**Explaining Rising Regionalism and Failing Multilateralism:
Consensus Decision-making and Expanding WTO membership**

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PRELIMINARY DRAFT

Abstract

The beleaguered progress of the Doha Development Agenda of the WTO presents something of a puzzle for economic theory: if multilateralism is an effective forum for liberalisation (as it has been in the past), then why have the current round of talks faltered amid the proliferation of preferential trade negotiations? Several authors have argued that the consensus decision-making and single-undertaking principles of the WTO have lead to coordination failures amongst an increasingly expanded and diverse membership which has caused frustrated WTO members to form PTAs. This paper constructs a formal model which shows that the combination of the single-undertaking and consensus decision-making principles with an expanded and more diverse membership can lead to more than just coordination failure; it can render multilateralism less desirable for some parties than bilateralism. It is argued that these principles give countries de facto veto power meaning that their threat point during multilateral negotiations is a reversion to bilateral negotiations between all parties. Accordingly, countries with relatively less to gain from multilateralism can use their veto power to extract gains from those that would benefit substantially from the WTO. If an expanding membership has increased the number of such countries, then the benefits of multilateralism versus regionalism from the perspective of their negotiating partners may have been diminished to such an extent that they are no longer willing to wait for the conclusion of the Doha round before engaging in regional negotiations. This result adds credence to the idea that 'variable geometry' be introduced into the WTO system, such that it acts as an umbrella organisation for a web of sub-agreements.

1   Introduction

The beleaguered progress of the Doha Development Agenda (DDA) of the World Trade Organisation (WTO) presents something of a puzzle for economic theory: if multilateral trade negotiations are an effective forum for liberalisation (as has been the case historically), then why have the current round of talks struggled amid the proliferation of preferential trade agreements (PTAs)? Numerous authors have posited that this recent phenomenon may in part be precipitated by the combination of the specific decision-making process of the WTO and the fact that the current membership of the WTO is larger and more diverse than it was during previous rounds.[2] Two features of WTO jurisprudence underpin this diagnosis: the requirement that WTO decision-making be formed by consensus; and the single-undertaking principle. The combination of these two elements means that all aspects of a WTO negotiating round must be acceptable to all WTO members before the round can be concluded. Accordingly, it is argued that reaching unanimous decisions amongst an expanded and more diverse membership will inevitably be frustrated by coordination failure.

It is the contention of this paper that the combination of the single-undertaking and consensus decision-making principles with an expanded and more diverse membership can lead to more than just coordination failure; it can render multilateralism less desirable for some parties than bilateralism. This contention is based on the fact that the single-undertaking and consensus decision-making principles ensure that bargaining in the WTO is multilateral in nature, i.e. it involves the maximisation of a single Nash bargaining product rather than the maximisation of bilateral Nash bargaining products as would occur via PTA negotiation. Thus, the threat point of each country during multilateral bargaining is a reversion to bilateral bargaining between all parties. Accordingly, multilateral bargaining affords great power to countries that have less to gain from multilateralism relative to bilateralism. This point is emphasised by an $N+1$

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[2] For examples see: Jackson (1998), Schott and Watal (2000), Steinberg (2002), Sutherland *et al.* (2004) and Ehlermann and Ehring (2005).

country endowment model in which one large 'hub' country deals with N smaller 'spoke' countries. It is found that, the greater the number of spoke countries that participate in multilateral bargaining, the lower the relative benefit of multilateral bargaining for the hub country. Given that WTO negotiations take longer to conclude than PTA negotiations, over-accession can occur, whereby the hub country does not gain enough from multilateralism to make it worth the wait. Accordingly, it is possible that rising regionalism and failing multilateralism could be explained thus: the recent expansion of WTO membership to include numerous small countries, in combination with the nature of multilateral bargaining facilitated by the single-undertaking and consensus decision-making principles, has eroded the gains from negotiating via the WTO relative to bilateralism from the perspective of larger countries. This analysis adds credence to suggestions, made by Sutherland *et al.* (2004) and Lawrence (2006) amongst others, that some form of 'variable geometry' be considered within the WTO framework in which a hybrid of multilateral and plurilateral negotiations take place.

The structure of this paper is as follows. Section 2 provides more detail on the difference between multilateral and bilateral negotiations in the current context. Section 3 outlines the basic model. In section 4 multilateral and bilateral negotiations are formally modelled. Section 5 utilises numerical simulations to assess the welfare differences between the two negotiating forums when WTO membership expands. Section 6 provides a discussion of the implications of these results.

## 2   The difference between WTO and PTA negotiations

The dominant theoretical approach to the logic underpinning trade agreements, epitomised in the work of Bagwell and Staiger (1999, 2002), posits that trade agreements facilitate avenues of escape from terms-of-trade driven prisoners' dilemmas that arise when countries with market power engage in optimal-tariff setting. Thus, trade agreements represent the outcome of bargaining games between countries over self-enforcing tariff combinations. However, this approach does not in itself explain why

countries would choose to engage in multilateral trade liberalisation let alone why an institution such as the WTO is required to mediate the process. Accordingly, in order to highlight the distinction between negotiating in the WTO and negotiating a web of bilateral PTAs, it is necessary to provide explanations of these two issues.

2.1   Multilateral versus bilateral bargaining

The issue of the benefit of negotiating multilaterally rather than bilaterally has been addressed by Maggi (1999). Maggi developed a 3 country model, as illustrated in figure 1 below, in which multilateral bargaining mitigates power imbalances between negotiating parties and thereby leads to global welfare improvements.

