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Dynamic Gains and Market Access Insurance: Another Look at the AUSFTA

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Abstract

We use a dynamic computable general equilibrium model to revisit the dynamic benefits of the Australia-USA Free Trade Agreement and, in particular, to evaluate the insurance value of this agreement in the face of regional and global trade wars. The insurance benefits are quantified by comparing the status quo against alternative scenarios where some or all regions raise tariffs by 10 percent, both permanently and temporarily. These insurance gains are found to be as much as four times larger than the traditional status quo efficiency gains.

JEL Classification: F15

Keywords: Trade policy, Computable General Equilibrium, Human Capital, Dynamics

1. Introduction

There are a number of papers in the literature evaluating the economic consequences of the Australia-US Free Trade Agreement (AUSFTA). Important contributions include Brown et. al (2005), the Center for International Economics (2004), Dee (2004), Findlay (2004), and Siriwardana (2006). Many of these are model based and for the most part have focused on the welfare gains, both static and dynamic, that the FTA might lead to. In this paper we extend this literature in one important dimension – a dynamic analysis of the potential insurance benefits of the agreement.

Trade agreements have many purposes, but one important issue, especially for smaller open economies such as Australia, is the ability of such agreements to reduce economic harm which might result in the face of adverse external developments in the world trading environment. Specifically, in the case of the AUSFTA, would the existence of a credible and binding FTA with the US limit economic damage to Australia in the face of alternative counterfactuals including either a global trade war of varying duration or one specifically with the US? As emphasized by Whalley and Perroni (2000) regional trading agreements are often entered into on the part of the smaller partner for precisely these reasons. In these circumstances the standard static efficiency gains measured relative to an historical base case which is relatively problem free may not be the only appropriate basis for comparison. Clearly much of the value of such an agreement is not in its reduction of existing trade barriers but rather promises to refrain from imposing barriers in the future. For example Phillippa Dee commenting on the US commitments on services in the agreement states

> *"The above promises to abstain from trade barriers do not necessarily imply that there are significant barriers present in these areas to start with. In most cases, there would not be. This is consistent with the Government's claim that the major achievements for Australia in the chapters on investment and cross-border trade are the promises by the United States not to initiate new discriminatory measures, rather than to roll back any existing measures."* Dee (2004), p.90.

In this paper we attempt to quantify these "insurance gains" using a dynamic general equilibrium model in which factor accumulation plays a central role. The model explicitly treats foresighted investment in three types of physical capital, as well as human capital, as the primary drivers of both long term growth and comparative advantage, as is familiar from dynamic Hecksher-Ohlin trade theory. When looking at the insurance value of an FTA the dynamics become central to the analysis for two reasons. First the duration of any trade conflict will impact importantly on the quantified effects as the anticipation of both the beginning and end of a 'trade war' will affect investment decisions. Second trade wars can trigger fairly large terms of trade effects which in turn can impact on capital rental prices through the traditional Stolper-Samuelson link. These shifts in relative rental prices in teurn impact on endogenous decisions to invest.

The paper proceeds as follows. In section 2 a basic outline of the model, theoretical framework and calibration is given. In section 3 the model is used in the conventional way to evaluate the welfare gains from both a static and dynamic perspective. The calibration here is such that the dynamic productivity effects are as close as possible to those used in the influential CIE (2004) report on the AUSFTA. Sections 4 and 5 carry out an analysis of the insurance benefits of the agreement. Section 6 concludes.

2. The Model and Calibration Framework

The model used in this paper have two specific 'third generation' CGE models which incorporate dynamic factor accumulation effects. As in the case of *G-Cubed* model (McKibbon and Wilcoxin 1998), which was used in the CIE (2004) study, an explicit long run rational expectations view of the process of physical investment and inter-temporal consumption choices, consistent for example with virtually all of the work in modern business cycle and growth theory is used. At a point in time, however, the model is Heckscher-Ohlin like. Factors of production are mobile between industries. There are three types of physical capital (structures, machinery and equipment, residential capital). The second dynamic feature is an inter-temporal optimizing treatment of education and human capital. Labor is divided into a skilled and non-skilled category and the relative supplies of these change over time as individuals choose to become educated based on

the cost of education, and their forward looking view on the returns to becoming skilled.[1] An important issue in the dynamic response of investment to a trade policy shock is the potential interaction with the endogenous response of human capital. We follow the tradition of the trade and wages debate as treating capital and skill as complements within production. Thus an increase in supply of human capital will, ceteris paribus, increase the demand for physical capital, (Krusell et al 2000).

