengthening the anti-enlargement forces while weakening the pro-enlargement forces operating in the policy-making process.

In the following we use graphical analysis to illustrate the impact of deeper integration on the supply-side political equilibrium, and we show that it contracts the size of the regional trading bloc where anti-enlargement and pro-enlargement forces balance, that is the supply-side implied maximum size of the regional trading bloc.

Figure 2-5 depicts the left-hand side of the supply-side condition, that is the gain in political support that the policy-maker would achieve if it chooses to marginally enlarge the regional trading bloc, as a function of the size of the bloc for different level of intra-bloc trade costs.

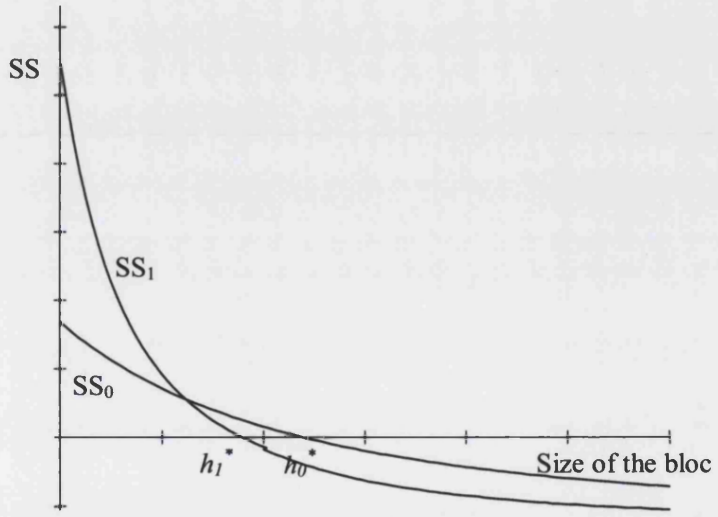
Thus, locus SS_0 plots the gain in political support that the regional policy-maker would obtain if it decided to marginally enlarge the bloc for the initial level of intra-bloc trade costs μ_0. On the other hand, locus SS_1 plots the gain in political support that the regional policy-maker would obtain if it decided to marginally enlarge the bloc for the level of intra-bloc trade costs μ_1 that would follow the implementation of deeper integration among members.

As shown in the Mathematical Appendix, the derivative with respect to level of intra-bloc trade costs of the profit differential and the welfare differential are positive for any size of the regional trading bloc such that the locus SS_1 is shifted inward with respect to locus SS_0.

For the initial level of intra-bloc trade costs μ_0, the supply-side implied maximum size of the regional trading bloc beyond which the regional policy-maker will not be willing to enlarge further corresponds to h_0^*, at the intersection between the locus SS_0 and the horizontal axis.

Following deeper integration leading to a reduction in the level of intra-bloc trade

Figure 2-5: The impact of deeper integration on the supply-side equilibrium



costs to μ_1, the supply-side maximum size of the regional trading bloc will be h_1^*, at the intersection between the locus SS_1 and the horizontal axis such that $h_1^* < h_0^*$.

Thus, *ceteris paribus,* deeper integration among the members of the regional trading bloc will reduce the supply-side implied maximum size of the regional trading bloc, that is the size of the bloc beyond which the regional policy-maker will not be willing to enlarge further.

2.7.2 Implications for the demand-side of membership

In order to assess the impact of deeper integration within the regional trading bloc on the demand-side of membership, we focus on the two components of the demand-side condition expressed in equation (2.39), that is the welfare differential and the donations differential.

First, we note that deeper integration among the members of the regional trading bloc increases the gain in net aggregate social welfare that would be reached in the representative third country if the policy-maker chose to join the regional trading bloc rather than not to.

The lower intra-bloc trade costs are, the lower would the price paid by consumers located in the representative third country for any manufactured variety produced in the regional trading bloc if the country joined the bloc.

Thus, the greater would be the increase in the indirect utility of consumers located in the representative third country if the country joined the regional trading bloc since the greater would be the increase in their consumption levels.

In addition, deeper integration among the members of the regional trading bloc increases the gain in donations that the incumbent policy-maker in the representative third country would receive if it decided to join the regional trading bloc rather than not to.

Notably, the lower intra-bloc trade costs, the greater the gain in the profits of manufacturing firms located in the representative third country would be if the incumbent policy-maker chose to join the regional trading bloc since the lower would be the

price paid by consumers in the regional trading bloc for varieties produced in the new member country.

Thus, deeper integration within the regional trading bloc boosts the number of countries that would choose to join the bloc since for a greater number of countries the gain in campaign contributions and in aggregate social welfare would be high enough to overcome the intrinsic non-economic resistance to membership.

In the following, we use graphical analysis to illustrate the implications of deeper integration on the demand-side political equilibrium, and we show that it boosting the requests for membership in the regional trading bloc.

In Figure 2-6 we depict the left-hand side of the demand-side condition, that is the weighed sum of the gain in campaign contribution and aggregate social welfare that the policy-maker would achieve if it chose to join the regional trading bloc, as a function of the size of the bloc for different level of intra-bloc trade costs.

Thus, locus DD_0 plots the weighed sum of the gain in political contributions and aggregate social welfare that the policy-maker would achieve if it chose to join the regional trading bloc rather than not to for the initial level of intra-bloc trade costs μ_0.

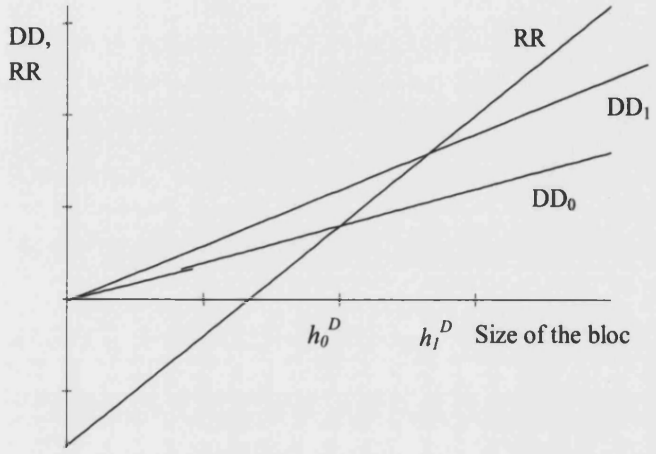
On the other hand, locus DD_1 plots the weighed sum of the gain in political contributions and aggregate social welfare that the policy-maker would achieve if it chose to join the regional trading bloc rather than not to for the level of intra-bloc trade costs $\mu_1$that would follow deeper integration among members.

We note that since the derivative with respect to the level of intra-bloc trade costs of both the profit differential and the welfare differential is negative for any size of the regional trading bloc, the locus DD_1 is upward shifted with respect to locus DD_0.

For the initial level of intra-bloc trade μ_0, the number of third countries that would like to join the regional bloc corresponds to h_0^D, at the intersection between the two loci DD_0 and RR.

Following deeper integration leading to a reduction in the level of intra-bloc trade costs to μ_1, the number of countries that would rather join the regional trading bloc

Figure 2-6: The impact of deeper integration on the demand-side equilibrium



is expressed by h_1^D, at the intersection between the two loci DD_1 and RR such that $h_1^D > h_0^D$.

We conclude that, *ceteris paribus*, deeper integration among the members of the regional trading bloc will affect the demand-side of membership by boosting third countries' requests for membership in the regional trading bloc.

2.7.3 Implications for the equilibrium size of the bloc

We showed that the equilibrium size of the regional trade bloc is the endogenous outcome of the interaction between the supply of, and the demand for membership.

Thus, in order to assess the implications of deeper integration among the members of the regional trading bloc on the equilibrium size of the regional bloc, we have to take into account the effects on both the supply-side and demand-side of membership.

We showed that deeper integration within the regional trading bloc boosts the third countries' requests for membership, while it contracts the supply-side implied maximum size of the bloc, that is the size beyond which the regional policy-maker is not willing to further enlarge.

We emphasize that the implications of deeper integration on the equilibrium size of

the regional trading bloc are, in general, ambiguous and crucially depend on whether the supply-side or the demand-side are binding in the determination of the equilibrium size of the bloc.

We use graphical analysis to illustrate the impact of deeper integration leading to a reduction in the intra-bloc costs on the equilibrium size of the regional trading bloc.

Notably, we compare the equilibrium size of the regional trading bloc for the initial level of intra-bloc trade costs μ_0, and the equilibrium size that would be reached if intra-bloc trade costs reduce to μ_1 due to the implementation of deeper integration among the members of the bloc.

In order to asses the implication of deeper integration on the equilibrium size of the bloc and illustrate the interaction between the supply-side and demand-side of membership, we consider two alternative initial scenarios.

First, we focus on a scenario in which the supply-side of membership is binding in the determination of the equilibrium size of the bloc for the initial level of intra-bloc trade costs μ_0.

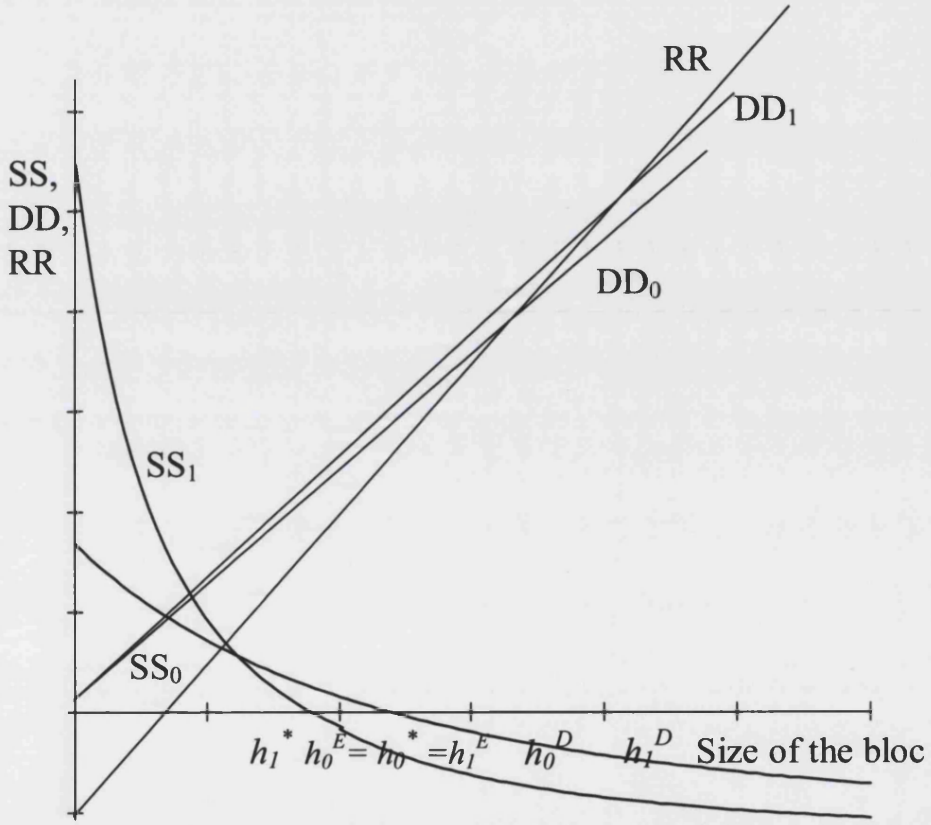
As shown in Figure 2-7 in this case the initial equilibrium size of the bloc, labelled as h_0^E, coincides with the supply-side implied maximum size of the bloc h_0^*, such that $h_0^E = h_0^*$, and $\left(h^D - h^E\right)$ countries are refused the membership in the bloc even if they would like to join it.

Due to deeper integration among the members of the regional trading bloc, the supply-side implied maximum size of the bloc will shrink from h_0^* to h_1^* while the number of countries that would like to join the regional bloc increases from h_0^D to h_1^D.

Assuming that the regional policy-maker cannot reduce the size of the regional trading bloc by forcing out members, our graphical analysis shows that if deeper integration arises when the supply-side of membership is binding, the equilibrium size of the bloc will be unaffected.

In fact, despite deeper integration stimulates the requests for membership, the supply-side of membership will be binding on further enlargement of the bloc such that $h_1^E = h_0^E = h_0^*$.

Figure 2-7: Deeper integration with binding supply-side: unaffected equilibrium size



We note that the equilibrium size of the bloc will be greater than the maximum size of the bloc to which the regional policy-maker would have been willing to enlarge under the lower level of intra-bloc trade costs, that is $h_1^E > h_1^*$.[39]

Alternatively, we consider a scenario in which the demand-side of membership is binding in the determination of the equilibrium size of the regional trading bloc for the initial level of intra-bloc trade costs μ_0.

As shown in Figure 2-8, in this case the initial equilibrium of the regional trading bloc, labelled as h_0^E, coincides with the number of third countries that would like to join the bloc h_0^D, such that $h_0^E = h_0^D$, and it is lower than the supply-side implied maximum size of the bloc h_0^*.

Our graphical analysis shows that deeper integration within the regional trading bloc will shrink the supply-side implied maximum size of the bloc from h_0^* to h_1^*, while boosting the number of countries that would rather join the bloc from h_0^D to h_1^D.

Notably, while deeper integration will boost membership requests thus removing the binding effect of the demand-side of membership, it will also contract the supply-side implied maximum size of the regional trading bloc.

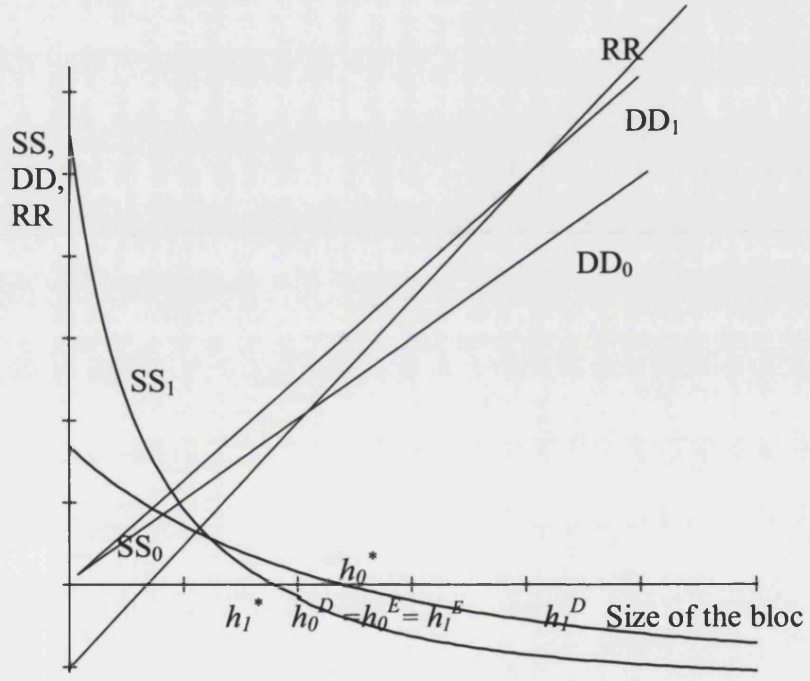
Assuming that the regional policy-maker can not force out existing members, our graphical analysis illustrates that the implementation of deeper integration within the regional trading bloc will not affect the equilibrium size of the regional trading bloc.

As shown in Figure 2-8, if the supply-side implied maximum size of the regional trading bloc that would follow deeper integration is lower than the initial equilibrium size, that is $h_1^* < h_0^E$, the equilibrium size of the bloc will not be affected since additional requests for membership from third countries will be refused, that is $h_1^E = h_0^E$.

In this case the equilibrium size of the regional trading bloc will be greater than the supply-side implied maximum size of the bloc to which the regional policy-maker

[39] If the regional policy-maker had the possibility to force members out, the equilibrium size of the bloc would contract following the implementation of deeper integration. Thus, not only the boost in the requests for membership induced by deeper integration would not be satisfied, but also the equilibrium size of the bloc would contract to coincide with the new supply-side induced maximum size, that is $h_1^E = h_1^*$ with $h_1^E < h_0^E$.

Figure 2-8: Deeper integration with binding demand-side: unaffected equilibrium size



would have been willing to enlarge under the lower level of intra-bloc trade costs, that is $h_1^E > h_1^*$.[40]

However, as shown in Figure 2-9, deeper integration will affect the equilibrium size of the regional trading bloc in the presence of an initially binding demand-side of membership when the new supply-side implied maximum size is greater than the initial equilibrium size, that is $h_0^E < h_1^* < h_0^*$.

In fact, if the supply-side implied maximum size of the regional trading bloc that would follow deeper integration is greater than the initial equilibrium size of the regional bloc, the regional policy-maker would be willing to further enlarge accepting new membership requests.

Thus, the equilibrium size of the regional trading bloc will increase since deeper integration within the bloc will remove the initially binding effect of the demand-side of membership.

As shown in Figure 2-9, if the additional requests for membership due to the implementation of deeper integration in the regional trading bloc are "numerous" enough, the regional trading bloc could reach its new supply-side implied maximum size, that is $h_0^E = h_1^*$ with $h_1^E > h_0^E$.

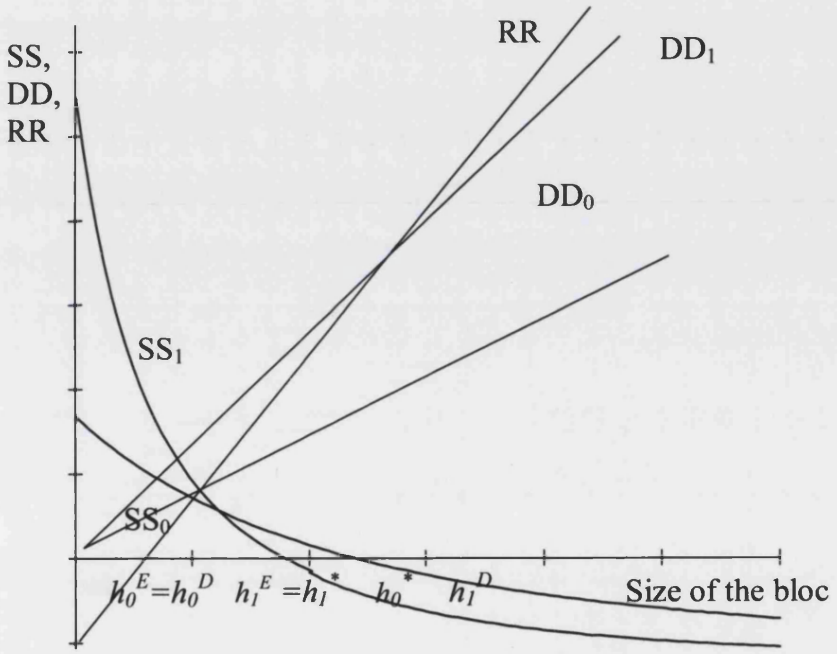
Our results on the implications of deeper integration among the members of a regional trading bloc on the equilibrium size of the bloc differ from Baldwin (1995) where deeper integration unambiguously lead to wider integration by boosting the requests of membership.

In our framework where the supply-side of membership is formalized and the equilibrium size of the regional trading bloc is the endogenous outcome of the interaction of supply of and demand for membership, deeper integration will not necessarily lead to wider integration.

Notably, the impact of deeper integration on the equilibrium size of the regional

[40] If the policy-maker could force members out, following deeper integration the equilibrium size of the bloc would contract to coincide with the new supply-side implied maximum size, that is $h_1^E = h_1^*$ with $h_1^E < h_0^E$.

Figure 2-9: Deeper integration with binding demand-side: greater equilibrium size



trading bloc depends crucially on whether the supply-side, or the demand-side of membership is binding in the determination of the initial equilibrium size of the bloc, and on the interaction between the effects of deeper integration on the supply-side and the demand-side of membership.

Our analysis shows that, *ceteris paribus*, deeper integration might lead to wider integration when the demand-side of membership is binding, while if the supply-side of membership is binding, the equilibrium size of the regional trading bloc will be unaffected.

2.8 Conclusions

In this chapter we addressed the question of whether a regional trading bloc will expand or keep stagnant in terms of its size by providing a theoretical model in which both the incentives for a regional trading bloc to enlarge and for non-members countries to join are formalised.

First we showed that, due to the interaction between pro and anti-enlargement forces in the policy-making process, a supply-side implied maximum size of the regional trading bloc exists.

In fact, our analysis pointed out that a maximum size of the regional trading bloc exists beyond which the political-support maximizing regional policy-maker will not be willing to further enlarge the bloc since this would imply a reduction in the political support it receives.

In addition, we showed that the enlargement of the regional trading bloc is the endogenous outcome of the interaction between the supply of membership arising from the bloc and the demand for membership arising from third countries.

Notably, when the size of the regional trading bloc is smaller than the supply-side implied maximum size, the bloc will enlarge if a request for membership from third countries arises.

On the other hand, once the regional trading bloc has reached its supply-side

implied maximum size, the regional policy-maker will not be willing to further enlarge such that any request of membership from third countries will be refused.

As a result, we derived the equilibriums size of the regional trading bloc as jointly determined by the supply of, and demand for membership.

We pointed out that the equilibrium size of the regional trading bloc will not exceed but could be smaller than the supply-side implied maximum size of the bloc.

On the one hand, the equilibrium size of the regional trading bloc can not exceed the supply-side implied maximum size of the bloc since, once the maximum size is reached, the regional policy-maker will not be wiling to further enlarge the regional trading bloc.

However, since the equilibrium size of the regional trading bloc is determined by the interaction between supply of and demand for membership, the equilibrium size of the bloc might be smaller than the supply-side implied maximum size if the requests for membership are not "numerous" enough.

Thus, we concluded that while the supply-side of membership is binding on the maximum size that the regional trading bloc will achieve, the demand-side of membership might be binding on further enlargements thus preventing the bloc from reaching its maximum size.

Finally, we studied how the "depth" of regional trading agreements may affect their "width".

We showed that the implementation of deeper integration among the members of a regional trading bloc will affect both the supply-side and the demand-side of membership and, as a result, the equilibrium size of the regional bloc.

Our analysis showed that deeper integration contracts the maximum size to which the regional policy-maker is willing to enlarge the bloc while it boosts the demand for membership of third countries through a "domino effect" à la Baldwin (1995).

We emphasised that the impact of deeper integration on the equilibrium size of the regional trading bloc depends on whether the supply-side or the demand-side are binding in the determination of the equilibrium size of the bloc, and on the interaction

between the effects of deeper integration on the supply-side and the demand-side of membership.

We concluded that deeper integration within a regional trading bloc may lead to wider integration when the demand-side of membership is binding in the determination of the equilibrium size of the bloc, while the equilibrium size of the bloc will be unaffected if the supply-side of membership is binding.

2.9 Mathematical Appendix

2.9.1 Proof of Proposition 1

The operating profit of the typical manufacturing firm located within the regional trading bloc as a function of the size of the bloc, $h \in [0, g]$, may be expressed as:

$$\Pi(h) = \frac{\lambda}{\sigma} \cdot \left[P_R^{\sigma-1} + (h-1)\,\mu^{(1-\sigma)} P_R^{\sigma-1} + (g-h)\,\tau^{(1-\sigma)} P_{NON}^{\sigma-1} \right]$$

where

$$P_R = \left[k + k \cdot (h-1)\,\mu^{(1-\sigma)} + k \cdot (g-h)\,\tau^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}}$$

$$P_{NON} = \left[k + k \cdot (g-1)\,\tau^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}}$$

In order to simplify the notation we can define:

$$p(h) = k + k \cdot (h-1)\,\mu^{(1-\sigma)} + k \cdot (g-h)\,\tau^{(1-\sigma)} = p(0) + h\frac{\partial p(h)}{\partial h}$$

Thus, given equations (2.13) and (2.14), we have:

$$P_R = p(h)^{\frac{1}{1-\sigma}}$$

$$P_{NON} = p(1)^{\frac{1}{1-\sigma}}$$

We can then rewrite the operating profit function as:

$$\Pi(h) = \frac{\lambda}{\sigma} \cdot \left[p(h)^{-1} + (h-1)\,\mu^{(1-\sigma)} p(h)^{-1} + (g-h)\,\tau^{(1-\sigma)} p(1)^{-1} \right]$$

First, we compute the value of the profit function for $h = 0$ and $h = g$, that is at the extremes of the interval where it is defined:

$$\Pi(0) = \frac{\lambda}{\sigma} \cdot \left[p(0)^{-1} \cdot \left(1 + (g-1)\tau^{(1-\sigma)} \right) \right] = 0$$

$$\Pi(g) = \frac{\lambda}{\sigma} \cdot \left[p(g)^{-1} + (g-1)\mu^{(1-\sigma)} p(g)^{-1} \right] = \frac{\lambda}{\sigma k}$$

Furthermore, the first order derivative of the operating profit function with respect to the endogenous variable h is given by:

$$\frac{\partial \Pi(h)}{\partial h} = \frac{\lambda}{\sigma} \cdot \left\{ \frac{p(h)\mu^{(1-\sigma)} + \frac{\partial p(h)}{\partial h} \cdot \left[(h+1)\mu^{(1-\sigma)} \right] - 1}{p(h)^2} - \frac{\tau^{(1-\sigma)}}{p(1)} \right\}$$

which may be rewritten as:

$$\frac{\partial \Pi(h)}{\partial h} = \frac{\lambda}{\sigma} \cdot \left\{ \frac{p(0)\mu^{(1-\sigma)} + \frac{\partial p(h)}{\partial h} \cdot \left(\mu^{(1-\sigma)} - 1 \right)}{p(h)^2} - \frac{\tau^{(1-\sigma)}}{p(1)} \right\}$$

After some manipulations, we have that $\frac{\partial \Pi(h)}{\partial h} \geq 0$ if:

$$p(h)^2 \leqslant \frac{p(1)}{\tau^{(1-\sigma)}} \cdot \left[p(0)\mu^{(1-\sigma)} + \frac{\delta p(h)}{\delta h} \cdot \left(\mu^{(1-\sigma)} - 1 \right) \right]$$

that is, recalling the definition of $p(h)$, if:

$$h \leq \frac{1}{\left[\mu^{(1-\sigma)} - \tau^{(1-\sigma)} \right]} \cdot \left\{ \left\{ kp(1) \left[(g-1)\mu^{(1-\sigma)} + 1 \right] \right\}^{\frac{1}{2}} + \left(\mu^{(1-\sigma)} - 1 - g\tau^{(1-\sigma)} \right) \right\}$$

where the right-hand side of the above equation is positive for any value of the parameters.

The profit function has then a global maximum in $\widehat{h}$ which corresponds to the optimal size of the regional bloc from the point of view of a typical manufacturing firm located in the bloc.

Notably, the optimal size of the regional trading bloc from the point of view of manufacturing firms located in the regional trading bloc is:

$$\widehat{h} = 1 + \left\{ k \left[1 + (g-1)\,\mu^{(1-\sigma)} \right]^{\frac{1}{2}} - \left[1 + (g-1)\,\tau^{(1-\sigma)} \right]^{\frac{1}{2}} \right\} \cdot \frac{\left[1 + (g-1)\,\tau^{(1-\sigma)} \right]^{\frac{1}{2}}}{\left[\mu^{(1-\sigma)} - \tau^{(1-\sigma)} \right]}$$

Due to the existence of a global maximum for the profit function $\Pi(h)$, a marginal enlargement of the regional trading bloc could be profit-enhancing or profit reducing for the typical manufacturing firm located in the bloc depending on the initial size of the bloc.

We conclude that a marginal enlargement of the regional trading bloc will be profit-enhancing when $h < \widehat{h}$, while it will be profit-reducing for $h \geq \widehat{h}$.

2.9.2 Proof of Proposition 2

The aggregate social welfare, net of contributions, that would be reached in the regional trading bloc under the two alternative stances of trade policy is given by:

$$W_{ENL} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{ENL}^{(-\lambda)}$$

$$W_{NON} = h \cdot \lambda^{\lambda} (1-\lambda)^{(1-\lambda)} \cdot P_{R}^{(-\lambda)}$$

where

$$P_R = \left[k + k \cdot (h-1) \cdot \mu^{(1-\sigma)} + k \cdot (g-h) \cdot \tau^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}}$$

$$P_{ENL} = \left[k + k \cdot h \cdot \mu^{(1-\sigma)} + k \cdot (g-h-1) \cdot \tau^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}}$$

Comparing W_{ENL} and W_{NON}, we observe that since we assumed that μ is lower than τ and σ is greater than 1, we have that P_{ENL} is lower than P_R.

Furthermore since we considered λ to be strictly between zero and one, we conclude that W_{ENL} is greater than W_N, for any size of the regional trading bloc.

2.9.3 Derivation of the regional aggregate social welfare

In our framework the regional trading bloc is conceived as a unique political entity with a centralized policy-maker whose support depends on the level of donations received by the industrial lobby and the net aggregate social welfare level achieved in the bloc as a whole.

The gross regional bloc aggregate welfare is assumed to be the sum of the level of aggregate welfare achieved in the countries that are members of the regional trading bloc.

Thus, given that countries are assumed to be economically symmetric, we have:

$$\widetilde{W}_{ENL} = h \cdot \widetilde{W}_i^{ENL}$$

$$\widetilde{W}_{NON} = h \cdot \widetilde{W}_i^{NON}$$

The gross aggregate welfare in the representative member country i is defined as the sum of the indirect utilities of the agents in the economy:

$$\widetilde{W}_i^{ENL} = V_L^{ENL} + V_F^{ENL}$$

$$\widetilde{W}_i^{NONENL} = V_L^N + V_F^N$$

where V_L and V_F are the indirect utility function of labourers and firm owners, respectively.

Focusing on labourers we recall that, given the Cobb-Douglas shape of the preferences, the amount consumed of the agricultural good and the composite manufacturing good are:

$$C_A^L = \frac{(1-\lambda) \cdot E_L}{p_A} = (1-\lambda)$$

$$C_M^L = \frac{\lambda \cdot E_L}{P} = \frac{\lambda}{P}$$

Alternatively, the labourers' demand of the composite manufactured good M can be derived aggregating the labourers' demand of the typical manufactured variety i.

The composite manufactured good is defined as:

$$C_M = \left[\sum_i c_i^{(\sigma-1)/\sigma}\right]^{\frac{\sigma}{(\sigma-1)}}$$

In equilibrium labourers' demand of the typical manufactured variety i is:

$$c_i^L = E \cdot \frac{p_i^{-\sigma}}{P^{1-\sigma}} = \lambda \frac{p_i^{(-\sigma)}}{P^{(1-\sigma)}}$$

Thus, we have:

$$\left(c_i^L\right)^{\frac{\sigma-1}{\sigma}} = \left[\lambda \cdot \frac{p_i^{(-\sigma)}}{P^{(1-\sigma)}}\right]^{\frac{(\sigma-1)}{\sigma}} = \lambda^{\frac{\sigma-1}{\sigma}} \cdot p_i^{(1-\sigma)} \cdot P^{\frac{(\sigma-1)^2}{\sigma}}$$

We can then rewrite:

$$C_M^L = \left[\sum_i \left(c_i^L\right)^{(\sigma-1)/\sigma}\right]^{\frac{\sigma}{(\sigma-1)}} = \left[\lambda^{\frac{\sigma-1}{\sigma}} \cdot p_i^{(1-\sigma)} \cdot P^{\frac{(\sigma-1)^2}{\sigma}}\right]^{\frac{\sigma}{(\sigma-1)}} = \lambda P^{(\sigma-1)} \left[\sum_i p_i^{(1-\sigma)}\right]^{\frac{\sigma}{(\sigma-1)}}$$

Recalling the definition of the index price, we have:

$$\left[\sum_i p_i^{(1-\sigma)}\right]^{\frac{\sigma}{(\sigma-1)}} = P^{-\sigma}$$

So labourers' demand of the manufactured good is:

$$C_M^L = \lambda \cdot P^{(\sigma-1)} \cdot P^{-\sigma} = \frac{\lambda}{P}$$

Then, the indirect utility function for labourers is given by:

$$V_L = (1-\lambda)^{(1-\lambda)} \cdot \lambda^{\lambda} \cdot P^{-\lambda}$$

Focusing on firms owners, since we assumed $(1-\phi)$ to be equal unity, their utility function reduces to the form:

$$U^F = C_A$$

Since the income perceived by firm owners derives from firms' profits, their demand of the agricultural good is:

$$C_A^F = \frac{k \cdot \Pi}{p_A}$$

Thus, given $p_A = 1$, the indirect utility function for firm owners is:

$$V_F = k \cdot \Pi$$

The gross aggregate welfare in the representative member country i under the two alternative stances of trade policy is:

$$\widetilde{W}_i^{ENL} = \lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot P_{ENL}^{(-\lambda)} + k \cdot \Pi_{ENL}$$

$$\widetilde{W}_i^{NONENL} = \lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot P_R^{(-\lambda)} + k \cdot \Pi_{NON}$$

Finally, the gross aggregate welfare that would be reached in the regional trading bloc under the two alternative stances of trade policy can be expressed as:

$$\widetilde{W}_{ENL} = h \cdot \left[\lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot P_{ENL}^{(-\lambda)} + k \cdot \Pi_{ENL}\right]$$

$$\widetilde{W}_{NON} = h \cdot \left[\lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot P_R^{(-\lambda)} + k \cdot \Pi_{NON}\right]$$

2.9.4 Welfare differential

Given equations (2.31) and (2.32), the net welfare differential that would be experienced in the representative member country if the regional policy-maker decided to marginally enlarge rather than not to is given by:

$$W_i^{ENL} - W_i^{NON} = \lambda^{\lambda}(1-\lambda)^{(1-\lambda)} \cdot \left[P_{ENL}^{(-\lambda)} - P_R^{(-\lambda)}\right]$$

The derivative of the welfare differential in the representative member country with respect to h, that is the size of the regional trading bloc, is:

$$\begin{aligned}\frac{\partial\left(W_i^{ENL} - W_i^{NON}\right)}{\partial h} &= \frac{\lambda^{\lambda+1}(1-\lambda)^{(1-\lambda)} \cdot k^{\frac{\lambda}{1-\sigma}}\left(\mu^{(1-\sigma)} - \tau^{(1-\sigma)}\right)}{\sigma - 1} \cdot \\ &\cdot \left[\begin{array}{l}\left[1 + h \cdot \mu^{(1-\sigma)} + (g-h-1)\cdot\tau^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}-1} + \\ -\left[1 + (h-1)\cdot\mu^{(1-\sigma)} + (g-h)\cdot\tau^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}-1}\end{array}\right]\end{aligned}$$

We observe that if $\sigma > \lambda + 1$, that is the elasticity of substitution is not excessively low, the derivative of the welfare differential with respect to h is negative since we assumed that $1 < \mu < \tau$, $0 < \lambda < 1$, and $\sigma > 1$.