Figure 1: Multilateral bargaining according to Maggi (1999, p. 196)
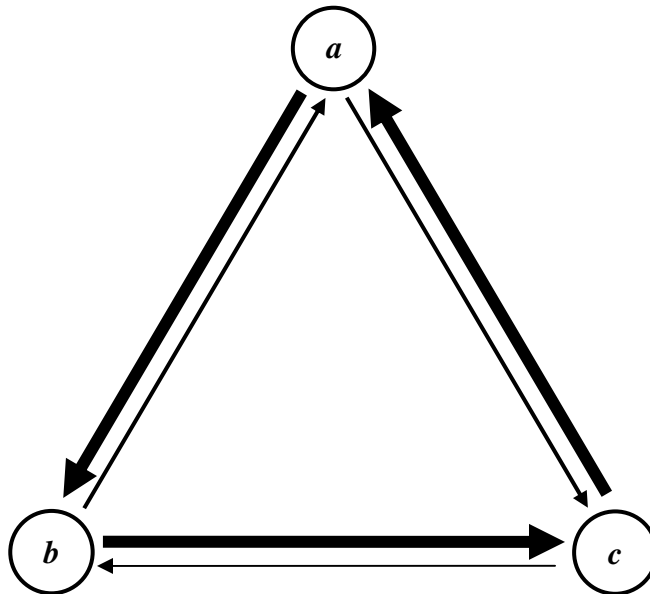
In figure 1 preferences and endowments are such that each country is a net exporter to the country on its right and a net importer from the country on its left. Given this situation, each bilateral pairing contains an imbalance of power. For example, country a can impose import taxes on country c without risk of commensurate retaliation and thus

4

stands to lose less from a trade war. However, country a faces the opposite situation when it engages with country b.

Bilateral Nash bargaining would maximise three separate Nash bargaining Products (NBPs) of the form:

$$NBP_{ij} = \left(u_{ij} - u_{ij}^{N} \right)\left(u_{ji} - u_{ji}^{N} \right) \tag{1}$$

where: u_{ij} denotes the utility of country i with respect to country j and u_{ij}^{N} denotes the Nash equilibrium utility of country i with respect to country j.

Conversely, (assuming symmetry) multilateral bargaining maximises a single NBP given as:

$$NBP_{M} = \left(u_{iM} - u_{iM}^{N} \right)^{3} \tag{2}$$

where: u_{iM} is the total utility of country i from trade with both other countries and u_{iM}^{N} is the total utility of country i at the Nash equilibrium.[3]

In order to highlight the difference between these two approaches it is useful to consider the case of extreme power imbalances where, as first argued by Johnson (1953-54), one country in each pair will prefer the Nash equilibrium outcome to that of bilateral reciprocal free trade. In this situation bilateral bargaining would not lead to free trade. However, given that multilateral bargaining maximises global welfare, and thereby

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[3] It is important to note that this approach to multilateral bargaining implicitly assumes that the WTO negotiations are not constrained by the reciprocity rule as it is interpreted by Bagwell and Staiger (1999, 2002), i.e. WTO negotiations do not necessarily maintain world prices. However, whether the reciprocity rule as described by Bagwell and Staiger pertains in reality or not is currently an open question (WTO, 2007).

balances power across all three countries, it would lead to global free trade. Thus bilateral bargaining is globally inefficient compared to multilateral bargaining.

By ensuring that all issues are treated as part of a single package that member countries either unanimously accept as a whole or do not accept at all, the single-undertaking and consensus decision-making principles of the WTO can be thought of as facilitating multilateral bargaining as described by Maggi (1999). However, it is important to recognise that the global welfare gains afforded by multilateralism in this context only arise when there is a 'balance of imbalances', i.e. when there are local imbalances in power within a globally symmetric system. When one country is more powerful than the rest, multilateral bargaining would benefit the weaker parties at the expense of the strong party. Hence, the fact that hegemonic countries like the USA have historically chosen to fully participate in the WTO system suggests that it yields benefits over and above those espoused by Maggi (1999).

2.2   *The benefit of negotiating via an institution*

An extensive literature exists regarding the myriad ways in which a central institution can mitigate the transaction costs associated with negotiating international trade agreements. For example, as noted by authors such as Koremenos *et al*. (2001) and Abbott and Snidal (1998), a central institution can provide common support services such as translators, the provision of background data, and technical assistance, etc. An institution can also lessen the chance of coordination failure amongst negotiating parties by organising and overseeing negotiations according to some pre-established rules (Fearon, 1998). Moreover, as argued by Maggi (1999) among others, ceding control to a third party mediator can more efficiently settle trade disputes in the presence of imperfect information. Indeed the Dispute Settlement Mechanism (DSM) of the WTO,

which serves this purpose, is seen as one of the central pillars of the WTO system (WTO, 2007a).[4]

Therefore, it may be the case that for large countries, the benefits from negotiating via a central institution outweigh the cost of multilateral bargaining, as opposed to bilateral bargaining, with respect to less powerful countries. The fact that the original contracting parties to the GATT welcomed the accession of smaller countries throughout its near 50 year history suggests that this is the case. However, the recent proliferation of PTAs coupled with deadlocked negotiations in the WTO raises the question of whether the stream of developing country accessions that has taken place in recent years has reversed this outcome. It is to this question that the analysis now turns.

3   Model setup

3.1   Basic setup

The model is an adapted version of the Kennan and Riezman (1990) $n \times m$ endowment model with two periods. The current model consists of $N+1$ countries, indexed by an i subscript. One country, country a, is a large 'hub' which trades with N smaller 'spoke' countries, n of which are WTO members, indexed by a j subscript, and $N-n$ of which are non-members of the WTO, indexed by a k subscript (country a is itself a WTO member). It is assumed that the pattern of trade is such that there is no inter-spoke trade. Whilst this is a restrictive assumption, it captures the extreme case of the situation that is of interest here: when one country is more concerned about the completion of a multilateral trade agreement than the others. Allowing trade between the spoke countries would moderate the results of this model quantitatively but not qualitatively and would considerably increase the complexity of the following analysis.

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[4] See Jackson (1998), Hoekman and Kostecki (2001) and Bagwell and Staiger (2002) for further discussion of the role of the DSM.

In keeping with Maggi (1999), all bilateral trading relationships are assumed to be separable such that trade policies in one relationship do not affect trade flows in other relationships, i.e. trade agreements do not cause trade diversion. This assumption focuses the analysis on the impact of multilateral versus bilateral bargaining by bypassing the possibility of the formation of strategic customs unions (CUs), which, whilst being relevant features of reality, are not of particular interest to the current paper. Consequently, as illustrated in figure 2 below, country a imports one unique good from each spoke country (m_{JA} in the case of country j and m_{KA} in the case of country k) in exchange for one unique good (m_{AJ} in the case of country j and m_{AK} in the case of country k). There are thus $2N$ goods, indexed by an l superscript.