We think that adding human capital to the analysis is important for two reasons. First the quantity of human capital in the economy is large. By most estimates the income share of human capital accounts for about one-third of national income. Thus changes in the supply of human capital, if they should occur, are likely to be important quantitatively. In the case of the AUSFTA much of the debate thus far has been on the consequence of the capital accumulation effects that result from the liberalization of services and investment provisions. Will such capital accumulation tend to raise or lower the level of human capital in the economy? Or alternatively will the Human capital response to AUSFTA itself tend to induce significant capital accumulation effects?

The model has three regions – Australia, United States and Rest–of–World (ROW). Trade occurs in six traded goods – agriculture, minerals (including energy), low-tech manufactures, intermediate manufactures, durable goods and traded services. There are five non-traded goods – non-traded services, construction, public services, housing services, and education. All industries are constant returns competitive sectors including education.

Unlike many of the other CGE models used to look at the FTA we do not use the Armington assumption on preferences which assumes that goods of different national origin enter utility functions as imperfect substitutes. This assumption has the well known consequence that terms of trade effects tend to dominate other factors in the ultimate welfare effect of any change in trade policy, (Brown 1987, Zhang 2006). The model used here rather uses a CET type specification in which goods are differentiated on the supply

[1] Within a Hecksher-Ohlin type model changes in the relative supplies of factor endowments has traditional consequences for the pattern of trade. Potentially the long run pattern of trade may differ from the short run due to changes induced in relative factor endowments by a policy change. This carries with it the important implication that impact effects of changes in trade policy may be quite different than the longer run effect in terms of the sectoral and distributional impact of the policy.

side. Thus 'cars' produced in Australia have a different marginal cost of supply depending on whether they are delivered to the domestic or foreign markets.

This type of assumption has much in common with the 'cost of trade' literature which emphasizes that there are costs (transportation, distribution, information) that make exporting an activity differentiated from supplying the domestic market. It allows for two-way trade and gets much closer to a small open economy framework. In the case of Australia for example it is a 'price-taker' in the sense that the price of Australian exports to the US are largely determined in the US market which sets that price.

Terms of trade effects are not completely absent however and usually come on the supply side. A cut in an Australian tariff for example on a US supplied import will cause an increase in the supply of imports from the US to Australia. It is possible this could raise the marginal cost of the US supply to Australia which would tend to deteriorate Australia's terms of trade. Conversely a US tariff cut on Australian imports into the US market could improve the Australian producers' price and improve the Australian terms of trade. These effects hinge not on demand substitution parameters but on the relevant elasticities of export supply.[2]

Aside from the trade side of the model outlined above factor dynamics are driven by income maximizing capital stock owners facing quadratic adjustment costs. Consumption and debt dynamics come from a standard inter-temporal utility maximizing framework. Both the US and Australia face a world economy growing at a constant rate with a constant real interest rate and supply prices of tradable goods. The model is calibrated to a year 2000 benchmark using primarily data from GTAP, aggregated to 11 sectors which include an education sector which produces skilled workers as an output. The interpretation these skilled workers is based on the occupational definitions used in GTAP, but it is assumed in addition that skilled workers have four year post school education.[3] The GTAP data is also scaled using *Penn World Tables 5.6* data so that income in each region is expressed in terms of $PPP. Data on industry value added is scaled to be consistent with investment spending data in a steady state. Likewise trade

[2] The full set of equations describing the model are available from the authors as an appendix.
[3] For details of the construction of this data see Liu (1998).

flow data is scaled so that the benchmark represents a hypothetical steady state with balanced trade.

3. A status-quo comparison of the FTA.

In this section we do a conventional status quo comparison of the AUSFTA similar to that of other modelers –see in particular CIE (2004) and Dee (2004). The status quo is a steady state world growth path based on data averaged over the late 1990's and early 2000-2002 period. The model is fairly aggregated on the goods side so that it is not capable of providing detailed trade creation and trade diversion results. But it is, by the standards of most models, quite detailed on the factor side. Moreover because of the Heckscher-Ohlin trade structure it provides a quite differential theoretical perspective than that of GTAP models where trade patterns are largely determined by assumed demand share and substitution parameters.

