

Flexibility in Trade Bloc Design

April 2010

(Work in progress – please do not cite without the permission of the authors)

Mark Melatos, *University of Sydney*[#]

Stephanie Dunn, *Reserve Bank of Australia*^{*}

Abstract

A key characteristic of any trade bloc is its degree of “flexibility” – the extent to which it can be modified or augmented by existing members. This paper investigates how prospective trade bloc members value the flexibility of proposed trade agreements in a changing trading environment. We demonstrate that, depending on the type of trade shock, countries may prefer either more or less flexible trade blocs. In particular, if a country is expected to liberalise trade policy, its trade partners will tend to prefer less (more) trade bloc flexibility the more (fewer) domestically domiciled firms they have relative to other countries. On the other hand, if a country is expected to become more trade protectionist in the future, all nations prefer more rigid trade agreements. Our endogenous coalition formation results are also consistent with three stylized facts which characterize regionalism: (i) overlapping trade agreements, (ii) the popularity of free trade areas relative to customs unions and (iii) renegotiation or disbandment of existing trade agreements is rare. Finally, for the first time in the literature, we provide clear predictions about the identity of “hub” and “spoke” trade bloc members when overlapping free trade areas arise in equilibrium.

Keywords: Trade agreement flexibility, optimal trade bloc design, regional trade agreements, free trade areas, customs unions.

JEL classification: F12, F13, F15.

[#] Corresponding author. Faculty of Economics and Business, University of Sydney, NSW 2006, Australia. Tel: +61 2 9036 9257; Fax: +61 2 9351 4341; Email: mark.melatos@sydney.edu.au.

^{*} The views expressed in this paper are the authors’ and do not necessarily reflect those of the Reserve Bank of Australia.

1. Introduction

Regional trade agreements (RTAs) have proliferated at an unprecedented rate in recent years. A number of stylised facts characterise this trend. First, overlapping RTAs, in which countries simultaneously belong to multiple agreements, are now common.¹ Second, in practice, RTAs are rarely disbanded or undergo significant renegotiation.² This is despite the fact that they operate in a dynamic trading environment and, hence, are unlikely to remain optimal without modification. Finally, the vast majority of RTAs take the form of free trade areas (FTAs); few customs unions (CUs) are observed.³ This is inconsistent with theoretical arguments that, from the point of view of member countries, CUs welfare-dominate FTAs.

This paper investigates how, in the context of a changing trading environment, countries make decisions about trade bloc formation and design. How does the nature of trade integration pursued today reflect beliefs about the future trading environment? In light of the stylised facts described above, three questions are of particular interest. First, in a trading world subject to shocks, how do countries decide whether to form an FTA or a CU? Second, when are countries likely to prefer to stand alone or to accept global free trade in preference to joining an RTA? Third, how does the potential for trade blocs to overlap influence these decisions? Underlying these questions is an issue that has received scant attention in the regionalism literature to date – trade bloc *flexibility*; the ease with which members can modify or augment an existing agreement. This paper represents a first attempt at understanding how nations value the degree of flexibility inherent in a trade bloc when such coalitions are (to some extent at least) irreversible. This is a crucial issue because, in a trading world subject to change, a country's attitude to trade bloc flexibility is likely to fundamentally determine the type of coalition they wish to join.⁴

There has also been relatively little analysis of how countries choose between different types of trade agreements in a static world, let alone over time. While Riezman (1985) pioneered a strand of the regionalism literature that employs coalition formation techniques to analyse trade agreement formation, much of this literature is confined to special cases.⁵ Recently, Abrego et al. (2006) and Melatos and Woodland (2007a) among others have systematically analysed coalition formation between symmetric and asymmetric countries. All these analyses, however, are static; the decision to form a particular trade agreement is assumed to be a once-off event. As a result, the potential for the trading environment to change and, hence, the inter-temporal suitability of trade bloc design is not considered. Moreover, issues of trade agreement flexibility and overlap do not arise. In this paper, we explicitly model trade bloc formation over time.

¹ Almost 75% of countries belong to two or more trade blocs simultaneously (authors' calculations based on data obtained from the WTO's *Regional Trade Agreements Information System (RTA-IS)* available at <http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx>).

² Most trade agreements include a final clause stipulating withdrawal procedures; member countries are typically required to give advance notice of 6-12 months. Nevertheless, changes to RTA membership are rare. Of 272 RTAs currently in force, 260 are "new" while only 12 relate to the accession of new members; most of the latter relate to European Union accession (WTO *RTA-IS* database). One exception, however, is Venezuela which withdrew from the Andean Pact in 2006. Even intense political pressure in the United States to "renegotiate NAFTA" has, so far, come to naught.

³ Of 272 RTAs currently in force, 161 are FTAs and only 21 are CUs (WTO *RTA-IS* database).

⁴ The practical relevance of these issues is highlighted by the 2009 issue of the WTO's *World Trade Report* which focused exclusively on the issue of trade agreement flexibility.

⁵ See Kennan and Riezman (1990) and Riezman (1999) for example.

While the regionalism literature has recently recognised the “spaghetti bowl” of overlapping trade agreements, there has been little formal analysis of the phenomenon. The potential welfare implications of a “hub-and-spoke” system of RTAs are discussed by Wonnacott (1996a, b) and Granados and Cornejo (2006). Krueger (1997a, b) also discusses overlapping FTAs. However, this work does not explain the formation of such agreements. Moreover, while illuminating, existing work is largely descriptive. There has been little attempt to formally model the formation of overlapping trade agreements.

Wonnacott (1996a) and Krueger (1997b) argue that overlapping trade agreements dilute the value of concessions (for member countries) associated with forming an RTA. Overlap alters trade and investment patterns reducing welfare via the increased administration and enforcement costs incurred in order to prove origin. Moreover, industry has more opportunity to lobby for protection. The problems with trade bloc overlap, however, fail to explain its pervasiveness. One of the main themes of this paper is that, in a trading environment subject to change, countries will pursue overlapping trade blocs if the benefits of doing so outweigh the costs.

In the existing literature, trade bloc flexibility has been addressed extensively in terms of the inclusion of “contingency measures” such as safeguards and antidumping procedures in trade agreements.⁶ While the inclusion of such measures tends to reduce the (terms-of-trade) benefits arising from cooperation, their inclusion, allows countries to respond to changes in the trading environment, enabling governments to credibly commit to time-consistent trade liberalisation and address the contractual incompleteness of trade agreements (Copeland, 1990; Ethier, 2002; Guriev and Klimenko, 2009; Horn et al., 2010).

A number of studies have demonstrated the particular benefits that can arise from the inclusion of contingency measures in trade agreements. Bagwell and Staiger (1990) show that such flexibilities act to forestall more extreme protectionist tendencies. Rosendorff and Milner (2001) and Bagwell and Staiger (2005) argue that contingency measures help governments garner current domestic support for trade liberalisation in a stochastic world in which future support for free trade is not guaranteed. Fischer and Prusa (2003) and Freund and Ozden (2008) demonstrate that flexible trade blocs may “shelter” firms in member countries from fluctuations in world prices. Paradoxically, Riezman (1991) and Martin and Vergote (2008) show that contingency measures in trade agreements may also help solidify cooperation between member countries who wish to avoid being targeted by such measures.

Since contingency measures are a characteristic common to all types of trade agreements this form of trade agreement flexibility is unlikely to explain the stylised facts identified at the outset of this paper. The literature on contingency measures in trade agreements does not (seek to) explain the popularity of FTAs relative to CUs nor the phenomenon of overlapping FTAs. Since these are our chief concerns, we focus on an alternative form of trade bloc flexibility in this paper.

Contingency measures enhance trade bloc flexibility by facilitating a *temporary* departure from existing trade commitments in response to a *temporary* change in the trading environment. Since such departures are WTO-compatible they invariably occur *within the framework of an existing trade agreement*. In contrast, since the stylised facts we are seeking to explain in this paper reflect countries’ (irreversible) trade bloc membership decisions, they are likely to be related to more *permanent* changes in the trading environment. As such, we define trade bloc

⁶ See WTO (2009) for a comprehensive and highly accessible survey of this literature.

flexibility as the degree to which countries can modify or augment an existing trade agreement; in particular the ability of a bloc member to *change their coalition membership status* in response to a permanent shock to the trading environment.

In order to understand why countries may value trade bloc flexibility, first consider when such flexibility considerations would be irrelevant. In a static trading world, the degree of flexibility is of no concern since countries' preference orderings over potential coalitions never change. Trade agreement flexibility is also irrelevant when such blocs can be disbanded or renegotiated costlessly. In this case, countries can break or modify existing trade agreements freely (and optimally) in response to changes in the trading environment. In short, trade bloc flexibility is an issue if and only if: (i) the trading world is subject to (anticipated or unanticipated) shocks which alter a country's preference ordering over types of trade agreements and (ii) trade blocs, once formed are, to some extent, irreversible – due, for example, to non-trivial reputational costs.⁷ These two crucial assumptions underpin the results in this paper.

The role of irreversibility in trade bloc formation has been the subject of little formal analysis in the regionalism literature. In a trading world subject to change, this is an important oversight because irreversibility implies that bloc formation is time dependent. The decision to establish a trade agreement, its design, and the identity of members all depend on coalition formation decisions taken by trading nations in the past. In other words, trade bloc formation and design depends, not just on the current trading environment, but also (implicitly) on the *past* trading environment.