Figure 2: Trade pattern between country *a* and its N trading partners
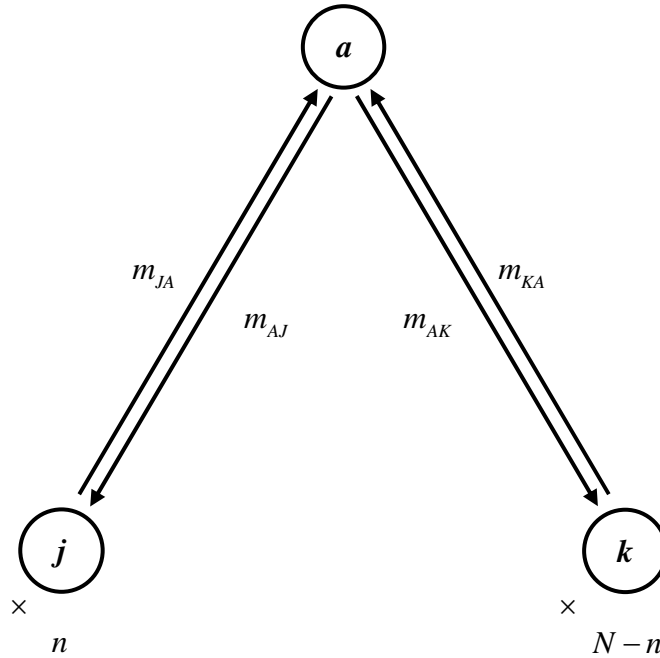
All countries share the following utility function:

$$u_i = \sum_{l=1}^{2N} \beta_{il} \log c_{il} \tag{3}$$

where: β_{il} denotes country i's preference for good l, and c_{il} denotes country i's consumption of good l.

Each country is endowed with E_{il} of each good. Given the assumed pattern of trade, the endowment and taste parameters of the spoke countries equal 0 for all goods except those that they exchange with country a. Furthermore, for simplicity, it is assumed that all countries have equal preferences over the remaining goods, such that:

$$\beta_{al} = \frac{1}{2N}; \quad \beta_{jAJ} = \beta_{jJA} = \beta_{kAK} = \beta_{kKA} = \frac{1}{2}.$$

The world endowment of each good is normalised to one such that the world distribution of endowments can be summarized as:

$$E_{aJA} = 1 - E_{jJA}; \quad E_{jAJ} = 1 - E_{aAJ}; \quad E_{aKA} = 1 - E_{kKA}; \quad E_{kAK} = 1 - E_{aAK}.$$

One further simplifying assumption is used to focus the analysis and to reduce the size of expressions: the endowment combination between country a and country j is assumed to be the same as that between country a and country k. Thus:

$$E_{aAJ} = E_{aAK} = E_a; \quad E_{jJA} = E_{kKA} = E_N.$$

The specific utility function of each country is thus given as:

$$u_{aT} = \frac{n}{2N}\left(\log c_{aAJ} + \log c_{aJA}\right) + \frac{N-n}{2N}\left(\log c_{aAK} + \log c_{aKA}\right) \tag{4}$$

$$u_j = \frac{1}{2}\left(\log c_{jJA} + \log c_{jAJ}\right) \tag{5}$$

$$u_k = \frac{1}{2}\left(\log c_{kKA} + \log c_{kAK}\right) \tag{6}$$

where u_{aT} denotes the total utility of country a from trade with all N of its trading partners.

The following analysis is conducted for trade between country a and country j, however, at this stage, the results are analogous for trade between country a and country k.

The assumed preference structure implies that the autarchic relative price of good m_{AJ}, in terms of good m_{JA} in each country is given as $p_{iAJ} = P_{iAJ}/P_{iJA} = E_{iJA}/E_{iAJ}$. The assumption that country a has a comparative advantage in good m_{AJ} requires that $p_{aAJ} < p_{jAJ}$, which implies that $\left(1-E_N\right)/E_a < E_N/\left(1-E_a\right)$. Accordingly, the range of possible endowment combinations is given as:

$$1 < E_{aAJ} + E_{jJA} < 2 \tag{7}$$

Each country levies a tariff at the rate τ_{il} on its import good. Note that, for convenience, it is useful to write this as $\tau_{il} = T_{il} - 1$ and to use $T_{il} = \tau_{il} + 1$ when expressing tariffs. Given that bilateral relationships are separable, country a sets tariffs with respect to country j to maximise utility subject to the following relationship-specific budget constraint:

$$p_{AJ}^W c_{aAJ} + T_{aJA} c_{aJA} = p_{AJ}^W E_a + T_{aJA}\left(1-E_N\right) + \left(T_{aJA}-1\right)i_{aJA} \tag{8}$$

where p_{AJ}^{W} is the world relative price of good m_{AJ} and i_{aJA} is country a's imports of good m_{JA} (hence $(T_{aJA}-1)i_{aJA}$ represents tariff revenue). Expressions for country a's consumption of goods m_{AJ} and m_{JA} are given as:

$$c_{aAJ} = E_a - e_{aAJ} \tag{9}$$

$$c_{aJA} = 1 - E_N + i_{aJA} \tag{10}$$

where e_{aAJ} denotes country a's exports of good m_{AJ}. Substituting (9) and (10) into (8) and rearranging yields the trade balance condition:

$$p_{AJ}^{W} e_{aAJ} = i_{aJA} \tag{11}$$

Given the assumed preference structure, utility is maximised by allocating equal expenditures to each good such that: $p_{AJ}^{W} c_{aAJ} = T_{aJA} c_{aJA}$. Substituting in expressions (9) and (10) yields:

$$p_{AJ}^{W} = \frac{T_{aJA}\left(1 - E_N + i_{aJA}\right)}{E_a - e_{aAJ}} \tag{12}$$

Substituting equation (12) into the trade balance condition given in equation (11) gives country a's offer curve:

$$\frac{E_a}{e_{aAJ}} = \frac{T_{aJA}\left(1 - E_N\right)}{i_{aJA}} + T_{aJA} + 1 \tag{13}$$