We will examine the three basic sources of gains discussed in the CIE report—gains to trade barrier elimination, productivity gains, and investment liberalization gains. Despite the different theoretical structure of the model the results are quite similar to the CIE projections. By and large, as noted by Lloyd and MacLaren (2004) the estimated economic gains to Australia from AUSFTA are quite modest compared to a historical benchmark based on the status quo. This is hardly surprising to trade policy analysts. The US accounts for about 20 percent of Australia's trade and the tariff cuts by both countries are quite modest under the agreement.

3.1 Tariff cut effects

In Tables 1 and 2 the basic effects of the bilateral tariff reduction are reported measured relative to a 'status quo' baseline. The effects are quite modest in line with most other models predictions. The steady state gains in real GDP per capita are approximately 0.2 percent and in real consumption per capital even more modest at 0.04 percent. The gains come slowly with about half arriving after 10 years from the start implementation. Recall some tariff cuts in the FTA are phased in quite slowly. There are some modest long run effects on factor accumulation. The skilled to unskilled labor ratio rises by 0.15 percent and machinery per unskilled worker rises by 0.38 percent. Trade

volumes between Australia and the US rise quite quickly by about 5 percent and increase only modestly thereafter peaking at a 6 percent increase. Australia's trade with the Rest-of-World (ROW) declines on impact by 0.18 percent and in the long run is hardly changed. As noted whether there are trade diversion effects is difficult to assess in a model with this degree of aggregation on the goods side.

Overall the results are entirely consistent with most the modeling done on RTA's in the several last years using GTAP-Armington type CGE models as surveyed by Lloyd and MacLaren (2004), and the quantitative effect is about in line with those type of studies. The long and short run sectoral output effects detailed in Table 2 are very modest as well with all long run changes being less than 1.0 percent in absolute value. The largest effect is on the durables sector which declines by 1.0 percent on impact.

3.2 Dynamic Gains

The model-based debate within Australia has focused on two sources of 'dynamic gains'—long run productivity gains as measured by changes in total factor productivity (TFP) levels, and increased investment due to investment liberalization which comes from a lower cost of capital. We follow as closely as possible the method used by the CIE (2004) report in quantifying these two parameters. The subsequent investment responses to these changes are endogenous in the model and represent the long run factor supply responses to the change policy environment.

Total factor productivity gains are calibrated as follows. We use the CIE (2004) baseline approximation of an assumed 0.3 percent increase in total factor productivity for each 1 percent unilateral tariff cut in the tradables sector. With an average tariff level of 5 percent that translates into a 1.5 percentage increase in total factor productivity. Tradables account for 47 percent of total value added so that, for the economy as a whole, the TFP gain would be 0.47 times 1.5 percent or 0.71 percent TFP gains on all sectors. The most natural interpretation of trade induced productivity gains are those that are biased towards capital and human capital which constitutes 69 percent of value added. The production structure is modeled such that physical and human capital are nested inside a capital 'aggregate'; thus they are treated as complements with each other but

substitutes against land, resources, and unskilled labour.[4] The 0.71 percent total TFP shock translates into a biased productivity shock on reproducible and capital and skilled labour equal to 0.71/0.69 which equals approximately 1 percent. This number is adjusted to reflect the fact US trade with Australia is only about 20 percent of total trade – thus the assumed net impact on the capital biased factor augmentation productivity parameter is 0.2 percent. This is the baseline productivity gain parameter assumed in the simulations.

The CIE (2004) identified as their single largest source of gains the impact of 'investment liberalization' within the agreement which was modeled as a 5 basis point reduction in the equity risk premium on all capital investment in Australia. We treat the reduction in the cost of capital on investment decisions as equivalent to a reduction in the producers rental price of capital on certain types of capital goods.[5] There is an important issue, however, as to exactly what types of capital are most likely to be impacted by the reduction in the equity risk premium. One argument would be that it applies only to business capital. In this case we take as out baseline adjustment an 8 basis point adjustment on *r* applied to *only* machinery and structures. This is equivalent to a 0.333 percent reduction in the rental prices on these assets. Alternatively one could argue that the investment liberalization effect would impact all investment decisions in the economy – including those on human capital. The idea is that the investment provisions in the agreement would 'spillover' to lower costs of borrowing for human capital acquisition. This case is also considered although the justification for this assumption is at best weak.