Irreversibility also implies that prospective members face a trade-off between rigid and flexible trade agreement design. Rigid trade blocs not only have the potential to yield immediate monopoly power benefits for their members, they also serve to lock-in members to a free-trade future with each other. Moreover, the ability of non-members to form (overlapping) trade agreements with member countries in the future is reduced the more rigid the design of the bloc. In other words, *inflexibility* in RTA design has an *insurance value* to prospective members.⁸ On the other hand, flexibility makes it easier for member countries to respond to changes in the trading environment – flexibility in RTA design has an *option value* to prospective members.⁹

In a trading environment subject to change, therefore, irreversibility provides an incentive for countries to be forward-looking when committing to a trade bloc. A country's coalition formation decision reflects its desired degree of flexibility. In particular, a country's preferred depth of integration reflects a desire to insure itself against trade environment shocks while maintaining an option to respond to changes. In this paper we explicitly model the costs and benefits of trade bloc flexibility.

In a world of trade bloc irreversibility the degree of agreement flexibility varies with coalition type. At one extreme, standing alone affords a country

⁷ Schwartz and Sykes (2002) argue that the costs of renegeing on trade agreements are twofold; the renegeing country suffers reputational and credibility costs when dealing with the injured country in the future and also incurs costs when dealing with all other nations aware of the breach. Maggi (1999) suggests that the dissemination of information is a primary role of the WTO, informing third parties of trade agreement breaches and thus strengthening the enforcement mechanism of reputational costs.

⁸ Ethier (2002) refers to the insurance motive for contingency measures (i.e. unilateralism) within a multilateral framework.

⁹ Observed behaviour confirms that nations consider the impact of (expected) future shocks when deciding whether or not to join a trade agreement. Perroni and Whalley (2000) argue that small countries may seek to join RTAs as insurance against future protection. According to Whalley (1998), one of Canada's main motivations for joining the Canada-US free trade agreement in 1989 was to obtain some respite from anti-dumping and countervailing duties by US producers.

maximum flexibility to respond to changes in the trading environment. At the other extreme, global free trade implies minimum coalitional flexibility. Regional agreements such as FTAs and CUs provide members with intermediate levels of coalitional flexibility. A CU, however, represents a more rigid (and deep) level of trade integration than a FTA. Union members levy a “common external tariff” (CET) on non-members and the CET revenue is shared according to an agreed formula. Partners in an FTA, on the other hand, choose their own external tariff rates, but must agree on a schedule of “rules-of-origin” (RoO) that determine the duty-free status of goods originating in non-member nations but traded within the FTA. While RoO impose additional costs on the operation of a FTA, they prevent non-members exploiting (i.e. arbitraging away) the external tariff choice autonomy of FTA members. In this respect, RoO enhance the coalitional flexibility of FTAs.

This paper is based on the following conjecture: that the growth in overlapping trade blocs reflects the prohibitively high (reputational) cost of ‘undoing’ (i.e., reneging on) a trade agreement. Consequently, and consistent with the stylised facts described, countries adapt to changes in the trading environment by forming new trade blocs *in addition to* their existing agreements – overlapping RTAs result.

Note that while breaking an existing trade agreement is costly, so too is establishing an overlapping agreement. The costs of overlap relate to the amount of compensation a country must pay members of their existing agreement in order to be allowed to establish a new, concurrent RTA. Since a CU requires members to coordinate their choice of external tariffs, these costs of overlap are greater when a CU is involved.¹⁰ For example, the establishment of an FTA involving a member of an existing CU requires the cooperation of both members of the original CU. The establishment of a CU which shares a member with an existing FTA requires all the CU members to levy a zero tariff on all members of the original FTA. For simplicity, in this paper we abstract from these issues by assuming that countries can only form overlapping trade blocs that *do not* require the payment of compensation. In practice, this means that only FTAs can overlap in our analysis. While this is a restrictive assumption, the primary aim of this paper is simply to demonstrate that, in a trading world subject to change, trade bloc irreversibility leads countries to pursue trade agreements of varying levels of flexibility.

So how do changes in the trading environment influence the value potential members place on trade agreement flexibility? In this paper, we focus on one particular type of change; namely, changes in future trade costs. We demonstrate that if these costs are expected to decline in the future, a country prefers less (more) flexible trade agreements the more (fewer) domestically domiciled firms it has relative to other countries. On the other hand, if trade costs are expected to rise in the future, potential RTA members opt for relatively *inflexible* RTAs now. The intuition for these results is that, in forming trade blocs, countries balance the impact on consumer surplus with the opportunity to shift profits from foreign firms. The fewer domestic firms there are, the greater the gains from free trade to domestic consumers and the less opportunity to shift profits from foreign firms. When more trade is expected in the future, countries want more flexible trade blocs to take advantage of this. – the opportunity cost of not taking advantage of anticipated fall in future trade costs (i.e. more trade) will be greater ... countries want more flexible trade blocs. When less trade expected in the future,

¹⁰ This is consistent with Crawford and Fiorentino (2005) who demonstrate that FTAs are concluded more rapidly than CU agreements.

The intuition for these results is straightforward. In the case of expected future trade liberalisation, the opportunity cost associated with membership of an inflexible trade bloc is significant. Member countries locked-in to such an agreement are unable to exploit the new trading opportunities. In the case of an expected increase in future trade protection, the opportunity cost associated with greater trade bloc flexibility is large. In the latter case, therefore, member countries can use inflexible trade agreements to lock-in trade partners to a free-trade strategy into the future. We can characterise these preferences over flexibility in terms of, on the one hand, a policymaker's desire for the *option* to alter trade policy in light of changes to the trading environment, versus her desire for *insurance* against trade policy changes by trade partners on the other.

The paper proceeds as follows. Section 2 sets out the theoretical model. Section 3 discusses individual country preferences for trade agreement flexibility while Section 4 analyses equilibrium coalition formation. Section 5 concludes.

2. The Model

In the spirit of Krishna (1998), Freund (2000) and Ornelas (2007), we specify a 3-country partial equilibrium model of world trade. There are N firms world-wide; N_X domiciled in Country X , N_Y in Country Y and N_Z in Country Z , $N_X, N_Y, N_Z > 0$.

Markets are assumed to be segmented.¹¹ Within each market firms compete on Cournot terms, producing a homogeneous good at constant marginal cost $c > 0$ (identical across firms and countries). Demand for this good in Country i is given by $P_i = A_i - Q_i$ where P_i is its price, Q_i is the total quantity and $A_i (> c > 0)$ is a demand parameter. Country i can levy a specific tariff $t_i^j \geq 0$ on imports from Country j .

Trade occurs over two periods. Trade agreements can form in each period, but, once established, they cannot be reversed. Effectively, therefore, the costs of disbanding a trade bloc are prohibitive. Between periods one and two, a trade shock occurs. For simplicity, we assume that this exogenous and perfectly anticipated shock either opens an autarkic country to trade (case 1) or renders an existing trading nation autarkic (case 2).¹²

In each period, countries play a three-stage game. First, trade agreements are formed. Second, given these coalitions, optimal tariffs are chosen. Third, firms engage in Cournot competition to select their profit maximising outputs; markets clear establishing equilibrium. In period 2, this game is repeated subject to the coalitions formed in period 1. We solve backwards for a subgame perfect Nash equilibrium.

2.1 Stage Three: Firm Output Choice

Since markets are segmented, we focus our attention on country X . The analysis is analogous for countries Y and Z . Demand for the homogeneous good in country X is

¹¹ Significant price discrimination is observed even in highly integrated markets. See, for example, Goldberg and Verboven's (2005) study of the European car industry and Raimondos-Møller and Schmitt's (2010) discussion of parallel imports within the European Union. In integrated markets, market segmentation may be unrelated to member country trade policies arising, for example, due to differences in: (i) consumer tastes or income (Malueg and Schwartz, 1994), (ii) demand intensity across markets (Raff and Schmitt, 2007) or (iii) government regulation (Grossman and Lai, 2008).

¹² Alternatively, the trade shock could be modeled more generally as a continuous trade costs variable.

given by $Q_X^D = A_X - P_X$ and total supply by $Q_X^S = N_X q_X^X + N_Y q_X^Y + N_Z q_X^Z$. Since all firms regardless of origin have identical costs, we focus on the symmetric equilibrium in which all firms of common nationality sell the same output in a particular market.