Similarly, country j sets tariffs to maximise utility subject to the following budget constraint:

$$c_{jJA} + T_{jAJ}\, p_{AJ}^{W} c_{jJA} = E_N + T_{jAJ}\, p_{AJ}^{W}\left(1 - E_a\right) + \left(T_{jAJ} - 1\right) i_{jAJ}\, p_{AJ}^{W} \tag{14}$$

Expressions for country j's consumption of goods m_{AJ} and m_{JA} are given as:

$$c_{jJA} = E_N - e_{jJA} \tag{15}$$

$$c_{jAJ} = 1 - E_a + i_{jAJ} \tag{16}$$

Substituting equations (15) and (16) into (14) and rearranging gives the trade balance condition:

$$p_{AJ}^{W}\, i_{jAJ} = e_{jJA} \tag{17}$$

As in country a, utility is maximised by allocating equal expenditure to each good such that: $p_{AJ}^{W} T_{jAJ} c_{jAJ} = c_{jJA}$. Substituting in the expressions for consumption gives:

$$p_{AJ}^{W} = \frac{E_N - e_{jJA}}{T_{jAJ}\left(1 - E_a + i_{jAJ}\right)} \tag{18}$$

Substituting equation (18) into the trade balance condition and rearranging gives country j's offer curve:

$$\frac{E_N}{e_{jJA}} = \frac{T_{jAJ}\left(1 - E_a\right)}{i_{jAJ}} + T_{jAJ} + 1 \tag{19}$$

Utilising the trade balance conditions given in (11) and (17), and the fact that a single world price prevails, each country's offer curve can be solved for world prices:

$$country\ a: \quad p_{AJ}^{W} = \frac{i_{aJA}}{e_{aAJ}} = \frac{T_{aJA}\left(1 - E_{N}\right)}{E_{a} - T_{aJA}e_{aAJ} - e_{aAJ}} \tag{20}$$

$$country\ j: \quad p_{AJ}^{W} = \frac{e_{jJA}}{i_{jAJ}} = \frac{E_{N}}{T_{jAJ}\left(1 - E_{a} + i_{jAJ}\right) + i_{jAJ}} \tag{21}$$

From the trade balance conditions it is clear that country a's exports must equal country j's imports. Thus, solving expression (21) for imports and substituting into equation (20) according to $e_{aAJ} = i_{jAJ}$ yields an expression for period 1 world prices in terms of endowments and tariffs:

$$p_{AJ}^{W} = \frac{T_{aJA} + E_{a} + T_{aJA}T_{jAJ}\left(1 - E_{a}\right)}{T_{jAJ} + E_{N} + T_{aJA}T_{jAJ}\left(1 - E_{N}\right)} \tag{22}$$

Substituting equation (22) into expressions (20) and (21) allows the following expressions for exports and imports to be derived:

$$e_{aAj} = i_{jAJ} = \frac{E_{a}E_{N} - T_{aJA}T_{jAJ}\left(1 - E_{a}\right)\left(1 - E_{N}\right)}{T_{aJA} + E_{N} + T_{aJA}T_{jAJ}\left(1 - E_{N}\right)} \tag{23}$$

$$e_{jJA} = i_{aJA} = \frac{E_{a}E_{N} - T_{aJA}T_{jAJ}\left(1 - E_{a}\right)\left(1 - E_{N}\right)}{T_{jAJ} + E_{a} + T_{aJA}T_{jAJ}\left(1 - E_{a}\right)} \tag{24}$$

Substituting equations (23) and (24) into equations (9), (10) yields expressions for consumption in terms of tariffs and endowments:

$$c_{aAj} = E_{a} - \frac{E_{a}E_{N} - T_{aJA}T_{jAJ}\left(1 - E_{a}\right)\left(1 - E_{N}\right)}{T_{aJA} + E_{N} + T_{aJA}T_{jAJ}\left(1 - E_{N}\right)} \tag{25}$$

$$c_{aJA} = 1 - E_N + \frac{E_a E_N - T_{aJA} T_{jAJ}\left(1 - E_a\right)\left(1 - E_N\right)}{T_{jAJ} + E_a + T_{aJA} T_{jAJ}\left(1 - E_a\right)} \tag{26}$$

$$c_{jJA} = E_N - \frac{E_a E_N - T_{aJA} T_{jAJ}\left(1 - E_a\right)\left(1 - E_N\right)}{T_{jAJ} + E_a + T_{aJA} T_{jAJ}\left(1 - E_a\right)} \tag{27}$$

$$c_{jAJ} = 1 - E_a + \frac{E_a E_N - T_{aJA} T_{jAJ}\left(1 - E_a\right)\left(1 - E_N\right)}{T_{aJA} + E_N + T_{aJA} T_{jAJ}\left(1 - E_N\right)} \tag{28}$$

Utilising the expression for utility given in equations (4) the following expression can now be derived for the utility of country a with respect to all its trading partners (signified by the subscript T) in terms of tariffs and endowments:

$$
\begin{aligned}
u_{aT} = &\frac{n}{2N}\left(\log\left(\frac{E_a + T_{jAJ}\left(1 - E_N\right)}{1 + T_{jAJ}\left(1 - E_N\right) + E_N / T_{aJA}} \right) + \log\left(\frac{E_a + T_{jAJ}\left(1 - E_N\right)}{T_{jAJ} + T_{aJA} T_{jAJ}\left(1 - E_a\right) + E_a} \right) \right) \\
&+ \frac{N - n}{2N}\left(\log\left(\frac{E_a + T_{kAK}\left(1 - E_N\right)}{1 + T_{kAK}\left(1 - E_N\right) + E_N / T_{aKA}} \right) + \log\left(\frac{E_a + T_{kAK}\left(1 - E_N\right)}{T_{kAK} + T_{aKA} T_{kAK}\left(1 - E_a\right) + E_a} \right) \right)
\end{aligned} \tag{29}
$$

Similarly, the utility of country j in terms of tariffs and endowments (an analogous expression exists for country k) is given as:

$$u_j = \frac{1}{2}\log\left(\frac{E_N + T_{aJA}\left(1 - E_a\right)}{1 + T_{aJA}\left(1 - E_a\right) + E_a / T_N} \right) + \frac{1}{2}\log\left(\frac{E_N + T_{aJA}\left(1 - E_a\right)}{T_{aJA} + T_{aJA} T_{jAJ}\left(1 - E_N\right) + E_N} \right) \tag{30}$$

3.2　Free trade outcomes

Free trade consumption levels are given by evaluating expressions (25) - (28) given $T_{aJA} = T_{aKA} = T_{jAJ} = T_{kAK} = 1$ to yield:

$$c_{aAJ}^{F} = c_{aJA}^{F} = \frac{1}{2}\left(E_a + 1 - E_N\right) \tag{31}$$

$$c_{jJA}^{F} = c_{jAJ}^{F} = \frac{1}{2}\left(1 - E_a + E_N\right) \tag{32}$$

These expressions are utilised later on in the computation of NBPs.