Furthermore we can compute the derivative of the welfare differential with respect to μ, the level of intra-bloc trade costs:

$$\begin{aligned}\frac{\partial\left(W_i^{ENL} - W_i^{NON}\right)}{\partial \mu} &= a\lambda^{\lambda}(1-\lambda)^{(1-\lambda)}\lambda\cdot(1-\sigma)\mu^{-\sigma}h\cdot \\ &\left\{k\left[1 + h\mu^{(1-\sigma)} + (g-h-1)\tau^{(1-\sigma)}\right]\right\}^{(-\lambda-1)} \\ &-a\lambda^{\lambda}(1-\lambda)^{(1-\lambda)}\cdot\lambda\cdot(1-\sigma)\mu^{-\sigma}h + (h-1)\cdot \\ &\cdot\left\{k\cdot\left[1 + (h-1)\mu^{(1-\sigma)} + (g-h)\cdot\tau^{(1-\sigma)}\right]\right\}^{(\lambda-1)}\end{aligned}$$

Given $\lambda < 1$ and $\sigma > 1$ and assuming that the elasticity of substitution does not take excessively low values, $\sigma > (1+\lambda)$, the derivative of the welfare differential with

respect to μ will be positive.

2.9.5 Profit differential

Given equations (2.24) and (2.25), the profit differential that a manufacturing firm located in the regional trading bloc would experience if the regional policy-maker decided to marginally enlarge rather than not to, can expressed as:

$$\Pi_{ENL} - \Pi_{NON} = \frac{\lambda}{\sigma} \cdot \left[\begin{array}{c} \left(P_{ENL}^{\sigma-1} - P_R^{\sigma-1}\right) + (h-1) \cdot \left(P_{ENL}^{\sigma-1} - P_R^{\sigma-1}\right) \cdot \mu^{(1-\sigma)} \\ + P_{ENL}^{\sigma-1} \mu^{(1-\sigma)} - P_N^{\sigma-1} \tau^{(1-\sigma)} \end{array} \right]$$

The derivative of the profit differential with respect to h, the size of the regional trading bloc, is given by:

$$\begin{aligned} \frac{\partial \left(\Pi_{ENL} - \Pi_{NON}\right)}{\partial h} \;=\; & -\frac{\lambda h}{\sigma} \cdot \left[\mu^{(1-\sigma)} - \tau^{(1-\sigma)}\right] \cdot \\ & \cdot \left\{ \begin{array}{l} \left[1 + h \cdot \mu^{(1-\sigma)} + (g-h-1) \cdot \tau^{(1-\sigma)}\right]^{-2} + \\ -\left[1 + (h-1) \cdot \mu^{(1-\sigma)} + (g-h) \cdot \tau^{(1-\sigma)}\right]^{-2} \end{array} \right\} + \\ & + \frac{\lambda}{\sigma} \cdot \left[1 + h \cdot \mu^{(1-\sigma)} + (g-h-1) \cdot \tau^{(1-\sigma)}\right]^{-1} \\ & - \frac{\lambda}{\sigma} \cdot \left[1 + (h-1) \cdot \mu^{(1-\sigma)} + (g-h) \cdot \tau^{(1-\sigma)}\right]^{-1} + \\ & - \left[1 + h \cdot \mu^{(1-\sigma)} + (g-h-1) \cdot \tau^{(1-\sigma)}\right]^{-2} \cdot \\ & \cdot \mu^{(1-\sigma)} \cdot \frac{\lambda}{\sigma} \cdot \left[\mu^{(1-\sigma)} - \tau^{(1-\sigma)}\right] \end{aligned}$$

Simulating the derivative of the profit differential with respect to the size of the regional trading bloc shows that it is negative for any value of the parameters of the model.

Similarly, we can compute the derivative of the profit differential with respect to μ, the level of intra-bloc trade costs:

$$\frac{\partial(\Pi_{ENL}-\Pi_{NON})}{\partial\mu} = \left\{ \begin{array}{c} h\left[1+h\mu^{(1-\sigma)}+(g-h-1)\tau^{(1-\sigma)}\right]^{-2}+ \\ -(h-1)\left[1+(h-1)\mu^{(1-\sigma)}+(g-h)\tau^{(1-\sigma)}\right]^{-2} \end{array} \right\} \cdot$$

$$\cdot\frac{\lambda h(\sigma-1)\mu^{-\sigma}k^{-2}}{\sigma}-\frac{\lambda(\sigma-1)\mu^{-\sigma}k^{-1}}{\sigma}\cdot$$

$$\left[\begin{array}{c} \left[1+h\mu^{(1-\sigma)}+(g-h-1)\cdot\tau^{(1-\sigma)}\right]^{-1}+ \\ -\left[1+(h-1)\mu^{(1-\sigma)}+(g-h)\cdot\tau^{1-\sigma}\right]^{-1}+ \end{array} \right]$$

$$-\frac{\lambda(\sigma-1)\mu^{-\sigma}k^{-1}}{\sigma}\left[1+h\mu^{(1-\sigma)}+(g-h-1)\tau^{(1-\sigma)}\right]^{-1}$$

Simulating the derivative of the profit differential with respect to the level of intra-bloc trade shows that it has a positive sign for any value of the parameters of the model.

Chapter 3

Regionalism or Multilateralism? A Choice of Political Economy

3.1 Introduction

The revival in regional trade agreements experienced since the 1990s has rapidly led to a wide range of economic studies that have focused on whether regionalism provides an impetus to, or detract from the worldwide multilateral trade liberalisation.[1]

Most of the contributions to the "regionalism versus multilateralism" debate have analysed the impact of regional trade agreements on multilateral trade liberalisation focusing on the imposed import tariff against non-members as a measure of the effects of regionalism.[2]

Thus, in his seminal contribution Krugman (1991) showed that in a world divided into symmetric trading blocs setting non-cooperative optimal tariffs on imports, an expansion in the size of the blocs leads to higher import tariffs. Richardson (1993) using a model of endogenous protection showed that tariffs against non-members fall

[1] See Winters (1996), and Baldwin and Venables (1997) for useful surveys of the contributions in the "regionalism versus multilateralism" debate.

[2] See Freud (2000) for an investigation of the implications of multilateral trade liberalisation on the formation of regional trade agreements. Her results indicated that as multilateral tariff levels fall the forces pulling countries into bilateral agreements strengthen.

due to the formation of a free trade area. Bagwell and Staiger (1993) proved that during the transition period over which free trade agreements are implemented, their trade diverting effect will lead to higher multilateral tariffs. Furthermore, Findlay and Panagariya (1994), in a model of endogenous protection proved that the formation of regional trade agreements leads to an increase in tariffs against non-member countries, with the increase being lower under a custom union than a free trade area. Bond and Syropolus (1996), generalizing Krugman (1991) by taking into account the existence of comparative advantages, showed that optimal import tariffs can fall as the absolute size of the trading blocs increases. Bagwell and Staiger (1997) showed that while in the early stages of the formation of a custom union a reduction of multilateral tariffs arises, the custom union will face an incentive to increase its external tariff once its impact on the degree of market power becomes felt.[3] Desrouelle and Richardson (1997) compared non-cooperative optimal tariffs before and after the creation of a custom union, concluding that the formation of the custom union will raise the tariff against non-members. Cadot *et al.* (1999) in a influence-driven model of trade policy formation showed that deeper integration can lead to rising protection against non-member imports. Bond *et al.* (2001) indicated that deepening of regional trade integration affects the sustainability of tariff agreements with non-members. Bond *et al.* (2004) showed that the formation of a free trade area induces members to reduce their external tariff.

However, recent contributions in the debate on whether regionalism will lead to broader multilateral trade liberalisation has investigated how entering a regional trade agreement affects a country's incentives to liberalise multilaterally using different political economy set-ups.

Notably, Levy (1997) used a political-economic approach á la Mayer (1984) to show that regional trade agreements may undermine political support for multilateral trade liberalization if they raise the reservation utility of key agents in a country above

[3]Bagwell and Staiger (1999) adopted a different perspective and investigated how preferential trade agreements affect the enforcement provisions of multilateral trade agreements. Their results suggested that the efficiency of the multilateral trading system will be compromised by preferential trade agreements.

the multilateral free-trade level. Furthermore, Krishna (1998) using a political support approach to endogenous policy formation showed that regional trade agreements may critically affect domestic incentives such that multilateral liberalization that was initially politically feasible could be rendered infeasible.

This chapter conceptually relates to this last strand in the ongoing "regionalism versus multilateralism" debate, and it contributes to the existing literature in two different ways.

First, this chapter develops a political economy analysis of a country's incentives to enter a regional trade agreement when a multilateral agreement leading to free trade is available.

We provide a theoretical model in which regionalism and multilateralism are formalised as alternative options of trade policy, and we investigate a country's choice between entering a regional trade agreement, or a multilateral free trade agreement.

Assuming a political economic framework à la Grossman-Helpman (1994), we consider that the policy-maker balances industrial interests and aggregate social welfare in choosing between the regional trade agreement, or the multilateral free trade agreement.

Our analysis shows that in a country faced with the choice of entering a regional trade agreement or, a multilateral free trade agreement, pro and anti-regionalism forces operate, and the policy-maker's decision is a political equilibrium that balances these contrasting forces.

Thus, we formalise the policy-maker's decision to enter the regional trade agreement as a choice of political economy driven by the presence of distortions in the policy-making process.

Notably, we derive a condition under which the policy-maker will choose to enter a regional trade agreement rather than a multilateral agreement leading to free trade.

Second, this chapter investigates the implications of a country's initial choice to enter a regional trade agreement on its incentives to pursue subsequent multilateral trade liberalization.

Drawing on our theoretical framework where the choice of a regional trade agreement is driven by the existence of distortions in the policy-making process, we show that the initial choice of regionalism unambiguously undermines the process of multilateral trade liberalization.

Notably, we show that once a country enters a politically-supported regional trade agreement, subsequent multilateral trade liberalization will no longer be pursued since the incumbent policy-maker will have no incentives to move from the *status quo*.

In this regard our analysis distinguishes from Levy (1997) who addressed the implications of regionalism on multilateral trade liberalisation in a median-voter political economy setting. Our analysis also differs from Krishna (1998) who investigated how regionalism affects the incentives for multilateral liberalisation assuming that domestic firms' profits are the only decisive variable in the policy-maker's choice.

3.2 The basic model

We assume that the world economy is constituted by three symmetric countries, labelled as country X, country Y, and the rest of the world Z.

We consider that in each country a manufacturing sector and an agricultural sector exist. Notably, the manufacturing sector is assumed to be characterised by differentiated products, increasing returns to scale and imperfect competition.

On the other hand, we consider that the agricultural sector is characterized by a homogenous product, constant returns to scale and perfect competition.

Focusing on consumers, we assume that in each country there are two groups of agents, that is labourers and firm owners. In particular, we assume that k is the fraction of firm owners in the population while $(1-k)$ is the fraction of labourers, with $0 < k < 1$.

We consider that labourers' and firm owners' preferences are, respectively, given by:

$$U^L = C_A^{(1-\lambda)} C_M^{\lambda} \tag{3.1}$$

$$U^F = C_A^{(1-\phi)} C_M^{\phi} \tag{3.2}$$

where

$$C_M = \left[\sum_i c_i^{\frac{(\sigma-1)}{\sigma}} \right]^{\frac{\sigma}{(\sigma-1)}}$$

Particularly c_i is the consumption of the manufactured variety i, $\sigma > 1$ is the elasticity of substitution between any two varieties, $0 \leq \lambda \leq 1$, and $0 \leq \phi \leq 1$.[4]

Focusing on the manufacturing sector, we assume that in each country the labour input requirement for any variety i is given by:

$$l_i = \alpha + \beta x_i \qquad \text{with } \alpha, \beta > 0.$$

where x_i is the output of variety i and α is a fixed cost.

We assume that the number of manufacturing firms in each country is fixed with each firm being sufficiently small to treat market aggregates as exogenous.[5,6]

In addition, in order to simplify our framework we consider that there is no possibility of relocation of activity for manufacturing firms, and each firm is totally owned by a firm owner. resident of the country in which the firm is located.

[4] We assume different parameters in the preferences of labourers and firm owners to capture the real world's feature that different groups of agents show different tastes over the same range of goods. However, our results would be maintained if we assumed the same parameters in the preferences of labourers and firm owners.

[5] Market behavior in the manufacturing sector might be thought to be like monopolistic competition but with no entry. See Baldwin (1995) and Desrouelle and Richardson (1997) for a similar approach.

[6] The assumption of non-entry is introduced to guarantee firm owners have positive profits to use in lobbying activity. Alternatively, we could assume free entry and the existence of specific factor of production owned by firm owners. In this case even if firms' profits would be zero, firm owners would have a positive income to lobby the incumbent policy-maker.

Focusing on the agricultural sector, we consider that in the production function is linear homogenous, and we choose units of good A such that the unit labour input coefficient is unity.

Finally, we assume that no trade barriers exist on the flows of international trade in the agricultural good while barriers to international trade in manufactured goods exist.

Thus, we consider that symmetric non-discriminatory ad-valorem tariffs are initially imposed by any country on imports of manufactured goods such that:

$$t_s^j = t \quad \text{if } s \neq j \tag{3.3}$$

$$t_s^j = 0 \quad \text{if } s = j \tag{3.4}$$

where t_s^j is the tariff imposed by country j on imports from country s.[7]

Notably, in any country the tariff revenue collected by the government on imports of manufactured goods is assumed to be uniformly redistributed through lump-sum transfers to all the agents in the economy.

Thus, firm owners' income is assumed to derive from firm profits plus the transfers received while labourers' income from the labour they provide to firms plus the transfers received.

[7] In order to simplify our theoretical framework we assume that the ad-valorem import tariffs are exogenously given. See Krugman (1991) for a model of endogenous import tariff determination in which countries choose their import tariff in order to maximize their level of aggregate social welfare. In addition, see Grossman and Helpman (1994) and Cadot *et al.* (1997) for influence-driven models of endogenous import tariff determination in which interest groups' lobbying activity affects the structure of protection.

3.3 The initial symmetric equilibrium

In view of the symmetric nature of countries and of import tariffs on flows of manufactured goods across countries, we derive the equilibrium for the representative country.

Having assumed that costless trade in the agricultural sector prevails, the equilibrium wage in all countries will be equalized as long as the agricultural good is produced in any of the countries, which is assumed henceforth.[8]

Notably, taking labour to be our numeraire, the wage perceived by labourers in the representative country will be equal to unity.

Focusing on consumers' utility maximization, we observe that labourers and firm owners will spend, respectively, a fraction $(1-\lambda)$ and $(1-\phi)$ of their incomes on the agricultural good A, and a fraction λ and ϕ of their incomes on the composite manufactured good M.

In the rest of our analysis in order to simplify the derivation of the equilibrium demand patterns, we assume ϕ to be zero and λ to be strictly between unity and zero.[9]

Normalizing the size of the population to unity, since firm owners' income derives from firm profits plus the transfers received, and labourers' income derives from the amount of labour they provided to firms plus the transfers received, the total income of labourers and firm owners, labelled as E^L and E^F, respectively, are:

$$E^L = (1-k)\cdot(1+R^0) \tag{3.5}$$

$$E^F = k\cdot(\Pi^0 + R^0) \tag{3.6}$$

[8]The non-full-specialisation (NFS) condition requires that no country has enough labour to satisfy the world demand for the agricultural good, i.e. that the world spending on this good is larger than the maximum value of its production that is possible in any of the countries. Being countries symmetric, the NFS condition requires that $3\cdot\left[(1-\lambda)\cdot E^L + (1-\phi)\cdot E^F\right] > p_A\cdot L$, which we assume to hold henceforth.

[9]Our final results would be maintained if we assumed ϕ to be strictly between zero and one.

where R^0 is the equilibrium import tariff revenue collected in the representative country and uniformly redistributed to all of the country's agents through lump-sum transfers, and Π^0 indicate the equilibrium profits earned by any manufacturing firm located in the representative country.

Thus, the aggregate demand for good A in the representative country is:

$$C^A = \frac{(1-\lambda)\cdot(1-k)\cdot(1+R^0)+k\cdot(\Pi^0+R^0)}{p_A} \tag{3.7}$$

where p_A is the equilibrium price of good A.

Similarly, the aggregate demand of the manufactured composite good in the representative country is:

$$C^M = \frac{\lambda\cdot(1-k)\cdot(1+R^0)}{P^0} \tag{3.8}$$

where P^0 represents the manufactured composite index price faced by consumers located in the representative country.

Having assumed the same manufacturing technology across firms and across countries, all varieties produced will be symmetric and have the same equilibrium price.

Assuming the cost of introducing a new manufactured variety to be zero, since all varieties enter consumers' demand symmetrically, no two firms will produce the same variety.

As a consequence, in the equilibrium there will be only one firm in any country that produces a given manufactured variety, and no duplication will arise across countries with each country specialised in the production of its own range of manufactured varieties.

Due to the existence of symmetric ad-valorem tariffs on international trade of manufactured goods, while the typical manufactured variety i is domestically sold at a price p_i, the price paid by consumers importing variety i will be $p_i\cdot(1+t)$.

Since in the equilibrium k manufactured varieties are produced in any country, the manufacturing composite index price in the representative country is:

$$P_0 = \left\{ k \cdot p_i^{(1-\sigma)} + 2k \cdot [p_i \cdot (1+t)]^{(1-\sigma)} \right\}^{\frac{1}{1-\sigma}} \tag{3.9}$$

Focusing on profits maximization, since we assumed the agricultural sector to be perfectly competitive, the equilibrium price of good A will be equal to its marginal cost such that:

$$p_A = 1$$

Turning to the manufacturing sector, the typical profit-maximizing firm located in the representative country faces an isoelastic demand defined as:

$$x_0 = \frac{\lambda (1-k) \cdot p_i^{-\sigma} \cdot (1+R_0) \cdot \left[1 + 2(1+t)^{-\sigma}\right]}{P_0^{(1-\sigma)}} \tag{3.10}$$

where, as shown in Mathematical Appendix, the amount of tariff revenue collected in the representative country is:

$$R_0 = \frac{2t \cdot \lambda \cdot k \cdot (1-k) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{(P_0)^{(1-\sigma)} - 2\lambda t \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}} \tag{3.11}$$

Given the demand function in equation (3.10), the typical manufacturing firm located in the representative country will set the equilibrium price as a constant mark-up over its marginal cost such that:

$$p_i = \frac{\beta\sigma}{(\sigma - 1)} \tag{3.12}$$

Assuming that manufactured goods are measured in units that are chosen so that the unit input coefficient β equals $\left(1 - \frac{1}{\sigma}\right)$, the profit-maximizing producer price of any manufactured variety will be equal to unity.

The typical manufacturing firm will impose a unitary price for any unit of variety but due to the existence of import tariffs consumers will pay a unitary price for any unit of variety produced locally and a price $(1+t)$ for any unit of imported variety.

Thus, given equation (3.9), the equilibrium manufactured composite index price faced by consumers located in the representative country is:

$$P_0 = \left[k + 2k \cdot (1+t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{3.13}$$

It follows, that given equations (3.10) and (3.12), the equilibrium profits earned by the typical manufacturing firm located in the representative country are:

$$\Pi_0^i = \frac{\lambda(1-k) \cdot (1+R_0) \cdot \left[1 + 2 \cdot (1+t)^{-\sigma}\right]}{\sigma k \left[1 + 2 \cdot (1+t)^{(1-\sigma)}\right]} \tag{3.14}$$

Given equations (3.7), (3.8), (3.12), and (3.13) the equilibrium aggregate level of consumption of agricultural good and manufactured good, respectively, are:

$$\begin{aligned} C_A^0 &= (1-\lambda)(1-k) \cdot (1+R_0) + kR^0 \\ &\quad + \frac{(1-k) \cdot (1+R_0) \cdot \left[1 + 2 \cdot (1+t)^{-\sigma}\right]}{\sigma \cdot \left[1 + 2 \cdot (1+t)^{(1-\sigma)}\right]} \end{aligned} \tag{3.15}$$

$$C_M^0 = \frac{\lambda(1-k) \cdot (1+R_0)}{\left[k + 2k \cdot (1+t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}}} \tag{3.16}$$

Finally, given equations (3.11) and (3.12), the equilibrium tariff revenue collected in the representative country is given by:

$$R_0 = \frac{2t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}}{1 + 2 \cdot (1+t)^{(1-\sigma)} - 2t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}} \tag{3.17}$$

3.4 Regional versus multilateral trade agreements

Having described the initial equilibrium characterized by symmetric non-discriminatory import tariff on international trade in manufactured goods, we consider that the policy-maker in country Y faces the choice between two different trade policy options.[10]

First, country Y may enter a regional trade agreement with country X leading to the formation of a free trade area (FTA) such that countries Y and X would reciprocally remove any barriers to trade in manufactured goods while maintaining their initial tariff t on imports of manufactured goods produced in the rest of the world Z.[11,12]

Alternatively, country Y may enter a multilateral free trade agreement with countries X and Z which would imply the removal of any tariff barrier on international flows of manufactured varieties among countries Y, X, and the rest of the world Z.

Relying on the political economy approach introduced by Grossman and Helpman (1994), we consider that the policy-maker in country Y shapes its choice between entering the regional trade agreement, or the multilateral free trade agreement taking into account not only aggregate social welfare but also to the level of political contributions provided by a special interest group which participates in the political process in order to influence policy outcomes.[13]

Notably, the objective function of the incumbent policy-maker in country Y is

[10] Since in this chapter we aim to investigate a country's choice between entering a regional trade agreement, or a multilateral free trade agreement, we assume that remaining in the initial equilibrium does not constitute a trade policy option for the policy-maker. We refer the reader to Chapter 2 for an analysis of the incentives underpinning a country's choice between remaining in the *status quo*, or entering a regional trading bloc. Also see Grossman and Helpman (1995) for an influence-driven model investigating a policy-maker's choice to pursue a regional trade agreement or remaining in the *status quo*.

[11] See Grossman and Helpman (1995) for a similar approach where two countries entering a FTA are assumed to continue to levy their *status quo* tariffs on imports from non-members.

[12] Article XXIV of the General Agreement on Trade and Tariffs allows for the formation of regional trade agreements if they eliminate "duties and other regulations of commerce" on "substantially all trade" among member countries.

[13] See Grossman and Helpman (2002) for a detailed survey of alternative political economy approaches to the formation of trade policy.

defined as the weighted sum of the total amount of political contributions received by the organized interest group and the aggregate welfare, net of contributions.[14]

Labelling as D_Y the amount of political contributions received by the policy maker and as W_Y the aggregate social welfare level, net of contributions, the objective function of the policy-maker in country Y, is expressed by:

$$G_Y = a_Y \cdot D_Y + (1 - a_Y) \cdot W_Y \tag{3.18}$$

where a_Y is a parameter which represents the degree of distortion in the policy-making process and lies in the range $[0, 1]$. Thus, when a_Y equals to zero, the policy-maker behaves as a social welfare maximizer, while the closer a_Y is to unity, the greater is the degree of political distortion in the policy-making process.

We consider that all manufacturing firms located in country Y are organized in an unique industrial lobby that offers a schedule of contingent (implicit) donations to the incumbent policy-maker with the final aim of affecting its trade policy choice.[15]

The organized interest group specifies donation contracts or "contribution schedules" that stipulate how large a donation will be made for each of the two possible stances of trade policy.

We consider that the organized interest group tailors its contribution schedule to maximize the total welfare of its members.

The game is assumed to be in two stages, that is in the first stage donation contracts are announced by the interest group and in the second stage the policy-maker sets the trade policy and collects the political contributions.

[14] Grossman and Helpman (1994) emphasised that an incumbent policy-maker may make trade policy choices while being aware that its decisions may affect its chances for re-election. Thus, a policy-maker may value political contributions since they can be used to finance campaign spending, and aggregate social welfare since voters are more likely to reelect a government which has delivered a high standard of living. In this chapter, as in Grossman and Helpman (1994), we do not explicitly formalise the existence of an electoral process. At this regard, see Grossman and Helpman (1996) for a model with electoral competition where interest groups may use campaign contributions to influence the outcome of the election, and the competing parties' platforms.

[15] In our analysis we rule out the possibility for the interest group to offer contributions to foreign governments. See Grossman and Helpman (1995) for a similar approach.

Political contributions paid by the organized interest group to the incumbent policy-maker in country Y are then *ex-post,* that is they are paid after the policy-maker has chosen whether to enter the regional trade agreement or, alternatively, the multilateral free trade agreement.

Following Grossman and Helpman (1994), the contribution schedule specified by the lobby group is restricted to be "truthful" in the Bernheim-Whinston specification such that it everywhere reflects the true preferences of the organised interest group.[16]

Focusing on the other component of the policy-maker's objective function, we define the net aggregate social welfare in country Y as the gross aggregate social welfare less the amount of political contributions provided by the organized interest group to the policy-maker.

Notably, the gross aggregate social welfare is defined in a "utilitarian" way as the sum of the utilities reached by the agents in the economy.

Thus, the gross aggregate social welfare in country Y is the sum of the aggregate indirect utility of labourers and the aggregate indirect utility, gross of contributions, of firm owners.

In order to analyze the policy maker's choice between the regional trade agreement and the multilateral free agreement, we first derive the equilibrium that would be reached under the two alternative trade agreements.

3.5 The equilibrium under regionalism

In this section, we derive the equilibrium that would arise if the policy-maker in country Y decided to enter the regional trade agreement.[17]

Thus, we assume that countries Y and X form an FTA and reciprocally remove

[16] Bernheim and Whinston (1986) showed that players bear essentially no costs from playing truthful strategies.

[17] Given the symmetry of countries Y and X, and assuming the same weights in the objective function of the policy-makers, we consider that if country Y chooses to enter the regional trade agreement, then also partner country X will choose to enter the regional trade agreement.

any barriers to trade in manufactured goods while maintaining an unchanged tariff t on imports from the rest of the world Z. In addition, we consider that country Z maintains an unchanged tariff t on all imports of manufactured goods from countries Y and X, belonging to the FTA.

As long as all countries produce in both sectors and costless trade in the agricultural sector prevails, the equilibrium wage will be equalized across countries.

In addition, taking labour to be our numeraire, the equilibrium wage will be equal to unity. Recalling that firm owners' income derives from firms' profits plus the transfers received and labourers' income derive from the labour provided to firms plus the transfers received, under the regional trade agreement the total income of labourers and firm owners located in country Y, labelled as $E^R_{L,Y}$ and $E^R_{F,Y}$, respectively, would be:

$$E^R_{L,Y} = (1-k)\cdot(1+R^R_Y) \tag{3.19}$$

$$E^R_{F,Y} = k\cdot(\Pi^R_Y + R^R_Y) \tag{3.20}$$

where Π^R_Y and R^R_Y indicate, respectively, the amount of profits earned by any manufacturing firm in country Y, and the import tariff revenue collected in country Y under the regional trade agreement.

Similarly, the total income of labourers and firm owners located in country X under the regional trade agreement labelled as $E^R_{L,X}$ and $E^R_{F,X}$, respectively, would be:

$$E^R_{L,X} = (1-k)\cdot(1+R^R_X) \tag{3.21}$$

$$E^R_{F,X} = k\cdot(\Pi^R_X + R^R_X) \tag{3.22}$$

where Π^R_X and R^R_X indicate, respectively, the amount of profits earned by any manufacturing firm located in country X, and the amount of import tariff revenue

collected in country X under the regional trade agreement.

Finally, the total income of labourers and firm owners located in the rest of the world Z when country Y decides to enter the regional trade agreement, labelled as $E^R_{L,Z}$ and $E^R_{F,Z}$, respectively, would be:

$$E^R_{L,Z} = (1-k) + (1-k) \cdot R^R_Z \tag{3.23}$$

$$E^R_{F,Z} = k \cdot \Pi^R_Y + k \cdot R^R_Z \tag{3.24}$$

where Π^R_Z and R^R_Z indicate, respectively, the amount of profits earned by any manufacturing firm located in country Z, and the amount of import tariff revenue collected in country Z.

Given the utility functions of labourers and firm owners and the unitary equilibrium price of the agricultural good, under the regional trade agreement the aggregate demand for the agricultural good and the composite manufactured good in country Y would, respectively, be:

$$C^R_{A,Y} = (1-\lambda) \cdot (1-k) \cdot \left(1 + R^R_Y\right) + k \cdot (\Pi^R_Y + R^R_Y) \tag{3.25}$$

$$C^R_{M,Y} = \frac{\lambda \cdot (1-k) \cdot \left(1 + R^R_Y\right)}{P^R_Y} \tag{3.26}$$

where P^R_Y represents the manufactured composite price index faced by consumers located in country Y under the regional trade agreement.

Similarly, the aggregate demand for the agricultural good and the composite manufactured good in country X under the regional trade agreement would be:

$$C^R_{A,X} = (1-\lambda) \cdot (1-k) \cdot \left(1 + R^R_X\right) + k \cdot (\Pi^R_X + R^R_X) \tag{3.27}$$

$$C_{M,X}^{R} = \frac{\lambda \cdot (1-k)\left(1+R_{Y}^{R}\right)}{P_{X}^{R}} \tag{3.28}$$

Furthermore the aggregate demand in country Z for the agricultural good and the composite manufactured good under the regional trade agreement would be:

$$C_{A,Z}^{R} = (1-\lambda) \cdot (1-k) \cdot \left(1+R_{Z}^{R}\right) + k \cdot (\Pi_{Z}^{R} + R_{Z}^{R}) \tag{3.29}$$

$$C_{M,Z}^{R} = \frac{\lambda \cdot (1-k) \cdot \left(1+R_{Z}^{R}\right)}{P_{Z}^{R}} \tag{3.30}$$

where P_{Z}^{R} is the composite price index of the manufacturing good that would be faced by consumers located in country Z.

Having assumed the same manufacturing technology across firms and across countries, all manufactured varieties produced will be symmetric and have the same equilibrium price.

Since we assume the cost of introducing a new variety to be zero, and all manufactured varieties enter consumers' demand symmetrically, no two firms will produce the same variety. Thus, in equilibrium there will be only one firm in any country producing a manufactured variety and no duplication will arise, with each country specializing in the production of its own range of manufactured varieties.

Consumers located in the FTA will pay a price p_i for any unit of a manufactured variety produced in the regional trading bloc, and a price $p_i \cdot (1+t)$ for any unit of variety imported from the rest of the world Z.

Alternatively, consumers located in country Z will pay a price p_i for any unit of a manufactured variety produced locally, and a price $p_i \cdot (1+t)$ for any unit of a manufactured variety imported from the regional trading bloc.

Since in equilibrium k manufactured varieties are produced in each country, under the regional trade agreement the manufactured composite index price faced by consumers located in countries Y and X would be:

$$P_Y^R = P_X^R = \left\{2k \cdot p_i^{(1-\sigma)} + k \cdot [p_i \cdot (1+t)]^{(1-\sigma)}\right\}^{\frac{1}{1-\sigma}} \tag{3.31}$$

On the other hand, the manufactured composite price index faced by consumers located in country Z, excluded from the FTA, would be given by:

$$P_Z^R = \left\{k \cdot p_i^{(1-\sigma)} + 2k \cdot [p_i \cdot (1+t)]^{(1-\sigma)}\right\}^{\frac{1}{1-\sigma}} \tag{3.32}$$

Focusing on the maximization of profits, we observe that a typical firm located in countries Y and X will maximize its profits facing an isoelastic demand given by:

$$x_Y = x_X = \lambda \cdot (1-k) \cdot p_i^{-\sigma} \cdot \left[\frac{2 \cdot (1+R_Y^R)}{\left(P_Y^R\right)^{(1-\sigma)}} + \frac{\left(1+R_Z^R\right) \cdot (1+t)^{-\sigma}}{\left(P_Z^R\right)^{(1-\sigma)}}\right] \tag{3.33}$$

where, as shown in the Mathematical Appendix, the amount of tariff revenue collected in country Y, X and Z, respectively, are:

$$R_Y^R = R_X^R = \frac{t \cdot \lambda \cdot k \cdot (1-k) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Y^R\right)^{(1-\sigma)} - \lambda t \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}} \tag{3.34}$$

$$R_Z^R = \frac{2t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Z^R\right)^{(1-\sigma)} - 2t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}} \tag{3.35}$$

Any manufacturing firm located in the rest of the world Z would face an isoelastic demand expressed by:

$$x_Z = \lambda \cdot (1-k) \cdot p_i^{-\sigma} \cdot \left[\frac{1+R_Z^R}{\left(P_Z^R\right)^{(1-\sigma)}} + \frac{2 \cdot \left(1+R_Y^R\right) \cdot (1+t)^{-\sigma}}{\left(P_Y^R\right)^{(1-\sigma)}}\right] \tag{3.36}$$

Given the demand functions expressed in (3.33) and (3.36), any profit-maximizing firm located in the regional trading bloc and in the rest of the world Z will set its equilibrium price as a constant mark-up over the marginal cost:

$$p_i = \frac{\beta\sigma}{(\sigma - 1)} \tag{3.37}$$

Assuming that manufactured goods are measured in units chosen so that the unit input coefficient β equals $\left(1 - \frac{1}{\sigma}\right)$, the equilibrium price of any manufactured variety will be equal to unity.

While all manufacturing firms will impose the same unitary price, consumers in the regional trading bloc will pay a unitary price for any manufactured variety produced locally, and a price $(1 + t)$ for any unit of imported variety from the rest of the world.

On the other hand, consumers located in the rest of the world Z will pay a unitary price for any manufacturing variety produced locally and a price $(1 + t)$ for any unit of manufactured variety imported from the regional trading bloc.