The profit a firm domiciled in Country j makes from selling in Country X can be written as $\pi_X^j = (P_X - c - t_X^j) q_X^j$, $j = X, Y, Z$. A Country- j firm chooses q_X^j to maximise this profit subject to the output choices of its Cournot competitors and independent of its own output choices in other markets. The first order condition is

$$\frac{\partial \pi_X^j}{\partial q_X^j} = (P_X - c - t_X^j) - q_X^j = 0, \quad j = X, Y, Z. \quad (1)$$

Equation system (1) comprises three best-response functions, one for each country, in three unknowns. Solving this system yields Nash equilibrium outputs of the form:

$$\begin{aligned} q_X^X &= \frac{(A_X - c) + N_Y t_X^Y + N_Z t_X^Z}{1 + N_X + N_Y + N_Z} \\ q_X^Y &= \frac{(A_X - c) - (1 + N_X + N_Z) t_X^Y + N_Z t_X^Z}{1 + N_X + N_Y + N_Z} \\ q_X^Z &= \frac{(A_X - c) + N_Y t_X^Y - (1 + N_X + N_Y) t_X^Z}{1 + N_X + N_Y + N_Z} \end{aligned} \quad (2)$$

Note that tariffs levied by Country X on imports from Country Y (or Z) reduces the volume of imports from Country Y (Z) while raising the volume of imports from Z (Y) and the level of domestic sales by Country X firms. The size of these impacts is weighted by the number of firms domiciled in each country. For example, the impact of t_X^Y on q_X^Y is weighted by $(1 + N_X + N_Z)$. Intuitively, this captures the degree of competition Country Y firms face in supplying X ; that is, how readily X can access alternative sources of supply to replace units no longer imported from Y . Similarly, the impact of country X tariffs on domestic sales is weighted by N_Y and N_Z - the more foreign firms there are, the more supply ‘slack’ needs to be covered by domestic firms once the higher tariff are introduced.

In equilibrium the goods market clears such that $Q_X^D = Q_X^S$. Substituting the output expressions from (2) into the demand function yields the following solution for the equilibrium price of the homogeneous good in country X :

$$P_X = \frac{A_X + c(N_X + N_Y + N_Z) + N_Y t_X^Y + N_Z t_X^Z}{1 + N_X + N_Y + N_Z} \quad (3)$$

Note from equation (3) that if $t_X^Y, t_X^Z \geq 0$, $P_X > 0$. Once again, note that local tariffs raise the domestic price by an amount weighted by the number of foreign firms. Intuitively, the larger the number of foreign firms, the more foreign supply will be choked off by higher tariffs; the upward pressure on domestic prices will be greater.

As can be seen from equations (2) and (3), an important implication of segmented markets is that a country’s tariffs influence neither the price nor output

levels in other countries. In other words, there is no tariff externality and, hence, no terms-of-trade welfare benefit associated with tariffs. This is important because, under perfect competition, the main reason for the welfare dominance of CUs over FTAs is that the former allows members to internalise the tariff externality. In this paper, there is no terms-of-trade benefit associated with forming a CU.

2.2 Stage Two: Optimal Tariff Choice

Policymakers choose optimal tariffs. For country X (analogous for Y and Z), national

welfare is given by: $W_X = \frac{Q_X^2}{2} + (t_X^Y N_Y q_X^Y + t_X^Z N_Z q_X^Z) + \sum_{i=X,Y,Z} N_X (P_i - c - t_i^X) q_i^X$. The

first term measures consumer surplus. The second and third terms capture tariff revenue. The final term represents the total profit made by Country- X firms. Note that, under segmented markets, the foreign profits of domestic firms only depend on the tariff rates set by the policymaker in the export destination; the domestic policymaker cannot influence her firms' foreign profits.

In choosing optimal tariffs, countries adhere to the most favoured nation (MFN) principle which underpins the WTO. That is, when setting tariff rates, countries treat all their trade partners equally. The only exception to this rule is made for RTA members who are permitted to discriminate in favour of fellow members.

In the case in which all countries stand alone, referred to here as "unilateral tariff setting" (UTS), MFN implies that $t_X^Y = t_X^Z = t_{X,UTS}$, $t_Y^X = t_Y^Z = t_{Y,UTS}$ and $t_Z^X = t_Z^Y = t_{Z,UTS}$. Countries choose MFN tariff rates to maximize their national welfare, i.e. $\frac{\partial W_i}{\partial t_{i,UTS}} = 0$, $i = X, Y, Z$. For Country X , the optimal UTS tariff is:

$$t_{X,UTS} = \frac{(A-c)(1+2N_X)}{2+2N_X(2+N_X)+N_Y+N_Z} \quad (4)$$

In the case where Country Z stands alone while countries X and Y form a free trade area, $FTA(X,Y)$, bilateral trade between countries X and Y is duty free, i.e. $t_X^Y = t_Y^X = 0$. Country X 's optimal tariff on the excluded country Z takes the form:

$$t_{X,FTAy}^Z = \frac{(A-c)(1+2N_X)}{2(1+N_X+N_Y)^2+N_Z+2N_YN_Z} \quad (5)$$

In the case where Country Z stands alone while countries X and Y form a customs union, $CU(X,Y)$, countries X and Y levy zero tariffs on each other as well as a common external tariff (CET) on imports from the excluded country Z , i.e. $t_X^Y = t_Y^X = 0$ and $t_X^Z = t_Y^Z = t_{CET,CU(X,Y)}^Z$. In choosing the optimal CET, countries X and Y maximise a weighted sum of their national welfare, $W_{CU(X,Y)} = \gamma W_X + (1-\gamma) W_Y$. In this paper, the weights are set to $\gamma = 1/2$ exogenously.¹³ In this case, the optimal CET levied on the excluded country Z takes the form:

¹³ Melatos and Woodland (2007b, 2009) point out that the choice of weights in the customs union social welfare function can influence which coalition structure is observed in equilibrium.

$$t_{CET, CU_{xy}}^Z = \frac{(A-c)(1+2N_X+2N_Y)}{2(1+N_X+N_Y)^2+N_Z} \quad (6)$$

In our framework, other coalition structures are also possible. In particular, we consider the case of global free trade (*GFT*) in which all trade regardless of origin or destination is duty free. Furthermore, we consider the possibility of overlapping FTAs. To illustrate the tariff equilibrium in this latter case, consider the situation in which $FTA(X,Y)$ and $FTA(X,Z)$ coexist. In this case, $t_X^Y = t_Y^X = 0$ and $t_X^Z = t_Z^X = 0$. Hence only two optimal tariff rates require to be solved for, t_Y^Z and t_Z^Y which, in this framework, are identical to $t_{Y,UTS}$ and $t_{Z,UTS}$ respectively. In fact, for all the coalition structures analysed in this paper, the equilibrium tariff rates are either analogous or identical to the rates defined in equations (4), (5) and (6).

Finally, note that, provided that $A > c > 0$ tariff rates are always positive. That is, given the framework implemented here, import subsidies are not possible. As pointed out earlier, this ensures that the price of the homogeneous good is always positive. With the optimal tariff rate expressions now in hand for each possible coalition structure we are able to rewrite equilibrium outputs, price and national welfare purely as functions of the model parameters.

2.3 Stage One: Coalition Formation

Having determined the welfare implications of each potential coalition structure, countries can select their preferred option from the menu of possible outcomes. Following Riezman (1985, 1999), the solution concept employed here is the core. A coalition structure resides in the core if it is not blocked by any coalition. A coalition, S , blocks a coalition structure, T , if for all countries i in S , $U^i(S) \geq U^i(T)$, with strict inequality for at least one member of S .

While countries choose a sequence of coalitions to maximize their two-period welfare,¹⁴ the assumed irreversibility of trade blocs implies that, in period 2, the feasible set of coalitions is constrained by the coalitions formed in the period 1. Tables 1 and 2 list the feasible two-period sequences of coalition structures that can occur in the “trade liberalisation” and “trade protection” cases respectively.

[insert Tables 1 and 2 about here]

Note that when Country Z is autarkic $FTA(X,Y)$ and $CU(X,Y)$ are equivalent. Moreover, while overlapping FTAs are allowed, CUs are not permitted to overlap with an FTA.¹⁵ If a CU overlaps with an existing FTA, or an FTA overlaps with an existing CU, the CET is necessarily zero and one union member will be obliged to levy this duty free rate in the face of a positive tariff from its trade partner outside the union. By forbidding CU-FTA overlap, the analysis is simplified by removing the need to consider compensatory income transfers between trade bloc members.¹⁶

¹⁴ For simplicity we abstract from time discounting.

¹⁵ In this model, if CUs overlap with each other global free trade (considered separately) results.

¹⁶ The role of compensation in trade bloc overlap is an important issue deserving of separate study.

Finally, note that countries are permitted to join multiple feasible trade blocs simultaneously in either period. That is, countries can form overlapping FTAs simultaneously. Furthermore, while existing trade blocs can be augmented with overlapping agreements, they can also be deepened or extended. Hence, a FTA in period 1 can mature into a CU or global free trade in period 2.

2.4 Trade Shocks

We have argued that countries' coalition formation decisions are likely to change in response to changes in the trading environment. To demonstrate how, we examine two cases of very simple, stylized (and exogenous) trade shocks.

The first case represents expected future "trade liberalization", modeled as the extreme case in which an initially autarkic Country Z opens to world trade in period 2. In solving this case, the above model is augmented with the following additional restrictions in period 1: $q_Z^X = q_Z^Y = q_X^Z = q_Y^Z = 0$. The second case represents an (extreme) episode of expected future "trade protection" in which Country Z , a trading nation in period 1, becomes autarkic in period 2. In solving this case, the following additional restrictions are imposed in period 2: $q_Z^X = q_Z^Y = q_X^Z = q_Y^Z = 0$. Note that in the "trade protection" case, although Country Z is isolated in period 2, we assume that it continues to trade freely with any country with which it concluded a trade agreement in period 1. This captures the insurance motive for trade bloc formation.