3.3　Nash equilibrium tariffs

In this model, as in Mayer (1981), Dixit (1987) and Bagwell and Staiger (1999, 2002), governments intervene in trade for optimal tariff reasons and duly arrive at a prisoners' dilemma which motivates them to form trade agreements. Reaction functions are generated by maximising the expressions for utility given in equations (29) and (30) with respect to tariffs:

$$T_{aJA} = \left(\frac{E_N\left(T_{jAJ} + E_a\right)}{T_{jAJ}\left(1 - E_a\right)\left(1 + T_{jAJ}\left(1 - E_N\right)\right)}\right)^{\frac{1}{2}} \tag{33}$$

$$T_{jAJ} = \left(\frac{E_a\left(T_{aJA} + E_N\right)}{T_{aJA}\left(1 - E_N\right)\left(1 + T_{aJA}\left(1 - E_a\right)\right)}\right)^{\frac{1}{2}} \tag{34}$$

Solving equations (33) and (34) simultaneously gives the Nash equilibrium tariffs as identified by Kennan and Riezman (1988):

$$T_{aJA}^N = T_{aKA}^N = \left(\frac{E_N}{1-E_a}\right)^{\frac{1}{2}} \qquad (35)$$

$$T_{jAJ}^N = T_{kAK}^N = \left(\frac{E_a}{1-E_N}\right)^{\frac{1}{2}} \qquad (36)$$

Substituting equations (35) and (36) into the expressions for consumption given in equations (25) - (28) gives Nash consumption levels:

$$c_{aAJ}^N = \frac{E_a + \left(E_a\left(1-E_N\right)\right)^{\frac{1}{2}}}{1+\left(E_a\left(1-E_N\right)\right)^{\frac{1}{2}} + \dfrac{E_N}{\left(\dfrac{E_N}{1-E_{aAAJ}}\right)^{\frac{1}{2}}}} \qquad (37)$$

$$c_{aJA}^N = \frac{E_a + \left(E_a\left(1-E_N\right)\right)^{\frac{1}{2}}}{\left(\dfrac{E_a}{1-E_N}\right)^{\frac{1}{2}}\left(1+\left(E_N\left(1-E_a\right)\right)^{\frac{1}{2}}\right) + E_a} \qquad (38)$$

$$c_{jAJ}^N = \frac{E_N + \left(E_N\left(1-E_a\right)\right)^{\frac{1}{2}}}{\left(\dfrac{E_N}{1-E_a}\right)^{\frac{1}{2}}\left(1+\left(E_a\left(1-E_N\right)\right)^{\frac{1}{2}}\right) + E_N} \qquad (39)$$

$$c_{jJA}^N = \frac{E_N + \left(E_N\left(1-E_a\right)\right)^{\frac{1}{2}}}{1+\left(E_N\left(1-E_a\right)\right)^{\frac{1}{2}} + \dfrac{E_a}{\left(\dfrac{E_a}{1-E_N}\right)^{\frac{1}{2}}}} \qquad (40)$$

Equations (37) - (40) could be used to derive expressions for Nash equilibrium utility in terms of endowments and tariffs. However, these, and subsequent expressions, would be too cumbersome to present here. Accordingly, utility from here on is simply given in terms of consumption. Thus, the utility achieved by countries a and j at the Nash equilibrium is given as:

$$U_{aT}^N = \frac{n}{2N}\left(\log c_{aAJ}^N + \log c_{aJA}^N\right) + \frac{N-n}{2N}\left(\log c_{aAK}^N + \log c_{aKA}^N\right) \qquad (41)$$

$$U_j^N = \frac{1}{2}\left(\log c_{jJA}^N + \log c_{jAJ}^N\right) \qquad (42)$$

As is well established, Nash equilibrium utility is inefficient and can be improved upon by mutual liberalisation via a trade agreement. However, such agreements can be formed either via the WTO or via a PTA. The following section details the distinction in the current setting.

4.   Bilateral versus multilateral trade agreements

In order to capture the benefits of multilateralism in this context it is assumed that deals conducted within the WTO are cheaper to establish than bilateral deals. This assumption conforms with the literature discussed in section 2.2 regarding the myriad ways in which a central institution can mitigate the transaction costs associated with negotiating international agreements. However, whilst in reality the WTO certainly confers such benefits on its members, negotiations conducted within it tend to take a considerable length of time. Indeed, the last time a multilateral trade negotiating round was successfully concluded was in 1994 when the Uruguay round came to an end. In contrast, over 160 PTAs have been notified to the WTO since 1995 (WTO, 2007a). In order to capture this aspect of reality in the current model, it is assumed that WTO negotiations take two periods to conclude whereas PTA negotiations can be conducted

within a single period. Accordingly, country *a* and the *n* other WTO member countries play the following two-period game:

Figure 3: The choice of trade agreement between WTO members
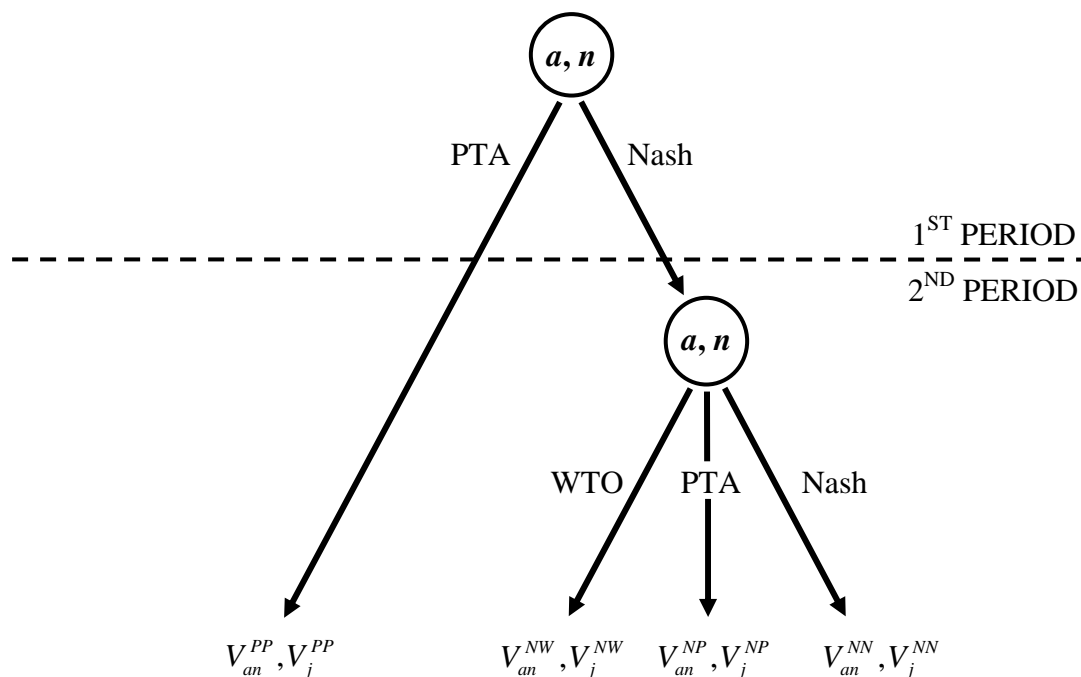
In the first stage countries *a* and the *n* other WTO members must decide whether to commence multilateral negotiations or to form a web of PTAs. If bilateralism is opted for, the game ends and the PTA outcome pertains in both periods. However, if multilateralism is chosen, the status quo, i.e. the Nash equilibrium, is maintained for the remainder of the period and the game continues on to the second period. In the second period there are three possible outcomes: a successfully concluded WTO agreement; a web of PTAs; or the maintenance of the Nash equilibrium. Reversion to PTA-based negotiation is the threat point during WTO negotiations. The threat point during PTA negotiations is, as it was in the first period, maintenance of the Nash equilibrium. Of crucial importance is the fact that the veto power afforded by WTO rules means that reversion to PTA-based negotiation in a game between country *a* and any country *j*

18

causes a reversion to PTA-based negotiation in all games between country a and its trading partners.

Note that the payoffs in figure 2 are given in terms of V_i, which represents inter-temporal utility. In the present scenario, discounting of the future would temper the outcomes quantitatively but have no qualitative effect. Hence, to facilitate a parsimonious exposition, inter-temporal utility is simply given as the sum of the utilities obtained in each period:

$$V_i = u_i + U_i \qquad (43)$$

where U_i denotes the utility obtained by country i in period 2.

The superscripts refer to the outcome in each period, for example, the superscript *NW* refers to Nash equilibrium in period 1 and a WTO agreement in period 2. In either period, the game between country a and the $N - n$ WTO non-members is simply that of bilateral PTA negotiation. The crucial question is whether an increasing WTO membership augments or diminishes the welfare benefit of forming a multilateral trade agreement, i.e. what is the effect of a rising value of n on $V_i^{NW} - V_i^{PP}$. This question is addressed in the following sections.

4.1 *Second period PTA bargaining*

PTA negotiations are the outside option for all parties to multilateral negotiations. Thus, in order to compute the outcome of multilateral bargaining, it is first necessary to evaluate the outcome of the bilateral negotiations that would occur in the event of their collapse. Utilising the approach of Mclaren (1997) and Epifani and Vitaloni (2006), the Nash bargaining solution (NBS) involves countries going to free trade with a transfer, *S*, between the party that favours free trade the most and the party that favours it the least.

However, in order to capture the notion that the WTO yields benefits over and above those obtained from bilateral bargaining, it is assumed that some portion of trade is lost during PTA negotiations, which is not lost during WTO negotiations. Thus, countries cannot achieve free trade from a PTA; a portion, θ, of the difference between Nash equilibrium and free trade levels of trade are lost. Accordingly, exports and imports under PTA-diminished free trade are given as:

$$e_i^{\theta F} = e_i^F - \left(e_i^F - e_i^N \right) \theta \tag{44}$$

$$i_i^{\theta F} = i_i^F - \left(i_i^F - i_i^N \right) \theta \tag{45}$$

In the second period PTA, Nash equilibrium is the outside option, thus the Nash bargaining product (NBP) between countries A and j is given as:

$$NBP^P = \left(U_{aj}^{\theta F} - \frac{S^P}{\left(P_{AJ}^N P_{JA}^N \right)^{1/2}} - U_{aM}^N \right) \left(U_j^{\theta F} + \frac{S^P}{\left(P_{AJ}^N P_{JA}^N \right)^{1/2}} - U_j^N \right) \tag{46}$$

Note that $U_{aj}^{\theta F}$ is the welfare that country a achieves from PTA-diminished free trade with respect to country j holding trade with all other $N-1$ of its trading partners constant at the Nash equilibrium:

$$U_{aj}^{\theta F} = \frac{1}{2N} \left(\log c_{aAJ}^{\theta F} + \log c_{aJA}^{\theta F} \right) + \frac{N-1}{2N} \left(\log c_{aAK}^N + \log c_{aKA}^N \right) \tag{47}$$

$U_j^{\theta F}$ is the utility that country j achieves from PTA-diminished free trade:

$$U_j^{\theta F} = \frac{1}{2} \left(\log c_{jJA}^{\theta F} + \log c_{jAJ}^{\theta F} \right) \tag{48}$$

Maximising the NBP with respect to S^P yields:

$$S^P = \frac{1}{2}\left(U_{aj}^{\theta F} - U_{aT}^{N}\right) - \frac{1}{2}\left(U_{j}^{\theta F} - U_{j}^{N}\right) \tag{49}$$