It follows that, given equations (3.31) and (3.32), the equilibrium composite manufacturing index price faced by consumers located in country Y , X and Z respectively, would be:

$$P_Y^R = P_Y^R = \left[2k + k \cdot (1 + t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{3.38}$$

$$P_Z^R = \left[k + 2k \cdot (1 + t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{3.39}$$

Given equations (3.33), (3.36), (3.38) and (3.39), the equilibrium level of operating profits of any manufacturing firm located in the FTA and in the rest of the world Z, respectively, would be:

$$\Pi_Y^R = \Pi_X^R = \frac{\lambda(1-k)}{\sigma k} \cdot \left[\frac{2 \cdot \left(1 + R_Y^R\right)}{2 + (1+t)^{(1-\sigma)}} + \frac{\left(1 + R_Z^R\right) \cdot (1+t)^{-\sigma}}{1 + 2 \cdot (1+t)^{(1-\sigma)}}\right] \tag{3.40}$$

$$\Pi_Z^R = \frac{\lambda(1-k)}{\sigma k} \cdot \left[\frac{\left(1 + R_Z^R\right)}{1 + 2 \cdot (1+t)^{(1-\sigma)}} + \frac{2 \cdot \left(1 + R_Y^R\right) \cdot (1+t)^{-\sigma}}{2 + (1+t)^{(1-\sigma)}}\right] \tag{3.41}$$

Furthermore, given equations (3.25), (3.26), (3.37), (3.38), and (3.40) the equilibrium aggregate level of consumption of the agricultural good and the composite manufactured good in countries Y and X would be:

$$\begin{aligned} C_{A,Y}^{R} &= C_{A,X}^{R} = (1-\lambda)\cdot(1-k)\cdot(1+R_{Y}^{R}) + \frac{\lambda(1-k)}{\sigma}\cdot \\ &\cdot\left[\frac{2\cdot(1+R_{Y}^{R})}{2+(1+t)^{(1-\sigma)}} + \frac{(1+R_{Z}^{R})\cdot(1+t)^{-\sigma}}{1+2\cdot(1+t)^{(1-\sigma)}}\right] + k\cdot R_{Y}^{R} \end{aligned} \tag{3.42}$$

$$C_{M,Y}^{R} = C_{M,X}^{R} = \frac{\lambda\cdot(1-k)\cdot(1+R_{Y}^{R})}{\left[2k+k\cdot(1+t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}}} \tag{3.43}$$

Also, given equations (3.29), (3.30), (3.37), (3.39) and (3.41), the equilibrium aggregate level of consumption of the agricultural good and manufactured good in the rest of the world Z would, respectively, be given by:

$$\begin{aligned} C_{A,Z}^{R} &= (1-\lambda)\cdot(1-k)\cdot(1+R_{Z}^{R}) + \frac{\lambda(1-k)}{\sigma} \\ &\cdot\left[\frac{1+R_{Z}^{R}}{1+2(1+t)^{(1-\sigma)}} + \frac{2(1+t)^{-\sigma}\cdot\left(1+R_{Y,X}^{R}\right)}{2+(1+t)^{(1-\sigma)}}\right] + k\cdot R_{Z}^{R} \end{aligned} \tag{3.44}$$

$$C_{M,Z}^{R} = \frac{\lambda\cdot(1-k)\cdot(1+R_{Z}^{R})}{\left[k+2k\cdot(1+t)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}}} \tag{3.45}$$

Finally, given equations (3.34), (3.35), (3.38), and (3.39) the equilibrium import tariff revenue collected in countries Y, X and Z, respectively, would be:

$$R_{Y}^{R} = R_{X}^{R} = \frac{t\cdot\lambda\cdot(1-k)\cdot k\cdot(1+t)^{-\sigma}}{2k+k\cdot(1+t)^{(1-\sigma)} - t\cdot\lambda\cdot(1-k)\cdot k\cdot(1+t)^{-\sigma}} \tag{3.46}$$

$$R_{Z}^{R} = \frac{2\cdot t\cdot\lambda\cdot(1-k)\cdot k\cdot(1+t)^{-\sigma}}{1+2\cdot(1+t)^{(1-\sigma)} - 2\cdot t\cdot\lambda\cdot(1-k)\cdot k\cdot(1+t)^{-\sigma}} \tag{3.47}$$

3.6 The equilibrium under multilateralism

In this section we derive the equilibrium that would arise if the policy-maker in country Y decides to enter the multilateral free trade agreement under which all barriers to international trade in manufactured varieties are removed among countries Y, X and Z.

Given the symmetric structure of the three countries and the reciprocal elimination of import tariffs on international flows of manufactured goods, we derive the equilibrium for the representative country.

As long as all countries produce in both sectors and costless trade in the agricultural sector prevails, the equilibrium wage in all countries will be equalized and, taking labour to be the numeraire, the equilibrium wage will be equal to unity.

Since under the multilateral free trade agreement the amount of import tariff revenue collected is nil, firms owners' income derives only from firm profits while labourers' income derives only from the amount of labour they provide to firms.

Thus, under the multilateral free trade agreement the total income of labourers and firm owners located in the representative country, labelled as E_L^{FT} and E_F^{FT}, respectively, would be:

$$E_L^{FT} = (1 - k) \tag{3.48}$$

$$E_F^{FT} = k\Pi^{FT} \tag{3.49}$$

where Π^{FT} is the level of profits earned by any manufacturing firm located in the representative country.

Given the utility functions of labourers and firm owners and the equilibrium unitary price of the agricultural good, under the multilateral free trade agreement the aggregate demand for the agricultural good and the composite manufactured good in the representative country would, respectively, be:

$$C_A^{FT} = (1-\lambda)\cdot(1-k) + k\Pi^{FT} \tag{3.50}$$

$$C_M^{FT} = \frac{\lambda\cdot(1-k)}{P^{FT}} \tag{3.51}$$

where P^{FT} represents the manufactured composite index price faced by consumers located in the representative country.

Having assumed the same manufacturing technology across firms and across countries, all manufactured varieties produced will have the same equilibrium price.

Since the cost of introducing a new variety is zero, no two firms will choose to produce the same variety since all manufactured varieties enter consumers' demand symmetrically.

Thus, in equilibrium there will be only one firm that produces a manufactured variety and no duplication will arise within or across countries with each country specializing in the production of its own range of manufactured varieties.

Since all tariff barriers to international trade in manufactured varieties are removed under the multilateral free trade agreement, consumers located in the representative country will pay a price p_i for any unit of manufacturing variety produced locally and for any unit of imported manufactured variety.

Since in equilibrium k manufactured varieties are produced in each country, the manufactured composite index price in the representative country under the multilateral free trade agreement is:

$$P^{FT} = \left[3\cdot k\cdot p_i^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{3.52}$$

Focusing on profits maximization, we note that the typical firm located in the representative country will maximize its profits facing an isoelastic demand given by:

$$x = \frac{3\cdot\lambda\cdot(1-k)\cdot p_i^{-\sigma}}{(P^{FT})^{(1-\sigma)}} \tag{3.53}$$

Given the demand function in equation (3.53), the typical profit-maximizing manufacturing firm located in the representative country will set the equilibrium price as a constant mark-up over the marginal cost:

$$p_i = \frac{\beta\sigma}{(\sigma - 1)} \tag{3.54}$$

Maintaining our assumption that manufactured goods are measured in units chosen such that the unit input coefficient β equals $\left(1 - \frac{1}{\sigma}\right)$, the profit-maximizing producer price of any manufactured variety will be equal to unity.

Following the equilibrium price condition in equation (3.54), the equilibrium composite manufactured composite index price faced by consumers located in the representative country would be:

$$P^{FT} = (3k)^{\frac{1}{1-\sigma}} \tag{3.55}$$

Given equations (3.53), (3.54), and (3.55), the equilibrium level of profits earned by the typical manufacturing firm located in the representative country under the multilateral free trade agreement would be:

$$\Pi^{FT} = \frac{\lambda \cdot (1 - k)}{\sigma k} \tag{3.56}$$

Furthermore, given equations (3.49), (3.55), and (3.56), under the multilateral free trade agreement the equilibrium aggregate level of consumption of the agricultural good and manufactured good in the representative country would, respectively, be:

$$C_A^{FT} = (1 - k) \cdot \left[(1 - \lambda) + \frac{\lambda}{\sigma}\right] \tag{3.57}$$

$$C_M^{FT} = \frac{\lambda \cdot (1 - k)}{(3k)^{\frac{1}{1-\sigma}}} \tag{3.58}$$

Finally, since under the multilateral free trade agreement all import tariffs would

be removed, the equilibrium import tariff revenue would be:

$$R^{FT} = 0 \tag{3.59}$$

3.7 Profit analysis

In this section we compare the equilibrium level of profits that would be earned by the typical manufacturing firm located in country Y under the regional trade agreement, or, alternatively, under the multilateral free trade agreement.

The choice of the policy-maker in country Y between entering the regional trade agreement with country X or, alternatively, the multilateral free trade agreement with countries X and Z will affect the level of profit earned by the typical manufacturing firm located in country Y.

First, if the incumbent policy-maker in country Y decided to enter the regional trade agreement, given equations (3.39), (3.40), and (3.46), the equilibrium operating profits that would be earned by the typical manufacturing firm located in country Y would be:

$$\begin{aligned} \Pi_Y^R &= \frac{\lambda(1-k)}{\sigma k} \cdot \frac{2}{2+(1+t)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}} + \\ &+ \frac{\lambda(1-k)}{\sigma k} \cdot \frac{(1+t)^{-\sigma}}{1+2 \cdot (1+t)^{(1-\sigma)} - 2 \cdot \lambda \cdot t \cdot (1-k) \cdot (1+t)^{-\sigma}} \end{aligned} \tag{3.60}$$

The equilibrium profits that a typical manufacturing firm would earn under the regional trade agreement are a function of the import tariff t, the elasticity of substitution, the fraction of laborers in the overall population, and laborers' propensity to consume the manufactured good.

On the other hand, if the incumbent policy-maker in country Y decided to enter the multilateral free trade agreement, given equation (3.56), the equilibrium operating

profits that would be earned by the typical manufacturing firm located in country Y would be:

$$\Pi_Y^{FT} = \frac{\lambda \cdot (1-k)}{\sigma k}$$

The equilibrium profits that a typical manufacturing firm in country Y would earn under the multilateral free trade agreement are a function the elasticity of substitution, the fraction of laborers in the overall population, and laborers' propensity to consume the manufactured good.

In order to assess the profits implications of the policy-maker's choice between the two alternative options of trade policy, we compare the profits that would be earned by the typical manufacturing firm in country Y under the regional trade agreement or, alternatively, under the multilateral free trade agreement.

We note that the typical manufacturing firm located in country Y earns its profits in the local market, in the country X's market, and in the rest of the world market.

First, for any value of the import tariff, the equilibrium profits earned by the typical manufacturing firm located in country Y in the local and in country X's market would be greater under the regional trade agreement than under the multilateral free trade agreement.

The equilibrium price paid by consumers located in countries Y and X for any manufactured variety imported from the rest of the world Z would be higher under the regional agreement than under the multilateral trade agreement.

In fact, consumers located in country Y and X would pay a price $(1+t)$ for any unit of manufactured varieties imported form the rest of the world under the regional trade agreement, while they would pay a unitary price for it under the multilateral free trade agreement.

Since consumers located in country Y and X would perceive varieties produced in country Z as relatively more expensive under the regional trade agreement, their demand for varieties produced in country Y will be higher under the regional trade

agreement than under the multilateral agreement.

However, for any value of the import tariff the equilibrium profits earned by the typical manufacturing firm located in country Y in the rest of the world market would be lower under the regional trade agreement than under the multilateral free trade agreement.

We note that the equilibrium price paid by consumers located in the rest of the world Z for any manufactured variety imported from countries Y would be higher under the regional agreement than under the multilateral trade agreement.

In fact, under the regional trade agreement consumers located in the rest of the world Z would pay a price $(1+t)$ for any unit of manufacturing varieties imported from country Y while they would pay a unitary price under the multilateral free trade agreement.

Since consumers located in the rest of the world Z would perceive varieties produced in countries Y as relatively more expensive under the regional trade agreement, their demand for varieties produced in country Y will be lower under the regional trade agreement than under the multilateral agreement.

Thus, the overall profits earned by the typical manufacturing firm in country Y would be higher under the regional trade agreement than under the multilateral free trade agreement if the greater profits earned in the local and country X's markets more than offset the lower profits in the rest of the world market.

On the other hand, the overall profits earned by the typical manufacturing firm located in country Y would be lower under the regional trade agreement than under the multilateral free trade agreement if the lower profits perceived in the rest of the world market more than offset the higher profits earned in the local market and in country X's market.

Simulating the overall profits that would be earned by the typical manufacturing firm located in country Y under the regional trade agreement and, alternatively, under the multilateral free trade agreement shows that two different scenarios may arise.

First, our simulation analysis indicates that for medium levels of the elasticity of

substitution, a critical level of the import tariff exists, labelled as t^*, which equalizes the profits that would be earned by the typical manufacturing firm located in country Y under the two alternative options of trade policy.

Thus, the equilibrium profits that would be earned by the typical manufacturing firm under the regional trade agreement could be greater or lower than under the multilateral trade agreement depending on the level of the import tariff t.

Notably, if the imposed import tariff t is lower than t^*, the equilibrium profits earned by the typical manufacturing firm located in country Y would be greater under the regional trade agreement than under the multilateral free trade agreement.

Instead if the imposed import tariff t is greater than t^*, the equilibrium profits earned by the typical manufacturing firm would be greater under the multilateral free trade agreement than under the regional trade agreement.

Alternatively, our simulation analysis points out that for high levels of the elasticity of substitution, the equilibrium profits earned by the typical manufacturing firm located in country Y under the regional trade agreement would be greater than under the multilateral free trade agreement for any level of the import tariff t.

3.8 Tariff revenue analysis

In this section we evaluate the implications of the alternative options of trade policy open to the incumbent policy-maker in country Y on the amount of tariff revenue collected and redistributed to all of the country's agents through lump-sum transfers.

The policy-maker's choice between entering the regional trade agreement with country X or, alternatively, the multilateral free trade agreement with both countries X and Z will affect the amount of tariff revenue collected in country Y and redistributed to the agents in the economy.

Recalling equation (3.46), if the incumbent policy-maker chooses to enter the regional trade agreement the equilibrium import tariff revenue collected in country Y would be:

$$R_Y^R = \frac{t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}}{2 + (1+t)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}}$$

Thus, the import tariff revenue collected in country Y under the regional trade agreement would be a function of the import tariff t, the elasticity of substitution, the fraction of labourers in the total size of the population, and labourers' propensity to consume the manufactured good.

Alternatively, if the incumbent policy-maker decided to enter the multilateral free trade agreement the amount of tariff revenue collected in country Y would be:

$$R_Y^{FT} = 0$$

In fact since under the multilateral free trade agreement all import tariffs would be removed, the import tariff revenue collected in country Y would be nil.

To assess the implications of the policy-maker's choice between the two alternative options of trade policy, we compare the tariff revenue that would be collected in country Y under the regional trade agreement and under the multilateral free trade agreement.

Thus, we can state the following proposition:

Proposition 5 *The amount of tariff revenue collected in country Y will be greater under the regional trade agreement than under the multilateral trade agreement for any positive level of the import tariff t.*

3.9 Lobbying: a pro-regionalism force

In this section we focus on the activity of the organized interest group in order to assess whether industrial lobbying constitutes a pro-regionalism or pro-multilateralism force in the policy-making process.

We considered that all firms' owners are organized in a unique industrial lobby that offers contingent donations to the incumbent policy-maker to affect its choice of trade policy.

The interest group specifies a contribution schedule that stipulates how large a donation will be made for each of the two possible stances of trade policy, and tailors its contribution schedule in order to maximize the total net welfare of its members.

The contribution schedule specified by the interest group will then consists of two items, D_Y^R and D_Y^{FT}, representing the political contributions associated with the policy-maker's choice to enter the regional trade agreement or, the multilateral free trade agreement, respectively.

We point out that it is not optimal for the interest group to specify a positive contribution for both policy outcomes since then it could cut back equally on both of its offers without affecting the policy-maker's choice, and since it will not wish to give the policy-maker an incentive to choose the trade policy outcome that it is contrary to the lobby's interests.

The assumption of "truthful" donation contracts implies that the interest group, will pay to the policy-maker for any of the two stance of trade policy chosen, the excess (if any) of the group's gross welfare reached under the specified stance of trade policy relative to some optimally chosen base level of welfare.

Since we assumed that the organized interest group is constituted by firm owners, its gross-of-contributions welfare, labelled as $\widetilde{V_Y}^F$, is defined as the sum of the gross indirect utility reached by the members of the interest group.

Thus, restricting political contributions to be non-negative, the truthful contribution function takes the form:

$$D_Y = \max\left[0, \widetilde{V}_Y^F - B\right] \tag{3.61}$$

where the organised interest group will choose B as such as to satisfy the voluntary participation constraint of the incumbent policy-maker in country Y.

Since the organised interest group's net welfare will be equal to B whenever the group makes a positive contribution to the regional policy-maker, the interest group will wish to make B as large as possible but without inducing the policy-maker to

choose a policy outcome which is damaging to the group's own interests.

Given that there is only one organised interest group in country Y, the interaction between the policy-maker and the interest group configures as a principal-agent problem such that the policy-maker's voluntary participation constraint can be used to derive the lobby's choice of B in equilibrium.[18]

The interest group will then choose B in order to make the policy-maker just indifferent between heeding the lobby's interests, and the trade policy choice that the policy-maker would implement in absence of any contributions, that is the socially optimal choice of trade policy.

Given that the interest group will lobby for the stance of trade policy that implies the greater level of the group's gross welfare, we compare the gross welfare that interest group will achieve if the policy-maker decided to enter the regional trade agreement or, alternatively, the multilateral free trade agreement.

Labelling as $\widetilde{V}^F_{R,Y}$ and $\widetilde{V}^F_{FT,Y}$, respectively, the gross-of-contributions welfare of the interest group if the policy-maker decides to enter the regional trade agreement or, alternatively, the multilateral agreement, we have:

$$\widetilde{V}^F_{R,Y} = k\Pi^R_Y + kR^R_Y \tag{3.62}$$

$$\widetilde{V}^F_{FT,Y} = k\Pi^{FT}_Y \tag{3.63}$$

As shown in equation (3.62), the gross-of contributions welfare that the interest group would achieve if the policy-maker decides to enter the regional trade agreement is the sum of the aggregate profits in the manufacturing sector and the share of import tariff revenue redistributed to firm owners through lump-sum transfers.

Instead, as shown in equation (3.63), the gross-of-contributions welfare that the interest group would achieve if the policy-maker decided to enter the multilateral free

[18] See Grossman and Helpman (1994) for the derivation of the lobby's choice of B in equilibrium when different organised interest groups compete for protection in a common agency framework.

trade agreement is simply given by the aggregate profits that would be earned in the manufacturing sector under the multilateral free trade agreement, given that the collected import tariff revenue would be nil.

Given equations (3.61), (3.62) and (3.63), the political contributions that the interest group would offer to the policy-maker if it chose to enter the regional trade agreement or, the multilateral free trade agreement, take the form:

$$D_Y^R = \max\left[0,\ k\Pi_Y^R + kR_Y^R - B\right] \tag{3.64}$$

$$D_Y^{FT} = \max\left[0,\ k\Pi_Y^{FT} - B\right] \tag{3.65}$$

In order to evaluate whether the organized interest group in country Y will lobby in favour of the regional trade agreement or, alternatively, in favour of the multilateral trade agreement, we compare the gross-of contributions welfare that the group would achieve under the two alternative stance of trade policy.

Notably, comparing the gross-of-contributions welfare that the interest group would achieve under the regional trade agreement or, alternatively, under the multilateral free trade agreement, we can state the following proposition:

Proposition 6 *The organized interest group is a pro-regionalism force for any value of the import tariff t.*

Proof. See Mathematical Appendix for proof. ■

In fact, as shown in the Mathematical Appendix, the gross-of-contributions welfare that the interest group would achieve if the policy-maker decided to enter the regional trade agreement is greater than the amount that it would achieve under the multilateral free trade agreement.

Thus, given that the regional trade agreement implies a higher level of gross-of contributions welfare for the organised interest group than the multilateral free trade

agreement, industrial lobbying will constitute a pro-regionalism force in the policy-making process.

We conclude that, insofar as the lobby's interests are in conflict with trade policy outcome that the incumbent policy-maker in country Y would choose in absence of any political contribution, the organized interest group will offer a positive contribution to the policy-maker if it chooses to enter the regional trade agreement, and a zero contribution otherwise.

Then, given equations (3.46), (3.56), (3.60), (3.64), and (3.65), the political contributions that the interest group will offer to the policy-maker under the regional trade agreement, and, alternatively, under the multilateral trade agreement are given by:

$$\begin{aligned} D_Y^R = & \frac{\lambda(1-k)}{\sigma} \cdot \frac{2+\sigma k(1+t)^{-\sigma}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)(1+t)^{-\sigma}} + \\ & \frac{\lambda(1-k)}{\sigma} \cdot \frac{(1+t)^{-\sigma}}{1+2(1+t)^{(1-\sigma)}-2\lambda t(1-k)(1+t)^{-\sigma}} - B \end{aligned} \tag{3.66}$$

$$D_Y^{FT} = 0 \tag{3.67}$$

3.10 Aggregate social welfare analysis

In this section we investigate the implications of the two alternative options of trade policy faced by the incumbent policy-maker on the aggregate social welfare reached in country Y.

The choice of the incumbent policy-maker to enter the regional trade agreement with country X or, alternatively, the multilateral free trade agreement with both countries X and Z will affect the level of aggregate social welfare reached in country Y.

Labelling as V_Y^L the aggregate indirect utility reached by labourers in country Y, and given that $\widetilde{V_Y}^F$ indicates the gross aggregate indirect utility of firm owners, we can express the gross aggregate social welfare in country Y as:

$$\widetilde{W_Y} = \widetilde{V}_Y^F + V_Y^L \tag{3.68}$$

We define the net aggregate social welfare in country Y as the gross aggregate social welfare less the political contribution paid by the interest group to the incumbent policy-maker.

It follows from equation (3.68) that net aggregate social welfare takes the form:

$$W_Y = \widetilde{V}_Y^F + V_Y^L - D_Y \tag{3.69}$$

Given equation (3.69) and labelling as $V_{R,Y}^L$ and $V_{FT,Y}^L$, respectively, the aggregate indirect utility of labourers if the policy-maker decides to enter the regional trade agreement or, alternatively, the multilateral free trade agreement, we have:

$$W_Y^R = \widetilde{V}_{R,Y}^F + V_{R,Y}^L - D_Y^R \tag{3.70}$$

$$W_Y^{FT} = \widetilde{V}_{FT,Y}^F + V_{FT,Y}^L - D_Y^{FT} \tag{3.71}$$

where W_Y^R is the net aggregate social welfare that would be reached in country Y under the regional trade agreement, while W_Y^{FT} is the net aggregate social welfare that would reached under the multilateral free trade agreement.

If the incumbent policy-maker chose to enter the regional trade agreement, given equations (3.1), (3.45), (3.46), (3.49), and (3.50), the labourers' indirect utility and firm owners' gross indirect utility, would be:

$$V_Y^{L,R} = \frac{(1-\lambda)^{1-\lambda} \cdot \lambda^{\lambda} \cdot k^{\frac{\lambda}{\sigma-1}} \cdot (1-k) \cdot \left[2 + (1+t)^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}+1}}{2 + (1+t)^{(1-\sigma)} - \lambda t (1-k) \cdot (1+t)^{-\sigma}} \tag{3.72}$$

$$\widetilde{V}_Y^{F,R} = \frac{\lambda(1-k)}{\sigma} \cdot \frac{2+\sigma kt(1+t)^{-\sigma}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)(1+t)^{-\sigma}} + \frac{\lambda(1-k)}{\sigma} \cdot \frac{(1+t)^{-\sigma}}{1+2(1+t)^{(1-\sigma)}-2\lambda t(1-k)(1+t)^{-\sigma}} \quad (3.73)$$

Given equations (3.20), (3.68), (3.70), (3.72), and (3.73), the gross aggregate social welfare reached in country Y if the policy-maker decided to enter the regional trade agreement would be:

$$\widetilde{W}_Y^R = \frac{(1-\lambda)^{1-\lambda} \cdot \lambda^{\lambda} \cdot k^{\frac{\lambda}{\sigma-1}} (1-k) \left[2+(1+t)^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}+1}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)\cdot(1+t)^{-\sigma}} + \quad (3.74)$$
$$+\frac{\lambda(1-k)}{\sigma} \cdot \left[\begin{array}{c} \frac{2+\sigma kt(1+t)^{-\sigma}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)(1+t)^{-\sigma}} \\ + \frac{(1+t)^{-\sigma}}{1+2(1+t)^{(1-\sigma)}-2\lambda t(1-k)\cdot(1+t)^{-\sigma}} \end{array} \right]$$

On the other hand, if the incumbent policy-maker chose to enter the multilateral free trade agreement, given equations (3.1), (3.51), (3.56), (3.58) and (3.60), the labourers' indirect utility and firm owners' gross indirect utility, would be:

$$V_Y^{L,FT} = (1-\lambda)^{1-\lambda} \cdot \lambda^{\lambda} \cdot k^{\frac{\lambda}{\sigma-1}} \cdot (1-k) \cdot (3)^{\frac{\lambda}{\sigma-1}} \quad (3.75)$$

$$\widetilde{V}_Y^{F,FT} = \frac{\lambda \cdot (1-k)}{\sigma} \quad (3.76)$$

Thus, given equations (3.21), (3.75), and (3.76), the gross aggregate social welfare reached in country Y under the multilateral free trade agreement would be:

$$\widetilde{W}_Y^{FT} = (1-\lambda)^{1-\lambda} \cdot \lambda^{\lambda} \cdot k^{\frac{\lambda}{\sigma-1}} \cdot (1-k) \cdot (3)^{\frac{\lambda}{\sigma-1}} + \frac{\lambda \cdot (1-k)}{\sigma} \quad (3.77)$$

Given equations (3.65), (3.66), (3.74), and (3.77), the net aggregate social welfare reached in country Y under the regional trade agreement and under the multilateral trade agreement would be:

$$W_Y^R = \frac{(1-\lambda)^{1-\lambda}\cdot\lambda^{\lambda}\cdot k^{\frac{\lambda}{\sigma-1}}(1-k)\cdot\left[2+(1+t)^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}+1}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)\cdot(1+t)^{-\sigma}} \tag{3.78}$$

$$+\frac{\lambda(1-k)}{\sigma}\cdot\left[\begin{array}{c}\frac{2+\sigma kt(1+t)^{-\sigma}}{2+(1+t)^{(1-\sigma)}-\lambda t(1-k)(1+t)^{-\sigma}} \\ +\frac{(1+t)^{-\sigma}}{1+2(1+t)^{(1-\sigma)}-2\lambda t(1-k)\cdot(1+t)^{-\sigma}}\end{array}\right]-D_Y^R \tag{3.79}$$

$$W_Y^{FT}=(1-\lambda)^{1-\lambda}\cdot\lambda^{\lambda}\cdot k^{\frac{\lambda}{\sigma-1}}\cdot(1-k)\cdot(3)^{\frac{\lambda}{\sigma-1}}+\frac{\lambda\cdot(1-k)}{\sigma}-D_Y^{FT} \tag{3.80}$$

Comparing the net aggregate social welfare that would be reached in country Y under the regional trade agreement and, alternatively, under the multilateral free trade agreement, we can state the following proposition:

Proposition 7 *The net aggregate social welfare reached in country Y would be greater under the multilateral free trade agreement than under the regional trade agreement for any positive value of the import tariff t.*

Proof. See Mathematical Appendix. ■

If the incumbent policy-maker in country Y decided to enter the regional trade agreement, consumers located in country Y would pay a unitary price for any manufactured varieties produced locally and in the partner country X.

Alternatively, if the policy-maker in country Y decided to enter the multilateral free trade agreement, consumers located in country Y would pay a unitary price for manufactured varieties produced locally as well as for manufactured varieties imported from both countries X and Z.

However, consumers located in country Y will perceive a higher income under the regional trade agreement than under the multilateral free trade agreement since the collected import tariff revenue redistributed to all of the country's agents will be positive.

Since the lower prices paid for varieties imported from the rest of the world under the multilateral trade agreement will more than compensate for the lower income perceived, consumers located in country Y will achieve a higher indirect utility under the multilateral trade agreement than under the regional trade agreement.

3.11 The policy-maker's choice of trade policy

In this section we investigate the choice of the incumbent policy maker in country Y between entering the regional trade agreement or, alternatively, the multilateral free trade agreement.

The policy-maker will achieve a different level of political support depending on whether it chooses to enter the regional trade agreement or, the multilateral free trade agreement.

Notably, the policy-maker's choice of trade policy will affect the level of support it receives by affecting the actual amount of political contributions that it would receive and the net aggregate social welfare that would be reached in country Y.

Given equation (3.17), the political support that the policy-maker in country Y would receive if it decided to enter the regional trade agreement may be expressed as:

$$G_Y^R = a_Y \cdot D_Y^R + (1 - a_Y) \cdot W_Y^R$$

where D_Y^R and W_Y^R are expressed in equations (3.66) and (3.78).

On the other hand, the political support that the policy-maker would receive if it decided to enter the multilateral free trade agreement, is given by:

$$G_Y^{FT} = a_Y \cdot D_Y^{FT} + (1 - a_Y) \cdot W_Y^{FT}$$

where D_Y^{FT} and W_Y^{FT} are expressed in equations (3.67) and (3.79).

Since we assumed that the policy-maker in country Y is a political-support maximizer, it will choose to enter the regional trade agreement or the multilateralism free

trade agreement depending on which stance of trade policy guarantees the higher level of political support.

Notably, we can express the problem of the policy-maker as choosing η in order to maximize:

$$\eta \cdot \left[a_Y \cdot D_Y^R + (1 - a_Y) \cdot W_Y^R\right] + (1 - \eta) \cdot \left[a_Y \cdot D_Y^{FT} + (1 - a_Y) \cdot W_Y^{FT}\right]$$

where the variable η equals one if the policy-maker chooses to enter the regional trade agreement while it equals zero if it chooses to enter the multilateral free trade agreement.

Given the policy-maker's maximization problem, we can state the following proposition:

Proposition 8 *The incumbent policy-maker in country Y will choose to enter the regional trade agreement if the following condition is satisfied:*

$$a_Y \cdot \left(D_Y^R - D_Y^{FT}\right) + (1 - a_Y) \cdot \left(W_Y^R - W_Y^{FT}\right) \geq 0 \tag{3.81}$$

We refer to the condition stated in Proposition 8 as the "regionalism" condition since when it is satisfied the policy-maker in country Y will choose to enter the regional trade agreement since this choice guarantees the greater level of political support.

Alternatively, when the regionalism condition is not satisfied the policy-maker will choose to enter the multilateral free trade agreement since choosing this stance of trade policy guarantees the greater level of political support.

Thus, our analysis points out that the choice of entering a regional trade agreement when multilateral free trade is at hand configures as a political economic decision driven by the political support maximizing behavior of the policy-maker.

Notably, the choice of the policy-maker between the two alternative stances of

trade policy may be conceived as a political equilibrium that balances pro- and anti-regionalism forces.

We showed that the organized interest group constitutes a pro-regionalism force offering a greater donation to the policy-maker if it chooses to enter the regional trade agreement rather than the multilateral free trade agreement.

On the other hand, we showed that the net aggregate social welfare reached in country Y would be greater under the multilateral free trade agreement rather than the regional trade agreement so operating as a anti-regionalism force in the policy-making process.

Thus, the policy-maker faces a trade-off between the greater political contributions that it would receive if it chose the regional trade agreement and the greater net aggregate social welfare that would be reached in country Y if it chose the multilateral free trade agreement.

As the regionalism condition indicates, the policy-maker will choose to enter the regional trade agreement if the weighted gain in the amount of political contributions received offsets at least the weighted loss in the net aggregate social welfare achieved in country Y.

On the other hand, the policy-maker will choose to enter the multilateral free trade agreement if weighted gain of in net aggregate social welfare reached in country Y more than offset the weighted loss in the amount of political contributions received.

Notably, the higher is the degree of political distortion, the greater is the weight the policy-maker attaches to the greater donations it would receive under the regional trade agreement, while the lower the weight it attaches to the greater net aggregate social welfare that would be achieved under the multilateral free trade agreement.

3.12 Simulation analysis: the policy-maker's choice

Our analysis developed a theoretical framework in which the choice of entering a regional trade agreement vis-a-vis to a multilateral free trade agreement is modeled as a

political economic decision driven by the political support-maximizing behavior of the policy-maker.

We showed that the policy-maker in country Y faces a trade-off between the political contribution that it would receive under the regional trade agreement and the greater net aggregate social welfare that would be achieved under the multilateral free trade agreement. As a result, the policy-maker will choose to enter the regional trade agreement if and only if the weighted gain in the political contributions it would receive under the regional trade agreement compensate for the weighted loss in net aggregate social welfare in country Y.

In this section we simulate our theoretical model under different values of the parameters depicting the choice of the policy-maker in country Y between the regional trade agreement or the multilateral free trade agreement, and we summarize our results in Figure 3-1.

In the following we discuss the baseline case in which the elasticity of substitution is $\sigma = 5$, labourers' propensity to consume the manufactured good is $\lambda = 0.4$, and the fraction of firm owners in the overall population is assumed to be $k = 0.6$.

Notably, we choose an elasticity of substitution of 5 in the baseline case to be in the middle of the range of estimates provided in Broda and Weinstein (2004) and Anderson and van Wincoop (2004), but we also experiment with values of 4 and 10 to cover the range of the empirical estimates.[19] Furthermore the share of the manufactured good in labourers' utility function is chosen to be equal to 0.4 in the baseline case to be in line with the value commonly used in the trade literature, as for example in Fujita, Krugman and Venables (1999), but we also provide simulations for the higher value of 0.6 and lower value of 0.3.[20] Finally, we choose a fraction of firm owners in the population of 0.6 in the baseline case to be in the middle of the range of the estimates

[19] Broda and Weinstein (2004) estimated that the average elasticity of substitution in the U.S. for the period between 1990 and 2001 was around eight for 10-digit goods, around five within 5-digitgoods, and about four within 3-digit goods. In addition, Anderson and van Wincoop (2004) provided a survey of the empirical estimates of the elasticity of substitution in the trade literature, and showed that it is likely to be in the range of four to ten.

[20] At this regard also see Head and Mayer (2004), and Martin and Rey (2005).

Figure 3-1: Simulations of the policy-maker's choice of trade policy

	σ	λ	k	α_Y	**The policy-maker's choice**
Baseline	5	0.4	0.6	Low	Multilateralism
Baseline	5	0.4	0.6	High	Regionalism for t lower than 0.58
Lower σ	4	0.4	0.6	Low	Multilateralism
Lower σ	4	0.4	0.6	High	Regionalism for t lower than 0.56
Higher σ	10	0.4	0.6	Low	Regionalism for any value of t
Higher σ	10	0.4	0.6	High	Regionalism for any value of t
Lower λ	5	0.3	0.6	Low	Multilateralism
Lower λ	5	0.3	0.6	High	Regionalism for t lower than 0.48
Higher λ	5	0.6	0.6	Low	Multilateralism
Higher λ	5	0.6	0.6	High	Regionalism for t lower than 0.71
Lower k	5	0.4	0.4	Low	Multilateralism
Lower k	5	0.4	0.4	High	Regionalism for t lower than 0.65
Higher k	5	0.4	0.8	Low	Multilateralism
Higher k	5	0.4	0.8	High	Regionalism for t lower than 0.42

provided in Goldberg and Maggi (1999), and Eicher and Osang (2002), but we also experiment with values of 0.4 and of 0.8 to cover the range of the empirical estimates.[21]

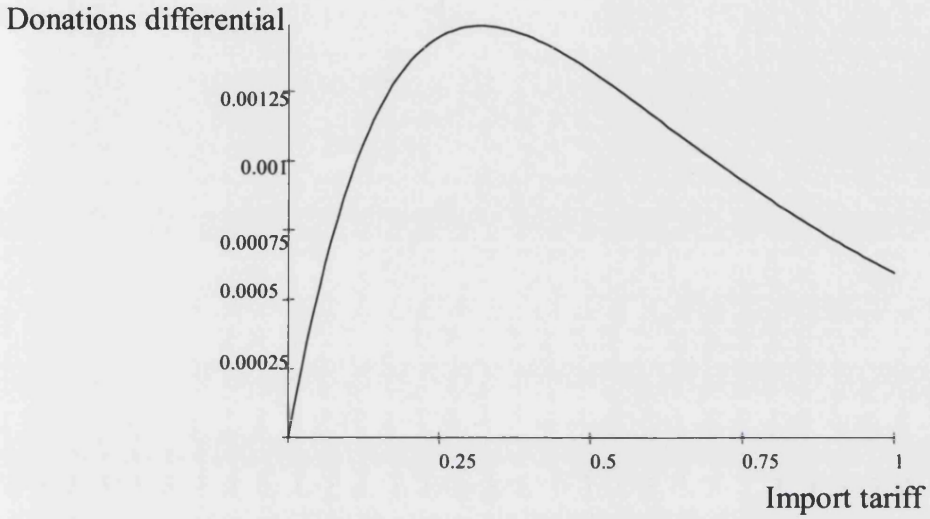
Focusing on the baseline case, in order to investigate the industrial lobbying activity, we analyse the donations differential, that is the difference between the donations that the policy-maker would receive under the regional trade agreement and, alternatively, under the multilateral free trade agreement.