These shocks are admittedly simplistic. However, our aim is not to model any specific real-world shocks. Rather, we simply wish to demonstrate that the nature of changes to the trading environment influences trade bloc formation. Of course, changes to the trading environment may not (as assumed here) be exogenous to trade policy decision-making. Nevertheless, we abstract from such complications in the interests of highlighting trade bloc formation and design issues while keeping our analysis as simple as possible. Having said this, a more robust treatment would investigate how changes to a continuous trade cost variable influences trade bloc formation. Qualitatively, this is unlikely to change the tenor of our results.

2.5 Some Important Relationships

In this section, we derive two important results which are important for clarifying the intuition behind the propositions presented in later sections.

Lemma 1. *Country i welfare is inversely related to foreign tariffs.*

Proof. See Appendix A.

The intuition behind Lemma 1 is that foreign tariffs shift profit from domestic to foreign firms. Given segmented markets this negative welfare impact is not offset by any positive impacts on domestic consumer welfare or tariff revenue. Lemma 1 implies that, other things being equal, if a country's trade partners levy "sufficiently high" tariffs on its exports, it will seek to avoid them. In this model, the mechanism for avoiding such trade taxes is to form a trade agreement with the levying country.

When are domestic firms likely to face "sufficiently high" foreign tariffs? Lemma 2 provides the answer.

Lemma 2.

- (i). *Country i 's optimal equilibrium tariffs are inversely related to the number of firms domiciled in Country i , provided that N_i is "sufficiently large" compared to the number of firms domiciled in the rest of the world.*
- (ii). *The optimal equilibrium CET for $CU(i,j)$ is inversely related to the number of firms domiciled in Country i and Country j provided that N_i and N_j are "sufficiently large" compared to the number of firms domiciled in the rest of the world.*

Proof. See Appendix A.

The intuition behind Lemma 2 is as follows. First, note that a country's consumer surplus, tariff revenue and the domestic profitability of local firms depend on its own (not foreign) tariffs. In contrast, the profitability of domestic firms in each foreign market depends, in each case, on the tariff levied in that market (not on the tariff rates levied by the firm's home country or any other nation).

In choosing its optimal tariff, therefore, a country balances (or CU members jointly balance) the impact of its tariff on consumer surplus, tariff revenue and the domestic profitability of local firms. First, described in Section 2.1, an increase in domestic tariffs will raise domestic prices and domestic sales by more the greater the number of foreign-domiciled firms relative to domestic firms. Second, the fall in foreign firm sales in the domestic market will be greater the more local firms there are. Third, as is clear from the definition of national welfare, an increase in domestic tariffs will raise tariff revenue by more the more firms are domiciled abroad. Overall, therefore, while higher domestic tariffs help shift profits to local firms (and tariff revenue to the local government), the reduction in consumer surplus may be even greater if there are too many local firms. In short, countries with many local firms relative to their trading partners will tend to levy lower tariffs.¹⁷

Lemma 3. *A prospective hub country prefers overlapping FTAs to a global free trade agreement.*

Proof. By example. Without loss of generality, consider the coalition structure $\{FTA(X,Y), \{Z\}\}$. In this case, Lemma 3 implies that Country X prefers to augment $FTA(X,Y)$ with the overlapping trade bloc $FTA(X,Z)$ rather than extend $FTA(X,Y)$ into a global free trade agreement. This is because under overlap, Country X firms benefit from higher domestic prices in Y and Z as those countries levy positive tariff rates on each other. At the same time, imports in Y and Z from X are duty free just as they would be under global free trade.

3 Preference for Flexibility in Trade Agreement Design

In this section we demonstrate that in a trading world such as that described in the previous section, the desire for trade bloc flexibility varies with country characteristics as well as with the nature of the shock. The model described above does not yield easily interpretable closed form solutions. Therefore, it must be

¹⁷ Note that, in this model, it is important not to confuse the number of domestically domiciled firms with country size. Here, countries with more firms levy lower tariffs; that is they act like the "small" countries of traditional analysis. Remember, however, that in this model, there are no terms of trade effects. Hence the traditional definition of a "small" country does not apply.

simulated. In the simulations that follow, all countries have identical demands but the distribution of firms is unequal across countries. In particular, $A_i = 10 \forall i$, $c = 1$ and $N_Z = 5$. The number of firms in X and Y vary in the range $N_X, N_Y \in [1, 50]$.¹⁸

For the trade liberalization case, Figure 1 shows, how Country X 's trade bloc preferences vary with the international distribution of firms. For each cell, the shading reveals Country X 's preferred 2-period sequence of coalition structures. That is, the sequence that maximizes Country X 's total 2-period (undiscounted) welfare.

[Insert Figure 1 about here]

The contents of each cell in Figure 1 indicate whether Country X 's preferred 2-period coalition sequence is consistent with welfare maximisation in periods 1 and 2 separately. Empty cells, indicate that it is. Cells populated with a “&”, however, indicate that while, in a static world, X would prefer to establish $FTA(X, Y)$ or $CU(X, Y)$ in period 1, concern for its second period welfare induces it to choose a less preferred coalition structure in the first period in order to maximise its total 2-period welfare. Cells labelled “\$” meanwhile, indicate that X prefers a 2-period coalition sequence which is inconsistent with welfare maximization in the *second* period.

In order to interpret Figure 1, note first that the bolded border cell at $(N_X, N_Y) = (5, 5)$ represents the symmetric equilibrium in which all three countries are identical. At this point, Country X 's welfare is maximized if in period 1 it forms $FTA(X, Y)$, and, in period 2 it forms an overlapping FTA with country Z .

Figure 1 reveals that if a sufficiently large number of firms are domiciled in Country Y relative to countries X and Z (the red, blue and green-shaded regions), Country X prefers to stand alone in period 1 and undertake regional integration in period 2. The only exception to this is in the blue-shaded region where Country X prefers to stand alone in *both* periods. If, on the other hand, a sufficiently large number of firms are domiciled in Country X relative to countries Y and Z (the yellow-shaded region), then X prefers to undertake regional integration from the first period. Moreover, comparing the yellow and green-shaded regions, note that in each case, Country X wishes to form overlapping FTAs with Y and Z in period 2. However, in the yellow-shaded region, X forms $FTA(X, Y)$ in period 1, whereas in the green-shaded region, X prefers to stand alone in period 1. All these observations suggest that when a large (small) number of firms are domiciled in Country X , it prefers less (more) trade bloc flexibility in the first period.

Next, consider the red and yellow-shaded regions. In the red-shaded region, X prefers to form a customs union with Country Z in period 2. Remember that Country Z is autarkic in period 1 and, therefore, stands alone. For those red-shaded cells that are empty, it is the case that UTS and $CU(X, Z)$ are Country X 's welfare maximizing coalition structures in periods 1 and 2 respectively. Note, however, that a significant number of cells in the red-shaded region are marked with a “&”. This means that while Country X ultimately chooses the 2-period coalition sequence $\{UTS, CU(X, Z)\}$, its greatest utility in period 1 would actually be attained by forming $RTA(X, Y)$.¹⁹ Country X avoids forming $RTA(X, Y)$ in period 1 as doing so would preclude it from forming $CU(X, Z)$ in period 2 – remember CUs and FTAs are not permitted to overlap. It turns out that the welfare Country X gains from $CU(X, Z)$ in period 2 more than

¹⁸ Firm distributions outside this range were also analysed. Similar results were obtained.

¹⁹ Remember that $FTA(X, Y)$ and $CU(X, Y)$ are identical in period 1 because Country Z is autarkic.

compensates it for the welfare it sacrifices by standing alone in period 1 rather than forming $FTA(X,Y)$. Country X clearly appreciates the *option value* of trade bloc flexibility (i.e. standing alone) in these cases.

In the yellow-shaded region X prefers to form a FTA with Y in period 1 followed by an overlapping FTA with Z in period 2. Once again, in the majority of cases, cells in this region are empty indicating that this 2-period coalition sequence is consistent with the coalition choices that maximize X 's welfare in each period individually. A significant number of cells in the yellow-shaded region, however, are populated with a "\$". This means that while Country X ultimately prefers the two period coalition sequence $\{FTA(X,Y), FTA(X,Y) \& FTA(X,Z)\}$, its greatest utility in period 2 would be obtained by forming $CU(X,Z)$. However, X 's preferred period 1 coalition, $FTA(X,Y)$, is (by design) inconsistent with the formation of $CU(X,Z)$ in period 2. In fact, for $CU(X,Z)$ to be feasible in period 2, Country X would have to stand alone in period 1 (see Table 1). That X does not choose to form $CU(X,Z)$ in period 2 reflects the fact that the higher period 2 payoff from $CU(X,Z)$ does not compensate for the lower period 1 welfare associated with standing alone. The *option value* of trade bloc flexibility in these cases is clearly insufficient to tempt Country X .

The preceding discussion suggests the following proposition.

Proposition 1. *If trade agreements are irreversible and trade liberalization is expected by some country in the future, then a non-liberalising country prefers less (more) trade bloc flexibility the more (fewer) domestically domiciled firms it has relative to other countries.*

The lemmas derived in Section 2.5 drive this result. Lemma 1 implies that, other things being equal, countries form trade agreements to avoid high tariffs levied by their trading partners. At the same time, Lemma 2 tells us that the fewer firms are domiciled in a particular country (above some minimum number), the higher its domestic tariffs will be.