The results for the first case of an investment liberalization, applied only to investment in machinery and structures – plus a productivity effect which falls as a biased factor augmentation shock on durable capital plus skilled labor – are presented in Table 3. Here we can see that the dynamic effects change the overall economic impact considerably. There is a 0.93 percent long run increase in real GDP per capita-almost five times that for the trade barrier effect alone. These gains show up in the form of higher

[4] This is similar to the framework used in Krussel et.al (2000) although in this case applied to each sector rather than at the aggregate economy level.

[5] Give the standard formulae linking rentals, depreciation and investment cost we have the relationship *Rental rate* =(*cost of capital* + *depreciation rate*) × *net price of new investment goods*, or $R = (r + \delta)Q$. If r=0.05, δ =0.15, and Q = 1, then R initially equals 0.2. A five basis point reduction in r to r =0.0495 is equivalent to a reduction in the rental price of 0.333 percent. For an 8 basis point change it would come out to a 0.2 percent decrease in the rental price. The CIE (2004) apply the 5 basis point adjustment to all capital formation as the investment liberalization shock.

real factor prices for both types of labor and land, and resource rents. Rentals on capital in the form of rentals on machinery and structures decline in the long run. Rents on the residential capital stock barely change.

The long run accumulation effects are much larger in this case as compared with the basic 'tariff cut only' changes reported in Table 1. Machinery and structures capital per unskilled worker rise in the long run by over 2 percent. The skilled to unskilled labor ratio rises by 1.3 percent – a fairly significant net skilling effect. The wages of skilled to unskilled workers declines slightly in the long run. The dynamic transition is fairly steady with about half the long run GDP gains in place by year 10. The long run versus impact effect on some sectors is quite different. Durables, intermediate manufactures and low–tech manufactures all contract on impact but in the long run all these sectors expand. The additional capital accumulation triggered by the dynamic drivers leads to a net expansion of what might appear, from purely static analysis, to be net losers from the AUSFTA agreement.

The second investment liberalization scenario we considered was a reduction in rental cost of capital to all types of capital formation including human capital. However in this case we used the 5 basis point adjustment factor similar to what was applied in the CIE report. The results were quite similar overall to those discussed above. Long run GDP gains were about 0.9 percent with significant accumulation effects. By expanding the set of factors to which 'investment liberalization' applies leads to a larger overall impact. These results are sensitive however to the assumed complementarity of physical and human capital. Overall these results confirm that the dynamic effects are very sensitive to the presumed productivity and investment liberalization assumptions.

4. The FTA as Insurance: Global and Regional Trade Wars

Whalley and Peroni (2000) argue that small country participation in Regional Trade Agreements (RTA's) are motivated to a considerable degree as an insurance arrangement against large country protection or to provide guaranteed market access. The structure of gains and losses is such that in a static model small countries must offer large countries side payments in order to induce them to participate in the RTA. They use a

static model to evaluate this idea using constrained and unconstrained Nash tariff war equilibrium as their point of evaluation. Given the complexity of the dynamic model we are not able to model a Nash tariff equilibrium. The model does, however, allow us to look at other aspects of the 'insurance value' of the FTA related to timing and duration. If an RTA is viewed as 'insurance' against a trade war, the value of the RTA could differ depending upon when the trade war occurs, with whom, and its duration.

4.1 The value of being Inside a Trade Bloc: Permanent vs. Temporary Trade Wars

Suppose the adverse event against which market access insurance is judged, is the prospect of world breaking into permanent trade blocs centered on a few key countries. What is the impact on a small country left being left outside versus inside a trade bloc? The FTA is treated as a commitment device for governments such that in the event of a general trade war the members of the FTA at least do not raise tariffs against each other. The insurance value of the FTA is judged relative to the alternative – no FTA and a similar global trade war. The basic issue is the extent to which the damage to Australia of a larger trade war can be reduced through commitment to the AUSFTA. It is certainly not a foregone conclusion that the value of this insurance is very high. The US, for example, only accounts for about 20% of Australia's exports in the baseline. How trade impacts with other countries and, in particular, whether the trade is bilateral or global, will impact on the perceived 'insurance' value of any RTA.