In Figure 3-2 we present a simulation of the donations differential as a function of the level of the import tariff for the chosen values of the elasticity of substitution, the fraction of firm owners in the total population, and labourers' propensity to consume the manufactured good.

Our simulation analysis shows that the organised interest group lobbies in favour of the regional trade agreement for any value of the import tariff thus acting as a

[21] Goldberg and Maggi (1999) estimated the fraction of the U.S. population that owned sector specific inputs to be 0.9 while Eicher and Osang (2002) estimated it to be 0.3. We use the estimates for the fraction of the population that owns specific inputs as a proxy for the fraction of firm owners in the population.

Figure 3-2: Donations differential



pro-regionalism force in the policy-making process.

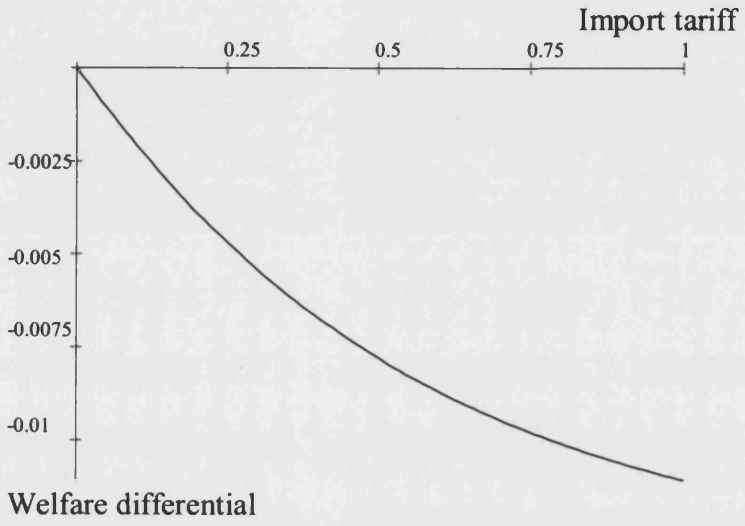
Focusing on the net aggregate social welfare, we consider the welfare differential that is the difference between the net aggregate social welfare that would be achieved in country Y under the regional trade agreement and, alternatively, under the multilateral free trade agreement.

In Figure 3-3 we provide a simulation of the welfare differential as a function of the import tariff, for the chosen values of the elasticity of substitution, the fraction of labourers in the total population and labourers' propensity to consume the manufactured good.

Our simulation analysis shows that the multilateral free trade agreement guarantees an higher level of net aggregate social welfare in country Y than the regional trade agreement for any value of the import tariff.

Thus, the greater level of aggregate social welfare that would be achieved under the multilateral free trade agreement compared with the regional trade agreement operates

Figure 3-3: Net aggregate social welfare differential



as a anti-regionalism force in the policy-making process.

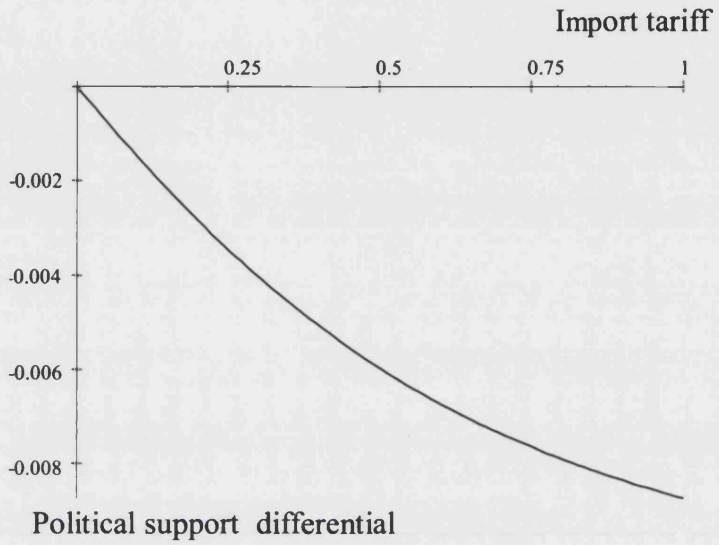
The policy-maker faces a trade-off between the greater political contributions that it would receive under the regional trade agreement and the greater net aggregate social welfare that would be reached in country Y under the multilateral free trade agreement.

The policy-maker will choose to enter the regional trade agreement if the weighted gain in amount of political contributions received under the regional trade agreement offsets at least the weighted loss of aggregate social welfare achieved in country Y.

In order to investigate the choice of the policy-maker, we focus on the political support differential defined as the difference between the political support that the policy-maker would obtain under the regional trade agreement and under the multilateral free trade agreement.

First, we note that for a low degree of political distortion in spite of the pro-regionalism lobbying activity the policy-maker will choose to enter the multilateral

Figure 3-4: Political support differential for a low degree of political distortion.



trade agreement. Modelling the existence of a low degree of political distortion by assuming $a_Y = 0.2$, in Figure 3-4 we simulate the political support differential for the chosen values of the parameters.

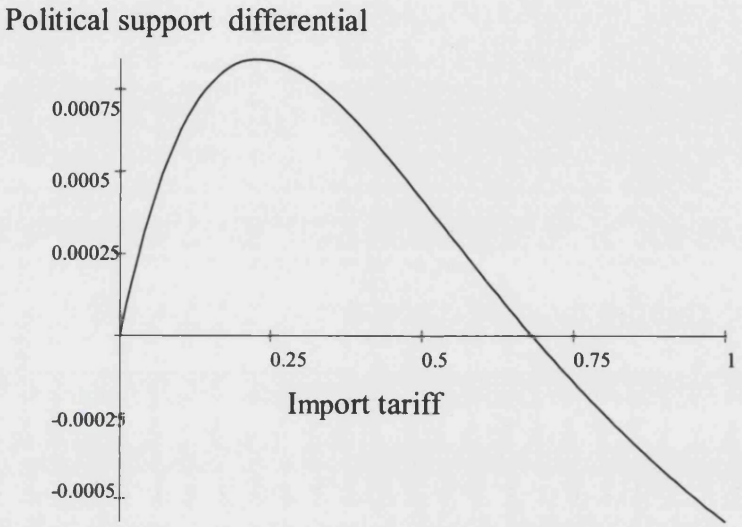
Our simulation shows that since the policy-maker attaches a low weight to the gain in political contributions that it would obtain by choosing to enter the regional trade agreement will not compensate for the weighted loss of net aggregate social welfare that would arise.

Thus the policy-maker will choose to enter the multilateral free trade agreement rather than the regional trade agreement for any value of the import tariff.

Alternatively, for a high level of political distortion the policy-maker might choose to enter the regional trade agreement or, alternatively, the multilateral free trade agreement.

Modelling the existence of a high degree of political distortion by assuming $a_Y =$

Figure 3-5: Political support differential for a high degree of political distortion



0.9, in Figure 3-5 we provide a simulation of the political support differential as a function of the import tariff for the chosen value of the parameters of the model.

Our simulation analysis shows that for a high degree of political distortion a level of the import tariff exists for which the regional trade agreement and the multilateral free trade agreement would entail the same level of political support for the policy-maker in country Y. Notably, given the values of the parameters, the value of the import tariff for which the alternative trade agreements imply the same level of political support for the policy-maker is $\widehat{t} = 0.58$.

Thus, when the import tariff is lower or equal to $\widehat{t} = 0.58$, the policy-maker will choose the regional trade agreement since this choice will guarantee a greater political support. In fact, the weighted gain in political contributions reached under the regional trade agreement will more than offset the weighted loss in net aggregate social welfare in country Y.

However, if the import tariff is greater than $\widehat{t} = 0.58$, the policy-maker will choose

the multilateral free trade agreement since this choice guarantees a greater political support. In this case, the weighted gain in net aggregate social welfare reached under the multilateral free trade agreement will more than offset the weighted loss in campaign contributions.

3.13 Is regionalism bad for multilateralism?

A buoyant debate exists between those who argue that regional agreements can complement existing multilateral efforts to foster greater economic integration among countries and those who see such agreements as a threat to multilateral trade liberalisation.

A relevant body of the recent literature has focused on the implications of regionalism for the multilateral trading system, investigating whether regionalism may be a faster way to reach multilateralism or hurt multilateral liberalization making it even more difficult.

The theoretical framework we developed provides useful insights on the implications of a country's initial decision of entering a regional trade agreement on its incentives to move toward subsequent multilateral trade liberalization.

In this section, we assume that the regionalism condition in Proposition 8 is satisfied such that the incumbent policy-maker in country Y decides to enter the regional trade agreement with country X rather than the multilateral free trade agreement.

Thus, the weighted gain in the amount of political contributions that the policy-maker receive under the regional trade agreement is assumed to more than offset the weighted loss in net aggregate social welfare in country Y.

We consider that once country Y has entered the regional trade agreement, the incumbent policy-maker has to choose between entering a multilateral free trade agreement or, remaining in the *status quo,* that is in the regional trade agreement with country X.

The policy-maker in country Y would choose to enter the multilateral free trade agreement only if this choice guarantees a greater level of political support than re-

maining in the *status quo*.

On the basis of Proposition 7 we note that the multilateral free trade agreement would lead to a greater net aggregate social welfare in country Y than remaining in the *status quo*.

However, on the basis of Proposition 6 we note that the organized interest group will lobby in favour of remaining in the *status quo* since this choice would imply a greater level gross-of-contributions aggregate welfare for the interest group.

The incumbent policy-maker in country Y would choose to move towards multilateralism rather than remaining in the *status quo* only if the weighted gain in net aggregate social welfare more than compensate for the weighted loss in the amount of political contributions received.

Assuming the degree of distortions in the policy-making process to be unchanged, the fact that the policy-maker has initially chosen to enter the regional trade agreement implies that the weighted gain in political contributions that it would obtain remaining in the *status quo* more than offset the weighted loss in net aggregate social welfare.

We conclude that once the incumbent policy-maker in country Y chooses to enter the regional trade agreement, subsequent multilateral trade liberalisation will no longer be pursued since the policy-maker will have no incentives to move from the *status quo*.

3.14 Conclusions

This chapter provided a political economy analysis of the incentives underpinning a country's choice to enter a regional trade agreement when a multilateral free trade agreement is available.

We built a theoretical model in which a country is faced with the choice between entering a regional trade agreement or, alternatively, a multilateral trade agreement leading to free trade.

Assuming that the policy-maker chooses its trade policy taking into account aggregate social welfare but also the pressure applied by industrial interests, we investigated

the policy-maker's choice between the two alternative trade agreements.

As a main result, we derived a formal condition under which the policy-maker will choose to enter the regional trade agreement rather than the multilateral free trade agreement.

Notably, we showed that in the economy both pro- and anti-regionalism forces operate and that the policy-maker's choice is a political equilibrium that balances these opposing forces.

On the one hand, we pointed out that the organized industrial interest group constitutes a pro-regionalism force in the policy-making process since the regional trade agreement implies a greater gross aggregate social welfare for the group than the multilateral free trade agreement.

On the other hand, we showed that the multilateral free trade agreement guarantees an higher level of net aggregate social welfare than the regional trade agreement thus operating as a anti-regionalism force in the policy-making process.

We emphasized that the policy-maker faces a trade-off in its choice of trade policy between the greater amount of political contributions it would receive if it chooses to enter the regional trade agreement and the lower aggregate social welfare that would be achieved in the country.

We showed that the incumbent policy-maker will choose to enter the regional trade agreement if the weighted gain in the amount of political contributions received offsets at least the weighted loss of net aggregate social welfare achieved in the country.

Our analysis pointed out that the decision to enter a regional trade agreement when a multilateral free trade agreement is available configures as a choice of political economy driven by the political support-maximising behavior of the incumbent policy-maker.

Notably, we provided a simulation analysis of our theoretical framework in order to depict the policy-maker's choice between the regional trade agreement and the multilateral free trade agreement.

Furthermore, this chapter investigated the implications of a country's choice to

enter a regional trade agreement on the incentives to pursue subsequent multilateral trade liberalization.

We showed that a country's choice to enter a regional trade agreement unambiguously undermines the incentives to further multilateral liberalization.

In fact, once a country enters a politically-supported regional trade agreement, multilateral trade liberalisation will no longer be pursued since the incumbent policy-maker will have no incentives to move from the *status quo*.

3.15 Mathematical Appendix

3.15.1 Derivation of the import tariff revenue

In the following we derive the import tariff revenue collected in countries X, Y and Z in the initial symmetric equilibrium, and in the equilibrium under the regional trade agreement.

The initial symmetric equilibrium

Focusing on the initial symmetric equilibrium, the import tariff revenue in the representative country is defined as the import tariff t times the country's total import of manufactured varieties.

Thus, we have:

$$R_0 = \frac{2t \cdot \lambda \cdot (1-k) \cdot k \cdot (1+R_0) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{P_0^{(1-\sigma)}}$$

We note that the total imports of manufactured varieties in the representative country are a function of the total income of consumers located in the country which depends, in turn, on the import tariff revenue redistributed to all the agents in the economy.

Thus, solving the previous equation for R_0 we obtain:

$$R_0 = \frac{2t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{P_0^{(1-\sigma)} - 2t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{-\sigma} (1+t)^{-\sigma}}$$

The equilibrium under the regional trade agreement

Under the regional trade agreement, the import tariff revenue collected in countries Y and X is defined as the import tariff t times each country's total imports of manufactured varieties from country Z.

Thus, we have:

$$R_Y^R = \frac{t \cdot \lambda \cdot (1-k) \cdot k \cdot \left(1 + R_Y^R\right) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Y^R\right)^{(1-\sigma)}}$$

$$R_X^R = \frac{t \cdot \lambda \cdot (1-k) \cdot k \cdot \left(1 + R_X^R\right) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_X^R\right)^{(1-\sigma)}}$$

Solving the previous equations for R_Y^R and R_X^R, respectively, we obtain:

$$R_Y^R = \frac{t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Y^R\right)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}$$

$$R_X^R = \frac{t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_X^R\right)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}$$

Focusing on the rest of the world Z, the import tariff revenue under the regional trade agreement is defined as the import tariff t times country Z's total imports of manufactured varieties from countries Y and X.

Thus, we obtain:

$$R_Z^R = \frac{2 \cdot t \cdot \lambda \cdot (1-k) \cdot k \cdot \left(1 + R_Z^R\right) \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Z^R\right)^{(1-\sigma)}}$$

Solving the previous equation for R_Z^R, we have:

$$R_Z^R = \frac{2 \cdot t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}{\left(P_Z^R\right)^{(1-\sigma)} - 2 \cdot t \cdot \lambda \cdot (1-k) \cdot k \cdot p_i^{(1-\sigma)} \cdot (1+t)^{-\sigma}}$$

3.15.2 Proof of Proposition 6

We prove that the amount of import tariff revenue collected in country Y would be greater under the regional trade agreement than under the multilateral trade agreement for any positive value of the import tariff t.

Given equations (3.46) and (3.58), the import tariff revenue that would be collected in country Y under the regional trade agreement and, alternatively, under the

multilateral trade agreement are given by:

$$R_Y^R = \frac{t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}}{2 + (1+t)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}}$$

$$R_Y^{FT} = 0$$

Having assumed λ and k to be in the range $(0,1)$, and σ to be greater than one, we note that the numerator of R_Y^R is greater than zero for any positive value of the import tariff t.

We conclude that the import tariff revenue collected in country Y is greater under the regional trade agreement than under the multilateral trade agreement for any positive value of the import tariff t.

3.15.3 Proof of Proposition 7

We prove that the gross aggregate welfare that the interest group will achieve would be greater under the regional trade agreement than under the multilateral free trade agreement for any value of the import tariff t.

We focus on the welfare differential, that is the difference between the gross welfare that the interest group would achieve under the regional trade agreement, and under the multilateral free trade agreement.

Given equations (3.66) and (3.67), the donation differential can be expressed as:

$$\begin{aligned} \widetilde{V}_Y^{R-FT} &= \frac{\lambda(1-k)}{\sigma} \cdot \frac{2 + \sigma \cdot k \cdot t \cdot (1+t)^{-\sigma}}{2 + (1+t)^{(1-\sigma)} - t \cdot \lambda \cdot (1-k) \cdot (1+t)^{-\sigma}} + \\ &+ \frac{\lambda(1-k)}{\sigma} \cdot \left[\frac{(1+t)^{-\sigma}}{1 + 2 \cdot (1+t)^{(1-\sigma)} - 2 \cdot \lambda \cdot t \cdot (1-\gamma) \cdot (1+t)^{-\sigma}} - 1 \right] \end{aligned} \tag{3.82}$$

After some manipulations, we have that the interest group' gross welfare will be greater under the regional trade agreement rather than the multilateral free trade

agreement if the following condition is satisfied:

$$\frac{\left(2+(1+t)^{(1-\sigma)}-t\cdot\lambda\cdot(1-k)\cdot(1+t)^{-\sigma}\right)}{1+2\cdot(1+t)^{(1-\sigma)}-2\cdot\lambda\cdot t\cdot(1-\gamma)\cdot(1+t)^{-\sigma}}+k\cdot\sigma\cdot t+\lambda\cdot(1-k)\cdot t>1+t$$

Assuming that the values of the parameters of the model are such that $\sigma > \frac{1-\lambda\cdot(1-k)}{k}$, that is the elasticity of substitution does not assume excessively low values, the above inequality is satisfied for any value of the import tariff t.

We conclude that the organised interest group lobbies in favour of the regional trade agreement rather than the multilateral free trade agreement for any value of the import tariff.

3.15.4 Proof of Proposition 8

We formally prove that the net aggregate social welfare reached in country Y would be greater under the multilateral free trade agreement than under the regional trade agreement for any positive value of the import tariff t.

Focusing on the welfare differential that is the difference between the net aggregate welfare reached in country Y under the regional trade agreement and under the multilateral free trade agreement, we prove that is always negative for any positive value of the import tariff t.

Given equations (3.78) and (3.79), the welfare differential can be written as:

$$\begin{aligned} W_Y^{R-FT} &= (1-\lambda)^{1-\lambda}\cdot\lambda^{\lambda}\cdot(1-k)\cdot k^{\frac{\lambda}{\sigma-1}} \\ &\cdot\left\{\frac{\left[2+(1+t)^{(1-\sigma)}\right]^{\frac{\lambda}{\sigma-1}+1}}{2+(1+t)^{(1-\sigma)}-\lambda\cdot t\cdot(1-k)\cdot(1+t)^{-\sigma}}-(3)^{\frac{\lambda}{\sigma-1}}\right\} \end{aligned} \quad (3.83)$$

We note that when the import tariff t is zero the welfare differential will be zero since the net aggregate social welfare that would be reached under the regional trade

agreement and under the multilateral free trade agreement will coincide.

In addition, we prove that the first-order derivative of the welfare differential with respect to the import tariff t has a negative value for any positive level of the import tariff t.

After some manipulations, the first order derivative of the welfare differential expressed in equation (3.82) with respect to the import tariff t is:

$$\frac{\partial\left(W_Y^{R-FT}\right)}{\partial t} = \frac{\lambda\cdot(1+t)^{(-\sigma)}\cdot}{\left[2+(1+t)^{(1-\sigma)}-\lambda\cdot t\cdot(1-k)\cdot(1+t)^{-\sigma}\right]^2}\cdot \tag{3.84}$$
$$\cdot\left\{\begin{array}{c}(\lambda+\sigma-1)\cdot t\cdot(1-k)\cdot(1+t)^{-\sigma}-k\cdot\left[2+(1+t)^{(1-\sigma)}\right]+\\ -\sigma t\cdot(1-k)\cdot(1+t)^{-1}\cdot\left[2+(1+t)^{(1-\sigma)}\right]\end{array}\right\}$$

Since the denominator of the derivative in equation (3.83) has a positive sign, we focus on the numerator in order to establish the sign of the overall derivative.

The numerator of the derivative expressed in equation (3.83) will have a negative sign for any positive value of the import tariff t if the following condition is satisfied:

$$\sigma+k>(\lambda+\sigma-1)\cdot(1+t)^{1-\sigma}$$

We note that the above condition is verified for any positive value of the import tariff t since we assumed σ to be greater than one, and λ to be in the range $(0,1)$.

Thus, the first order derivative of the welfare differential with respect to the import tariff t has a negative value for any positive level of the import tariff t.

We conclude that since the welfare differential will be zero when the import tariff t is zero and its first order derivative is negative for any positive value of the import tariff, the net aggregate social welfare in country Y will be greater under the multilateral free trade agreement than under the regional trade agreement for any positive value of the import tariff t.

Chapter 4

Trade effects of currency unions: the role of economic dissimilarities

4.1 Introduction

One of the most commonly identified benefits of currency unions is the potential increase in trade that they might foster among their members.[1]

The first contribution to provide an empirical study of the impact of sharing a common currency on trade was Rose (2000) who, adding a common currency dummy to an augmented gravity model and estimating it on a sample of over 200 countries, concluded that sharing a common currency more than triple bilateral trade realised between countries.[2]

[1] Mundell (1961) in his seminal contribution stressed that the main benefit of a currency union was to facilitate trade among its members while its main disadvantage being the loss of independent monetary policy by its members.

[2] McCallum (1995) and Helliwell (1998) indicated that country borders matter for trade flows by showing that trade between Canadian provinces was ten to twenty times greater than trade to trade between a Canadian province and a US state. However, until Rose (2000) there were no studies measuring the direct impact of sharing a common currency on the international flows of trade.

The magnitude of Rose's estimates of the "currency union effect" on trade generated a buoyant debate, and a number of empirical studies followed proposing alternative methodologies to estimate how trade between countries is affected by the use of a common currency.

These contributions refined the magnitude of the currency union effect but confirmed that sharing a common currency has a significant positive effect on trade.[3]

Thus, Glick and Rose (2001) using different panel estimation techniques showed that sharing a common currency approximately doubles bilateral trade realised between pair of countries. Rose and van Wincoop (2001) using sample prediction showed that the adoption of the euro by the members of the European Union could lead to an increase of 60% in the Euro-zone trade. Frankel and Rose (2001) concluded that belonging to a currency union more than triples bilateral trade realised between pair of member countries. Nitsch (2001) addressed problems of aggregation bias and, manipulating Rose (2000) data-set, showed that the estimated currency union effect on trade is actually halved. Persson (2001), applying non-parametric matching techniques to Rose (2000) data-set, showed that the currency union effect on trade ranges between 45% and 13%. Alesina, Barro and Tenreyro (2002), using an instrumental variable approach to the common currency dummy in the gravity model, showed a large positive currency union effect on trade. Micco *et al.* (2003), showed that the formation of the European Monetary Union (EMU) had a significant positive effect on bilateral trade between members with the effect of the EMU on bilateral trade ranging between 4 and 10%, when compared to trade between all other pairs of countries, and between 8 and 16% when compared to trade between non-EMU countries. On the theoretical side, Alesina and Barro (2002) provided a model which incorporated the trade effects of currency unions showing that countries that trade more with each other would benefit more from the adoption of a common currency.

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[3] However, Thom and Walsh (2002) presented a case study on Ireland's break with sterling, following its decision to enter the European Monetary System in 1979, finding no significant effect on the Anglo-Irish trade.

This chapter contributes to the literature by providing a general equilibrium analysis of the trade effects of currency unions on member and non-member countries, by pointing out the implications of sharing a common currency on trade costs and on the equilibrium relative wages across countries, and by investigating how economic dissimilarities among countries affect the trade effects fostered by a common currency.

We build a three-country general equilibrium intra-industry trade model in which economic dissimilarities across countries exist, and sharing a common currency affects the patterns of trade by reducing trade costs through the elimination of transaction costs due to the use of different currencies, and by a general equilibrium induced effect on the relative wages.[4]

Thus, within this theoretical framework, we investigate the trade effects of the formation of a currency union as a form of deepening of integration between the members of a regional trading bloc, and the trade effects of the subsequent enlargement of the currency union to include an economically dissimilar country.[5]

Furthermore, we draw on our theoretical general equilibrium model to assess the implications of greater economic dissimilarities among the original members of the currency union and the accession country on the magnitude of the trade effects of the enlargement.

First, we analyse the implications of the formation of a currency union between the two symmetric members of a regional trading bloc on the volume of bilateral trade realised between the member countries, and between any of the members and the non-member country.

[4] Our analysis disregards other channels through which sharing a common currency may affect bilateral trade, i.e. eliminating the volatility in bilateral nominal exchange rates and increasing the transparency of markets. See Emerson *et al.* (1992) for a formal presentation of the channels through which a monetary union may potentially affect trade among members. See Frankel and Wei (1992), and Eichengreen and Irwin (1995), and De Grauwe and Skudelny (2000) for an assessment of the effect of reduced exchange rate volatility on international trade. Furthermore, see De Grauwe (1994) for a detailed discussion of the effect sharing a common currency on the transparency of markets.

[5] Our analysis abstracts from the loss of independent monetary policy of the member countries following the adoption of common currency.

Notably, the non-member country is assumed to be economically dissimilar from the members of the currency union by having a less efficient manufacturing production technology.

Our analysis shows that the formation of the currency union affects the patterns of trade of both member and non-member countries by reducing the intra-bloc trade costs through the elimination of transaction costs due to the use of different currencies, and by leading to a general equilibrium induced reduction of the relative wage in the non-member country.[6]

In this regard, we prove that the formation of a currency union between the members of a regional trading bloc increases the volume of bilateral trade between the members, and it reduces the volume of bilateral trade between any member and the non-member country.

Second, we examine the implications of the enlargement of the currency union to include the economically dissimilar non-member country on the volume of bilateral trade realised between any of the original members and the accession country, and between the original members.

Our analysis shows that the enlargement affects the patterns of trade of the original members and the accession country by reducing the extra-bloc trade costs via the elimination of transaction costs due to the use of different currencies, and by implying a general equilibrium induced increase in the relative wage in the accession country.

We prove that the enlargement of the currency union to the economically dissimilar accession country increases the volume of bilateral trade between the original members

[6]Since for simplicity in our framework we rule out the possibility for firms to relocate, our analysis does not depict the potential location effects that the formation of a currency union, and its enlargement to an economically dissimilar country might entail. On the contrary, the analysis of the effects of trade integration on industrial location is central to the "new economic geography" literature. In particular, Puga and Venables (1997) showed that a preferential move towards a free trade area pulls industry into the integrating countries while hub-and spoke arrangements favour industrial location in the hub. In addition, Baldwin and al. (2003) showed that a symmetric reciprocal trade liberalization between asymmetrically sized countries leads to industrial relocation in the large country, and to achieve fully open trade while avoiding delocation the large country has to maintain lower import barriers during the transition to free trade.

and the accession country, and reduces the volume of bilateral trade between the original members.

Finally, we investigate how the existence of economic dissimilarities between the original members of the currency union and the accession country affect the magnitude of the trade effects fostered by the enlargement of the currency union.

Simulating our general equilibrium model, we show that the more economically dissimilar the accession country is with respect to the original members of the currency union, the lower is the increase in the volume of bilateral trade between any original member and the accession country that would follow the enlargement of the currency union.

We note that our analysis provides relevant insights on the trade effects of the formation of the EMU, and its envisaged enlargement to include the Eastern European accession countries.

Our results indicate that the formation of the EMU would lead to an unambiguous increase in the volume of intra-industry bilateral trade realised between any pair of member countries. Furthermore, the eventual eastward enlargement of the EMU would unambiguously enhance the volume of bilateral intra-industry trade between the EMU members and the accession countries.

However, the economic dissimilarities existing between the EMU members and the Eastern European accession countries would constrain the magnitude of the gains in the volume of bilateral intra-industry trade between the EMU members and the accession countries that would follow the eastward enlargement of the EMU.

As a main policy implication, our analysis suggests that the more Eastern European accession countries reduce their economic dissimilarities with respect to the EMU members, the greater would be the gains in the volume of bilateral intra-industry trade between EMU members and the accession countries that would follow the eastward enlargement of the EMU.

4.2 The basic model

We consider that the world economy is constituted by three countries, labelled as X, Y and Z, respectively. Notably, we assume that countries X and Y are symmetric while country Z is economically dissimilar from countries X and Y.

Furthermore, we consider that the symmetric countries X and Y are members of a regional trade agreement while country Z is excluded from it. Thus, in the rest of our analysis we refer to countries X and Y as the member countries, and to country Z as the excluded country.

Focusing on the consumption side, we assume that in any of the member countries and in the excluded country, consumers' preferences are given by:

$$U = C_M \quad \text{with} \quad C_M = \left[\sum_{i=1} c_i^{(\sigma-1)/\sigma}\right]^{\frac{\sigma}{(\sigma-1)}} \tag{4.1}$$

where C_M represents a composite index of the consumption of manufactured goods, with c_i being the consumption level of each available manufactured variety i, and σ represents the constant elasticity of substitution between any two manufactured varieties.

Thus, we consider that consumers have a taste for variety, their utility depends on the level of consumption of the range of manufactured varieties available, and their income only derives from the labour provided to manufacturing firms.

Focusing on the production side, we assume that in any of the member countries and in the excluded country a manufacturing sector exists, characterised by differentiated products, increasing returns to scale and monopolistic competition.[7]

Notably, we consider that in any country the cost of introducing a new manufactured variety is zero, free entry and free exit exist in response to profits or losses, firms can not internationally relocate, and manufacturing firms only employ local labourers.

[7] The monopolistic competition framework was introduced by the seminal work of Dixit and Stiglitz (1976). See Helpman and Krugman (1989), and Fujta, Krugman and Venables (1999) for a detailed discussion of the Dixit-Stiglitz model of monopolistic competition.

Furthermore, we assume that all countries are endowed with the same amount of labour and labourers cannot relocate across different countries.

Crucially, we consider that the excluded country is economically dissimilar from the two symmetric member countries since its manufacturing production technology is less efficient than the one used in the member countries.

Thus, we assume that the labour input requirement for any manufactured variety produced in any of the two member countries is:

$$l_R = \alpha_1 + \beta \cdot x_R \qquad \text{with } \alpha_1 > 0 \text{ and } \beta > 0 \tag{4.2}$$

where x_R is the amount produced of any manufactured variety in any of the member countries, and α_1 is the fixed labour input requirement.

On the other hand, we consider that the fixed labour cost required to produce any manufactured variety in the excluded country is greater than in the member countries such that the manufacturing technology in the accession is less efficient than the one in the member countries.[8]

The labour input requirement for any manufactured variety produced in the excluded country is assumed to be:

$$l_A = \alpha_2 + \beta \cdot x_A \qquad \text{with } \alpha_2 > 0, \text{ and } \beta > 0 \tag{4.3}$$

where x_A is the amount produced of any manufactured variety in the excluded country, and α_2 is the fixed labour input requirement, with $\alpha_2 > \alpha_1$.

Focusing on the international flows of goods, we assume that trade costs exist on international exchanges of manufactured goods while no trade costs apply on domestic sales. We consider that trade costs applying to international flows of manufactured

[8]In our analysis we assume the marginal labour costs to be equal across countries in order to simplify the derivation of the equilibrium. However, our results could be generalized to the case where technological inefficiency in the excluded country is also due to a higher marginal labour cost compared to the member countries.

varieties are of the "iceberg" type such that shipping any manufactured good between any two countries melts a fraction of the shipment.

Furthermore, we assume that trade costs on international flows of manufactured goods are the sum of non-rent creating barriers to trade and transaction costs due to the use of different currencies in the international exchanges of manufactured goods.[9]

Focusing on non-rent creating barriers to trade, we consider that they reflect the extent of trade integration among countries such that they are lower the more integrated the countries. Having assumed that countries X and Y are members of a regional trading bloc, we consider that non-rent creating barriers to trade are lower between the two member countries than between any of the member countries and the excluded country.

On the other hand, transaction costs are assumed to reflect the use of different currencies in international exchanges of manufactured goods and to equally apply to trade between the two member countries and between any of the member countries and the excluded country.[10]

Thus, trade costs applying on any unit of manufactured goods traded between the two member countries can be expressed as:

$$\tau_1 = \delta_1 + \theta \tag{4.4}$$

where δ_1 indicates the non-rent creating barriers applying on trade in manufactured goods between the two member countries, and θ represents the transaction costs due

[9] See Alesina and Barro (2002) for a similar approach where iceberg trade costs are assumed to reflect both non-rent creating trade barriers and transaction costs.

[10] Our analytical framework differs in several respects from Krugman (1993) who showed how manufacturing firms may agglomerate in a transportation hub. First, we model the existence of economic dissimilarities across countries, and non-wage equalization across countries in equilibrium while in Krugman (1993) countries are symmetric and wages are equalized. Furthermore, we focus on the implications of changes in the transaction costs component of trade costs due to deepening of integration while Krugman (1993) concentrates on transportation costs. Finally, in our framework the adjustment to changes in trade costs arises through a general equlibrium-induced effect on relative wages with no firms relocation, while in Krugman (1993) the adjustment takes places through firms relocation with unaffected wages.

to the use of different currencies in the trade exchanges.

On the other hand, trade costs applying on any unit of trade in manufactured goods realised between any of the member countries and the excluded country are:

$$\tau_2 = \delta_2 + \theta \tag{4.5}$$

where δ_2 indicates the non-rent creating barriers applying on trade in manufactured goods between any member country and the excluded country, with $\delta_2 > \delta_1 > 1$.

Thus, trade costs applying on international flows of manufactured goods realised between the two member countries are lower than trade costs applying on international trade flows between any of the member countries and the excluded country.

Notably, international trade between the member countries requires $\tau_1 > 1$ units to be shipped for every unit sold while international trade between any of the member countries and the excluded country requires $\tau_2 > 1$ units to be shipped for every unit sold, with $\tau_2 > \tau_1$.