Given the assumption of symmetry between country a's trading partners, the transfer between country a and country j is of the same magnitude as that between country a and country k. Consequently, the utility obtained by all 3 country types can be given as:

$$U_{aT}^{P} = U_{aT}^{\theta F} - NS^P \tag{50}$$

$$U_{j}^{P} = U_{k}^{P} = U_{j}^{\theta F} + S^P \tag{51}$$

4.2 Second period WTO bargaining

WTO negotiations differ from PTA negotiations in several ways. Firstly, by assumption, they yield benefits over and above PTA negotiations; captured here by the absence of the diminishing variable, θ, during WTO negotiations. Secondly, the outside option during WTO negotiations is the welfare that countries would obtain via PTA negotiations. Thus parties to the WTO bargain over the benefit of negotiating via the WTO relative to negotiating a web of PTAs. Thirdly, given that bargaining is multilateral, the outside option of country a during WTO negotiations is not simply a reversion to PTA negotiations with respect to a single country, but a reversion to PTA negotiations with respect to all countries. Consequently, all n WTO members that trade with country a have significant bargaining power during WTO negotiations.

The multilateral NBP during WTO negotiations is given as:

$$NBP^W = \left(U_{an}^{F} - n\frac{S^W}{\left(P_{AJ}^{N} P_{JA}^{N}\right)^{1/2}} - U_{aM}^{P} \right)\left(U_{j}^{F} + \frac{S^W}{\left(P_{AJ}^{N} P_{JA}^{N}\right)^{1/2}} - U_{j}^{P} \right)^{n} \tag{52}$$

21

where U_{an}^F is the welfare that country a achieves from free trade with respect to all n WTO members, holding trade with the $N-n$ WTO non-member countries constant at PTA levels:

$$U_{an}^F = \frac{n}{2N}\left(\log c_{aAJ}^F + \log c_{aJA}^F\right) + \frac{N-n}{2N}\left(\log c_{aAK}^{\theta F} + \log c_{aKA}^{\theta F}\right) - \left(N-n\right)S^P \tag{53}$$

Maximising the NBP with respect to S^W yields:

$$S^W = \frac{1}{1+n}\left(U_{an}^F - U_{aM}^P\right) - \frac{1}{1+n}\left(U_j^F - U_j^P\right) \tag{54}$$

The utility of WTO members following multilateral negotiations can thus be given as:

$$U_{an}^W = U_{an}^F - nS^W \tag{55}$$

$$U_j^W = U_j^F + S^W \tag{56}$$

The welfare of the $N-n$ WTO non-members remains unchanged at that which they achieve from PTA negotiations.

4.3 Bilateralism versus multilateralism in the first period

If WTO members decide not to participate in multilateral negotiations, the PTA outcome will pertain in both periods such that inter-temporal welfare is given as:

$$V_{aM}^{PP} = u_{aM}^P + U_{aM}^P = 2U_{aM}^P \tag{57}$$

$$V_j^{PP} = V_k^P = u_j^P + U_j^P = 2U_j^P \tag{58}$$

If WTO member countries do decide to engage in multilateral negotiations, they must accept that the bargaining process requires a period to complete; thus the Nash equilibrium pertains for the first period. Accordingly, the inter-temporal welfare of countries A and j from WTO negotiations is given as:

$$V_{an}^{NW} = u_{an}^N + U_{an}^W \tag{59}$$

$$V_j^{NW} = u_j^N + U_j^W \tag{60}$$

Note that u_{an}^N denotes the utility that country a achieves from remaining at the Nash equilibrium with respect to all n WTO member countries, but negotiating PTAs with all $N-n$ WTO non-members. This is given as:

$$u_{an}^N = \frac{n}{2N}\left(\log c_{aAJ}^N + \log c_{aJA}^N\right) + \frac{N-n}{2N}\left(\log c_{aAK}^{\theta F} + \log c_{aKA}^{\theta F}\right) - \left(N-n\right)S^P \tag{61}$$

5   Results

From the above analysis, it is clear that the utility of countries a and j are determined by endowments, the cost of a PTA, and the number of countries that are WTO members. Numerically simulating $V_i^{NW} - V_i^{PP}$ for various values of n ($n=1\ldots50$) yields multiple different outcomes depending on the values chosen for endowments and θ. In order to restrict attention to scenarios more likely to correspond with reality, country a is assumed not to be smaller than country j in all simulations. This conforms with the notion that country a is a large developed 'hub' that trades with multiple developing country 'spokes'. One important case is used as a benchmark and discussed in section

5.1 below: when country *a* chooses to negotiate multilaterally when WTO membership is low but chooses to negotiate bilaterally when membership expands too much. Section 5.2 then discusses how this benchmark changes with variations in endowments and θ.

5.1   Benchmark case: multilateralism collapses as WTO membership expands

The benchmark case is illustrated in figure 4 below:

Figure 4: Multilateralism versus bilateralism for countries *a* and *j* given:

$$E_a = 0.9, E_N = 0.2, N = 50, \theta = 0.9$$
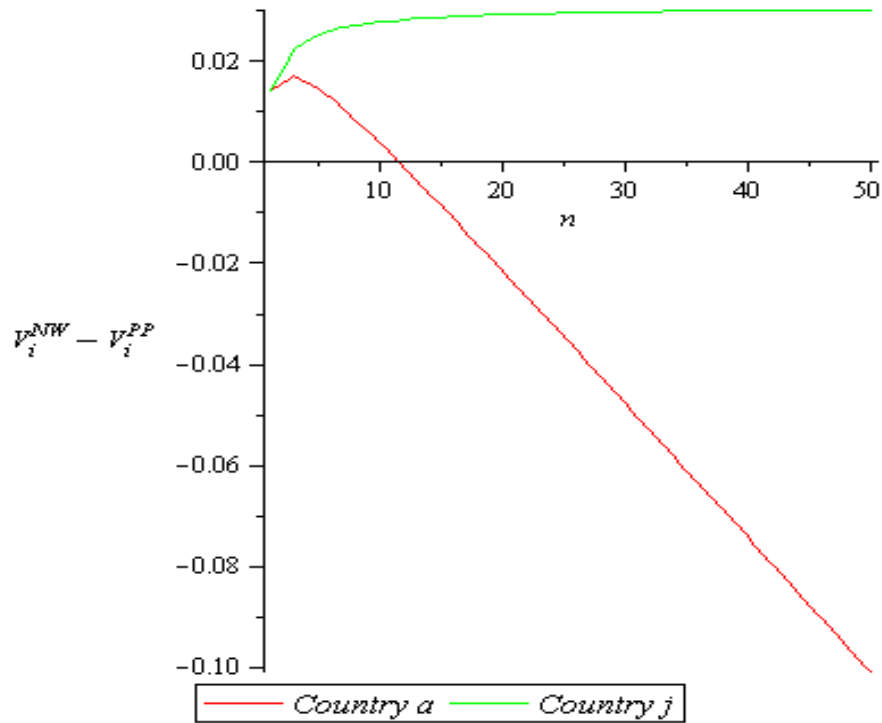
From figure 4 it is clear that, when country *a* is larger than country *j*, country *a*'s utility from multilateralism relative to bilateralism is parabolic with respect to *n*. Hence, for country *a*, there is an optimal number of WTO member countries. If accession continues past this point, the benefit country *a* obtains from negotiating multilaterally declines and

eventually becomes negative. On the other hand, each country *j* benefits from expanding WTO membership but at a declining rate.

The intuition underlying this result is as follows. Each acceding country shifts out the multilateral bargaining frontier because of the utility it, and country *a*, gain from negotiating multilaterally rather than bilaterally. However, the total gains must then be spread amongst the existing membership plus the acceding country. Thus, as the membership grows, the extra gains brought by an acceding country must be spread increasingly thinly. For country *a*, and each country *j*, second period utility from multilateralism is diminishing with respect to *n*. However, for country *a*, each acceding country entails a further loss in the first period relative to bilateralism because it must endure the lower Nash equilibrium welfare for that period.

Given that, without country *a*'s consent, a WTO accord will not be reached, it is clear that, once WTO membership has expanded too much, multilateralism will collapse and bilateralism will prevail; as appears to be occurring in reality.

Note that the *y*-axis intercept in figure 4 represents the relative value of multilateralism when there is only one spoke country. If the single-undertaking and consensus decision-making principles were not applied, then this would be the utility country *a* would attain from the accession of each new WTO member. Given that utility is also positive for country *j* at the intercept, it is clear that, in this admittedly highly stylised scenario, were negotiations within the WTO to be conducted purely bilaterally, then country *a* would embrace WTO negotiations and global welfare gains would result.

5.2   Other scenarios

As noted above, utility is dependent upon endowments, the cost of a PTA and the number of WTO members. Varying the cost of a PTA shifts the positions of the curves vertically: a higher value of θ causes the curves to shift upwards; a lower value causes

the curves to shift downwards. It is thus possible to construct examples where multilateralism is always rejected by country a, always rejected by both countries, and always accepted by both countries. However, the basic intuition remains: multilateralism is more likely to be rejected at higher levels of WTO membership.

Altering the relative sizes of countries a and j does not change the basic intuition either; it simply alters the optimum number of WTO members for country a. The closer countries a and j are in size, the lower the optimum membership for country a and hence the sooner it will reject multilateralism as membership expands.

6.   Conclusions

By constructing a more realistic model of multilateral trade negotiations than has previously been ventured, the above analysis has highlighted that, under certain circumstances, an expanding WTO membership can lead to a collapse in multilateral negotiations because of the veto power afforded to member countries under WTO jurisprudence. The circumstances under which this situation arises are akin to those currently prevailing in the WTO: when large 'hub' countries deal with smaller 'spoke' countries; when WTO agreements yield benefits relative to a web of PTAs; and, when the conclusion of WTO negotiations is time-consuming. Moreover, the current model shows that, were the veto power of countries to be removed, global welfare gains could be attained through the successful conclusion of WTO negotiations.

It is important to highlight an important caveat: the pattern of trade assumed in this model negates the benefits of multilateralism as described by Maggi (1999). Whilst this served to highlight the deleterious effect of the single-undertaking and consensus decision-making principles, it is necessary to temper advocacy of removal of these principles with the realisation that the issue-linkages they facilitate can be beneficial. However, some halfway measures have been proposed. For example, Sutherland *et al.* (2004, p. 64) suggest that:

"a Member considering blocking a measure which otherwise has very broad consensus support shall only block such consensus if it declares in writing, with reasons included, that the matter is of vital importance to it".

This proposal would dissuade countries from attempting to capture the gains that other countries obtain from multilateralism relative to regionalism and would thereby assuage the pessimistic prognosis of the model in this paper. More extreme proposals have been ventured that suggest that 'variable geometry' be introduced into the WTO, i.e. relaxing the single-undertaking restriction and thereby making the WTO an umbrella institution circumscribing a range of 'plurilateral' agreements, participation in which would be on a purely voluntary basis.[5] According to proponents of this approach, variable geometry would allow coalitions of the willing to proceed unhindered by the objections of others and thus impasse would be less likely to arise. Cornford (2004), Sutherland *et al.* (2004) and Lawrence (2006) note that variable geometry is not without historical precedent in the multilateral trade negotiating system. For example, the Tokyo round of the GATT established a number of 'codes' covering issues such as 'trade in civil aircraft', the 'arrangement on bovine meat' and the 'agreement on government procurement' (AGP) which were undertaken voluntarily. Lawrence (2006) suggests that a similar approach be adopted in the WTO as was utilised in the AGP. Thus, all members would be free to negotiate agreements but ratification would be on a voluntary basis. To avoid free-riding, he suggests that non-signatories do not receive the benefits of the agreement. The analysis in this paper suggests that such ideas warrant consideration.

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[5] Authors subscribing to this approach include: Cornford (2004), Hufbauer (2005), Messerlin (2005), and Lawrence (2006), etc. Moreover, whilst cognisant of the potential benefits of variable geometry, Sutherland *et al.* (2004) temper their advocacy with concerns about the practicality of its implementation.

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