Timing and anticipation of the trade war will also matter. We will consider two cases – anticipated permanent trade wars and temporary and unanticipated trade wars. For small open economies that are not members of a bloc these anticipation effects will drive investment and human capital decisions to some degree. Thus the expectation of being out of the bloc in the future will have negative consequences in the present. In particular instability can result in an economy simply as a consequence of market perception as to the likelihood of a trade war. Joining a bloc, however, may mitigate these risks and therefore would avoid the consequences of the trade war anticipation effects.

In order to quantitatively evaluate the potential insurance value to Australia of the AUSFTA it is necessary to quantify the impact on Australia in two counterfactual

situations – that of being IN versus being OUT of the US trade block. For modeling purposes we standardize the 'trade war event' as an increase in tariffs by ten percent from their existing levels by all involved parties. In the event that Australia is a member of a the US bloc, by virtue of the AUSFTA commitments, neither Australia nor the US raise tariffs against each other. From a national interest standpoint a measure of the insurance value of the AUSFTA is the *reduction* in cumulative real GDP losses to Australia from avoiding a trade war which is assumed to arise by committing to an FTA arrangement with the United States. This of course presumes that both countries honor their market access commitments.[6]

On historical grounds the ten percent number is not particularly high, and certainly not high relative to Nash optimal tariffs calculated in the literature. While one could argue along optimal tariff theory lines it would be unlikely that Australia would impose a ten percent tariff on all imports as the optimal retaliatory response. It is also unlikely, from a political economy standpoint, that a no-retaliation response would occur. Rather "tit-for-tat" retaliation, even by small countries, fits with the historical experience of known trade wars.

4.2 Permanent or Long Lived Trade Wars

In this section we consider the case of a long-lived or permanent trade war. We also assume that the trade war is fully anticipated. Specifically the case examined considers a trade war between blocs which begins in year 11 after the agreement is signed, or simply in year 11 in the event that the AUSFTA is not implemented. Market participants in both the *IN* and *OUT* scenarios fully anticipate the trade war and this has consequences for factor accumulation. In reality there would obviously be substantial uncertainty regarding the exact dates and magnitudes of response in a "tit-for-tat" trade war. The fully anticipated case can best be thought of as providing lower bound to the possible damage which might result in the unanticipated case, given that the ability of the economy to respond in the short run would be more limited. Moreover we do not include

[6] McLaren (1997) has argued that static analysis of trade agreements between parties with asymmetric economic power are flawed because they do not deal with the 'sunk cost' aspect of entering a trade agreement. One in an agreement a lot of investments are made whose value hinges on the presumed continuation of the agreement. This model avoids such a criticism given the use of the perfect foresight assumption investment decisions respond rationally to both the anticipation of a trade war starting and to one ending. Over the long run all sunk capital is ultimately malleable.

any dynamic add-on effects due to productivity reductions or increased risk premia on investment. While the latter are clearly relevant we have no particular way in which to calibrate these possible effects.

To evaluate the insurance value of AUSFTA we first consider a benchmark of global trade war with Australia on the outside beginning in year 11 of the simulation. The economic consequences of a global trade war for Australia relative to the status quo are, unsurprisingly, considerable.[7] Steady state real GDP per capita falls by 4.6 percent and real wages fall by an average of about 3.7 percent The openness ratio declines by 23 percent. The terms of trade tend to improve marginally. There are some negative effects on capital. Machinery and structures to GDP ratios fall by 1.6 and 2.8 percent respectively.

The global trade war is also significantly de-skilling for Australia; the skilled to unskilled labour ratio falls by 3.7 percent. Not surprisingly, relative to the status quo, the big losers on a sectoral basis are agriculture and minerals, and all sectors contract with the exception of durables and low-tech manufacturing. Note there are also significant anticipation effects on capital accumulation – a slowdown in growth and investment begins well ahead of the trade war with per capital GDP falling by over 1% relative to the base in the year prior to the trade war starting. Also because of the de-skilling effect of the trade war, the output of the education sector falls significantly. Education falls by over 10% in the year the trade war starts, in anticipation of the reduced demand for skilled labour.