4.3 The initial equilibrium

In this section we derive the equilibrium in which the symmetric countries X and Y are members of a regional trading bloc from which country Z is excluded, taking into account that the excluded country is less technologically efficient than the member countries and the asymmetric structure of trade costs on international trade.

Assuming the wage in the symmetric member countries to be the numeraire, and normalizing the labour force in any country to one, we have:

$$w_R = 1 \tag{4.6}$$

$$L_R = L_A = 1 \tag{4.7}$$

where w_R is the wage perceived by labourers in any of the member countries, and

L_R and L_A indicate, respectively, the labour forces located in any of the member countries and in the excluded country.

Given equations (4.6) and (4.7), and having assumed that consumers' income only derives from the labour they provide to manufacturing firms, the aggregate income of labourers in any of the member countries and in the excluded country, labelled as E_R and E_A, respectively, are:

$$E_R = 1 \tag{4.8}$$

$$E_A = w_A \tag{4.9}$$

where w_A indicates the wage perceived by labourers in the excluded country.

Having assumed that the costs of introducing a new manufactured variety is zero and that all manufactured varieties enter consumers' demand in a symmetric way, in the equilibrium there will be only one firm producing a given manufactured variety.

Furthermore, since manufacturing firms located in any country use the same technology, all manufactured varieties produced within a country will be symmetric and have the same price.

Since manufactured goods incur iceberg trade costs when shipped between different countries, we denote the mill or f.o.b. price of the typical manufactured variety produced in any member country and in the excluded country as p_R and p_A, respectively.

We assumed that τ_1 is the amount dispatched per unit received of any manufactured variety shipped between the two member countries, and τ_2 is the amount dispatched per unit received of a manufactured variety shipped between any of the members and the excluded country.

Thus, any manufactured variety produced in any of the member countries is sold at price p_R, while the delivered or c.i.f. price paid for it by consumers located in the other member country and in the excluded country are $p_R \cdot \tau_1$ and $p_R \cdot \tau_2$, respectively.

On the other hand, any manufactured variety produced in the excluded country is sold at price p_A while the delivered or c.i.f. price paid for it by consumers located in

any of the member countries is $p_A \cdot \tau_2$.

Thus, the manufacturing composite price indices faced by consumers located in any of the member countries and in the excluded country, labelled as P_R and P_A, respectively, then are:

$$P_R = \left[n_R \cdot p_R^{(1-\sigma)} + n_R \cdot (p_R \cdot \tau_1)^{(1-\sigma)} + n_A \cdot (p_A \cdot \tau_2)^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}} \tag{4.10}$$

$$P_A = \left[n_A \cdot p_A^{(1-\sigma)} + 2 \cdot n_R \cdot (p_R \cdot \tau_2)^{(1-\sigma)} \right]^{\frac{1}{1-\sigma}} \tag{4.11}$$

where n_R and n_A indicate the number of manufactured varieties produced, respectively, in any member country and in the excluded country.

Given equations (4.1), (4.8) and (4.10), consumers' utility maximization subject to budget constraints implies that the demand in any of the member countries for any manufactured variety produced locally, in the other member country, and in the excluded country, labelled as c_R, c_R^R and c_R^A, respectively, can be expressed as:

$$c_R = \frac{p_R^{-\sigma}}{P_R^{(1-\sigma)}} \tag{4.12}$$

$$c_R^R = \frac{(p_R \cdot \tau_1)^{-\sigma}}{P_R^{(1-\sigma)}} \tag{4.13}$$

$$c_R^A = \frac{(p_A \cdot \tau_2)^{-\sigma}}{(P_R)^{(1-\sigma)}} \tag{4.14}$$

Similarly, given equations (4.1), (4.9), and (4.11), the demand in the excluded country for any manufactured variety produced locally, and in any of the member countries, labelled as c_A and c_A^R, respectively, are:

$$c_A = \frac{p_A^{-\sigma}}{P_A^{(1-\sigma)}} \cdot w_A \tag{4.15}$$

$$c_A^R = \frac{(p_R \cdot \tau_2)^{-\sigma}}{P_A^{(1-\sigma)}} \cdot w_A \tag{4.16}$$

Focusing on the maximization of profits, we note that any manufacturing firm located in any of the member countries faces an aggregate consumption demand given by the sum of the local demand, the other member country's demand, and the excluded country's demand, expressed in equations (4.12), (4.13) and (4.16), respectively.

It follows that, due to the existence of the iceberg trade costs, the total sales realised by any manufacturing firm located in any of the member countries, labelled as s_R, are:

$$s_R = \frac{p_R^{-\sigma}}{P_R^{(1-\sigma)}} + \frac{\tau_1 \cdot (p_R \cdot \tau_1)^{-\sigma}}{P_R^{(1-\sigma)}} + \frac{\tau_2 \cdot (p_R \cdot \tau_2)^{-\sigma}}{P_A^{-(\sigma-1)}} \cdot w_A \tag{4.17}$$

Similarly, any manufacturing firm located in the excluded country faces an aggregate consumption demand given by the sum of the local demand and the demand in any of the member countries expressed by equations (4.14) and (4.15), respectively.

On the other hand, the total sales realised by any manufacturing firm located in the excluded country, denoted as s_A, is given by:

$$s_A = \frac{p_A^{-\sigma}}{P_A^{(1-\sigma)}} \cdot w_A + 2 \cdot \frac{\tau_2 \cdot (p_A \cdot \tau_2)^{-\sigma}}{P_R^{(1-\sigma)}} \tag{4.18}$$

Assuming that any profit-maximizing manufacturing firm sets its price taking the manufacturing composite price index as given, the equilibrium f.o.b. price of any manufactured variety is a constant mark-up over its marginal cost.

Notably, the equilibrium f.o.b. price of any manufactured variety produced in any of the member countries and in the excluded country are given by:

$$p_R = \frac{\sigma}{\sigma - 1} \cdot \beta$$

$$p_A = \frac{\sigma}{\sigma - 1} \cdot \beta \cdot w_A$$

Assuming that manufactured goods are measured in units chosen so that the unit input coefficient β just equals $(\sigma - 1)/\sigma$, the equilibrium f.o.b. price of any manufactured variety produced in any of the member countries and in the excluded country are:

$$p_R = 1 \tag{4.19}$$

$$p_A = w_A \tag{4.20}$$

Given equation (4.19) and the asymmetric structure of trade costs, the equilibrium c.i.f. price paid by consumers located in any of the member country for any manufactured variety produced in the other member country and in the excluded country are τ_1 and τ_2, respectively.

Similarly, given equation (4.20), the equilibrium c.i.f. price paid for any manufactured variety produced in the excluded country by consumers located in any member country is $w_A \cdot \tau_2$.

We observe that, given equations (4.2) and (4.19), the profits of any manufacturing firm located in any of the member countries are:

$$\Pi_R = \frac{x_R}{\sigma} - \alpha_1$$

On the other hand, given equations (4.3) and (4.22), the profits of any manufacturing firm located in the excluded country are:

$$\Pi_A = w_A \cdot \left(\frac{x_A}{\sigma} - \alpha_2\right)$$

Having assumed that there is free entry and free exit in the manufacturing sector in response to profits or losses, the zero-profit condition implies that the equilibrium output of a typical firm located in any of the member countries and in the excluded country are, respectively:

$$x_R^* = \alpha_1 \cdot \sigma \tag{4.21}$$

$$x_A^* = \alpha_2 \cdot \sigma \tag{4.22}$$

It follows that, given equations (4.2), (4.3), (4.21) and (4.22), the equilibrium labour input requirement for any manufacturing firm located in any of the member countries and in the excluded country, respectively, are:

$$l_R^* = \alpha_1 \cdot \sigma \tag{4.23}$$

$$l_A^* = \alpha_2 \cdot \sigma \tag{4.24}$$

Given the equilibrium labour input requirements expressed in equations (4.23) and (4.24), and since all countries are endowed with same amount of labor force normalised to one, the equilibrium endogenous number of manufactured varieties produced in any of the member countries and in the excluded country, respectively, are:

$$n_R = \frac{1}{\sigma\alpha_1} \tag{4.25}$$

$$n_A = \frac{1}{\sigma\alpha_2} \tag{4.26}$$

Following our assumption that the manufacturing technology in the excluded country is less efficient than the one used in any of the member countries, the equilibrium number of manufactured varieties produced in the excluded country is smaller than the equilibrium number of manufactured varieties produced in any of the member countries.

Given equations (4.10), (4.11), (4.19), (4.20), (4.25) and (4.26), the equilibrium price indices faced by consumers located in any member country and in any excluded country are, respectively:

$$P_R = \left[\frac{1}{\sigma\alpha_1}\cdot\left(1+\tau_1^{(1-\sigma)}\right)+\frac{1}{\sigma\alpha_2}\cdot(\tau_2\cdot w_A)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{10'}$$

$$P_A = \left[\frac{1}{\sigma\alpha_2}\cdot w_A^{(1-\sigma)}+2\cdot\frac{1}{\sigma\alpha_1}\cdot\tau_2^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{11'}$$

We note that the equilibrium composite manufacturing price indices are different for consumers located in any of the member countries and in the excluded country due to the different f.o.b. prices of manufactured varieties and the asymmetric structure of trade costs.

The zero-profit condition implies that x_R^* and x_A^* are, respectively, the equilibrium output of any manufacturing firm located in any of the member countries and in the excluded country. However, for any manufacturing firm located in any of the member countries to produce the amount of output specified in equation (4.21), the following condition needs to be satisfied:

$$x_R^* = s_R \tag{4.27}$$

Similarly, for any manufacturing firm located in the excluded country to produce the equilibrium output specified in (4.22), the following condition has to be verified:

$$x_A^* = s_A \tag{4.28}$$

Given equations (4.17), (4.18), (4.19), (4.20), (4.21), (4.22), (4.10') and (4.11'), conditions (4.27) and (4.28) may be rewritten as:

$$\alpha_1\cdot\sigma = \frac{1+\tau_1^{(1-\sigma)}}{\frac{1+\tau_1^{(1-\sigma)}}{\sigma\alpha_1}+\frac{(\tau_2\cdot w_A)^{(1-\sigma)}}{\sigma\alpha_2}}+\frac{w_A\cdot\tau_2^{(1-\sigma)}}{\frac{w_A^{(1-\sigma)}}{\sigma\alpha_2}+\frac{2\tau_2^{(1-\sigma)}}{\sigma\alpha_1}} \tag{27'}$$

$$\alpha_2\cdot\sigma = \frac{w_A^{(1-\sigma)}}{\frac{w_A^{(1-\sigma)}}{\sigma\alpha_2}+\frac{2\tau_2^{(1-\sigma)}}{\sigma\alpha_1}}+\frac{2\cdot w_A\cdot\tau_2^{(1-\sigma)}}{\frac{1+\tau_1^{(1-\sigma)}}{\sigma\alpha_1}+\frac{(\tau_2\cdot w_A)^{(1-\sigma)}}{\sigma\alpha_2}} \tag{28'}$$

Thus, given conditions (4.27') and (4.28'), any manufacturing firm located in any of the member countries and in the excluded country will break even if the equilibrium

wage in the excluded country is such that the following condition is verified:

$$w_A^{\sigma} - \frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2 \cdot w_A^{(1-\sigma)} + 2\frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)}}{1+\tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}} = 0 \tag{4.29}$$

We refer to the expression in (4.29) as the wage equation since it implicitly expresses the equilibrium wage in the excluded country in the initial equilibrium as a function of the fixed labour input costs in the member countries and in the excluded country, α_1 and α_2, and of the intra-bloc and extra-bloc trade costs, τ_1 and τ_2.[11]

Focusing on the international flows of manufactured goods, given equations (4.10′), (4.11′), (4.17), (4.19), (4.20), (4.25), (4.26), the equilibrium volume of exports and imports of any member country to and from the other member country, labelled as EXP_R^R and IMP_R^R, respectively, are:

$$EXP_R^R = IMP_R^R = \frac{\tau_1^{(1-\sigma)}}{1+\tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}} \tag{4.30}$$

Since the two member countries are symmetric, they will export and import the same amount of manufactured goods, and the volume of exports of any member country to the other member will be equal to the volume of its imports from the other member country.

It follows from equation (4.30) that the equilibrium volume of bilateral trade realised between the two members, defined as the sum of the volume of exports and imports of any member to and from the other member, is:

$$BIL_R^R = \frac{2\tau_1^{(1-\sigma)}}{1+\tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}} \tag{4.31}$$

Given equations (4.10′), (4.11′), (4.16), (4.17), (4.19), (4.20), (4.25) and (4.26), the

[11] Having chosen the wage in the member countries as the numeraire and assumed that the accession country has a trade costs disadvantage relative to the symmetric member countries, the equilibrium wage in the accession country is less than unity for any value of the parameters, as shown in the Mathematical Appendix.

equilibrium volume of exports and imports of any member country to and from the excluded country, labelled as EXP_A^R and IMP_A^R, respectively, are:

$$EXP_A^R = \frac{\tau_2^{(1-\sigma)} \cdot w_A}{\frac{\alpha_1}{\alpha_2} \cdot w_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}} \tag{4.32}$$

$$IMP_A^R = \frac{\tau_2^{(1-\sigma)} \cdot w_A^{-\sigma}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \tau_1^{(1-\sigma)}\right) + (\tau_2 \cdot w_A)^{(1-\sigma)}} \tag{4.33}$$

Finally, given equations (4.32) and (4.33), the equilibrium volume of bilateral trade realised between any of the member countries and the excluded country, defined as the sum of the volume of exports and imports of any member to and from the excluded country, is:

$$BIL_A^R = \frac{\tau_2^{(1-\sigma)} \cdot w_A}{\frac{\alpha_1}{\alpha_2} \cdot w_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}} + \frac{\tau_2^{(1-\sigma)} \cdot w_A^{-\sigma}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \tau_1^{(1-\sigma)}\right) + (\tau_2 \cdot w_A)^{(1-\sigma)}} \tag{4.34}$$

4.4 The formation of a currency union

In this section we consider that the two symmetric members of the regional trading bloc deepen their integration by forming a currency union.[12,13]

We model the formation of the currency union as the elimination of the transaction costs due to the use of different currencies in the trade exchanges between the two member countries leading to a reduction in the intra-bloc trade costs.

First, we derive the equilibrium in which a currency union between the two mem-

[12] Our analysis focuses on the formation of a currency union as a form of deeper integration among countries in a regional trading bloc. However, our results can be generalised to any form of deepening of regional integration leading to a reduction in intra-bloc trade costs.

[13] We model the choice of the members of a regional trading bloc to form a currency union as exogenous. We refer the reader to Chapter 2 for a formal analysis of a country's choice to enter a regional trading bloc modelled as endogenous.

ber countries exists, pointing out the implications of the formation of the currency union on the level of intra-bloc trade costs and on the equilibrium relative wage (in terms of the numeraire) in the excluded country.

We evaluate, then, how the formation of the currency union affects the volume of bilateral trade realised between the two member countries, and between any of the member countries and the excluded country with respect to the initial equilibrium developed in Section 4.3.

4.4.1 The equilibrium

Having chosen the wage in the symmetric member countries to be the numeraire, and normalised labour forces in any country to one, since consumers' income only derives from the labour they provide to manufacturing firms, the aggregate income of labourers in any of the member countries and in the accession country, labelled as $\widehat{E}_R$ and $\widehat{E}_A$, respectively, are:

$$\widehat{E}_R = 1 \tag{4.35}$$

$$\widehat{E}_A = \widehat{w}_A \tag{4.36}$$

where $\widehat{w}_A$ indicates the wage perceived by labourers in the excluded country.

The formation of the currency union between the two symmetric members of the regional trading bloc reduces the level of intra-bloc trade costs on flows of manufactured varieties.[14]

As shown by equation (4.4), intra-bloc trade costs reflect the existence of non-rent creating barriers to trade between the two member countries, and of transaction costs due to the use of different currencies in the trade exchanges between the two member countries.

Thus, the formation of the currency union between the member countries reduces

[14] See Alesina and Barro (2002) for a similar approach where the adoption of a common currency is formalised as the reduction of the iceberg trade costs between two countries.

the level of intra-bloc trade costs by eliminating the transaction costs due to the use of different currencies applying to the flows of manufactured goods between the member countries.

Notably, the formation of the currency union between the two member countries will reduce intra-bloc trade costs from the initial level of τ_1 to δ_1, with $\delta_1 < \tau_1$.

We denote the equilibrium f.o.b. price of any manufactured variety produced in any member country and in the excluded country as $\widehat{p}_R$ and $\widehat{p}_A$, respectively.

It follows that, while any unit of manufactured variety produced in any of the member countries is sold at price $\widehat{p}_R$, the c.i.f. price paid by consumers located in the other member country and in the excluded country are $\widehat{p}_R \cdot \delta_1$ and $\widehat{p}_R \cdot \tau_2$, respectively.

Similarly, while any unit of manufactured variety produced in the excluded country is sold at price $\widehat{p}_A$, the c.i.f. price paid for it by consumers located in any member country is $\widehat{p}_A \cdot \tau_2$.

The manufacturing composite price indices faced by consumers located in any of the member countries and in the excluded country, labelled as $\widehat{P}_R$ and $\widehat{P}_A$, respectively, are:

$$\widehat{P}_R = \left[\widehat{n}_R \cdot \widehat{p}_R^{(1-\sigma)} + \widehat{n}_R \cdot (\widehat{p}_R \cdot \delta_1)^{(1-\sigma)} + \widehat{n}_A \cdot (\widehat{p}_A \cdot \tau_2)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{4.37}$$

$$\widehat{P}_A = \left[\widehat{n}_A \cdot \widehat{p}_A^{(1-\sigma)} + 2 \cdot \widehat{n}_R \cdot (\widehat{p}_R \cdot \tau_2)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{4.38}$$

where $\widehat{n}_R$ and $\widehat{n}_A$ represent, respectively, the equilibrium number of manufactured varieties produced in any member country and in the excluded country.

Following consumers' utility maximization subject to budget constraints, given equations (4.1), (4.35), and (4.37), the demand in any member country for any variety produced locally, in the other member country, and in the excluded country, labelled as $\widehat{c}_R$, $\widehat{c}_R^R$ and $\widehat{c}_R^A$, respectively, are:

$$\widehat{c}_R = \frac{\widehat{p}_R^{(-\sigma)}}{\widehat{P}_R^{(1-\sigma)}} \tag{4.39}$$

$$\widehat{c}_R^R = \frac{(\widehat{p}_R \cdot \delta_1)^{-\sigma}}{\widehat{P}_R^{(1-\sigma)}} \tag{4.40}$$

$$\widehat{c}_R^A = \frac{(\widehat{p}_A \tau_2)^{-\sigma}}{\widehat{P}_R^{(1-\sigma)}} \tag{4.41}$$

On the other hand, given equations (4.1), (4.36) and (4.38), the demand in the excluded country for any manufactured variety produced locally, and in any of the member countries, labelled as $\widehat{c}_A$ and $\widehat{c}_A^R$, respectively, are:

$$\widehat{c}_A = \frac{\widehat{w}_A \cdot \widehat{p}_A^{(-\sigma)}}{\widehat{P}_A^{(1-\sigma)}} \tag{4.42}$$

$$\widehat{c}_A^R = \frac{\widehat{w}_A \cdot (\widehat{p}_R \cdot \tau_2)^{-\sigma}}{\widehat{P}_A^{(1-\sigma)}} \tag{4.43}$$

The aggregate demand faced by any manufacturing firm located in any of the member countries is the sum of the local demand in equation (4.39), the demand in the other member country in equation (4.40), and the demand in the excluded country in equation (4.41).

Likewise, the aggregate demand faced by any manufacturing firm located in the excluded country is given by the sum of the local demand, expressed by equation (4.42), and the demand in any of the member countries for the firm's own variety, expressed by equation (4.43).

Given the structure of trade costs, the total sales of a manufacturing firm located in any of the member countries and in the excluded country, labelled as $\widehat{s}_R$ and $\widehat{s}_A$, respectively, are:

$$\widehat{s}_R = \frac{\widehat{p}_R^{-\sigma}}{\widehat{P}_R^{(1-\sigma)}} + \frac{\delta_1 \cdot (\widehat{p}_R \cdot \delta_1)^{-\sigma}}{\widehat{P}_R^{(1-\sigma)}} + \frac{\widehat{w}_A \cdot \tau_2 \cdot (\widehat{p}_R \cdot \tau_2)^{-\sigma}}{\widehat{P}_A^{(1-\sigma)}} \tag{4.44}$$

$$\widehat{s}_A = \frac{\widehat{w}_A \cdot \widehat{p}_A^{-\sigma}}{\widehat{P}_A^{(1-\sigma)}} + \frac{2 \cdot \tau_2 \cdot (\widehat{p}_A \cdot \tau_2)^{-\sigma}}{\widehat{P}_R^{(1-\sigma)}} \tag{4.45}$$

Assuming that any profit-maximizing manufacturing firm chooses its price taking the composite price indices as given and the unit input coefficient β is equal to $(\sigma - 1)/\sigma$, the equilibrium f.o.b. price of any variety produced in the member countries and in the excluded country, respectively, are:

$$\widehat{p}_R = 1 \tag{4.46}$$

$$\widehat{p}_A = \widehat{w}_A \tag{4.47}$$

Thus, the equilibrium c.i.f. price of any manufactured variety produced in any of the member countries faced by consumers located in the other member country and in the accession country are, respectively, δ_1 and τ_2.

Similarly, the equilibrium c.i.f. price paid for any manufactured variety produced in the excluded country by consumers located in any of the member country is $\widehat{w}_A \cdot \tau_2$.

Given the equilibrium pricing rules in equation (4.46) and (4.47), the profits of any manufacturing firm located in any of the member countries and in the excluded country, labelled as $\widehat{\Pi}_R$ and $\widehat{\Pi}_A$, respectively, are:

$$\widehat{\Pi}_R = \frac{\widehat{x}_R}{\sigma} - \alpha_1 \tag{4.48}$$

$$\widehat{\Pi}_A = \widehat{w}_A \cdot \left(\frac{\widehat{x}_A}{\sigma} - \alpha_2 \right) \tag{4.49}$$

where $\widehat{x}_R$ and $\widehat{x}_A$ indicate, respectively, the equilibrium output produced of any manufactured variety in any of the member countries and in the excluded country.

Given equations (4.46), (4.47), (4.48) and (4.49), following the zero-profit condition, the equilibrium output of a typical manufacturing firm located in any of the member countries and in the excluded country, respectively, result in:

$$\widehat{x}_R = \alpha_1 \cdot \sigma \tag{4.50}$$

$$\widehat{x}_A = \alpha_2 \cdot \sigma \tag{4.51}$$

Thus, given equations (4.50) and (4.51), the equilibrium number of manufactured varieties produced in any of the member countries and in the excluded country, respectively, are:

$$\widehat{n}_R = \frac{1}{\sigma\alpha_1} \tag{25'}$$

$$\widehat{n}_A = \frac{1}{\sigma\alpha_2} \tag{26'}$$

Given equations (4.25'), (4.26'), (4.37), (4.38), (4.46) and (4.47), the equilibrium price indices faced by consumers located in any member country and in the excluded country, respectively, are:

$$\widehat{P}_R = \left[\frac{1}{\sigma\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + \frac{1}{\sigma\alpha_2} \cdot (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{37'}$$

$$\widehat{P}_A = \left[\frac{1}{\sigma\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} + 2 \cdot \frac{1}{\sigma\alpha_1} \cdot \tau_2^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{38'}$$

We note that for any manufacturing firm located in any of the member countries and in the excluded country to produce, respectively, the amount of output specified, in equations (4.50) and (4.51), the following conditions needs to be verified:

$$\widehat{x}_R = \widehat{s}_R \tag{4.52}$$

$$\widehat{x}_A = \widehat{s}_A \tag{4.53}$$

Given equations (4.37'), (4.38'), (4.44), (4.45), (4.46), and (4.47), conditions (4.52) and (4.53) may be rewritten as:

$$\alpha_1 \cdot \sigma = \frac{1+\delta_1^{(1-\sigma)}}{\frac{1+\delta_1^{(1-\sigma)}}{\sigma\alpha_1}+\frac{(\tau_2\cdot\widehat{w}_A)^{(1-\sigma)}}{\sigma\alpha_2}} + \frac{\widehat{w}_A\cdot\tau_2^{(1-\sigma)}}{\frac{\widehat{w}_A^{(1-\sigma)}}{\sigma\alpha_2}+\frac{2\tau_2^{(1-\sigma)}}{\sigma\alpha_1}} \tag{52'}$$

$$\alpha_2 \cdot \sigma = \frac{\widehat{w}_A^{(1-\sigma)}}{\frac{\widehat{w}_A^{(1-\sigma)}}{\sigma\alpha_2}+\frac{2\tau_2^{(1-\sigma)}}{\sigma\alpha_1}} + \frac{2\cdot\widehat{w}_A\cdot\tau_2^{(1-\sigma)}}{\frac{1+\delta_1^{(1-\sigma)}}{\sigma\alpha_1}+\frac{(\tau_2\cdot\widehat{w}_A)^{(1-\sigma)}}{\sigma\alpha_2}} \tag{53'}$$

Thus, any manufacturing firm located in any of the member countries and in the excluded country breaks even if the equilibrium wage in the excluded country is such that the following condition is verified:

$$\widehat{w}_A^{\sigma} - \frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2\cdot\widehat{w}_A^{(1-\sigma)}+2\frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}(\tau_2\cdot\widehat{w}_A)^{(1-\sigma)}} = 0 \tag{4.54}$$

,

Notably, the wage equation in (4.54) implicitly expresses the wage in the excluded country in the equilibrium characterised by the existence of a currency union between the two symmetric member countries belonging to the regional trading bloc.

4.4.2 The general equilibrium effect on the relative wage

The formation of the currency union between the two symmetric members of the regional trading bloc will affect the equilibrium relative wage (in terms of the numeraire) in the excluded country, compared to the initial equilibrium discussed in Section 4.3.

Notably, we can state the following proposition:

Proposition 9 *The formation of the currency union between the members of the regional trading bloc reduces the equilibrium relative wage in the excluded country compared to the initial equilibrium.*

Proof. See Mathematical Appendix. ■

We previously pointed out that the formation of the currency union reduces the level of trade costs applying to the flows of manufactured varieties between the member countries.

Thus, consumers located in any of the member countries will perceive varieties produced in the other member country as relatively cheaper since their c.i.f. price decreases with respect to the initial equilibrium.

The reduction in the intra-bloc trade costs leads then consumers in any of the member countries to increase their demand for manufactured varieties produced in the other member country, and to reduce their demand for varieties produced locally and in the excluded country.

Overall, the reduction in the intra-bloc trade costs implied by the formation of the currency union increases the amount of sales of any manufacturing firm located in any of the member countries and reduces the amount of sales of any firm located in the excluded country.

On the other hand, the reduction in the intra-bloc trade costs will not affect the amount of production for which any manufacturing firm located in any of the member countries and in the excluded country, respectively, breaks even.

Thus, the equilibrium relative wage in the excluded country will adjust such that the amount of sales of any manufacturing firm located in any of the member countries and in the excluded country equals the level of output for which the firm breaks even.

Notably, the equilibrium relative wage in the excluded country will decrease compared to the initial equilibrium counterbalancing the effects of the reduction in the intra-bloc trade costs on the sales of firms located in any of the member countries and in the excluded country.

The reduction in the equilibrium relative wage in the excluded country implies an equal reduction in the equilibrium f.o.b. price of manufactured varieties produced in the excluded country, as well as in the income of consumers located in the excluded country compared to the initial equilibrium.

In turn, the reduction in the equilibrium f.o.b. price of varieties produced in the excluded country and in the income of consumers located in the excluded country will affect the amount of sales of manufacturing firms located, respectively, in any of the member countries and in the excluded country.

The reduction in the equilibrium f.o.b. price of varieties produced in the excluded country will reduce the amount of sales of any firm located in any of the member countries, and increase the amount of sales of any firm located in the excluded country.

Consumers in the member countries and in the excluded country, perceiving varieties produced in the excluded country as relatively cheaper, will increase their demand for these varieties while decreasing their demand for varieties produced locally and in the other member country.

Similarly, consumers located in the excluded country, perceiving local varieties as relatively cheaper, will increase their demand for varieties produced locally, and decrease their demand for varieties produced in any of the member countries.

In addition, the reduction in the income of consumers located in the excluded country will reinforce the reduction in their demand for varieties produced in any of the member countries while limiting the increase in their demand for varieties produced locally.

We conclude that the general equilibrium induced reduction in the equilibrium relative wage in the excluded country, with respect to the initial equilibrium, will be such to offset the effects of the reduction in intra-bloc trade costs on the sales of manufacturing firms located in any member country and in the excluded country.

4.4.3 The effect on the bilateral patterns of trade

The formation of the currency union affects the patterns of trade of the members and the excluded country compared to the initial equilibrium by reducing the level of intra-bloc trade costs through the elimination of transaction costs due to the use of different currencies, and by a general equilibrium induced reduction of the relative wage in the excluded country.

First, we analyse the implications of the formation of the currency union between the members of the regional trading bloc on the volume of bilateral trade between members.

At this regard, we can state the following proposition:

Proposition 10 *The formation of the currency union unambiguously enhances the volume of bilateral trade realised between the member countries compared to the initial equilibrium.*

Proof. See Mathematical Appendix. ■

The formation of the currency union enhances the volume of bilateral trade between the two member countries with respect to the initial equilibrium by increasing the volume of exports and imports realised by any member country from, and to the other member country.

On the one hand, the reduction in the level of intra-bloc trade implied by the formation of the currency union increases the volume of exports and imports of any member country from, and to the other member country.

In fact, the reduction in the level of intra-bloc trade costs implies that the equilibrium c.i.f. price paid by consumers located in any of the member countries to import any manufactured variety produced in the other member country will decrease.

As a consequence, consumers located in any of the member countries will increase their consumption of manufactured varieties produced in the other member country, perceiving them as relatively cheaper than in the initial equilibrium.

On the other hand, the general equilibrium induced reduction in the relative wage in the excluded country will reduce the volume of exports and imports realised by any member country from and to the other member country, compared to the initial equilibrium.

The reduction in the relative wage in the excluded country will imply an equal reduction in the equilibrium f.o.b. price of varieties produced in the excluded country.

Consumers located in any of the member countries, perceiving varieties produced in the excluded country as relatively cheaper than in the initial equilibrium, will then increase their consumption of those varieties while reducing their consumption of varieties produced in the other member country.

We emphasise that the reduction in the level of intra-bloc trade costs and the general equilibrium induced reduction in the relative wage in the excluded country

implied by the formation of the currency union have opposite implications on the volume of bilateral trade realised between the member countries.

However, as shown in the Mathematical Appendix, the positive effect of the reduction in the intra-bloc trade costs on the volume of bilateral trade between members is greater than the negative effect of the reduction in the relative wage in the excluded country.

As a consequence we conclude that the formation of the currency union between the members of the regional trading bloc will unambiguously increase the volume of bilateral trade realised between the member countries, compared to the initial equilibrium.

Given equations (4.25′), (4.26′), (4.37′), (4.44), (4.46) and (4.47), the volume of exports and imports of any member country to and from the other member country in the equilibrium characterised by the existence of a currency union between the members of the regional trading bloc is:

$$\widehat{EXP}_R^R = \widehat{IMP}_R^R = \frac{\tau_1^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\left(\tau_2\cdot\widehat{w}_A\right)^{(1-\sigma)}} \tag{4.55}$$

It follows that, given equation (4.55), the equilibrium volume of bilateral trade realised between the two members in the equilibrium characterised by the existence of a currency union between the members of the regional trading bloc is:

$$\widehat{BIL}_R^R = \frac{2\delta_1^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\cdot\left(\tau_2\cdot\widehat{w}_A\right)^{(1-\sigma)}} \tag{4.56}$$

Having pointed out the implications of the formation of the currency union on the patterns of trade between the member countries, we focus on how the formation of the currency union affects the volume of bilateral trade between any member country and the excluded country.

We underline that when the two symmetric member countries form a currency union, intra-bloc trade costs are reduced but trade costs applying to the flows of manufactured goods between any member country and excluded country are unaffected.

In fact, since different currencies are still used in the trade exchanges between any of the member countries and the excluded country, transaction costs applying to these flows of manufactured goods will be unchanged.

Nonetheless, the formation of the currency union will affect the volume of bilateral trade between any of the member countries and the excluded country through the reduction in the intra-bloc trade costs and the general equilibrium induced reduction in the relative wage in the excluded country.

At this regard, we can state the following proposition:

Proposition 11 *The formation of the currency union unambiguously reduces the volume of bilateral trade realised between any of the members and the excluded country compared to the initial equilibrium.*

Proof. See Mathematical Appendix. ■

First, the formation of the currency union between the members of the regional trading bloc will reduce the volume of export of any member country to the excluded country, compared to the initial equilibrium.

In fact, consumers located in the excluded country, experiencing a negative income effect due to the reduction in the equilibrium relative wage in the excluded country, will reduce their consumption of manufactured varieties produced locally and in any of the member countries.

Furthermore, consumers located in the excluded country will perceive local varieties as relatively cheaper since the reduction in the relative wage in the excluded country will lead to an equal reduction in the equilibrium f.o.b. price of varieties produced in the excluded country.

Thus, consumers located in the excluded country will reduce their consumption of manufactured varieties produced in any of the member countries while increasing their consumption of local varieties.

Furthermore, the formation of the currency union between the members of the regional trading bloc will reduce the volume of imports of any member country from

the excluded country, compared to the initial equilibrium.

Due to the reduction in intra-bloc trade costs consumers located in any of the member countries, perceiving manufactured varieties produced in the other member country as relatively cheaper, will increase their consumption of those varieties while reducing their consumption of varieties produced in the excluded country.

On the other hand, the general equilibrium induced reduction in the relative wage in the excluded country, with respect to the initial equilibrium, will increase the volume of imports of any member country from the excluded country.

In fact, since the reduction in the relative wage in the excluded country will imply an equal reduction in the equilibrium f.o.b. price of varieties produced in the excluded country, consumers located in any of the member countries will increase their consumption of those varieties, perceiving them as relatively cheaper.

Thus, the reduction in the intra-bloc trade costs and the general equilibrium induced reduction in the relative wage in the excluded country implied by the formation of the currency union have opposite implications on the volume of import of any member country from the excluded country.

However, as shown in the Mathematical Appendix, the negative effect on the volume of imports of any member country from the excluded country of the reduction in the intra-bloc trade costs is greater than the positive effect on the volume of imports of the reduction in the equilibrium relative wage in the excluded country.

We conclude that the formation of the currency union between the members of the regional trading bloc unambiguously decreases the volume of bilateral trade between any of the member countries and the excluded country by reducing both the volume of exports and imports of any member to and from the excluded country compared to the initial equilibrium.