Thus, in the yellow-shaded region in Figure 1 where N_Y and N_Z are relatively small compared to N_X , Country X wants free trade with both Y and Z to avoid the high tariff rates these latter countries would otherwise impose on its exports. Since overlapping CUs are equivalent to GFT , and since from Lemma 3 we know that a "hub" country prefers overlapping FTAs to GFT , then Country X prefers $FTA(X,Y) \& FTA(X,Z)$ in period 2.

In the red-shaded region where N_Y and N_X are large relative to N_Z Country X wants free trade with Z which would otherwise impose high tariff rates on its imports. Country X prefers $CU(X,Z)$ to $FTA(X,Z)$ because the CU internalizes the tariff externality by allowing X and Z to choose their external tariffs jointly. Similarly, in the purple shaded region, Countries X and Y have a small number of domestic firms relative to Z . Country X , therefore, seeks free trade (a CU) with Country Y in order to avoid the latter's relatively high-tariff rates.

When N_X becomes smaller relative to N_Y and N_Z (the blue-shaded region), Country X prefers to stand alone in both periods as the high tariffs it levies on imports from Y and Z shift sufficient profits from those countries to outweigh the associated consumer surplus losses to Country X consumers. However, if N_X becomes too small (the green-shaded region), the consumer surplus gains from free trade outweigh profit shifting gains resulting from X 's high tariffs. This is because, while each X firm makes higher profits, the total profit shift to Country X is small since there are so few

firms domiciled there. In this case, consumer surplus concerns once again dominate and Country X again prefers overlapping FTAs with Y and Z .

Finally, it is worth noting a heartening feature of Figure 1; overlapping FTAs are commonly, though not always, preferred. In fact, Figure 1 demonstrates that a country, at a given point of time, may prefer to stand alone (the red-shaded region), be a member of a single CU (the purple and red-shaded regions), be a member of a single FTA (the yellow and blue-shaded region) or be a member of multiple FTAs simultaneously (the green and yellow shaded regions). Figure 1, therefore, reflects the observed diversity of trade agreement designs.

Turning to the case of future “trade protection”, Figure 2 suggests the following proposition.

Proposition 2. *If trade agreements are irreversible and some country is expected to become more trade protectionist in the future, then all non-liberalising countries tend to prefer greater trade bloc rigidity.*

[Insert Figure 2 about here]

Proposition 2 suggests that in a world in which increased levels of trade protection are expected in the future, *there is no desire for trade bloc flexibility*. This is demonstrated by two characteristics of X 's preferences in Figure 2. First, in spite of the trade shock, X keeps its trade bloc membership status constant over both periods. Second, in contrast to the trade liberalization case illustrated in Figure 1, X 's preferred first period coalition structures provide no leeway for modification or augmentation in period 2 (see Table 2). This is despite the fact that flexible trade bloc designs are available, and sometimes even preferred, in period 1.

In the red-shaded region in Figure 2, Country X prefers $CU(X,Z)$ in period 1.²⁰ Due to irreversibility, this endures in period 2. In period 2, however, when Y only trades with its period one trade bloc partners or not at all, X would prefer to be the hub country in the overlapping agreements $FTA(X,Y)$ and $FTA(X,Z)$. In order to achieve this, X could choose to form the flexible bloc $FTA(X,Z)$ in period 1 instead of $CU(X,Z)$. The fact that it does not do this, shows that in these cases the option value associated with flexible trade agreements is insufficient to compensate for the welfare forgone in period 1 by not forming $CU(X,Z)$. Effectively, therefore, Country X seeks to “lock-in” welfare gains arising from first period trade bloc formation, *insuring* itself against the constraints on period 2 coalition formation resulting from Z 's increased trade protection.

In the green-shaded region X prefers to be a hub of two overlapping trade blocs, $FTA(X,Y)$ and $FTA(X,Z)$, in both periods 1 and 2.²¹ Note that this preference maintains even when $CU(X,Z)$, $FTA(Y,Z)$ or $CU(X,Y)$ would yield a higher payoff in period 1 (respectively, the &-labelled, #-labelled and \$-labelled cells). Of course, none of these alternative first period coalition structures are consistent with X 's desire to be the hub of overlapping FTAs in period 2. The fact that X prefers to establish the overlapping agreements from the first period merely demonstrates its desire to guarantee the formation of $FTA(X,Y)$ and $FTA(X,Z)$ in period 2 even if that means sacrificing some welfare in the first period by entering into a sub-optimal period 1

²⁰ This is for the same reasons that X preferred $CU(X,Z)$ in period 2 in Figure 1 (red-shaded region).

²¹ This is for the same reasons that X preferred to form overlapping FTAs in period 2 in Figure 1 (yellow-shaded region).

trade agreement. In this case, X is compelled to “lock-in” its trade partners to a desired coalition structure from period 1 as a result of constraints imposed by trade bloc irreversibility and Country Z 's increased period 2 protectionism.

4. Equilibrium Coalition Formation

While the preceding analysis has shed light on individual country attitudes to trade bloc flexibility, it provides little guidance on what sorts of coalition structures are likely to be observed in equilibrium. In particular, are the coalition structures predicted by our model consistent with the stylized facts on trade bloc formation identified at the outset? To answer these questions and others like them, we need to analyse the contents of the core – the task undertaken in this section.

In the preceding section it was demonstrated that, consistent with reality, countries commonly prefer forming FTAs and, indeed, overlapping FTAs to alternative coalition structures. But do these preferences survive in the core? Figure 3 suggests that often they do.

[Insert Figure 3 about here]

For the case of anticipated future trade liberalization, Figure 3 identifies those cells in our simulation range in which either FTAs or CUs (or, in some cases, both) exist in the core. The green-shaded regions highlight those cells in which overlapping trade agreements are elements of the core. In the blue-shaded regions CUs are observed. Note that in some cases (the red-shaded cells) overlapping FTAs and CUs coexist in the core.

Figure 3 suggests the following two propositions.

Proposition 3. *Only customs unions between similar countries are observed in the core. In particular, CUs are observed when: (i) the non-liberalising countries are “sufficiently similar” to each other and “sufficiently dissimilar” to the liberalising country and (ii) the liberalising country and one non-liberalising country are “sufficiently similar” to each other.*

Proposition 4. *If the distribution of firms among countries is “sufficiently similar”, the core consists of either: (i) a FTA between the two countries with the smallest number of domestically domiciled firms, or (ii) overlapping FTAs in which the country with a relatively small number of domestic firms is the “hub” and the countries with the relatively large number of domestic firms are the “spokes”.*

Proposition 3 confirms a result obtained by Melatos and Woodland (2007a) in a perfectly competitive general equilibrium model of world trade. The fact that, in this paper, the same result has been derived from a partial equilibrium, imperfectly competitive model of world trade speaks to the robustness of Proposition 3.

The intuition behind Propositions 3 is as follows. In the blue shaded regions in Figure 3, two of the three nations in our trading world have a relatively large number of domestic firms. From Lemmas 1 and 2 above, we know that each of these two countries wishes to engage in free trade with the third country whose small number of domestic firms will induce it to levy high import tariffs. From the point of view of the core, however, symmetry ensures that the preferred coalition of each of the two similar countries – a CU with the dissimilar country – block each other. Now, remember that the dissimilar country will always prefer overlapping FTAs with itself

as the hub to GFT (Lemma 4). Overlapping FTAs, however, do not survive in the core when the hub country is too different to the spoke countries because the latter will always have an incentive to team-up in a CU and set a punitive CET against the hub nation. The fact that the CU members are similar means that the CET that is chosen will be close to their individually optimal external tariff rates. The net result of all this is that, in the blue-shaded regions in Figure 3, the similar countries must settle for the second-best CU among themselves that is observed in the core.

Proposition 4 is an important result that links our paper to the literature on hub and spoke trade agreements and, in particular, to the pioneering work on overlapping trade agreements by Wonnacott and Wonnacott (1996a, b). Proposition 4, to the best of our knowledge, represents the first time that a theoretical result has been derived predicting the characteristics of hub and spoke countries in overlapping trade agreements.

The intuition behind Proposition 4 is similar to that for Proposition 3. The only difference is that in the green-shaded regions in Figure 3, the international distribution of firms is more even – in each case, the dissimilar country is not too dissimilar. This means that the similar countries have less to gain from “ganging-up” on the dissimilar nation and levying a punitive CET on its imports. As a result, the surviving coalition structure in the core is characterized by overlapping FTAs with the country with the smallest number of domestic firms as the hub.

Note that Propositions 3 and 4 also hold in the case of an anticipated increase in trade protection in the future. This can be seen in Figure 4.

[Insert Figure 4 about here]

Once again, similarly sized countries tend to form customs unions among themselves – witness the sky-blue shaded regions in Figure 4. Moreover, when overlapping FTAs form, the smallest country plays the role of the “hub” while the larger countries are the spokes. It is important, however, to note an important difference between the trade liberalization and trade protection cases. In the latter case (Figure 4), Countries *X* and *Y* *never* form a CU, even when their sizes are similar. As a result, overlapping FTAs are much more commonly observed in the trade protection case than in the trade liberalization case. This occurs because, in the trade protection case, Country *Z* effectively withdraws from the trading system in period 2. This means that *X* and *Y* have a greater incentive than in the trade liberalization case to lock *Z* into a free trade arrangement before it ceases trading in period 2. The formation of $CU(X,Y)$ in period 2 would imply that Country *Z* was excluded from free trade agreements with *X* or *Y* in period 1 and does not trade with them in period 2 – a bad outcome for *X* and *Y*.