For our purposes however the global trade war scenario is primarily relevant because it provides a benchmark against which to assess the value of the AUSFTA in terms of mitigating the damage of such a trade war. The net impact of Australia being *IN* relative to having no such agreement are detailed in Table 5. From a long run perspective the net insurance value of the FTA in these circumstances is distinctly positive and provides a much larger impact than the conventional status quo based efficiency gains. GDP per capita gains are one percent – this is five times the gains in Table 1, which

[7] We do not include a table of these results. While they are of independent interest they are not directly relevant to quantifying the 'insurance gains'. Tables 5-7 report the value of being inside the US bloc relative to alternative cases of being outside the bloc.

reports the FTA against a status quo (no trade war) base case. In the first 5 years the gains are relatively modest but build steadily after that. If one simply looks at total undiscounted GDP gains by being *IN* versus *OUT* the number is very large. Cumulative GDP losses from being *OUT* are 35 percent of base GDP. This is a very significant effect. The FTA in this case also serves to reduce some of the substantial deskilling effects of the unconstrained trade war. Thus the skilled to unskilled trade ratio is higher by one percent than in the case of being *OUT*. At the sectoral level the insurance benefits are generally small and spread across all sectors in the long run.

We do not report an exhaustive set of parameter sensitivity result here. One parameter of particular interest though is the degree of substitution on the supply side between different destination markets. To the extent a supplier is more responsive to changes in relative prices between different export markets, a global trade war with the US market remaining open would imply that Australian exporters would shift from the ROW market to the US market. This is in fact what happens. However the sensitivity of the insurance benefits of changing the relative supply elasticities is actually very modest. Increasing supply elasticities has the implication that the overall cost of the trade war is higher, but the insurance value of the FTA does not appear sensitive to the presumed relative export supply elasticity.[8]

4.3 Temporary and Unanticipated Trade Wars

Temporary but unanticipated trade wars with a finite duration (say 3 to 6 years) have the usual tariff-war type effects—trade volumes are reduced, efficiency losses mount and the non-traded sector expands. Depending on the duration of the trade war the factor endowment profile could change. For example if capital intensive sectors have had to contract the economy might begin to disinvest in certain types of capital. Unlike the previous case, however, as the trade war comes to an end markets will anticipate this, and investment will take place such as to return the capital structure back to its long run value. Temporary trade wars thus induce not only the traditional trade volume and terms

[8] Recall supply to different markets is modeled using sector specific CET functions. Thus the elasticity of relative supply with respect to relative export prices is constant. The parameter value for this elasticity in the base range from 1.5 to 3. In the experiment discussed above all these elasticities were doubled for all suppliers in all countries.

of trade effects, but also raise adjustment costs because of 'double adjustment' in the process of factor accumulation as capital stocks re-adjust to the pre-trade war policy environment.

The results are reported for simulations involving temporary trade wars which begin in year 1.[9] Because the start date is year 1 this corresponds to an unanticipated trade war. The trade war lasts for five years but the ending date is fully anticipated. The tariff increases are 10 percent on all traded goods by all trade war participants. The quantitative effects of a temporary unanticipated trade war relative to the status quo are much less severe than a permanent trade war discussed above. GDP per capita losses to Australia are about 2% for the five years and then rapidly diminish thereafter. Trade volumes diminish rapidly throughout the trade war but then also recover rapidly.

Interestingly the trade war actually causes some skilled labor accumulation and reduction of unskilled labor supplies relative to 'no trade war'. The driving factor here appears to be a fall in unskilled wages which reduces the opportunity cost of going to school, thus increasing the demand for education. For reference purposes note that cumulative GDP losses for the five years during which the trade war occurs (measured relative to the steady state with no trade wars) is about 10 percent. Now what of the FTA as insurance?