Given equations (4.25′), (4.26′), (4.37′), (4.38′), (4.44), (4.45), (4.46) and (4.47), the volume of exports and imports of any member country to and from the other member country in the equilibrium characterised by the existence of a currency union between the members of the regional trading bloc, respectively, are:

$$\widehat{EXP}_A^R = \frac{\tau_2^{(1-\sigma)} \cdot \widehat{w}_A}{\frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}} \tag{4.57}$$

$$\widehat{IMP}_A^R = \frac{\tau_2^{(1-\sigma)} \cdot \widehat{w}_A^{-\sigma}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}} \tag{4.58}$$

Given equations (4.57) and (4.58), the volume of bilateral trade between any member country and the excluded country in the equilibrium characterised by the existence of the currency union between the members of the regional trading bloc is:

$$\widehat{BIL}_A^R = \frac{\widehat{w}_A \cdot \tau_2^{(1-\sigma)}}{\frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}} + \frac{\tau_2^{(1-\sigma)} \cdot \widehat{w}_A^{-\sigma}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}} \tag{4.59}$$

4.5 The enlargement of the currency union

In this section, we consider that the currency union formed by the two symmetric member countries enlarges toward the initially excluded country, labelled in the remaining of the analysis as the accession country.[15]

Notably, we model the enlargement of the currency union as the elimination of the transaction costs due to the use of different currencies in the trade exchanges between the original members and the accession country leading to a reduction in the extra-bloc trade costs.

First, we derive the equilibrium characterised by the enlarged currency union, pointing out the implications of the enlargement on the extra-bloc trade costs and on the equilibrium relative wage (in terms of the numeraire) in the accession country.

We evaluate then how the enlargement of the currency union toward the economically dissimilar accession country affects the volume of bilateral trade realised between any of the original members and the accession country, and between the original mem-

[15] In the analysis developed in this chapter, the choice for the currency union to enlarge and for the accession country to join is assumed to be exogenous. We refer the reader to Chapter 2 for a formal analysis of the endogenous choice of a regional trading bloc to enlarge and for third countries to join.

ber countries.

4.5.1 The equilibrium under the enlargement

Having assumed the wage in the symmetric member countries to be the numeraire, and normalised labour forces to one, the aggregate income of labourers located in any of the original member countries and in the accession country, labelled as $\widetilde{E}_R$ and $\widetilde{E}_A$, respectively, are:

$$\widetilde{E}_R = 1 \tag{4.60}$$

$$\widetilde{E}_A = \widetilde{w}_A \tag{4.61}$$

where $\widetilde{w}_A$ indicates the wage perceived by labourers in the accession country in the equilibrium characterised by the enlarged currency union.

We note that the enlargement of the currency union to include the accession country reduces trade costs applying to the flows of manufactured goods between any of the original member countries and the accession country.

As shown by equation (4.5), we assumed extra-bloc trade costs to reflect the existence of non-rent creating barriers to trade between the member countries and the accession country, and of transaction costs due to the use of different currencies in the exchanges between any member and the accession country.

Following the enlargement of the currency union, transactions costs applying to the flows of manufactured goods between any original member and the accession country will disappear.

Thus, the enlargement of the currency union implies then a reduction in the extra-bloc trade costs, from the initial level τ_2 to δ_2, with $\delta_2 < \tau_2$.

We label the f.o.b. price of any manufactured variety produced in any of the original member countries and in the accession country as $\widetilde{p}_R$ and $\widetilde{p}_A$, respectively.

Thus, any manufactured variety produced in any of the original member countries is sold at price $\widetilde{p}_R$, while the c.i.f. price paid for it by consumers located in the other

original member country and in the accession country are $\widetilde{p}_R \cdot \delta_1$ and $\widetilde{p}_A \cdot \delta_2$, respectively.

Similarly, any manufactured variety produced in the accession country is sold at price $\widetilde{p}_A$ while the c.i.f. price paid for it by consumers located in any original member country is $\widetilde{p}_A \cdot \delta_2$.

The manufacturing composite price indices faced by consumers located in any of the member countries and in the accession country, labelled as $\widetilde{P}_R$ and $\widetilde{P}_A$, respectively, are:

$$\widetilde{P}_R = \left[\widetilde{n}_R \cdot \widetilde{p}_R^{(1-\sigma)} + \widetilde{n}_R \cdot (\widetilde{p}_R \cdot \delta_1)^{(1-\sigma)} + \widetilde{n}_A \cdot (\widetilde{p}_A \cdot \delta_2)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{4.62}$$

$$\widetilde{P}_A = \left[\widetilde{n}_A \cdot \widetilde{p}_A^{(1-\sigma)} + 2 \cdot \widetilde{n}_R \cdot (\widetilde{p}_R \cdot \delta_2)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{4.63}$$

with $\widetilde{n}_R$ and $\widetilde{n}_A$ indicate the equilibrium number of manufactured varieties produced, respectively, in any of the original member countries and in the accession country.

Following consumers' utility maximization subject to budget constraints, given equations (4.1), (4.60) and (4.62), the demand in any original member country for any variety produced locally, in the other original member, and in the accession country, labelled as $\widetilde{c}_R$, $\widetilde{c}_R^R$ and $\widetilde{c}_R^A$, respectively, are:

$$\widetilde{c}_R = \frac{\widetilde{p}_R^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} \tag{4.64}$$

$$\widetilde{c}_R^R = \frac{(\widetilde{p}_R \cdot \delta_1)^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} \tag{4.65}$$

$$\widetilde{c}_R^A = \frac{(\widetilde{p}_A \cdot \delta_2)^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} \tag{4.66}$$

Furthermore, given equations (4.1), (4.61) and (4.63), the demand in the accession country for any manufactured variety produced locally, and in any of the original

member countries, labelled as $\widetilde{c}_A$ and $\widetilde{c}_A^R$, respectively, are:

$$\widetilde{c}_A = \frac{\widetilde{w}_A \cdot \widetilde{p}_A^{(-\sigma)}}{\widetilde{P}_A^{(1-\sigma)}} \tag{4.67}$$

$$\widetilde{c}_A^R = \frac{\widetilde{w}_A \cdot (\widetilde{p}_R \cdot \delta_2)^{-\sigma}}{\widetilde{P}_A^{(1-\sigma)}} \tag{4.68}$$

Focusing on the maximization of profits, any manufacturing firm located in any of the original member countries faces an aggregate demand given by the sum of the local demand, the demand in the other original member country, and the demand in the accession country.

Likewise, a typical manufacturing firm located in the accession country faces an aggregate demand given by the sum of the local demand, and the demand in any of the original members.

Given equations (4.64), (4.65), (4.66), (4.67), and (4.68), as well as the structure of trade costs, the amount of sales of any manufacturing firm located in any original member country and in the accession country, labelled as $\widetilde{s}_R$ and $\widetilde{s}_A$, respectively, are:

$$\widetilde{s}_R = \frac{\widetilde{p}_R^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} + \frac{\delta_1 \cdot (\widetilde{p}_R \cdot \delta_1)^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} + \frac{\widetilde{w}_A \cdot \delta_2 \cdot (\widetilde{p}_R \cdot \delta_2)^{-\sigma}}{\widetilde{P}_A^{(1-\sigma)}} \tag{4.69}$$

$$\widetilde{s}_A = \frac{\widetilde{w}_A \cdot \widetilde{p}_A^{-\sigma}}{\widetilde{P}_A^{(1-\sigma)}} + \frac{2 \cdot \delta_2 \cdot (\widetilde{p}_A \cdot \delta_2)^{-\sigma}}{\widetilde{P}_R^{(1-\sigma)}} \tag{4.70}$$

Since any profit-maximizing manufacturing firm sets its price taking the manufacturing composite price index as given and the unit input coefficient β is assumed to be equal to $(\sigma - 1)/\sigma$, the equilibrium f.o.b. price of any manufactured variety produced in any of the original member countries and in the accession country, respectively, are:

$$\widetilde{p}_R = 1 \tag{4.71}$$

$$\widetilde{p}_A = \widetilde{w}_A \tag{4.72}$$

It follows that the equilibrium c.i.f. price of any manufactured variety produced in any of the original member countries faced by consumers located in the other original member country and in the accession country are, respectively, δ_1 and δ_2.

Furthermore, the equilibrium c.i.f. price paid for any manufactured variety produced in the accession country by consumers located in any of the original members is $\widetilde{w}_A \cdot \delta_2$.

Given the equilibrium pricing rules in equation (4.71) and (4.72), the profits of any manufacturing firm located in any of the original member countries and in the accession country, labelled as $\widetilde{\Pi}_R$ and $\widetilde{\Pi}_A$, respectively, are:

$$\widetilde{\Pi}_R = \frac{\widetilde{x}_R}{\sigma} - \alpha_1 \tag{4.73}$$

$$\widetilde{\Pi}_A = \widetilde{w}_A \cdot \left(\frac{\widetilde{x}_A}{\sigma} - \alpha_2\right) \tag{4.74}$$

where $\widetilde{x}_R$ and $\widetilde{x}_A$ indicate the equilibrium output of any manufactured variety produced, respectively, in any of the member countries and in the accession country.

Given equations (4.71), (4.72), (4.73) and (4.74), the zero-profit condition implies that the equilibrium output of any manufacturing firm located, respectively, in any of the original member countries and in the accession country are:

$$\widetilde{x}_R = \alpha_1 \cdot \sigma \tag{4.75}$$

$$\widetilde{x}_A = \alpha_2 \cdot \sigma \tag{4.76}$$

Thus, given equations (4.75) and (4.76), the number of manufactured varieties produced in any of the member countries and in the accession country, respectively,

are:

$$\widetilde{n}_R = \frac{1}{\sigma\alpha_1} \tag{25''}$$

$$\widetilde{n}_A = \frac{1}{\sigma\alpha_2} \tag{26''}$$

Given equations (4.25''), (4.26''), (4.62), (4.63), (4.71), and (4.72), the equilibrium price indices faced by consumers located in any of the original member countries and in the accession country are:

$$\widetilde{P}_R = \left[\frac{1}{\sigma\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + \frac{1}{\sigma\alpha_2} \cdot (\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{(62')}$$

$$\widetilde{P}_A = \left[\frac{1}{\sigma\alpha_2} \cdot \widetilde{w}_A^{(1-\sigma)} + 2 \cdot \frac{1}{\sigma\alpha_1} \cdot \delta_2^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \tag{(63')}$$

Any manufacturing firm located in any of the original member countries and in the accession country will produce, respectively, the amount of output specified in equations (4.75) and (4.76), if the following conditions are satisfied:

$$\widetilde{x}_R = \widetilde{s}_R \tag{4.77}$$

$$\widetilde{x}_A = \widetilde{s}_A \tag{4.78}$$

Given equations (4.62'), (4.63'), (4.69), (4.70), (4.71), and (4.72), we may rewrite conditions (4.77) and (4.78) as:

$$\alpha_1 \cdot \sigma = \frac{1 + \delta_1^{(1-\sigma)}}{\frac{1+\delta_1^{(1-\sigma)}}{\sigma\alpha_1} + \frac{(\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}}{\sigma\alpha_2}} + \frac{\widetilde{w}_A \cdot \delta_2^{(1-\sigma)}}{\frac{\widetilde{w}_A^{(1-\sigma)}}{\sigma\alpha_2} + \frac{2 \cdot \delta_2^{(1-\sigma)}}{\sigma\alpha_1}} \tag{77'}$$

$$\alpha_2 \cdot \sigma = \frac{\widetilde{w}_A^{(1-\sigma)}}{\frac{\widetilde{w}_A^{(1-\sigma)}}{\sigma\alpha_2} + \frac{2 \cdot \delta_2^{(1-\sigma)}}{\sigma\alpha_1}} + \frac{2 \cdot \widetilde{w}_A \cdot \delta_2^{(1-\sigma)}}{\frac{1+\delta_1^{(1-\sigma)}}{\sigma\alpha_1} + \frac{(\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}}{\sigma\alpha_2}} \tag{78'}$$

Thus, any manufacturing firm located in any of the original member countries and in the accession country breaks even if the equilibrium wage in the accession country

is such that the following condition is verified:

$$\widetilde{w}_A^{\sigma} - \frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2 \cdot \widetilde{w}_A^{(1-\sigma)} + 2 \cdot \frac{\alpha_1}{\alpha_2} \cdot \delta_2^{(1-\sigma)}}{1 + \delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} \cdot (\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}} = 0 \tag{4.79}$$

The wage equation in (4.78) implicitly expresses the wage in the accession country in the equilibrium characterised by an enlarged currency union including the initially excluded country.

4.5.2 The general equilibrium effect on the relative wage

The enlargement of the currency union toward the accession country will affect the relative wage (in terms of the numeraire) in the accession country compared to the equilibrium in which the accession country is excluded from the currency union between the members of the regional trading bloc described in Section 4.4.

At this regard, we can state the following proposition:

Proposition 12 *The enlargement of the currency union increases the equilibrium relative wage in the accession country compared to the equilibrium in which the accession country is excluded from the currency union.*

Proof. See Mathematical Appendix. ■

We noted that the enlargement of the currency union to include the accession country leads to a reduction in the level of trade costs applying to the flows of manufactured varieties between any of the original member countries and the accession country.

Consumers in any of the original member countries will then perceive varieties produced in the accession country as relatively cheaper since their c.i.f. price decreases compared to the equilibrium in which the accession country is excluded from the currency union.

Thus, the reduction in the extra-bloc trade costs will lead consumers located in any of the original member countries to increase the consumption of varieties produced in

the accession country while decreasing the consumption of varieties produced locally and in the other original member.

Similarly, consumers located in the accession country, perceiving manufactured varieties produced in any of the original member countries as relatively cheaper, will increase their consumption of manufactured varieties produced in any of the original member countries while decreasing their demand of varieties produced locally compared to the equilibrium in which the accession country is excluded from the currency union.

Overall, the reduction in the extra-bloc trade costs implied by the enlargement of the currency union will decrease the sales of any manufacturing firm located in any of the original member countries, and increase the sales of any firm located in the accession country.

However, the reduction in the extra-bloc trade costs will not affect the amount of production for which any manufacturing firm located, respectively, in any of the original member countries and in the accession country, breaks even.

As a consequence, the equilibrium relative wage in the accession country will adjust such that the amount of sales of any manufacturing firm located in any of the original member countries and in the accession country equals the level of output for which the firm breaks even.

Thus, the equilibrium relative wage in the accession country will increase with respect to the equilibrium in which the accession country is excluded from the currency counterbalancing the effects of the reduction in the extra-bloc trade costs on the sales of firms located in any of the original member countries and in the accession country.

The increase in the equilibrium relative wage in the accession country will imply an equal increase in the equilibrium f.o.b. price of manufactured varieties produced in the accession country, and in the income of consumers located in the accession country.

In turn, the increase in the equilibrium f.o.b. price of varieties produced in the accession country and in the income of consumers located in the accession country will affect the amount of sales of manufacturing firms located in any of the original member countries and in the accession country.

First, we note that the increase in the equilibrium f.o.b. price of varieties produced in the accession country will increase the amount of sales of firms located in any of the original member countries while reducing the amount of sales of firms located in the accession country.

In fact, consumers located in any of the original member countries, perceiving varieties produced in the accession country as relatively more expensive, will increase their consumption of manufactured varieties produced locally and in other original member countries, and decrease their consumption of varieties produced in the accession country.

On the other hand, consumers located in the accession country, perceiving manufactured varieties produced locally as relatively more expensive will decrease their consumption of local varieties and they will increase their demand of varieties produced in any of the original member countries.

Furthermore, the increase in the income of consumers located in the accession country will reinforce the increase in their consumption of varieties produced in any original member.

Thus, the general equilibrium induced increase in the relative wage in the accession country will be such that to counterbalance the effects of the reduction in the extra-bloc trade costs on the sales of manufacturing firms located in any of the original member country and in the accession country.

4.5.3 The effect on the bilateral patterns of trade

The enlargement of the currency union affects the patterns of trade of the original member countries and the accession country by reducing the extra-bloc trade costs through the elimination of transaction costs due to the use of different currencies, and by leading to a general equilibrium induced increase in the relative wage in the accession country.

First, we investigate the implications of the enlargement of the currency union on the volume of bilateral trade realised between any of the original members and the

accession country.

At this regard we can state the following proposition:

Proposition 13 *The enlargement of the currency union unambiguously increases the volume of bilateral trade between any of the member countries and the accession country, compared to the equilibrium in which the accession country is excluded from the currency union.*

Proof. See Mathematical Appendix. ■

The enlargement of the currency union increases the volume of bilateral trade between any of the original member countries and the accession country by increasing the volume of exports and imports of any original member country to, and from the accession country.

First, the reduction in the extra-bloc trade costs and the general equilibrium induced increase in the relative wage in the accession country will increase the volume of exports of any of the original member countries to the accession country, compared to the equilibrium in which the accession country is excluded from the currency union.

Following the reduction in the extra-bloc trade costs, consumers located in the accession country, perceiving manufactured varieties produced in any of the member country as relatively cheaper, will increase their demand of those varieties.

In addition, consumers located in the accession country, experiencing a positive income effect due to the increase in the equilibrium relative wage in the accession country, will increase their consumption of varieties produced in any of the original member countries and in the accession country.

Furthermore, the increase in the relative wage in the accession country implies an equal increase in the equilibrium f.o.b. price of varieties produced in the accession country.

Thus, consumers located in the accession country, perceiving varieties produced locally as relative more expensive, will reduce their consumption of those varieties and increase their consumption of varieties produced in any of the original members.

On the other hand, the reduction in extra-bloc trade costs and the general equilibrium induced increase in the accession country's relative wage have opposite implications on the volume of import of any of the original member countries from the accession country.

Due to the reduction in extra-bloc trade costs, consumers in any of the original member countries, perceiving manufactured varieties produced in the accession country as relatively cheaper, will increase their consumption of those varieties and decrease their consumption of varieties produced locally and in the other original member country.

However, since the increase in the equilibrium relative wage in the accession country implies an equal increase in the equilibrium f.o.b. price of varieties produced in the accession country, consumers located in any of the member countries will decrease their consumption of these varieties, perceiving them as relatively more expensive.

However, the positive effect on the volume of imports of any original member country from the accession country implied by the reduction in extra-bloc trade costs is greater than the negative effect implied by the increase in equilibrium relative wage in the accession country, as shown in the Mathematical Appendix,.

Given equations (4.25″), (4.26″), (4.62′), (4.63′), (4.69), (4.70), (4.71) and (4.72), the volume of exports and imports of any member country to and from the other member country in the equilibrium characterized by the enlarged currency union, respectively, are:

$$\widehat{EXP}_A^R = \frac{\widetilde{w}_A \cdot \delta_2^{(1-\sigma)}}{\frac{\alpha_1}{\alpha_2} \cdot \widetilde{w}_A^{(1-\sigma)} + 2\delta_2^{(1-\sigma)}} \tag{4.80}$$

$$\widehat{IMP}_A^R = \frac{\delta_2^{(1-\sigma)} \cdot \widetilde{w}_A^{(-\sigma)}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}} \tag{4.81}$$

Given equations (4.80) and (4.81), the volume of bilateral trade between any member country and the accession country in the equilibrium characterised by the enlarged currency union is:

$$\widehat{BIL}_A^R = \frac{\widetilde{w}_A \cdot \delta_2^{(1-\sigma)}}{\frac{\alpha_1}{\alpha_2} \cdot \widetilde{w}_A^{(1-\sigma)} + 2\delta_2^{(1-\sigma)}} + \frac{\delta_2^{(1-\sigma)} \cdot \widetilde{w}_A^{-\sigma}}{\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}} \tag{4.82}$$

Having assessed the implications of the enlargement of the currency union on the volume of bilateral trade between any of the original member countries and accession country, we examine how the enlargement affects the volume of bilateral trade between the two original member countries.

At this regard, we can state the following proposition:

Proposition 14 *The enlargement of the currency union unambiguously reduces the volume of bilateral trade between the original member countries, compared to the equilibrium in which the accession country is excluded from the currency union.*

Proof. See Mathematical Appendix. ■

The enlargement of the currency union toward the accession country reduces the volume of bilateral trade between the two original member countries by increasing the volume of exports and imports of any original member country to and from the accession country.

First, we note that the reduction in the extra-bloc trade costs reduces the volume of exports and imports of any original member country from and to the other member, compared to the equilibrium in which the accession country is excluded from the currency union between the two symmetric member countries.

Notably, the reduction in extra-bloc trade costs implies that the equilibrium c.i.f. price paid by consumers located in any original member country to import any variety produced in the accession country will decrease.

Thus, consumers located in any of the original member countries, perceiving varieties produced in the other member country as relatively more expensive, will reduce their demand for manufacturing varieties produced in the other original member country.

On the other hand, the general equilibrium induced increase in the relative wage in the accession country will reduce the volume of imports of any of the original member countries from the accession country compared to the equilibrium in which the accession country is excluded from the currency union.

We recall that the increase in the equilibrium relative wage leads to an equal increase in the equilibrium f.o.b. price of manufacturing varieties produced in the accession country.

As a result, consumers located in any of the member countries, perceiving manufactured varieties produced in the accession country as relatively more expensive, will decrease their consumption of these varieties while increasing their consumption of varieties produced in the other original member country.

The reduction in the extra-bloc trade costs and the general equilibrium induced increase in the relative wage in the accession country implied by the enlargement of the currency union has opposite implications on the volume of bilateral trade between the original member countries.

However, as shown in the Mathematical Appendix, the negative effect of the reduction of extra-bloc trade costs on the volume of bilateral trade between the member countries is greater than the positive effect of the increase in the equilibrium relative wage in the accession country.

The enlargement of the currency union to include the accession country will, then, unambiguously decrease the volume of bilateral trade realised between the original member countries, compared to the equilibrium in which the accession country is excluded from the currency union between the two symmetric member countries.

Notably, given equations (4.25″), (4.26″), (4.62′), (4.63′), (4.70), (4.71), and (4.72), the volume of exports and imports of any member country to and from the other member country in the equilibrium characterized by the enlarged the currency union, is:

$$\widehat{EXP}_R^R = \widehat{IMP}_R^R = \frac{\tau_1^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\delta_2 \cdot \widetilde{w}_A)^{(1-\sigma)}} \tag{4.83}$$

Finally, given equation (4.83), the equilibrium volume of bilateral trade realised between the two members in the equilibrium characterized by the enlarged the currency union, is given by:

$$\widehat{BIL}_R^R = \frac{2\delta_1^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} \cdot (\tau_2 \cdot \widetilde{w}_A)^{(1-\sigma)}} \tag{4.84}$$

4.6 The role of economic dissimilarities

Our general equilibrium analysis showed that the enlargement of the currency union toward a less technological efficient accession country will unambiguously increase the volume of bilateral trade between any original member and the accession country.

At this regard, we proved that the enlargement of the currency union will increase both the volume of exports of any original member country to the accession country, and the volume of imports of any original member country from the accession country.

In this section we investigate how greater technological inefficiency in the accession country, modelled as a greater fixed labour input requirement in the manufacturing sector, affects the magnitude of the gain in bilateral trade between any original member and the accession country that would follow the enlargement of the currency union.

Greater technological inefficiency in the accession country would affect the magnitude of the gains in the volume of bilateral trade between any original member to and from the accession country following the enlargement by contracting the number of manufactured varieties produced in the accession country, by reducing the equilibrium wage in the accession country before the enlargement, and by enhancing the general equilibrium induced increase in the relative wage in the accession country.

As shown by equations (4.57), (4.58), (4.80), and (4.81), the gain in the volume of exports and imports of any original member to and from the accession country are complex functions of the number of varieties produced in the accession country, the

equilibrium wage in the accession country before the enlargement, and the increase in the equilibrium relative wage in the accession country implied by the enlargement.

Thus, to assess how greater technological inefficiency in the accession country affects the magnitude of the gain in the volume of bilateral trade that would follow the enlargement, we simulate under different values of the parameters the gain in bilateral trade due to a marginal reduction in the level of extra-bloc trade costs, and we summarize our results in Figure 4-1.

In the following we discuss a baseline case in which the elasticity of substitution is $\sigma = 5$, the level of "iceberg" intra-bloc trade costs is $\tau_1 = 1.2$, and the level of "iceberg" extra-bloc trade costs is $\tau_2 = 1.6$, under different assumptions on the extent of technological inefficiency in the accession country, compared to the original members.

Notably, we choose an elasticity of substitution of 5 in the baseline to be in the middle of the range of estimates provided in Broda and Weinstein (2004) and Anderson and van Wincoop (2004), but we also experiment with values of 4 and 10 to cover the range of the empirical estimates.[16] In addition we choose extra-bloc trade costs of 1.6, to be in the middle of the estimates in Anderson and van Wincoop (2004), but we also provide simulations for the lower value of 1.4 and higher value of 1.8 to cover the range of their empirical estimates.[17] Finally, we choose intra-bloc trade costs of 1.2 to replicate the estimates of the transport costs component of trade costs in Anderson and van Wincoop (2004), but we also experiment with values of 1.1 and 1.5 to reflect the possibility that intra-bloc costs might be higher than simple transportation costs.[18]

Thus, in the baseline case 1 we simulate the gain in the volume of bilateral trade

[16] Broda and Weinstein (2004) estimated that the average elasticity of substitution in the U.S. for the period between 1990 and 2001 was around eight for 10-digit goods, around five within 5-digitgoods, and about four within 3-digit goods. In addition, Anderson and van Wincoop (2004) provided a survey of the empirical estimates of the elasticity of substitution in the trade literature, and showed that it is likely to be in the range of four to ten.

[17] Anderson and van Wincoop (2004) estimated the tax equivalent of trade costs, including transport costs and border barriers while excluding local distribution margins, to be in the range of 40-80 percent for industrialized countries.

[18] Anderson and van Wincoop (2004) estimated the tax equivalent of the transportation costs component of trade costs to be about 21 percent for industrialized countries.

Figure 4-1: Gain in bilateral trade due to a marginal reduction in τ_2

	σ	τ_1	τ_2	α_2/α_1	$\partial Bil_A^R / \partial \tau_2$
Baseline Case 1	5	1.2	1.6	Low	0.43879
Baseline Case 2	5	1.2	1.6	High	0.43514
Lower σ	4	1.2	1.6	Low	0.53417
Lower σ	4	1.2	1.6	High	0.44657
Higher σ	10	1.2	1.6	Low	0.14395
Higher σ	10	1.2	1.6	High	0.20153
Lower τ_1	5	1.1	1.6	Low	0.41994
Lower τ_1	5	1.1	1.6	High	0.39185
Higher τ_1	5	1.5	1.6	Low	0.47096
Higher τ_1	5	1.5	1.6	High	0.43674
Lower τ_2	5	1.2	1.4	Low	0.68202
Lower τ_2	5	1.2	1.4	High	0.66486
Higher τ_2	5	1.2	1.8	Low	0.27699
Higher τ_2	5	1.2	1.8	High	0.27701

between any original member and the accession country due to a marginal reduction in the level of extra-bloc trade costs under the assumption that the accession country is almost as technologically efficient as the original members.

On the other hand, in the baseline case 2 we simulate the gain in the volume of bilateral trade due to a marginal reduction in the level of extra-bloc trade costs under the alternative assumption that the accession country is highly technologically inefficient compared to the original member countries.

Our main conclusion is that the more technologically inefficient the accession country is compared to the original member countries, the lower is the gain in the volume of bilateral trade between any of the original member countries and the accession country that would follow the enlargement of the currency union.

4.6.1 Baseline case 1

We assume that the elasticity of substitution is $\sigma = 5$, the level of the "iceberg" intra-bloc trade costs is $\tau_1 = 1.2$, the level of the "iceberg" extra-bloc trade costs is $\tau_2 = 1.6$, and the fixed labour input requirement in the accession country, relative to the one in the original members, is $\alpha_2/\alpha_1 = 1.5$.

Thus, manufacturing technology in the accession country is assumed to be almost as efficient as the manufacturing technology used in the original member countries.

In the equilibrium in which the accession country is excluded from the currency union between the two symmetric member countries, given the assumed values of the parameters and the wage equation expressed in (4.54), the wage in the accession country is $\widehat{w}_A = 0.88919$.

Given conditions (4.25′) and (4.26′), the number of manufactured varieties produced in any member country and in the accession country are $\widehat{n}_R = 1$ and $\widehat{n}_A = 0.66667$.

It follows that, given equations (4.57) and (4.58), the equilibrium volume of exports of any member country toward the accession country and the equilibrium volume of imports of any member country from the accession country are $\widehat{EXP}_A^R = 0.09892$ and $\widehat{IMP}_A^R = 0.11125$.

As a result, given equation (4.59), in the equilibrium in which the accession country is excluded from the currency union the volume of bilateral trade realised between any of the original member countries and the accession country is $\widehat{BIL}_A^R = 0.21017$.

The gain in the volume of exports

Assuming that a marginal reduction in the level of extra-bloc trade costs arises, we analyse its implications on the equilibrium volume of exports of any member country to the accession country and the volume of imports of any original member country from the accession country.

Given equation (4.104), the direct effect of the marginal reduction in the level of extra-bloc trade costs will imply a gain in the volume of exports of any original member

country to the accession country equal to $\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2,\ \widehat{w}_A} = 0.19228$.

Furthermore, given equation (4.99), the marginal reduction in the level of extra-bloc trade costs will lead to an increase in the equilibrium relative wage in the accession country equal to $\frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.00345$.

Thus, given equation (4.105), the gain in the volume of exports of any original member country to the accession country due to the indirect effect of the marginal reduction in the extra-bloc trade costs will be equal to $\frac{\partial \widehat{EXP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.01579$.

We conclude that, given equation (4.106), the overall gain in the volume of exports of any original member country to the accession country that would follow a marginal reduction in the level of extra-bloc trade costs will be equal to $\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2} = \frac{\partial \widehat{EXP}_A^R}{\partial \tau_2,\ \widehat{w}_A} + \frac{\partial \widehat{EXP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.20808$.

The gain in the volume of imports

We focus on the impact of a marginal reduction in the extra-bloc trade costs on the volume of imports of any of the original member countries from the accession country.

Given equation (4.107), the direct effect of the marginal reduction in the level of extra-bloc trade costs will imply a gain in the volume of imports equal to $\frac{\partial \widehat{IMP}_A^R}{\partial \tau_2,\ \widehat{w}_A} = 0.25061$.

In addition, given equation (4.108), since the equilibrium wage in the accession country will increase due to the marginal reduction in the extra-bloc trade costs, the reduction in the volume of imports of any original member from the accession country due to the indirect effect of the marginal reduction in the extra-bloc trade costs equals to $\frac{\partial \widehat{IMP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = -0.01990$.

We note that the gain in imports implied by the direct effect of the marginal reduction in the level of extra-bloc trade costs is greater than the reduction in imports implied by the indirect effect of the marginal reduction in the level of extra-bloc-trade costs.

Finally, given equation (4.109), the overall gain in the volume of imports of any original member country to the accession country due to the marginal reduction in the

level of extra-bloc trade will be equal to $\frac{\partial \widehat{IMP}_A^R}{\partial \tau_2} = \frac{\partial \widehat{IMP}_A^R}{\partial \tau_2,\, \widehat{w}_A} + \frac{\partial \widehat{IMP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.23071.$

The gain in the volume of bilateral trade

Given equation (4.59), and having derived the gain in the volume of exports of any member country to the accession country and the gain in the volume of imports of any member country from the accession country, the gain in the volume of bilateral trade between any original member country and the accession country due to a marginal reduction in the level of extra-bloc trade costs, will be equal to $\frac{\partial \widehat{BIL}_A^R}{\partial \tau_2} = \frac{\partial \widehat{EXP}_A^R}{\partial \tau_2} + \frac{\partial \widehat{IMP}_A^R}{\partial \tau_2} = 0.43879.$

4.6.2 Baseline case 2

As in the baseline case 1 we consider that the elasticity of substitution is $\sigma = 5$, the level of the "iceberg" intra-bloc trade costs is $\tau_1 = 1.2$, the level of the "iceberg" extra-bloc trade costs is $\tau_2 = 1.4$, while the fixed labour input requirement in the accession country, relative to the one in the original members, is $\alpha_2/\alpha_1 = 4$.

Thus, the manufacturing technology in the accession country is assumed to be highly inefficient with respect to the manufacturing technology used in the original members of the currency union.

Given the values of the parameters and the wage equation expressed in (4.54), the wage in the accession country in the equilibrium in which the accession country is excluded from the currency union is $\widehat{w}_A = 0.71837$.

Since the equilibrium wage in the accession country is lower than under Case 1, we can affirm that the more technologically inefficient the accession country is, the lower the equilibrium wage will be in the accession country before the enlargement of the currency union.

Given conditions (4.25′) and (4.26′), the number of manufactured varieties produced in any of the original member countries and in the accession country are given by $\widehat{n}_R = 1$ and $\widehat{n}_A = 0.25$.

Due to the greater technological inefficiency in the accession country, the number of manufactured varieties produced in the accession country will be lower than under Case 1, while the number of manufactured varieties produced in any member country will be unchanged.

It follows that, given equations (4.57) and (4.58), the equilibrium volume of exports of any original member country to the accession country and the equilibrium volume of imports of any member country from the accession country are $\widehat{EXP}_A^R = 0.08712$ and $\widehat{IMP}_A^R = 0.12267$.

Thus, the equilibrium volume of exports of any member country to the accession country is lower while the equilibrium volume of imports of any member country from the accession country is greater than under Case 1.

We can affirm that the more technologically inefficient the accession country is, the lower will be the volume of exports and imports of any member country to and from the accession country before the enlargement of the currency union.

Given equation (4.59), in the equilibrium in which the accession country is excluded from the currency union, the volume of bilateral trade realised between any member country and the accession country will be equal to $\widehat{BIL}_A^R = 0.209\,79$.

Since the equilibrium volume of bilateral trade is lower than under Case 1, we can affirm that the more technologically inefficient the accession country is, the lower will be the equilibrium volume of bilateral trade between any member country and the accession country before the enlargement of the currency union.

The gain in the volume of exports

We investigate the implications of a marginal reduction in the extra-bloc trade costs on the equilibrium volume of exports of any member country to the accession country and the equilibrium volume of imports of any member country from the accession country.

First, given equation (4.104), the direct effect of the marginal reduction in the level of extra-bloc trade costs will imply a gain in the volume of exports of any original member country to the accession country equal to $\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2,\, \widehat{w}_A} = 0.16625$.

Since the gain in the volume of exports is lower than under Case 1, we can affirm that the more technologically inefficient the accession country, the lower the gain in the volume of exports of any original member to the accession country following the direct effect of the enlargement of the currency union.[19]

The direct effect of the enlargement will reduce the level of extra-bloc trade costs such that consumers located in the accession country, perceiving varieties produced in any of the original member countries as relatively cheaper, will increase their consumption of those varieties.