Finally, two other issues merit some comment. The first concerns the lack of renegotiation of existing trade blocs even in the face of changes to the trade environment. Figure 5 shows that in this model, such ‘coalitional inertia’ is often an element of the core. This is consistent with the third stylized fact of regionalism identified at the outset.

[Insert Figure 5 here]

Invariably, this inertia is associated with countries either standing alone in both periods or forming CUs in period 1 which endure into period 2. Note, however, that in a small number of cases – the green-shaded region in Figure 5 – countries do

pursue deeper integration in response to the anticipated liberalization of the trading environment in period 2.

The second issue worthy of comment relates to the likelihood of global free trade arising in equilibrium. Figure 6 provides some insight into this.

[Insert Figure 6 here]

Figure 6 identifies those cells in our simulation range for which *GFT* is an element (albeit, not the unique element) of the core. Note that *GFT* is much more likely to be observed if trade protection is expected to increase in the future. This is because countries look to circumvent the expected trade protection in period 2 by locking-in free trade agreements from the first period. This is another manifestation of the insurance motive for rigidity in trade bloc design.

5. Conclusion

The main aim of this paper has been to model trade bloc formation and design over time when the trading environment is changing. In the process, we have sought to highlight the role trade agreement flexibility plays in coalition formation. Moreover, we set ourselves the goal of developing a model to endogenously explain three stylized facts characterizing regionalism: (i) overlapping RTAs, (ii) the popularity of FTAs relative to CUs and (iii) renegotiation or disbandment of existing RTAs is rare.

Implementing a partial equilibrium trade model that incorporates endogenous coalition formation, we find that when trade liberalization by some country is expected in the future, its trading partners will prefer more flexible or rigid trade agreements depending on their similarity to the liberalizing country. On the other hand, when some country is expected to implement more trade protectionist policies in the future, there is no desire for trade bloc flexibility by any nation.

Our model also makes predictions regarding which coalition structures are likely to arise in equilibrium. When customs unions are observed in equilibrium, they involve similar countries. When individual free trade areas are observed in the core, the member countries are those with the fewest domestic firms. In the case where overlapping FTAs are observed the country with the smaller number of domestic firms is the “hub” while the countries with the relatively large number of domestic firms are the “spokes”. Cases of deeper integration and also a reticence to renegotiate existing trade agreements in the face of a trade shock are also observed. All of these situations are consistent with the stylized facts we set ourselves the task of explaining.

References

- Abrego, L., R. Riezman and J. Whalley (2006) “How often are propositions on the effects of regional trade agreements theoretical curiosa?” *Journal of International Economics*, **68**, pp. 59–78.
- Bagwell, K. and R. Staiger (1990) “A Theory of Managed Trade,” *American Economic Review* **80**(4), pp. 779-95.
- Bagwell, K. and R. Staiger (2005) “Enforcement, Private Political Pressure and the GATT/WTO Escape Clause,” *Journal of Legal Studies*, **34**(2), pp. 471-513.
- Copeland, B. (1990) “Strategic Interaction Among Nations: Negotiable and Non-Negotiable Trade Barriers,” *Canadian Journal of Economics*, **23**(1), pp. 84-108.
- Crawford, J. and R.V. Fiorentino (2005) “The Changing Landscape of Regional Trade Agreements,” Discussion Paper No. 8, World Trade Organization.

- Ethier, W.J. (2002) “Unilateralism in a Multilateral World,” *Economic Journal*, **112**(479), pp. 266-92.
- Fischer, R. and T. Prusa (2003) “WTO Exceptions As Insurance,” *Review of International Economics*, **11**(5), pp. 745-57.
- Freund, C. (2000) “Multilateralism and the Endogenous Formation of Preferential Trade Agreements,” *Journal of International Economics*, **52**, pp. 359-76.
- Freund, C. and Ç. Özden (2008) “Trade Policy and Loss Aversion,” *American Economic Review*, **98**(4), pp. 1675-91.
- Goldberg, P.K. and F. Verboven (2005) “Market Integration and Convergence to the Law of One Price: Evidence from the European Car Market,” *Journal of International Economics*, **65**(1), pp. 49-73.
- Granados, J. and R. Cornejo (2006) “Convergence in the Americas: Some Lessons from the DR-CAFTA Process,” *World Economy*, **29**(7), pp. 857-91.
- Grossman, G.M. and E. L-C. Lai (2008) “Parallel Imports and Price Controls,” *RAND Journal of Economics*, **39**(2), pp. 378-402.
- Guriev, S.M. and M.M. Klimenko (2010) “Duration and Term Structure of Trade Agreements,” Available at SSRN: <http://ssrn.com/abstract=1337231>.
- Horn, H., G. Maggi and R.W. Staiger (2010) “Trade Agreements as Endogenously Incomplete Contracts,” forthcoming in *American Economic Review*.
- Kennan, J. and R. Riezman (1990) “Optimal tariff equilibria with customs unions,” *Canadian Journal of Economics*, **23**(1), pp. 70–83.
- Krishna, P. (1998) “Regionalism and Multilateralism: A Political Economy Approach,” *Quarterly Journal of Economics*, **113**, pp. 227-52.
- Krueger, A.O. (1997a) “Free trade agreements versus customs unions,” *Journal of Development Economics*, **54**(1), pp. 169–87.
- Krueger, A.O. (1997b) “Problems with Overlapping Free Trade Areas” in Ito, T. and A.O. Kreuger eds., *Regionalism vs Multilateral Trade Arrangements*, Chicago: University of Chicago Press, pp. 9-23.
- Maggi, G. (1999) “The Role of Multilateral Institutions in International Trade Cooperation,” *American Economic Review*, **89**, pp. 190–214.
- Malueg, D.A. and M. Schwartz (1994) “Parallel Imports, Demand Dispersion, and International Price Discrimination,” *Journal of International Economics*, **37**(3-4), pp. 167-95.
- Martin, A. and W. Vergote (2008) “On the Role of Retaliation in Trade Agreements,” *Journal of International Economics*, **76**, pp. 61-77.
- Melatos, M. and A.D. Woodland (2007a) “Endogenous Trade Bloc Formation in an Asymmetric World,” *European Economic Review*, **51**(4), pp. 901-24.
- Melatos, M. and A. Woodland (2007b) “Pareto Optimal Delegation in Customs Unions,” *Review of International Economics*, **15**(3), pp. 441-61.
- Melatos, M. and A. Woodland (2009) “Common External Tariff Choice in Core Customs Unions,” *Review of International Economics*, **17**(2), pp. 292-303.
- Ornelas, E. (2007) “Exchanging Market Access at the Outsiders’ Expense: The Case of Customs Unions,” *Canadian Journal of Economics*, **40**(1), pp. 207-24.
- Perroni, C. and J. Whalley (2000) “The New Regionalism: Trade Liberalization or Insurance?” *Canadian Journal of Economics*, **3**, pp. 1–24.
- Raff, H. and N. Schmitt (2007) “Why Parallel Trade May Raise Producers’ Profits,” *Journal of International Economics*, **71**(2), pp. 434-47.
- Raimondos-Møller, P. and N. Schmitt (2010) “Commodity Taxes and Parallel Imports,” *Journal of Public Economics*, **94**, pp. 153-62.

- Riezman, R. (1985) “Customs unions and the core,” *Journal of International Economics*, **19**(3–4), pp. 355–65.
- Riezman, R. (1991) “Dynamic Tariffs With Asymmetric Information,” *Journal of International Economics*, **30**(3), pp. 267-83.
- Riezman, R. (1999) “Can bilateral trade agreements help induce free trade?” *Canadian Journal of Economics*, **32**(3), pp. 751–66.
- Rosendorff, B. P. and H.V. Milner (2001) “The Optimal Design of International Trade Institutions: Uncertainty and Escape,” *International Organization*, **55**(4), pp. 829-57.
- Schwartz, W. F. and A.O. Sykes (2002) “The Economic Structure of Renegotiation and Dispute Resolution in the WTO/GATT System,” *Journal of Legal Studies*, **31**(1), pp. 170-204.
- Whalley, J. (1998) “Why do Countries Seek Regional Trade Agreements?” in Frankel, J.A. ed., *The Regionalization of the World Economy*, Chicago: University of Chicago Press, pp. 63-83.
- Wonnacott, R.J. (1996a) “Free-Trade Agreements: For Better or Worse?” *American Economic Review*, **86**(2), pp. 62-6.
- Wonnacott, R.J. (1996b) “Trade and Investment in a Hub-and-Spoke System versus a Free Trade Area,” *World Economy*, **19**(3), pp. 237-52.
- World Trade Organisation (2009) *World Trade Report*, WTO Publications: Geneva.

Appendix A

Proof of Lemma 1

We prove Lemma 1 for Country X only; the proof is analogous for countries Y and Z . We wish to demonstrate that Country X welfare is inversely related to foreign MFN tariffs, t_Y and t_Z .