The consequences of Australia membership within the US bloc in the event of a temporary (5 year) global trade war are detailed in Table 6. The market access insurance gains from being in the US bloc peak at 0.52 percent GDP per capita in the last year of the five year trade war. The cumulative GDP gains over the 5 years are 2.33 percent of base year GDP. By year 10, that is five years after the end of the trade war, the value of AUSFTA measured by levels effects has diminished considerably as can be seen in the last column of the Table, although cumulative GDP losses are permanent and at year 10 sit at 2.7 percent of GDP. Trade between Australia and the United States is about 30 percent higher as a consequence of Australia being inside the US bloc than being out. The distribution of the insurance benefits of bloc membership are spread across most factors with the exception of machinery which appears to lose marginally.

[9] Year 1 is based on a 2005 data benchmark.

4.4. Insurance Against Australia directed US Protectionism

The last case considered is US protectionism targeted at Australia. Certainly one purpose of the agreement from the Australian perspective was too prevent future US protectionism against Australian exports to the U.S. This insurance benefit can be evaluated on stand-alone basis—that is independent of whether there is a larger external trade war. Certainly the possibility of a US initiated trade war specifically against Australia seems less likely than the scenarios considered above. The US does, however, count for about 20 percent of Australia's exports and therefore putting a number on 'secure market access' is of some interest.

To quantify these gains we use as a benchmark a bilateral US-Australia trade war which is unanticipated and lasts for five years. Note that it is assumed Australia retaliates reciprocally against the US with all tariffs going up to the 10 percent level. The ROW is not involved in any way. These results are presented in Table 7. Per capita GDP gains are about one half of a percent by the end of the trade war in year 5. It can be seen that cumulative GDP gains from trade war avoidance are just over 2 percent by year 5. One can also see the substantial cost of a trade war with the US, in the trade volume figures. Overall trade with the US falls by 30 percent relative to an AUSFTA benchmark, and, interestingly, AUS-ROW trade only increases by less than one percent.

6. Conclusion

In this paper we have used a dynamic Heckscher-Ohlin model of Australia-US-Rest-of-World trade to examine the potential impact of the Australia-US Free Trade Agreement. The model incorporates a detailed treatment of three types of physical capital accumulation, as well as the dynamics of investment and accumulation of human capital. The paper first re-examined the impacts of tariff reduction and dynamic add-on effects which follow for total factor productivity gains and cost of capital reductions which might follow from the agreement. Broadly speaking the results of the model confirm what has been found in other CGE analysis of the agreement, with total gains from all three sources amounting to a gain in per capita GDP of about half a percent after ten years and a steady-state gain of about one percent. These gains, however, stem largely from the presumed dynamic effects. The effects of tariff reduction are very modest

amount to a gain of about 2/10th of one percent of steady-state GDP per capita. These results confirm the importance of modeling dynamic effects in looking at potential benefits to regional trade liberalization.

The paper also provides new estimates on the 'insurance benefits' of Australian membership in the US trade bloc in the event of possible global trade wars. Trade wars were modeled as increases in tariffs of 10 percent from the base level against all non-member countries. In this setting the FTA provides Australia market access at a time other markets are being shut. We found that, excluding any possible dynamic productivity or risk premia effects, the net insurance gains are substantial and much larger than the traditional status quo based efficiency gains. In the case of permanent global trade war the benefits of Australia to being in the US bloc amount to a one percent gain in GDP per capita, or a cumulative GDP gain of 30 percent of base GDP. In the case of a temporary trade war lasting five years GDP per capita is estimated to be about 0.5 percent higher by the end of the trade war as consequence of being inside the US trade bloc.

Lastly the paper looks at the possible insurance or commitment value of AUSFTA as a means of preventing future US protectionism targeted at Australia. Using a five year Australia-US trade war as the basis against which to evaluate the commitment/insurance benefits the net impact is a per capita GDP gain of about 0.5 per cent. The number is not large but is larger than the presumed static efficiency gains of the tariff reductions alone achieved by AUSFTA. Overall the paper suggests that the economic analysis of RTA's is not complete without quantification of the insurance benefits of such agreements. The AUSFTA is typical of many of these agreements in that the static gains to the smaller partner are modest. However both the dynamic gains and market access insurance gains are much larger.