Greater technological inefficiency in the accession country will affect the gain in the volume of exports implied by the direct effect of the enlargement by reducing the equilibrium number of manufactured varieties produced in the accession country, and by reducing the equilibrium f.o.b. price of varieties produced in the accession country before the enlargement.

First, the more technologically inefficient the accession country is, the lower the equilibrium number of varieties produced in the accession country will be.

Thus, once the direct effect of the enlargement will reduce the extra-bloc trade costs, consumers located in the accession country will increase more their consumption of varieties produced in any member country since the range of varieties available in the accession country will be narrower.

Furthermore, the more technologically inefficient the accession country is, the lower the equilibrium wage in the accession country will be before the enlargement of the currency union such that the f.o.b. price of varieties produced in the accession country will be lower.

Once the extra-bloc trade costs will reduce due to the direct effect of the enlargement, consumers located in the accession country will increase less their consumption of varieties produced in any of the original member country since they will perceive them as relatively less cheaper being lower their f.o.b. price of the manufactured varieties

[19] We refer to the reduction in the extra-bloc trade costs implied by the enlargement of the currency union as the direct effect of the enlargement.

before the enlargement.

Thus, greater technological inefficiency in the accession country will increase the gain in exports due to the direct effect of enlargement by reducing the range of manufactured varieties produced in the accession country but it will reduce the gain in exports by reducing the equilibrium f.o.b price of varieties produced in the accession country.

Our simulation analysis indicates that the more technologically inefficient the accession country is, the smaller the gain in exports implied by the direct effect of enlargement will be.

In fact, the negative impact on the gains in exports of the lower f.o.b. price of varieties produced in the accession country will be greater than the positive impact on the gains in exports of the reduction in the number of varieties produced in the accession country.

Furthermore, the marginal reduction in the extra-bloc trade costs will lead to a general equilibrium induced increase in the equilibrium relative wage in the accession country.

Notably, given equation (4.99), the increase in the equilibrium wage in the accession country due to the marginal reduction in extra-bloc trade costs will be equal to $\frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.003585$.

Since the increase in the relative wage in the accession country due to the marginal reduction in the level of extra-bloc trade costs is greater than in Case 1, we affirm that the more technologically inefficient the accession country is the greater is the general equilibrium induced increase in the relative wage in the accession country following the enlargement.

Given equation (4.105), we have that the gain in the volume of exports of any member country toward the accession country due to the indirect effect of the marginal reduction in the extra-bloc trade costs is $\frac{\partial \widehat{EXP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.017675$.

Since the gain in exports due to the indirect effect of the marginal reduction in the extra-bloc trade costs is greater than under Case 1, the more technologically inefficient

the accession country is, the greater will be the gain in the volume of exports of any original member country to the accession country implied by the indirect effect of the enlargement.[20]

The indirect effect of the enlargement will increase the equilibrium relative wage in the accession country such that consumers located in the accession country, perceiving a greater income, will increase their consumption of varieties produced in the original member countries as well as in the accession country.

Greater technological inefficiency in the accession country affects the gain in the volume of exports of any original member country to the accession country due to the indirect effect of the enlargement by reducing the equilibrium number of varieties produced in the accession country, by reducing the equilibrium f.o.b. price of varieties produced in the accession country, and by enhancing the increase in the relative wage in the accession country following the enlargement.

First, the more technologically inefficient the accession country is, the lower the equilibrium number of manufactured varieties produced in the accession country will be.

Thus, once the indirect effect of the enlargement will increase the income perceived by consumers in the accession country, they will increase more their consumption of varieties produced in the original member country since the range of manufactured varieties produced in the accession country will be narrower.

Furthermore, the more technological inefficient the accession country is, the lower will be the equilibrium wage in the accession country before the enlargement of the currency union such that the f.o.b. price of varieties produced in the accession country will be lower.

Once the indirect effect of the enlargement will increase the income of consumers located in the accession country, they will increase less the consumption of varieties produced in the member country since they will increase more the consumption of

[20]We refer to the general equilibrium induced increase in the relative wage in the accession country implied by the enlargement of the currency union as the indirect effect of the enlargement.

those varieties being lower the price of varieties produced in the accession country before the enlargement.

Finally, the more technologically inefficient the accession country is, the greater the general equilibrium implied increase in the relative wage in the accession country will be.

As a consequence, consumers located in the accession country will increase more their consumption of varieties produced in any original member country since their income will increase more following the indirect effect of the enlargement.

Thus, greater technological inefficiency in the accession country will increase the gain in exports due to the indirect effect of enlargement by reducing the range of manufactured varieties produced in the accession country and by enhancing the general equilibrium implied increase in the relative wage in the accession country.

However, greater technological inefficiency will reduce the gain in exports due to the indirect effect of the enlargement by reducing the equilibrium f.o.b price of manufacturing varieties produced in the accession country.

Our simulation analysis indicates that the more technologically inefficient the accession country is, the greater the gain in exports implied by the indirect effect of enlargement will be since the positive impact of the reduction in the number of varieties in the accession country and of the greater increase in the wage in the accession country will be greater than the negative impact of the lower f.o.b. price of varieties produced in the accession country.

Finally, given equation (4.106), the overall gain in the volume of exports of any original member country to the accession country following the marginal reduction in the level of extra-bloc trade costs will be equal to $\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2} = \frac{\partial \widehat{EXP}_A^R}{\partial \tau_2,\, \widehat{w}_A} + \frac{\partial \widehat{EXP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} =$ 0.18393.

We note that since the gain exports due to the marginal reduction in the level of extra–bloc trade cost is lower than in Case 1, we can affirm that the more technologically inefficient is the accession country the lower will be the increase in exports of any member country to the accession country that would follow the enlargement of

the currency union.

In fact, our simulations analysis indicates that the negative impact of greater technological inefficiency in the accession country on the gains in exports following the direct effect of enlargement will be greater than the positive impact on the gains of exports following the indirect effect of the enlargement.

The gain in the volume of imports

We focus on the impact of the marginal reduction in extra-bloc trade costs on the volume of imports of any original member country from the accession country.

First, given equation (4.107), the direct effect of the marginal reduction in the extra-bloc trade costs will lead to a gain in the volume of imports equal to $\frac{\partial \widehat{IMP}_A^R}{\partial \tau_2,\ \widehat{w}_A} =$ 0.27965.

Since the gain in the volume of imports is greater than under Case 1, we can affirm that the more technologically inefficient the accession country is, the greater the gain in the volume of imports of any original member country from the accession country will be following the direct effect of the enlargement of the currency union.

The direct effect of the enlargement will reduce the level of extra-bloc trade costs such that consumers located in any member country, perceiving manufactured varieties produced in the accession country as relatively cheaper, will increase their consumption of those varieties.

Greater technological inefficiency in the accession country will affect the gains in the volume of imports due to the direct effect of the enlargement by reducing the equilibrium number of manufactured varieties produced in the accession country, and by reducing the equilibrium f.o.b. price of those varieties.

As we pointed out, the more technologically inefficient the accession country is, the smaller the equilibrium number of manufactured varieties produced in the accession country will be. Once the direct effect of the enlargement will reduce extra-bloc trade costs, consumers located in any original member country will increase less their consumption of varieties produced in the accession country since the narrower is the range

of varieties produced in the accession country. Furthermore, the more technologically inefficient the accession country is, the lower will be the equilibrium wage in the accession country before the enlargement of the currency union such that the lower will be the f.o.b. price of varieties produced in the accession country.

Once the extra-bloc trade costs are reduced due to the direct effect of the enlargement, consumers located in any original member country will increase more their consumption of varieties produced in the accession country.

In fact, varieties produced in the accession country will seem relatively more cheaper once extra-bloc trade costs reduce since the lower will be their f.o.b. price before the enlargement.

Greater technological inefficiency in the accession country will, then, reduce the gain in imports due to the direct effect of enlargement by reducing the number of manufactured varieties produced in the accession country but it will increase the gain in imports by reducing equilibrium f.o.b. price of manufacturing varieties produced in the accession country.

Our simulation analysis shows that the more technologically inefficient the accession country is, the greater the gain in imports due to the direct effect of enlargement will be.

In fact, the positive impact on the gain in imports of the lower equilibrium f.o.b. price of varieties produced in the accession country will be greater than the negative effect on the gain in imports of the reduction in the number of varieties produced in the accession country.

Focusing on the indirect effect of the marginal reduction in extra-bloc trade costs we previously pointed out that it will lead to an increase in the equilibrium relative wage in the accession country.

Given equation (4.99) and being the increase in the equilibrium relative wage in the accession country equal to $\frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.03585$, the reduction in the volume of imports of any original member country from the accession country following the indirect effect of the marginal reduction in the extra-bloc trade costs is $\frac{\partial \widehat{IMP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = -0.028455$.

We note that the reduction in the volume of imports of any original member country from the accession country due to the indirect effect of the marginal reduction in the extra-bloc trade costs is greater than under Case 1.

We can, then, affirm that the more technologically inefficient the accession country is, the greater the reduction in the volume of imports of any member country from the accession country will be following the indirect effect of the enlargement of the currency union.

The indirect effect of the enlargement will increase the equilibrium relative wage in the accession country such that to equally increase the equilibrium f.o.b. price of varieties produced in the accession country.

As a consequence, consumers located in any member country, perceiving varieties produced in the accession country as more expensive, will reduce their consumption of those varieties. Greater technological inefficiency in the accession country will affect the reduction in imports due to the indirect effect of the enlargement by reducing the equilibrium number of manufactured varieties produced in the accession country, by reducing the equilibrium f.o.b. price of varieties produced in the accession country before the enlargement, and by enhancing the increase in the relative wage in the accession country following the enlargement.

First, the more technologically inefficient is the accession country, the lower will be the equilibrium number of manufactured varieties produced in the accession country.

Thus, once the indirect effect of the enlargement increases the equilibrium f.o.b. price of varieties produced in the accession country, consumers located in any member country will reduce less their consumption of varieties produced in the accession countries since the narrower will be the range of manufactured varieties produced in the accession country.

In addition, the more technologically inefficient is the accession country, the lower will be the equilibrium wage in the accession country before the enlargement such that the lower will be the f.o.b. price of varieties produced in the accession country before the enlargement.

Thus, once due to the indirect effect of the enlargement the equilibrium f.o.b. price of varieties produced in the accession country increases, consumers located in any member country will reduce more their consumption of varieties produced in the accession country.

In fact, consumers located in any member country will perceive varieties produced in the accession country as relatively more expensive following the indirect effect of the enlargement since their equilibrium f.o.b. price will be lower before the enlargement.

Finally, the more technologically inefficient the accession country is, the greater will be the magnitude of the general equilibrium induced increase in the relative wage in the accession country. As a result, consumers located in any member country will decrease more their consumption of manufactured varieties produced in the accession country since the relatively more expensive those varieties will be following the indirect effect of the enlargement.

Greater technological inefficiency in the accession country increases the reduction of imports due to the indirect effect of enlargement by reducing the f.o.b price of varieties produced in the accession country before the enlargement and by increasing the magnitude of the general equilibrium implied increase in the relative wage in the accession country.

On the other hand, greater technological inefficiency will decrease the reduction in the volume of imports due to the indirect effect of the enlargement by reducing the range of manufactured varieties produced in the accession country.

Our simulation analysis indicates that the more technologically inefficient the accession country is, the greater is the reduction in the imports of any original member country from the accession country due to the indirect effect of the enlargement.

In fact, the greater reduction in imports due to the lower equilibrium f.o.b. price of varieties produced in the accession country and the greater increase in the relative wage in the accession country will more than compensate for the lower reduction in imports due to the smaller number of varieties produced in the accession country.

Given equation (4.109), the overall gain in the volume of imports of any member

country from the accession country following the marginal reduction in the level of extra-bloc trade costs will be equal to $\frac{\partial IMP_A^R}{\partial \tau_2} = \frac{\partial IMP_A^R}{\partial \tau_2,\ \widehat{w}_A} + \frac{\partial IMP_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = 0.25121.$

Since the gain in imports due to the marginal reduction in the level of extra–bloc trade cost is greater than under Case 1, we can affirm that the more technologically inefficient is the accession country, the greater the increase in the volume of imports of any member country from the accession country will be following the enlargement of the currency union.

In fact, our simulation analysis points out that the increase in the gain in imports due to the direct effect of enlargement will be greater than the increase in the reduction in imports due to the indirect effect of the enlargement induced by greater technological inefficiency in the accession country.

The gain in the volume of bilateral trade

Given equation (4.81), the gain in the volume of bilateral trade between any member country and the accession country, due to the marginal reduction in the level of extra-bloc trade costs, will be equal to $\frac{\partial \widehat{BIL}_A^R}{\partial \tau_2} = \frac{\partial \widehat{EXP}_A^R}{\partial \tau_2} + \frac{\partial \widehat{IMP}_A^R}{\partial \tau_2} = 0.43514.$

Since the gain in bilateral trade due to the marginal reduction in the level of extra-bloc trade cost is lower than under Case 1, we conclude that the more technologically inefficient the accession country is, the lower will be the increase in the volume of bilateral trade between any original member country and the accession country that would follow the enlargement.[21]

In fact, our simulation analysis shows that the reduction in the gain in the volume of exports of any member country to the accession country due to greater technological inefficiency in the accession country will be greater than the increase in the gain in the

[21] The prediction of our model that the more technological inefficient is the accession country the lower the gain in the volume of bilateral trade following the enlargement concerns intra-industry trade explained by consumers' love of variety and increasing returns to scale. If we extended our model to add comparative advantages, the positive effects of greater economic dissimilarities on trade explained by comparative advantages would have to be taken into account in assessing the impact of greater technological inefficiency in the accession country on the gains in the volume of bilateral trade that would follow the enlargement.

volume of imports of any original member from the accession country.

4.7 Conclusions

Recent empirical findings have suggested that sharing a common currency significantly enhances bilateral trade realised between pair of countries.

Our work provided a general equilibrium analysis of the trade effects of the formation of a currency union between the members of a regional trading bloc, of the subsequent enlargement of the currency union to include an economically dissimilar country, and the role played by economic dissimilarities on the magnitude of the trade effects of a common currency.

We built a three-countries general equilibrium intra-industry trade model in which economic dissimilarities across countries are featured, and sharing a common currency affects patterns of trade by reducing transaction costs due to the use of different currencies, and by affecting the equilibrium relative wage across countries.

First, we investigated the implications of the formation of a currency union between the members of a regional trading bloc on the volume of bilateral trade realised between the member countries and between any of the members and the excluded country.

Specifically, we considered the excluded country to be economically dissimilar from the members of the currency union by having a less efficient manufacturing production technology compared to the member countries.

Thus, we showed that the formation of a currency union between the members of a regional bloc affects the patterns of trade by reducing intra-bloc trade costs through the elimination of transaction costs due to the use of different currencies, and by leading to a general equilibrium induced reduction of the equilibrium relative wage in the excluded country.

Taking into account these effects, we proved that the formation of a currency union between the members of a regional trading bloc enhances the volume of bilateral trade between the member countries while it reduces the volume of bilateral trade between

any of the members and the excluded country.

Concerning the volume of bilateral trade between members, we showed that the formation of the currency union enhances it by increasing the volume of exports and imports that any member realises to and from the other member.

Notably, we proved that the volume of exports and imports of any member to and from the other member is increased by the reduction in intra-bloc trade costs while it is reduced by the general equilibrium induced reduction in the equilibrium relative wage in the excluded country.

At this regard, we demonstrated that the positive implications of the reduction in intra-bloc trade costs on the volume of bilateral trade between the member countries is greater than the negative implication of the reduction in the relative wage in the excluded country.

Concerning the volume of bilateral trade between any member and the excluded country, we showed that the formation of the currency union reduces it by reducing the volume of exports and imports that any member realises to and from the excluded country.

Thus, we showed that the reduction in the intra-bloc trade costs reduces the volume of imports that any of member countries realises from the excluded country.

Notably we showed that the negative impact of the reduction in intra-bloc trade costs on the volume of imports of any member from the excluded country is greater than the positive impact of the reduction of the relative wage in the excluded country.[22]

[22]The equilibrium relative wage in the excluded country is such as to guarantee that firms break even. The formation of the currency union implies a reduction in the intra-bloc costs that tends to increase (reduce) the sales of firms located in the currency union (excluded country). However, the fact that the level of output for which firms break even is unaffected leads to a general equilibrium induced reduction in the relative wage in the excluded country that tends to reduce (increase) the sales of firms located in the excluded country (currency union). As we can expect, since the reduction in the relative wage is a general equilibrium adjustment resulting from the initial reduction in intra-bloc trade costs, its impact on the overall firms' sales will counterbalance the impact of the reduction in intra-bloc trade costs. However, a rigorous analysis is needed to assess how the different components of firms' sales are affected by the operating of those two effects. At this regard, we provide analytical proof that the impact of the reduction in the relative wage on a member's imports from the excluded country is dominated by the impact of lower intra-bloc trade costs.

In addition, we proved that the general equilibrium induced reduction in the relative wage in the excluded country reduces the volume of exports of any member country to the excluded country while it enhances the volume of imports of any member from the excluded country.

Second, we analysed how the enlargement of the currency union to include the economically dissimilar country affects the volume of bilateral trade realised between any original member and the accession country, and between the original members.

We showed that the enlargement of the currency union affects the patterns of trade by reducing extra-bloc trade costs through the elimination of transaction costs due toward the use of different currencies, and by implying a general equilibrium induced increase in the relative wage in the accession country.

Considering these effects, we showed that the enlargement of a currency union to an economically dissimilar country enhances the volume of bilateral trade between any original member and the accession country, while it reduces the volume of bilateral trade between the original member countries.

Concerning the volume of bilateral trade between any original member and the accession country, we proved that the enlargement enhances it by increasing the volume of exports and imports of any original member from and to the accession country.

In this regard, we showed that the reduction in the extra-bloc trade costs increases the volume of exports and imports of any original member to and from the accession country. Furthermore, the general equilibrium induced increase in the relative wage in the accession country enhances the volume of exports of any original member to the accession country while it reduces the volume of imports of any original member from the accession country.

We demonstrated, then, that the positive implications of the reduction in extra-bloc trade costs on the volume of imports of any original member from the accession country is greater than the negative implications of the increase in the relative wage in the accession country.

Concerning the volume of bilateral trade between the original members, we proved

that the enlargement of the currency union reduces it by reducing the volume of exports and imports of any original member from and to the other member.

We showed that the volume of exports and imports between the original member countries is reduced by the reduction in the extra-bloc trade costs while it is enhanced by the general equilibrium induced increase in the relative wage in the accession country.

We proved, then, that the negative implication of the increase in the accession country's relative wage on the volume of bilateral trade between the original members is greater than the positive implication of the reduction in extra-bloc trade costs.

Finally, we analysed how economic dissimilarities between the original members of the currency union and the accession country affect the magnitude of the gain in the volume of bilateral trade that would follow the enlargement.

Simulating our general equilibrium model, we showed that the more technologically inefficient the accession country is compared to the original members of the currency union, the lower is the gain in the volume of bilateral trade between any original member and the accession country following the enlargement of the currency union.

4.8 Mathematical Appendix

4.8.1 Derivation of the wage equation in the initial equilibrium

In the initial equilibrium, manufacturing firms located in any of the member countries and in the excluded country break even if conditions (4.27′) and (4.28′) are satisfied.

Notably, it is possible to show that the wage in the excluded country that would satisfy the condition for which firms in the member countries break even would also satisfy the condition for which firms in the excluded country break even.

Focusing on the condition for which firms in the member countries break even, condition (4.27′) may be rewritten as:

$$1 = \frac{1 + \tau_1^{(1-\sigma)}}{1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 w_A)^{(1-\sigma)}} + \frac{w_A \tau_2^{(1-\sigma)}}{\frac{\alpha_1}{\alpha_2} \cdot w_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}}$$

After some simplifications, solving the previous equation with respect to the equilibrium wage in the excluded country, we derive the wage equation that implicitly defines the equilibrium wage in the excluded country as a function of the parameters of the model:

$$1 - \frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2 \cdot w_A^{(1-2\sigma)} + 2\frac{\alpha_1}{\alpha_2} w_A^{-\sigma} \tau_2^{(1-\sigma)}}{1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} \tau_2 \cdot w_A^{(1-\sigma)}} = 0 \tag{4.85}$$

Notably, we can prove that the equilibrium wage in the excluded country results to be lower than unity for any value of the parameters of the model.

Since the equilibrium wage in the excluded country is such that the wage equation in (4.84) is satisfied, if we substitute into equation (4.84) the unitary value for the equilibrium wage and the wage equation is not satisfied, then the equilibrium wage in the excluded country will never assume the unitary value.

Defining as G the left-hand side of the wage equation in (4.84), if we substitute the unitary value for the equilibrium wage in the excluded country and G is positive for any value of the parameters, we might conclude that the equilibrium wage in the

excluded country is lower than unity given that $\frac{\partial G_0}{\partial w_A}$ is positive for any value of the parameters (See Proof of Proposition 10).

Substituting the unitary value for the equilibrium wage in the excluded country into the wage equation, we may rewrite G as:

$$G = \frac{\frac{\alpha_2}{\alpha_1} + \frac{\alpha_2}{\alpha 1}\tau_1^{(1-\sigma)} - \frac{\alpha_1}{\alpha_2} - \tau_2^{(1-\sigma)}}{\frac{\alpha_1}{\alpha_2} \cdot \left(1 + (\tau_1)^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}\right)} \tag{84'}$$

Since the denominator of (4.84′) is positive for any value of the parameters, given that $\alpha_2 > 0$, $\alpha_1 > 0$, $\tau_2 > 1$, and $\tau_1 > 1$, we focus on the numerator of (4.84′) in order to assess the sign of G.

Given that $\alpha_2 > \alpha_1$, $\sigma > 1$, and $\tau_2 > \tau_1$, the numerator of (4.84′) has a positive sign for any value of the parameters.

We conclude that the equilibrium wage in the excluded country is lower than unity for any value of the parameters of the model.

4.8.2 Proof of Proposition 9

In order to analyze the general equilibrium relative wage effect of the formation of the currency union between the two member countries, we investigate how a marginal reduction in the intra-bloc trade costs would affect the equilibrium relative wage in the excluded country.

Applying the implicit function theorem to the wage equation we have:

$$\frac{\partial w_A}{\partial \tau_1} = -\frac{\frac{\partial G}{\partial \tau_1}}{\frac{\partial G}{\partial w_A}} \tag{4.86}$$

After some simplifications, we obtain:

$$\frac{\partial G}{\partial \tau_1} = \frac{-\frac{\alpha_1}{\alpha_2} \cdot (\sigma - 1)\tau_1^{-\sigma} \cdot \left[\frac{\alpha_1}{\alpha_2} \cdot w_A^{(1-2\sigma)} + 2w_A^{-\sigma}\tau_2^{(1-\sigma)}\right]}{\left[1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}\right]^2} \tag{4.87}$$

$$\frac{\partial G}{\partial w_A} = \frac{\begin{array}{c}\left[(2\sigma-1)\left(\frac{\alpha_1}{\alpha_2}\right)^2 \cdot w_A^{-2\sigma} + 2\frac{\alpha_1}{\alpha_2}\sigma w_A^{(-\sigma-1)}\tau_2^{(1-\sigma)}\right]\cdot\left(1+\tau_1^{(1-\sigma)}\right) \\ +\sigma\left(\frac{\alpha_1}{\alpha_2}\right)^3 \cdot w_A^{(1-3\sigma)}\tau_2^{(1-\sigma)} + 2\left(\frac{\alpha_1}{\alpha_2}\right)^2 w_A^{-2\sigma}\tau_2^{2(1-\sigma)}\end{array}}{\left[1+\tau_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\left(\tau_2 \cdot w_A\right)^{(1-\sigma)}\right]^2} \tag{4.88}$$

In order to assess the sign of $\frac{dw_A}{d\tau_1}$ we focus on the signs of $\frac{\partial G}{\partial \tau_1}$ and $\frac{\partial G}{\partial w_A}$ expressed by equations (4.86) and (4.87), respectively.

Having assumed that $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_1 > 1$, $\tau_2 > 1$ and $\sigma > 1$, we observe that for any value of the parameters $\frac{\partial G}{\partial \tau_1}$ will have a negative sign while $\frac{\partial G}{\partial w_A}$ will have a positive sign.

Thus, given equation (4.84), since $\frac{\partial G}{\partial \tau_1} < 0$ and $\frac{\partial G}{\partial w_A} > 0$, we have that for any value of the parameters of the model:

$$\frac{\partial w_A}{\partial \tau_1} > 0$$

We conclude that the formation of the currency union between the two symmetric member countries, leading the reduction in the level of intra-bloc trade costs, will reduce the equilibrium relative wage in the excluded country, compared to the initial equilibrium.

4.8.3 Proof of Proposition 10

The volume of bilateral trade between the two member countries will be affected by the formation of the currency union through the reduction in the level of intra-bloc trade costs, and the general equilibrium implied reduction in the equilibrium relative wage in the excluded country.

In order to investigate the trade impact of the direct effect of the formation of the currency union, that is the reduction in intra-bloc trade costs, we compute the partial derivative of the initial equilibrium volume of bilateral trade between the two member countries, expressed in equation (4.31), with respect to the intra-bloc trade costs, τ_1,

assuming the equilibrium relative wage in the excluded country is unchanged.

Thus, after some manipulations, we have:

$$\frac{\partial BIL_R^R}{\partial \tau_1, \overline{w}_A} = \frac{2(1-\sigma)\tau_1^{-\sigma} \cdot \left[1 + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}\right]}{\left[1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot w_A)^{(1-\sigma)}\right]^2} \tag{4.89}$$

Having assumed $\alpha_1 > 0, \alpha_2 > 0$, $\tau_1 > 0$, $\tau_2 > 0$ and $\sigma > 1$, the partial derivative in (4.88) has a negative sign for any value of the parameters such that a marginal reduction in the intra-bloc trade costs will increase the volume of bilateral trade between the member countries.

We can affirm that the direct effect of the formation of the currency union will increase the volume of bilateral trade between the member countries, compared to the initial equilibrium.

To investigate the trade impact of the indirect effect of the formation of the currency union i.e. the general equilibrium implied reduction in the relative wage in the excluded country, we compute the partial derivative of the initial equilibrium volume of bilateral trade between the member countries, expressed in equation (4.31), with respect to the equilibrium relative wage in the excluded country times the derivative of the equilibrium wage in the excluded country with respect to the level of intra-bloc trade costs.

After some simplifications, we obtain:

$$\frac{\partial BIL_R^R}{\partial w_A} \cdot \frac{\partial w_A}{\partial \tau_1} = \frac{2\tau_1^{(1-\sigma)} \cdot (\sigma - 1)\frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)} \cdot w_A^{-\sigma}}{\left[1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 w_A)^{(1-\sigma)}\right]^2} \cdot \frac{\partial w_A}{\partial \tau_1} \tag{4.90}$$

Having proved that $\frac{\partial w_A}{\partial \tau_1}$, expressed in (4.84), is always positive and assumed that $\alpha_1 > 0, \alpha_2 > 0$, $\tau_1 > 0$, $\tau_2 > 0$ and $\sigma > 1$, the expression in (4.89) will have a positive sign for any value of the parameters.

It follows that the general equilibrium induced reduction in the relative wage in the excluded country implied by a marginal reduction in intra-bloc trade costs, will reduce the volume of bilateral trade between the two member countries.

We note that the indirect effect of the formation of the currency union will reduce the volume of bilateral trade between the two member countries, compared to the initial equilibrium.

Finally in order to investigate the overall effect of the formation of the currency union on the volume of bilateral trade between the member countries, we compute the total derivative of (4.31) with respect to the level of intra-bloc trade costs, taking into account that the equilibrium relative wage in the excluded country is a function of level of intra-bloc trade costs.

After some manipulations, we have:

$$\frac{\partial BIL_R^R}{\partial \tau_1} = \frac{2(1-\sigma)\tau_1^{-\sigma}\left[1+\frac{\alpha_1}{\alpha_2}(\tau_2 w_A)^{(1-\sigma)}\right] + 2\frac{\alpha_1}{\alpha_2}(\sigma-1)\tau_1^{(1-\sigma)}\tau_2^{(1-\sigma)}\cdot w_A^{-\sigma}\frac{\partial w_A}{\partial \tau_1}}{\left[1+\tau_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}(\tau_2 w_A)^{(1-\sigma)}\right]^2} \tag{4.91}$$

We observe that the volume of bilateral trade between the member countries will increase due to a marginal reduction of intra-bloc trade costs if the total derivative in (4.90) is negative.

Since we assumed $\alpha_1 > 0$ and $\alpha_2 > 0$ and $\tau_2 > 1$, the denominator of the expression in (4.90) is always positive such that the total derivative results negative only if its numerator is negative. After some manipulations, we obtain that the numerator of the expression in (4.90) is negative if:

$$\frac{\tau_1}{w_A}\cdot\frac{\partial w_A}{\partial \tau_1} < 1+\frac{\alpha_2}{\alpha_1}\tau_2^{(\sigma-1)}w_A^{(\sigma-1)} \tag{4.92}$$

Given equations (4.85), (4.86) and (4.87), it is possible to show that the condition in (91) will be satisfied if the following inequality holds:

$$\left[\begin{array}{l} 2\sigma w_A^{\sigma-1}\cdot\tau_2^{(1-\sigma)}\cdot\left(1+\tau_1^{(1-\sigma)}\right)-2(\sigma-1)w_A^{(\sigma-1)}\cdot\tau_2^{(1-\sigma)}\cdot\tau_1^{(1-\sigma)} \\ +\sigma\frac{\alpha_1}{\alpha_2}\cdot\left(\tau_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)}w_A^{(1-\sigma)}\right)+\frac{\alpha_1}{\alpha_2}\cdot(2\sigma-1)+2\frac{\alpha_1}{\alpha_2}\cdot\tau_2^{2(1-\sigma)} \end{array}\right] > 0$$

Having assumed $\sigma > 1$, the above inequality will be satisfied for any value of the parameters implying that the condition expressed in (4.91) will be satisfied for any value of the parameters.

Since the total derivative in (4.90) will be positive for any value of the parameters, a marginal reduction in the intra-bloc trade costs will increase the volume of bilateral trade realized between member countries, taking into account the general equilibrium induced reduction in the relative wage in the excluded country.

We conclude that the formation of the currency union unambiguously increases the volume of bilateral trade between the member countries compared to the initial equilibrium since the positive impact of the reduction in the intra-bloc trade costs will be greater than the negative effect of the general equilibrium induced reduction in the relative wage in the excluded country.

4.8.4 Proof of Proposition 11

The formation of the currency union affects the volume of bilateral trade between any of the member countries and the excluded country by reducing the intra-bloc trade costs, and leading to a general equilibrium induced reduction in the relative wage in the excluded country.

In order to investigate the trade implications of the direct effect of the formation of the currency union, that is the reduction in intra-bloc trade costs on volume of exports of any member country to the excluded country, we compute the partial derivative of the initial equilibrium, expressed in equation (4.32), with respect to the intra-bloc trade costs, assuming unchanged the equilibrium relative wage in the excluded country.

Thus, we have:

$$\frac{\partial \left(EXP_A^R\right)}{\partial \tau_1, \overline{w}_A} = 0 \tag{4.93}$$

Since the partial derivative in (4.92) is zero, a marginal reduction in the intra-bloc trade costs will not affect the volume of bilateral trade between any of the members

and the excluded country, assuming unchanged the equilibrium relative wage in the excluded country.

We can affirm that the direct effect of the formation of the currency union will not affect the volume of bilateral trade between any of the member countries and the excluded country.

To analyze the trade implications of the indirect effect of the formation of the currency union, that is the general equilibrium induced reduction in the relative wage in the excluded country, on the volume of export of any member to the accession country we compute the partial derivative of equation (4.32) with respect to the equilibrium relative wage in the excluded country times the derivative of the equilibrium relative wage in the excluded country with respect to the level of intra-bloc trade costs.

Notably, we obtain:

$$\frac{\partial EXP_A^R}{\partial w_A} \cdot \frac{\partial w_A}{\partial t_1} = \frac{\tau_2^{(1-\sigma)} \cdot \left(\frac{\alpha_1}{\alpha_2} w_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)} + (\sigma - 1) \frac{\alpha_1}{\alpha_2} w_A^{(1-\sigma)} \right)}{\left[\frac{\alpha_1}{\alpha_2} w_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)} \right]^2} \cdot \frac{\partial w_A}{\partial t_1} \quad (4.94)$$

In order to assess the sign of (4.93), we focus on its numerator since, having assumed that $\sigma > 1$, $\alpha_1 > 0$ and $\alpha_2 > 0$, its denominator is always positive.

Having proved that $\frac{\partial w_A}{\partial \tau_1}$, expressed in (4.84), is always positive and assumed that $\sigma > 1$ and $\tau_2 > 1$, the numerator of (4.93) will be positive for any value of the parameters.

It follows that the reduction in the equilibrium relative wage in the excluded country implied by a marginal reduction in intra-bloc trade costs will lead to a reduction in the volume of exports of any member country to the excluded country.

Thus, the indirect effect of the formation of the currency union will reduce the volume of exports of any member country to the excluded, compared to the initial equilibrium.

Since the direct effect of the formation of the currency union does not affect the volume of bilateral trade between any of the member countries and the excluded coun-

try, we conclude that the formation of the currency union unambiguously decreases the volume of exports of any member country and the excluded country compared to the initial equilibrium.

In order to investigate the implications of the direct effect of the formation of the currency union on the volume of imports of any member country from the excluded country, we compute the partial derivative of (4.33) with respect to the level of intra-bloc trade costs, assuming that the equilibrium wage in the excluded country is unchanged.

After some manipulations, we have:

$$\frac{\partial IMP_A^R}{\partial \tau_1, \overline{w}_A} = \frac{\frac{\alpha_2}{\alpha_1}(\sigma - 1) \cdot \tau_1^{-\sigma} \cdot (\tau_2 w_A)^{1-\sigma}}{\left[\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \tau_1^{(1-\sigma)}\right) + (\tau_2 w_A)^{(1-\sigma)}\right]^2} \tag{4.95}$$

Having assumed that $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 0$ and $\tau_1 > 0$, the partial derivative in (4.94) is positive for any value of the parameters.

It follows that a marginal reduction in the level of intra-bloc trade costs will lead to a reduction in the volume of imports of any member country from the excluded country, assuming the equilibrium relative wage to be unchanged.

The direct effect of the formation of the currency union reduces then the volume of imports of any member country from the excluded country, compared to the initial equilibrium.

On the other hand, to investigate the implications of the indirect effect of the formation of the currency union on the volume of imports of any member country from the excluded country, we compute the partial derivative of (4.33) with respect to the equilibrium relative wage in the excluded country times the derivative of the equilibrium wage in the excluded country with respect to the level of intra-bloc trade costs.