Consider the definition of Country X welfare in the text. Note that the assumption of segmented markets implies that foreign tariffs (i.e. t_Y and t_Z) only impact Country X welfare through the (foreign) profits Country X firms make in Y and Z , π_Y^X and π_Z^X respectively. Foreign tariffs do not influence Country X 's consumer surplus, its tariff revenue nor the domestic profits of its firms, π_X^X .

The profit of a country X firm in Y is given by: $\pi_Y^X = (P_Y - c - t_Y^X)q_Y^X$. Analogously to equation (3) in the text, an increase in Y 's MFN tariff increases P_Y by a smaller amount (since $\frac{\partial P_Y}{\partial t_Y} = \frac{N_X + N_Z}{1 + N_X + N_Y + N_Z} < 1$). Moreover, analogously to equation system (2) in the text, an increase in t_Y reduces q_Y^X . Hence, an increase in t_Z reduces Country X welfare unambiguously. Similarly, an increase in t_Z reduces Country X welfare unambiguously.

Proof of Lemma 2

We prove Lemma 2 for Country X only; the proof is analogous for countries Y and Z .

We wish to show that, for each type of coalition structure, CS, $\frac{\partial t_{X,CS}}{\partial N_X} < 0$.

Differentiating equations (4), (5) in the text with respect to N_X and (6) with respect to both N_X and N_Y yields, respectively:

$$\begin{aligned}\frac{\partial t_{X,UTS}}{\partial N_X} &= -\frac{2(A-c)[2N_X(1+N_X) - N_Y - N_Z]}{[2 + 2N_X(2+N_X) + N_Y + N_Z]^2} \\ \frac{\partial t_{X,FTA(X,Y)}}{\partial N_X} &= -\frac{2(A-c)[2N_X(1+N_X) - N_Z - 2N_Y(1+N_Y+N_Z)]}{[2(1+N_X+N_Y)^2 + N_Z + 2N_YN_Z]^2} \\ \frac{\partial t_{X,CU(X,Y)}}{\partial N_X} &= \frac{\partial t_{X,CU(X,Y)}}{\partial N_Y} = -\frac{2(A-c)[2(N_X+N_Y)(1+N_X+N_Y) - N_Z]}{4(1+N_X+N_Y)^4 + 4N_Z(1+N_X+N_Y)^2 + N_Z^2}\end{aligned}$$

Note that in each case where X stands alone or is a member of a FTA, $\frac{\partial t_{X,CS}}{\partial N_X} < 0$

provided that N_X is large enough relative to N_Y and N_Z as required by part (i) of

Lemma 2. In the case that X is a member of $CU(X,Y)$, $\frac{\partial t_{X,CS}}{\partial N_X} = \frac{\partial t_{X,CS}}{\partial N_Y} < 0$ provided

that N_X and N_X are large enough relative to N_Z as required by part (ii) of Lemma 2.

As pointed out in the text, all other coalition structures either yield identical or symmetric outcomes to UTS , $FTA(X,Y)$ and $CU(X,Y)$.

Table 1: Feasible Two-period Coalition Sequences: “Trade Liberalisation” case

Period-by-period coalition options		
Period 1 (2 countries)	Period 2 (3 countries)	2-period coalition sequence
UTS	UTS	{UTS, UTS}
	FTA(X,Y)	{UTS, FTA(X,Y)}
	FTA(X,Z)	{UTS, FTA(X,Z)}
	FTA(Y,Z)	{UTS, FTA(Y,Z)}
	CU(X,Y)	{UTS, CU(X,Y)}
	CU(X,Z)	{UTS, CU(X,Z)}
	CU(Y,Z)	{UTS, CU(Y,Z)}
	GFT	{UTS, GFT}
	FTA(X,Y) & FTA(X,Z)	{UTS, FTA(X,Y) & FTA(X,Z)}
	FTA(X,Y) & FTA(Y,Z)	{UTS, FTA(X,Y) & FTA(Y,Z)}
	FTA(X,Z) & FTA(Y,Z)	{UTS, FTA(X,Z) & FTA(Y,Z)}
FTA(X,Y)	FTA(X,Y)	{FTA(X,Y), FTA(X,Y)}
	CU(X,Y)	{FTA(X,Y), CU(X,Y)}
	FTA(X,Z)	{FTA(X,Y), FTA(X,Z)}
	FTA(Y,Z)	{FTA(X,Y), FTA(Y,Z)}
	GFT	{FTA(X,Y), GFT}
CU(X,Y)	CU(X,Y)	{CU(X,Y), CU(X,Y)}
	GFT	{CU(X,Y), GFT}

Table 2: Feasible Two-period Coalition Sequences: “Trade Protection” case

Period-by-period coalition options		
Period 1 (3 countries)	Period 2 (2 countries)	2-period coalition sequence
UTS	UTS	{UTS, UTS}
	FTA(X,Y)	{UTS, FTA(X,Y)}
	CU(X,Y)	{UTS, CU(X,Y)}
FTA(X,Y)	FTA(X,Y)	{FTA(X,Y), FTA(X,Y)}
	CU(X,Y)	{FTA(X,Y), CU(X,Y)}
FTA(X,Z)	FTA(X,Z)	{FTA(X,Z), FTA(X,Z)}
	FTA(X,Z) & FTA(X,Y)	{FTA(X,Z), FTA(X,Z) & FTA(X,Y)}
FTA(Y,Z)	FTA(Y,Z)	{FTA(Y,Z), FTA(Y,Z)}
	FTA(Y,Z) & FTA(X,Y)	{FTA(Y,Z), FTA(Y,Z) & FTA(X,Y)}
FTA(X,Y) & FTA(X,Z)	FTA(X,Y) & FTA(X,Z)	{FTA(X,Y) & FTA(X,Z), FTA(X,Y) & FTA(X,Z)}
FTA(X,Y) & FTA(Y,Z)	FTA(X,Y) & FTA(Y,Z)	{FTA(X,Y) & FTA(Y,Z), FTA(X,Y) & FTA(Y,Z)}
FTA(X,Z) & FTA(Y,Z)	FTA(X,Z) & FTA(Y,Z)	{FTA(X,Z) & FTA(Y,Z), FTA(X,Z) & FTA(Y,Z)}
	GFT	{FTA(X,Z) & FTA(Y,Z), GFT}
GFT	GFT	{GFT, GFT}
CU(X,Y)	CU(X,Y)	{CU(X,Y), CU(X,Y)}
CU(X,Z)	CU(X,Z)	{CU(X,Z), CU(X,Z)}
CU(Y,Z)	CU(Y,Z)	{CU(Y,Z), CU(Y,Z)}

Figure 1: Country X's preferred coalition structures – the future trade liberalization case

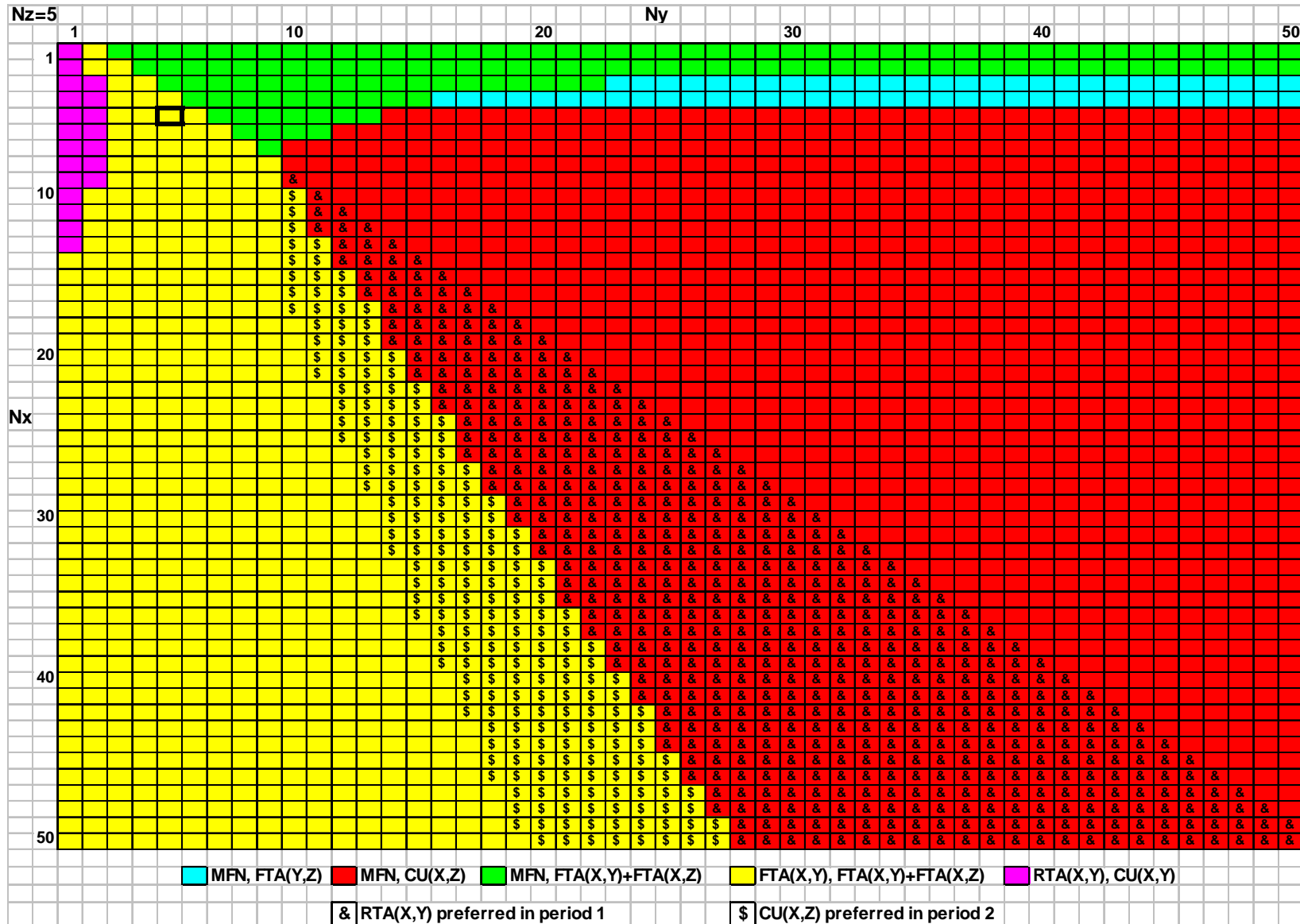


Figure 2: Country X's preferred coalition structures – the future trade protection case