After some manipulations, we obtain:

$$\frac{\partial IMP_A^R}{\partial w_A} \cdot \frac{\partial w_A}{\partial t_1} = \frac{\frac{\alpha_2}{\alpha_1}(1-\sigma) \cdot \tau_2^{1-\sigma} w_A^{-\sigma} \cdot \left(1+\tau_1^{(1-\sigma)}\right)}{\left[\frac{\alpha_2}{\alpha_1} \cdot \left(1+\tau_1^{(1-\sigma)}\right) + (\tau_2 w_A)^{(1-\sigma)}\right]^2} \cdot \frac{\partial w_A}{\partial t_1} \tag{4.96}$$

Having proved that $\frac{\partial w_A}{\partial \tau_1}$ is always positive and assumed given $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 0$ and $\tau_1 > 0$, we conclude that the derivative in (4.95) has a negative sign for any value of the parameters .

It follows that the reduction in the equilibrium relative wage in the excluded country due to a marginal reduction in the level of intra-bloc trade costs increases the volume of imports of any member country from the excluded country.

The indirect effect of the formation of the currency union increases then the volume of imports of any member country from the excluded country, compared to the initial equilibrium.

Finally, in order to investigate the overall effect of the formation of the currency union on the volume of imports of any member country from the excluded country, we compute the total derivative of (4.33) with respect to the level of intra-bloc trade costs, taking into account that the equilibrium relative wage in the excluded country is a function of level of intra-bloc trade costs. After some manipulations, we have:

$$\frac{\partial IMP_A^R}{\partial \tau_1} = \frac{\frac{\alpha_2}{\alpha_1}(\sigma-1)\tau_2^{(1-\sigma)} w_A^{-\sigma} \cdot \left[\tau_1^{-\sigma} w_A - \left(1+\tau_1^{(1-\sigma)}\right) \cdot \frac{\partial w_A}{\partial t_1}\right]}{\left[\frac{\alpha_2}{\alpha_1}\left(1+\tau_1^{(1-\sigma)}\right) + (\tau_2 w_A)^{(1-\sigma)}\right]^2} \tag{4.97}$$

The volume of imports of any member country from the excluded country will decrease due a marginal reduction in the intra-bloc trade costs if the total derivative expressed in (4.96) is positive.

Having assumed $\sigma > 1$, $\alpha_1 > 0$ and $\alpha_2 > 0$, $\tau_2 > 1$, and $\tau_1 > 1$, the denominator of (4.96) is always positive such that the total derivative will be positive only if its numerator is positive. After some manipulations we obtain that the numerator of (4.96) will be positive only if the following condition is satisfied:

$$\frac{\partial w_A}{\partial \tau_1} < \frac{\tau_1^{-\sigma} \cdot w_A}{1 + \tau_1^{(1-\sigma)}} \tag{4.98}$$

Given $\frac{\partial w_A}{\partial \tau_1}$ expressed in (4.85), the condition expressed in (4.97) may be rewritten as:

$$\frac{\frac{\partial G}{\partial \tau_1} \cdot \left(1 + \tau_1^{(1-\sigma)}\right) - \tau_1^{(-\sigma)} \cdot (w_A) \cdot \frac{\partial G}{\partial w_A}}{\frac{\partial G}{\partial w_A} \cdot \left(1 + \tau_1^{(1-\sigma)}\right)} < 0 \tag{97'}$$

where $\frac{\partial G}{\partial w_A}$ and $\frac{\partial G}{\partial \tau_1}$ are expressed in (4.86) and (4.87), respectively.

Having proved that $\frac{\partial G}{\partial w_A}$ is always positive, given our assumptions on the parameters of the model, the denominator of (4.97′) is always positive.

Furthermore, since we showed that $\frac{\partial G}{\partial \tau_1}$ is negative for any value of the parameters, it follows that the numerator of (4.97′) will be always positive, implying that the condition expressed in (4.97) will always be verified.

It follows that the numerator of (4.96) is negative for any value of the parameters such that the volume of imports of any member country from the excluded country will reduce due to a marginal reduction in the level of intra-bloc trade costs.

Thus, the formation of the currency union unambiguously decreases the volume of imports of any member country from excluded country compared to the initial equilibrium since the negative effect of the reduction in the intra-bloc trade costs is greater than the positive effect of the general equilibrium induced reduction in the relative wage in the excluded country.

We conclude that the volume of bilateral trade between any member country and the excluded country unambiguously reduces following the formation of the currency union since both the volume of exports and imports of any member to and from the excluded country will reduce.

4.8.5 Proof of Proposition 12

Given expression (4.84), the wage equation in the equilibrium characterized by the existence of a currency union between the two symmetric member countries is:

$$1-\frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2\cdot\widehat{w}_A^{(1-2\sigma)}+2\frac{\alpha_1}{\alpha_2}\widehat{w}_A^{-\sigma}\tau_2^{(1-\sigma)}}{1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\left(\tau_2\cdot\widehat{w}_A\right)^{(1-\sigma)}}=0 \tag{4.99}$$

In order to investigate the general equilibrium induced relative wage effect of the enlargement of the currency union toward the accession country, we investigate how a marginal reduction in the extra-bloc trade costs would affect the equilibrium relative wage in the accession country.

Defining as G_1 the left-hand side of (4.98), the implicit function theorem implies that:

$$\frac{\partial\widehat{w}_A}{\partial\tau_2}=-\frac{\frac{\partial G_1}{\partial\tau_2}}{\frac{\partial G_1}{\partial\widehat{w}_A}} \tag{4.100}$$

$$\frac{\partial G_1}{\partial\tau_2}=\frac{+2\frac{\alpha_1}{\alpha_2}\left(\sigma-1\right)\tau_2^{-\sigma}\widehat{w}_A^{(-\sigma)}\cdot\left[1+\delta_1^{(1-\sigma)}\right]-\left(\sigma-1\right)\cdot\left(\frac{\alpha_1}{\alpha_2}\right)^3\cdot\tau_2^{-\sigma}\widehat{w}_A^{(2-3\sigma)}}{\left[1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\left(\tau_2\cdot\widehat{w}_A\right)^{(1-\sigma)}\right]^2} \tag{4.101}$$

$$\frac{\partial G_1}{\partial w_1}=\frac{\begin{array}{c}\left[\left(2\sigma-1\right)\left(\frac{\alpha_1}{\alpha_2}\right)^2\cdot\widehat{w}_A^{-2\sigma}+2\frac{\alpha_1}{\alpha_2}\sigma\cdot\widehat{w}_A^{(-\sigma-1)}\cdot\tau_2^{(1-\sigma)}\right]\cdot\left(1+\delta_1^{(1-\sigma)}\right)+\\ +\sigma\left(\frac{\alpha_1}{\alpha_2}\right)^3\cdot\widehat{w}_A^{(1-3\sigma)}\tau_2^{(1-\sigma)}+2\left(\frac{\alpha_1}{\alpha_2}\right)^2\widehat{w}_A^{(-2\sigma)}\tau_2^{2(1-\sigma)}\end{array}}{\left[1+\delta_1^{(1-\sigma)}+\frac{\alpha_1}{\alpha_2}\left(\tau_2\cdot\widehat{w}_A\right)^{(1-\sigma)}\right]^2} \tag{4.102}$$

Given expression (4.99), in order to assess the sign of $\frac{\partial\widehat{w}_A}{\partial\tau_2}$ we focus on the analysis of the signs of $\frac{\partial G_1}{\partial\tau_2}$ and $\frac{\partial G_1}{\partial\widehat{w}_A}$ expressed in equations (4.100) and (4.101), respectively.

First, we note that, having assumed that $\alpha_1>0,\alpha_2>0$, $\tau_1>1$, $\tau_2>1$ and $\sigma>1$, $\frac{\partial G_1}{\partial w_1}$ is positive for any value of the parameters.

In order to assess the sign of $\frac{\partial G_1}{\partial \tau_2}$, we note that since the denominator of (4.100) is positive for any value of the parameters, having assumed that $\alpha_1 > 0$, $\alpha_2 > 0$, $\delta_1 > 1$ and $\tau_2 > 1$, we may focus on its numerator.

After some manipulations, it is possible to show that the numerator of (4.100) will be positive when the equilibrium wage in the accession country satisfies the following condition:

$$\widehat{w}_A > \frac{\left(\frac{\alpha_1}{\alpha_2}\right)^{\frac{1}{(\sigma-1)}}}{\left[2 \cdot \left(1+\delta_1^{(1-\sigma)}\right)\right]^{\frac{1}{2(\sigma-1)}}} \tag{4.103}$$

Since the equilibrium wage in the accession country is such that the wage equation in (4.98) is 'satisfied, if we substitute into the wage equation the value specified in the right-hand side of (4.102) for the equilibrium wage and the wage equation is not satisfied, then the equilibrium wage in the accession country will never assume the specified value.

Furthermore, if we substitute in (4.98) the right hand side of (4.102) for the equilibrium wage in the accession country and G_1 is negative we conclude that the equilibrium wage will be greater than the specified value since we previously proved that $\frac{\partial G_1}{\partial \widehat{w}_A}$ is positive for any value of the parameters.

Substituting the right-hand side of (4.102) for the equilibrium wage into the wage equation in (4.98), after some simplifications we may rewrite G_1 as:

$$G_1 = \frac{\begin{array}{c}\left(\frac{\alpha_1}{\alpha_2}\right)^{\frac{\sigma}{(\sigma-1)}} \cdot 2^{\frac{\sigma}{2(1-\sigma)}} \cdot \left[1+\delta_1^{(1-\sigma)}\right]^{\frac{\sigma-2}{2\cdot(\sigma-1)}} - \frac{\alpha_1}{\alpha_2} \cdot 2^{\frac{1}{2}} \cdot \left[1+\delta_1^{(1-\sigma)}\right]^{\frac{1}{2}} + \\ -\frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)} \cdot \left\{2 - \left[\frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2}{2\cdot\left(1+\delta_1^{(1-\sigma)}\right)}\right]^{\frac{1}{2(\sigma-1)}}\right\}\end{array}}{1+\delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}\tau_2^{(1-\sigma)} \cdot \left[\frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2}{2\cdot\left(1+\delta_1^{(1-\sigma)}\right)}\right]^{-\frac{1}{2}}} \tag{4.104}$$

In order to assess the sign of (4.103), we can focus on its numerator since its

denominator is positive for any value of the parameters given that $\alpha_1 > 0$, $\alpha_2 > 0$, $\delta_1 > 1$ and $\tau_2 > 1$.

Notably, we have:

$$\frac{\alpha_1}{\alpha_2} > \left(\frac{\alpha_1}{\alpha_2}\right)^{\frac{\sigma}{(\sigma-1)}}$$

$$2^{\frac{1}{2}} > 2^{\frac{\sigma}{2(1-\sigma)}}$$

$$\left[1+\delta_1^{(1-\sigma)}\right]^{\frac{1}{2}} > \left(1+(\tau_1)^{(1-\sigma)}\right)^{\frac{\sigma-2}{2\cdot(\sigma-1)}}$$

$$2 > \left[\frac{\left(\frac{\alpha_1}{\alpha_2}\right)^2}{2+2\delta_1^{(1-\sigma)}}\right]^{\frac{1}{2(\sigma-1)}}$$

Since the numerator of (4.103) has a negative sign for any value of the parameters, G_1 is always negative such that the equilibrium wage in the accession country will always satisfy the condition in (4.102).

It follows that $\frac{\partial G_1}{\partial \tau_2}$ will have a positive sign for any value of the parameters of the model.

Having proved that $\frac{\partial G_1}{\partial \tau_2} > 0$ and $\frac{\partial G_1}{\partial \widehat{w}_A} > 0$ and given equation (4.98), for any value of the parameters we have:

$$\frac{\partial \widehat{w}_A}{\partial \tau_2} < 0$$

We conclude that the enlargement of the currency union to the accession country, implying a reduction in the level of extra-bloc trade costs, will lead to an increase in the equilibrium relative wage in the accession country, compared to the equilibrium in which the accession country is excluded from the currency union.

4.8.6 Proof of Proposition 13

The enlargement of the currency union to the accession country affects the volume of bilateral trade between any of the original members and the accession country by reducing the extra-bloc trade costs, and by leading to a the general equilibrium induced increase in the equilibrium relative wage in the accession country.

In order to investigate the implications of the direct effect of the enlargement of the currency union, that is the reduction in the extra-bloc trade costs, on the volume of exports of any original member country to the accession country, we compute the partial derivative of equation (57), with respect to the level of extra-bloc trade costs, assuming the equilibrium relative wage in the accession country to be unchanged.

After some manipulations, we have:

$$\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2, \widehat{\widehat{w}_A}} = \frac{(1-\sigma)\,\tau_2^{-\sigma} \cdot \frac{\alpha_1}{\alpha_2} \cdot \hat{w}_A^{(2-\sigma)}}{\left[\frac{\alpha_1}{\alpha_2} \cdot \hat{w}_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}\right]^2} \tag{4.105}$$

Having assumed $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, and $\tau_2 > 1$, the derivative expressed in (4.104) is negative for any value of the parameters.

It follows that a marginal reduction in the level of extra-bloc trade costs will increase the volume of exports of any original member country to the accession country, assuming that the equilibrium relative wage in the accession country is unchanged.

We conclude that the direct effect of the enlargement of the currency union increases the volume of exports of any original member country to the accession country compared to the equilibrium in which the accession country is excluded from the currency union.

In order to investigate the implications of the indirect effect of the enlargement of the currency i.e. the general equilibrium induced increase in the relative wage in the accession country, on the volume of exports of any original member to the accession country we compute the partial derivative of equation (4.57), with respect to the equilibrium relative wage in the accession country times the derivative of the equilibrium relative wage in the accession with respect to the level of extra-bloc trade

costs.

After some simplifications, we obtain:

$$\frac{\partial \widehat{EXP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = \frac{2\tau_2^{2(1-\sigma)} + \sigma \frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} \tau_2^{1-\sigma}}{\left[\frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}\right]^2} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} \tag{4.106}$$

Having proved that $\frac{\partial \widehat{w}_A}{\partial \tau_2}$, expressed in (4.99), is always negative and assumed that $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, and $\tau_2 > 1$, the derivative in (4.105) is negative for any value of the parameters.

It follows that the increase in the equilibrium relative wage in the accession country due to a marginal reduction in the level of extra-bloc trade costs will increase in the volume of exports of any member country to the accession country.

We conclude that the indirect effect of the enlargement of the currency union increases the volume of exports of any member country to the accession country, compared to the equilibrium in which the accession country is excluded from the currency union.

In order to assess the overall effect of the enlargement of the currency union on the volume of export of any member country to the accession country, we compute the total derivative of (4.57) with respect to the level of extra-bloc trade costs, taking into account that the equilibrium relative wage in the accession country is a function of level of extra-bloc trade costs.

After some manipulations, the overall derivative is:

$$\frac{\partial \widehat{EXP}_A^R}{\partial \tau_2} = \frac{(1-\sigma)\tau_2^{-\sigma} \cdot \frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(2-\sigma)} + \frac{\partial \widehat{w}_A}{\partial \tau_2} \cdot 2\tau_2^{2(1-\sigma)} + \sigma \frac{\alpha_1}{\alpha_2} \frac{\partial \widehat{w}_A}{\partial \tau_2} \cdot \widehat{w}_A^{(1-\sigma)} \cdot \tau_2^{(1-\sigma)}}{\left[\frac{\alpha_1}{\alpha_2} \cdot \widehat{w}_A^{(1-\sigma)} + 2\tau_2^{(1-\sigma)}\right]^2} \tag{4.107}$$

Having assumed that $\sigma > 1$, $\alpha_1 > 0$ and $\alpha_2 > 0$, and $\tau_2 > 1$, the denominator of (4.106) is always positive while, having proved that $\frac{\partial \widehat{w}_A}{\partial t_2} < 0$, the numerator of (4.106) is negative for any value of the parameters of the model.

Since the total derivative expressed in (4.106) is always a negative, the volume of exports of any original member country to the accession country will increase due to marginal reduction of the level of extra-bloc trade costs.

We conclude that the enlargement of the currency union unambiguously increases the volume of exports of any original member country to the accession country compared to the equilibrium in which the accession country is excluded from the currency union.

The volume of exports of any member country to the accession country will increase due to the reduction in the level of extra-bloc trade costs and the general equilibrium induced increase in the relative wage in the accession country following the enlargement.

In order to assess the direct effect of the enlargement of the currency union on the volume of imports of any original member country from the accession country, we compute the partial derivative of equation (4.58) with respect to the level of intra-bloc trade costs, assuming unchanged the equilibrium wage in the accession country.

Thus, we have:

$$\frac{\partial \widehat{IMP}_A^R}{\partial \tau_2, \widehat{\widehat{w}_A}} = \frac{\widehat{w}_A^{(-\sigma)} \cdot (1-\sigma) \cdot \tau_2^{-\sigma} \cdot \frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right)}{\left[\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^2} \tag{4.108}$$

Since we assumed $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 1$, the partial derivative in (4.107) is always negative.

It follows that a marginal reduction in the level of extra-bloc trade costs increases the volume of imports of any original member country from the accession country, assuming unchanged the equilibrium relative wage in the accession country.

We can affirm that the direct effect of the enlargement of the currency union increases the volume of imports of any original member from the accession country compared to the equilibrium in which the accession country is excluded from the currency union.

In order to evaluate the implications of the indirect effect of the enlargement of the

currency union on the volume of imports of any member from the accession country, we compute the partial derivative of (4.58) with respect to the equilibrium relative wage in the accession country times the derivative of the equilibrium relative wage in the accession country with respect to the level of extra-bloc trade costs.

After some simplifications, we obtain:

$$\frac{\partial \widehat{IMP}_A^R}{\partial \widehat{w}_A} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} = \frac{-\sigma \tau_2^{(1-\sigma)} \frac{\alpha_2}{\alpha_1} \left(1 + \delta_1^{(1-\sigma)}\right) \widehat{w}_A^{(-\sigma-1)} - \tau_2^{2(1-\sigma)} \widehat{w}_A^{(-2\sigma)}}{\left[\frac{\alpha_2}{\alpha_1} \left(1 + \delta_1^{(1-\sigma)}\right) + (\tau_2 \widehat{w}_A)^{(1-\sigma)}\right]^2} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2} \quad (4.109)$$

Since we proved that $\frac{\partial \widehat{w}_A}{\partial \tau_2}$, expressed in (4.99), is always negative and we assumed that $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 1$, the expression in (4.108) will have a positive sign for any value of the parameters.

It follows that the increase in the equilibrium wage in the accession country due to a marginal reduction in the level of extra-bloc trade costs decreases the volume of imports of any member country from the accession country.

Thus, the indirect effect of the enlargement of the currency union increases the volume of imports of any member country from the accession country, compared to the equilibrium in which the accession country is excluded from the currency union.

In order to examine the overall effect of the enlargement of the currency union on the volume of imports of any original member country from the accession country, we compute the total derivative of (4.58) with respect to the extra-bloc trade costs, taking into account that the equilibrium relative wage in the accession country is a function of the extra-bloc trade costs.

After some manipulations, the total derivative is given by:

$$\frac{\partial \widehat{IMP}_A^R}{\partial \tau_2} = \frac{\begin{array}{c}\left[(1-\sigma)\tau_2^{-\sigma} - \sigma\tau_2^{(1-\sigma)} \cdot \widehat{w}_A^{(-1)} \frac{\partial \widehat{w}_A}{\partial \tau_2}\right] \cdot \\ \cdot \widehat{w}_A^{(-\sigma)} \cdot \frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + \\ -\tau_2^{2(1-\sigma)} \cdot \widehat{w}_A^{(-2\sigma)} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2}\end{array}}{\left[\frac{\alpha_2}{\alpha_1} \cdot \left(1 + \delta_1^{(1-\sigma)}\right) + (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^2} \tag{4.110}$$

We observe that the volume of imports of any original member country from the accession will increase due to a marginal reduction in extra-bloc trade costs if the overall derivative expressed in (4.109) has a negative sign.

Having assumed $\sigma > 1$, $\alpha_1 > 0$ and $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 1$, the denominator of (4.109) is always positive implying that the total derivative is negative only if its numerator is negative. After some manipulations, we note that the numerator of (4.109) is negative only if the following condition is satisfied:

$$\frac{\partial \widehat{w}_A}{\partial \tau_2} > -\frac{\widehat{w}_A}{\tau_2} \tag{4.111}$$

Given $\frac{\partial w_1}{\partial \tau_2}$ expressed in (99), the condition in (4.110) may be rewritten as:

$$\frac{-\frac{dG_1}{d\tau_2} \cdot \tau_2 + w_1 \cdot \frac{dG_1}{d\widehat{w}_A}}{\frac{dG_1}{d\widehat{w}_A} \cdot \tau_2} > 0 \tag{110'}$$

where $\frac{\partial G_1}{\partial \tau_2}$ and $\frac{\partial G_1}{\partial \widehat{w}_A}$ are expressed in (4.100) and (4.101), respectively.

Having proved that $\frac{\partial G_1}{\partial \widehat{w}_A}$ is always positive, given our assumptions on the parameters of the model, the denominator of the left hand side of (4.110′) is always positive.

Furthermore, given $\frac{\partial G_1}{\partial \tau_2}$ and $\frac{\partial G_1}{\partial \widehat{w}_A}$, the numerator of the left hand side of (4.110′) may be rewritten as:

$$\left[1 + \tau_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2}(\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right] \cdot \left[2\tau_2^{(1-\sigma)}\widehat{w}_A^{(-\sigma)} + \frac{\alpha_1}{\alpha_2}(2\sigma - 1) \cdot \widehat{w}_A^{(1-2\sigma)}\right] +$$
$$+ (\sigma - 1)\left[\left(\frac{\alpha_1}{\alpha_2}\right)^2 \cdot \widehat{w}_A^{(2-3\sigma)}\tau_2^{(1-\sigma)} + 2\frac{\alpha_1}{\alpha_2}\widehat{w}_A^{(1-2\sigma)} \cdot \tau_2^{2(1-\sigma)}\right]$$

Since we assumed that $\sigma > 1$, the numerator of the left hand side of (4.110′) results

positive for any value of the parameters of the model, implying that the condition expressed in (4.110) will be verified for any value of the parameters.

It follows that the numerator of (4.109) is negative for any value of the parameters.

The volume of imports of any original member country from the accession country will reduce due to a marginal reduction in the level of intra-bloc trade costs, taking into account the general equilibrium induced increase in the equilibrium relative wage in the accession country.

Thus, the enlargement of the currency union unambiguously increases the volume of imports of any original member country from the accession country compared to the equilibrium in which the accession country is excluded from the currency union.

In fact, the positive effect implied by the reduction in extra-bloc trade costs will be greater than the negative effect of the general equilibrium implied increase in the equilibrium wage in the accession country.

We conclude that the volume of bilateral trade between any of the original member countries and the accession country unambiguously increases due to the enlargement of the currency union since both the volume of exports and imports of any original member to and from the accession country will increase.

4.8.7 Proof of Proposition 14

The enlargement of the currency union to the accession country affects the volume of bilateral trade between the two original member countries by reducing the extra-bloc trade costs, and by the general equilibrium induced increase in the relative wage in the accession country.

In order to investigate the trade implications of direct effect of the enlargement of the currency union, that is the reduction in the level of extra-bloc trade costs on the volume between the two original member countries, we compute the partial derivative of equation (4.56), with respect to the level of extra-bloc trade costs, assuming the equilibrium relative wage in the accession country to be unchanged.

Thus, after some manipulations, we have:

$$\frac{\partial \widehat{BIL}_R^R}{\partial \tau_2, \widehat{w}_A} = \frac{2\delta_1^{(1-\sigma)} \cdot \frac{\alpha_1}{\alpha_2} (\sigma - 1) \tau_2^{-\sigma} \cdot \widehat{w}_A^{(1-\sigma)}}{\left[1 + \delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^2} \tag{4.112}$$

Having assumed $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 0$, the derivative expressed in (4.111) has a positive sign for any value of the parameters.

It follows that a marginal reduction in the extra-bloc trade costs will decrease the volume of bilateral trade realized between the original member countries.

We can affirm that the direct effect of the enlargement of the currency union decreases the volume of bilateral trade between the original member countries, compared to the equilibrium in which the accession country is excluded from the currency union.

In order to investigate the impact of the indirect effect of the enlargement of the currency union i.e. the general equilibrium implied reduction in the relative wage in the accession country, we compute the partial derivative of (4.56) with respect to the equilibrium relative wage in the accession country times the derivative of the equilibrium relative wage in the accession country with respect to the level of extra-bloc trade costs.

After some simplifications, we have:

$$\frac{\partial \widehat{BIL}_R^R}{\partial \widehat{w}_A} = \frac{2\delta_1^{(1-\sigma)} \cdot \frac{\alpha_1}{\alpha_2} \cdot (\sigma - 1) \cdot \tau_2^{(1-\sigma)} \cdot \widehat{w}_A^{(-\sigma)} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2}}{\left[1 + \delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^2} \tag{4.113}$$

Having proved that $\frac{\partial \widehat{w}_A}{\partial \tau_2}$, expressed in (4.99), is always negative and assumed that $\sigma > 1$, $\alpha_1 > 0$, $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 1$, the expression in (4.112) will have a negative sign for any value of the parameters.

It follows that the general equilibrium implied increase in the relative wage in the accession country due to a marginal reduction in the level of extra-bloc trade costs increases the volume of bilateral trade between the original member countries.

Thus, the indirect effect of the enlargement of the currency union increases the volume of bilateral trade between the two original members of the currency union, compared to the equilibrium in which the accession country is excluded from the cur-

rency union.

Finally, in order to investigate the overall effect of the enlargement of the currency union on the volume of bilateral trade between the original member countries, we compute the total derivative of (4.58) with respect to the level of extra-bloc trade costs, taking into account that the equilibrium relative wage in the accession country is a function of the extra-bloc trade costs.

After some manipulations, we obtain:

$$\frac{\partial \widehat{BIL}_R^R}{\partial \tau_2} = \frac{2\delta_1^{(1-\sigma)} \cdot \frac{\alpha_1}{\alpha_2} \cdot (\sigma - 1) \cdot \left[\tau_2^{-\sigma} \widehat{w}_A^{(1-\sigma)} + \tau_2^{1-\sigma} \widehat{w}_A^{(-\sigma)} \cdot \frac{\partial \widehat{w}_A}{\partial \tau_2}\right]}{\left[1 + \delta_1^{(1-\sigma)} + \frac{\alpha_1}{\alpha_2} (\tau_2 \cdot \widehat{w}_A)^{(1-\sigma)}\right]^2} \tag{4.114}$$

The volume of bilateral trade between the original member countries decreases due to the enlargement of the currency union if the overall derivative expressed in (4.113) is positive.

Since we assumed $\alpha_1 > 0$ and $\alpha_2 > 0$, $\tau_2 > 1$, and $\delta_1 > 1$, the denominator of (4.113) is always positive such that the overall derivative is positive if its numerator is positive.

After some manipulations, we have that the numerator of (4.113) will be positive if:

$$\frac{\partial \widehat{w}_A}{\partial \tau_2} > -\frac{\widehat{w}_A}{\tau_2}$$

Having shown in the proof of Proposition 14 that the above condition is verified for any value of the parameters, we note that the numerator of (4.113) is always positive such that the total derivative expressed in (4.113) is positive for any value of the parameters.

Thus, a marginal reduction in the level of extra-bloc trade costs reduces the volume of bilateral trade between member countries, taking into account the general equilibrium induced increase in the equilibrium relative wage in the accession country.

We conclude that the enlargement of the currency union unambiguously decreases the volume of bilateral trade between the original member countries compared to the equilibrium in which the accession country is excluded from the currency union.

In fact, the negative effect of the reduction in the extra-bloc trade costs is greater than the positive effect of the general equilibrium induced increase in the relative equilibrium wage in the accession country.

Chapter 5

Conclusions

This thesis contributed in several ways to the theoretical literature that studies regionalism and its dynamic time-path effect, that is whether regionalism provides an impetus to, or detract from the multilateral non-discriminatory freeing of trade.

First, this thesis contributed to the literature by addressing the question of whether there are incentives for a regional trading bloc to enlarge through further extensions of its membership, or to reject new membership requests.

Thus, the analysis we provided in Chapter 2 filled a gap in the existing literature which had so far focused on the incentives for third countries to join regional trading bloc assuming that any country asking for membership in a regional trading bloc would be admitted in it.

Notably, we developed a theoretical model in which the incentives for a regional trading bloc to enlarge, and for third countries to join are formalized, and the enlargement of the bloc endogenously arises from the interaction between supply of, and demand for membership.

Our theoretical model is the first in the literature to formalise the supply of membership of a regional trading bloc, and to provide a formal analysis of the incentives underpinning members' decision on whether to accept or reject third countries' membership requests.

In addition, our model is the first to formalise the enlargement of a regional trading

bloc as endogenously determined by the interaction of the supply of, and demand for membership.

Assuming a political economy setting à la Grossman-Helpman (1994), we showed that pro and anti-enlargement forces operate in a regional trading bloc, and the regional policy-maker's choice to enlarge or not to is a political equilibrium that balances these contrasting forces.

Our analysis indicated that industrial lobbing may operate as a pro- or an anti-enlargement force in the policy-making process depending on the initial size of the regional trading bloc.

On the other hand, we emphasised that the higher level of aggregate social welfare that could be achieved if the regional policy-maker chose to enlarge the regional trading bloc represents a pro-enlargement force in the policy-making process.

Notably, we showed that due to interaction between pro- and anti-enlargement forces, a maximum size of the regional trading bloc exists beyond which the regional policy-maker will prevent any further enlargement to avoid a loss in the political support it receives, labelled as the supply-side implied maximum size of the bloc.

Furthermore, we formalised the enlargement of a regional trading bloc as the endogenous outcome of the interaction between the supply of membership of the bloc, and the demand of membership from third countries.

Our analysis showed that when the size of a regional trading bloc is smaller than its supply-side implied maximum size, the bloc will enlarge in the event of a request for membership from third countries.

However, once the regional bloc has reached its supply-side implied maximum size, the regional policy-maker will not be willing to further enlarge the bloc such that any eventual request for membership from third countries will not be satisfied.

On these grounds, we emphasised that the equilibrium size of a regional trading bloc cannot exceed the supply-side implied maximum size of the bloc since the supply-side of membership will be binding on further enlargements once this maximum size has been reached.

In addition, we showed that the equilibrium size of a regional trading bloc might be smaller than its supply-side implied maximum size if third countries' requests for membership are not "numerous" enough such that the demand-side of membership is binding on further enlargements of the bloc.

The analysis we developed in Chapter 2 also studied how a process of deeper integration among the members of a regional trading bloc might affect the equilibrium size of the bloc.

In this regard, drawing on our theoretical framework we showed that deeper integration within a regional trading bloc contracts the maximum size to which the regional policy-maker is willing to enlarge the bloc, while it boosts the demand of membership from third countries. Notably, we showed that the impact of deeper integration on the equilibrium size of a regional trading bloc depends on whether the supply-side or the demand-side of membership are binding in the determination of the equilibrium size of the bloc.

We concluded that deeper integration among the members of a regional trading bloc might lead to wider integration when the demand-side for membership is binding in the determination of the equilibrium size of the bloc.

On the other hand, a process of deeper integration within a regional trading bloc will not affect the equilibrium size of the bloc when the supply-side of membership is binding in the determination of the equilibrium size of the bloc.

Second, this thesis contributed to the literature by formalising the incentives for a country to enter a regional trade agreement when a multilateral free trade agreement is available, and the implications of this choice on the country's incentives to pursue multilateral trade liberalization.

Thus, in Chapter 3 we developed a theoretical model which depicted a regional trade agreement and a multilateral free trade agreement as alternative options of trade policy, and formalised a country's choice between the two alternative trade agreements.

Assuming a political economic framework à la Grossman-Helpman (1994), our analysis pointed out that pro- and anti-regionalism forces operate, and the choice

of the incumbent policy-maker is a political equilibrium that balances these opposing forces.

In this regard, we showed that industrial lobbying constitutes a pro-regionalism force in the policy-making process, while the higher level of net aggregate social welfare that could be achieved under the multilateral free trade agreement operates as an anti-regionalism force.

Thus, we derived a condition which reflected the interaction between pro and anti-regionalism forces in the policy-making process, and under which the policy-maker prefers to enter a regional trade agreement rather than a multilateral free trade agreement.

We concluded that the decision of entering a regional trade agreement rather than a multilateral free trade agreement is a choice of political economy driven by the policy-maker's objective to maximize the political support it receives.

Furthermore, the analysis we developed in Chapter 3 pointed out the implications of a country's initial choice of entering a regional trade agreement on its incentives to subsequently move toward multilateral trade liberalization.

In this regard we proved that in our theoretical framework where policy-maker balances the industrial interests and social welfare in choosing its trade policy, the choice of regionalism unambiguously undermines multilateral trade liberalisation.

Notably, our analysis indicated that when a country chooses to enter a regional trade agreement, further multilateral trade liberalization will no longer be pursued since the policy-maker will have no incentives to move from the *status quo*.

Third, this thesis contributed to the literature by providing a general equilibrium analysis of the trade implications of deeper integration within a regional trading bloc, and by assessing the impact of economic dissimilarities on the magnitude of the identified trade effects.

Thus, in Chapter 4 we developed a theoretical general equilibrium model which formalised the trade effects of the formation of a currency union among the members of a regional trading bloc, and of its subsequent enlargement toward an economically

dissimilar accession country.

We built an intra-industry trade model in which economic dissimilarities across countries exist, and sharing a common currency affects the patterns of trade by eliminating the transaction costs due to the use of different currencies, and by affecting the relative wage across countries.

The analysis we conducted in Chapter 4 pointed out that the formation of a currency union among the members of a regional trading bloc increases the volume of bilateral trade between members, and reduces the volume of bilateral trade between members and non-members.

In this regard, we emphasized that the formation of a currency union affects the patterns of trade of members and non-members by reducing intra-bloc transaction costs, and leading to a general equilibrium induced reduction in the relative wage in non-member countries.

Our analysis also proved that the enlargement of a currency union toward an economically dissimilar country increases the volume of bilateral trade between the original members and the accession country, and reduces the volume of bilateral trade between the original members.

We emphasized that the enlargement of a currency union affects the patterns of trade of the original members and the accession country by reducing the extra-bloc transaction costs, and to a general equilibrium induced increase in the relative wage in the accession country.

Furthermore, the analysis conducted in Chapter 4 pointed out the implications of greater economic dissimilarities between the original members of a currency union and an accession country on the magnitude of the trade effects implied by the enlargement of the currency union.

Thus, simulating our theoretical model, we showed that the more economically dissimilar the accession country compared to the original members, the smaller the gains in the volume of bilateral trade between any member and the accession country fostered by the enlargement.

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