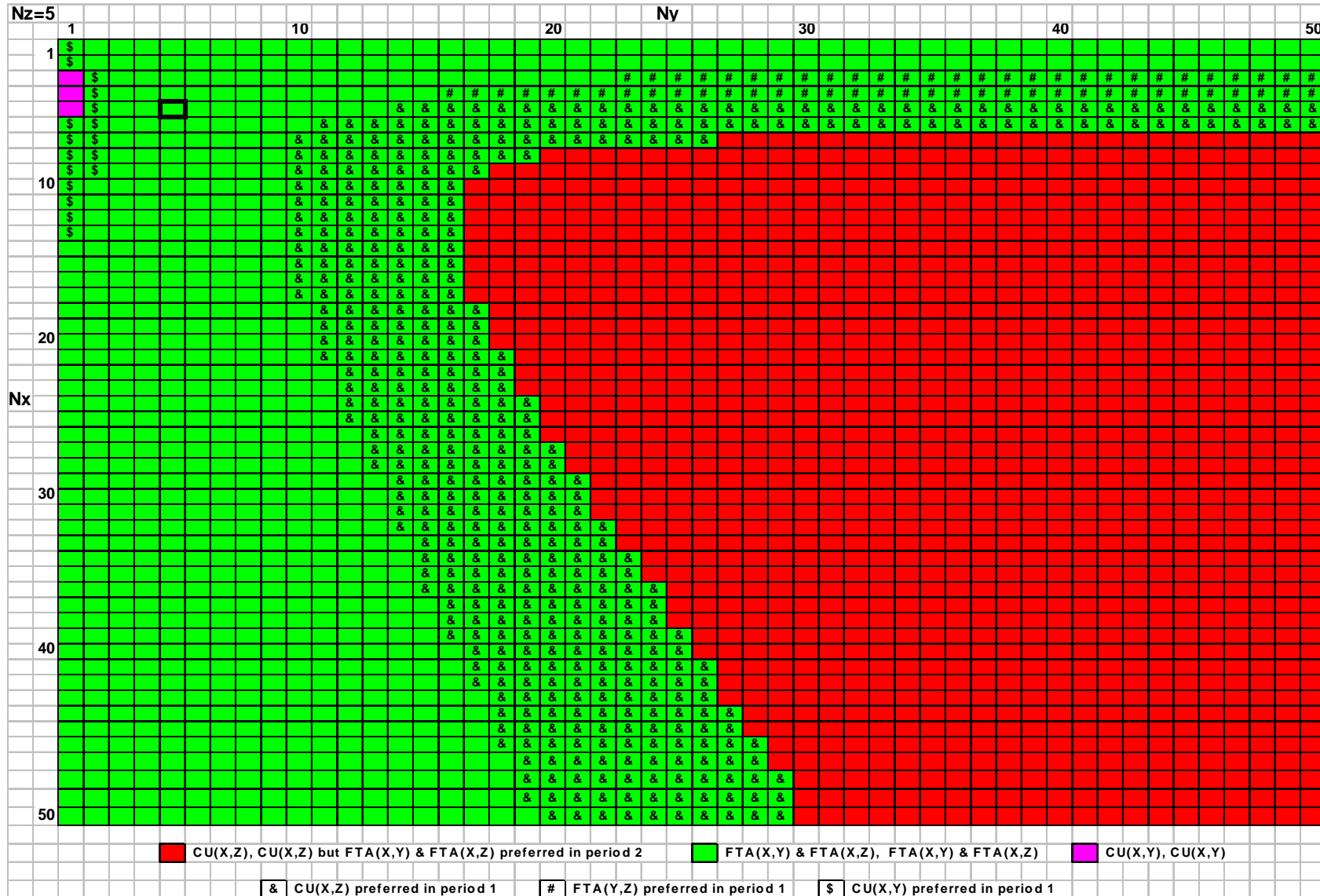


Figure 3: Core Composition – FTAs and CUs in the future trade liberalisation case



Figure 4: Core Composition – CUs, FTAs and Overlapping FTAs in the future trade protection case

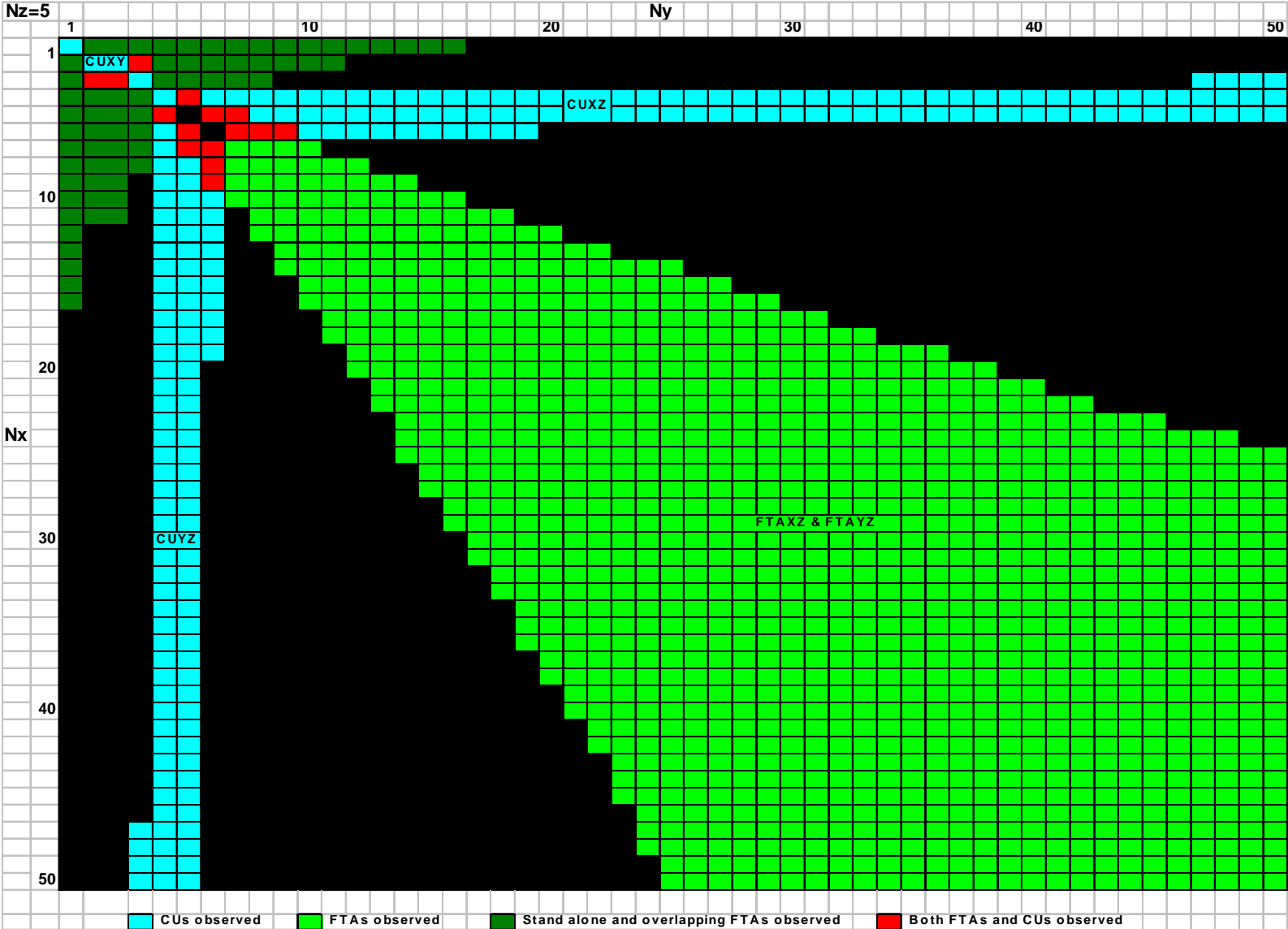


Figure 5: Core Composition – Trade Bloc “Inertia” and deeper integration in the future trade protection case



Figure 6: Core Composition – Global free trade in the future trade protection and future trade liberalization cases