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Table 1

AUSFTA Australia Impact-Trade Barrier Removal Only

(percentage change relative to steady state benchmark)

	1 year	5 years	10 years	Steady State
Welfare Indicators				
Real GDP per capita	0.06	0.11	0.15	0.20
Real Consumption per capita	0.03	-0.06	-0.01	0.04
Investment-Output ratios				
Machinery Investment to GDP	0.07	0.04	-0.02	-0.03
Structures Investment to GDP	0.11	0.13	0.09	0.07
Residential Investment to GDP	-0.09	-0.05	-0.07	-0.09
Educational Output to GDP ratio	0.11	0.08	0.01	-0.09
Real Factor Prices				
Machine Rental	0.04	-0.05	-0.13	-0.15
Structures Rental	0.03	0.11	0.07	0.02
Residential Rental	0.08	-0.01	0.04	0.03
Skilled wage	0.05	0.12	0.17	0.17
Unskilled wage	0.07	0.13	0.15	0.19
Land Rental	0.18	0.12	0.17	0.19
Resource Stock Rental	-0.08	0.07	0.06	0.08
Skilled-Unskilled wage ratio	-0.02	-0.01	0.02	-0.02
Factor Endowment Indicators				
Machine Stock to real GDP ratio	-0.06	0.04	0.09	0.13
Structures Stock to real GDP ratio	-0.06	-0.04	-0.01	0.05
Machinery capital per Unskilled worker	0.01	0.17	0.26	0.38
Structures capital per Unskilled worker	0.01	0.09	0.16	0.29
Residential Housing Stock to GDP ratio	-0.06	-0.12	-0.13	-0.11
Skilled to Unskilled Labour ratio	0.01	0.03	0.06	0.15
Trade Indicators				
Real Exchange Rate	-0.12	-0.14	-0.16	-0.16
Terms_of_Trade	-0.09	-0.05	-0.07	-0.08
Trade Volume US-Australia	5.10	5.43	5.83	6.08
Trade Volume Australia-ROW	-0.18	-0.12	-0.10	-0.07
Openness Ratio Australia	0.70	0.77	0.81	0.83
Trade Surplus as percent of value of GDP (measured as level variable)	1.68	1.76	1.76	1.75

Table 2

AUSFTA Impact Australia: Trade Barrier Removal Only

Sectoral Output Changes

(percentage change relative to steady state benchmark)

	1 year	5 years	10 years	Steady State
Agriculture	0.79	0.90	0.96	0.98
Minerals	-0.25	-0.06	-0.02	0.05
Lowtech Manufactures	-0.26	-0.21	-0.25	-0.24
Intermediate Manufactures	-0.17	0.06	0.07	0.11
Durable Manufactures	-1.00	-0.62	-0.57	-0.41
Traded Services	-0.01	-0.01	0.03	0.09
Construction	0.03	0.09	0.11	0.15
Non Traded Services	0.02	0.01	0.05	0.10
Public Sector	0.01	-0.01	0.02	0.07
Housing	-0.05	-0.08	-0.06	-0.01
Education	0.17	0.19	0.16	0.10

Table 3

Investment plus Productivity Gain

Investment impact on Machinery and Structures Only (8 basis case)

(percentage change relative to steady state benchmark)

	1 year	5 years	10 years	Steady State
Welfare Indicators				
Real GDP per capita	0.01	0.24	0.52	0.93
Real Consumption per capita	0.49	-0.24	0.08	0.60
Investment-Output ratios				
Machinery Investment to GDP	-0.09	0.74	0.76	0.63
Structures Investment to GDP	0.22	0.92	0.97	0.73
Residential Investment to GDP	-0.27	0.15	0.03	-0.21
Educational Output to GDP ratio	0.92	1.29	0.86	-0.07
Real Factor Prices				
Machine Rental	-0.23	0.03	-0.40	-0.62
Structures Rental	-0.27	0.17	-0.04	-0.52
Residential Rental	0.66	-0.27	-0.01	-0.02
Skilled wage	0.09	0.26	0.59	0.58
Unskilled wage	-0.05	0.3	0.45	0.75
Land Rental	0.56	-0.11	0.09	0.34
Resource Stock Rental	-0.64	0.25	0.30	0.45
Skilled-Unskilled wage ratio	0.14	-0.05	0.14	-0.17
Factor Endowment Indicators				
Machine Stock to real GDP ratio	-0.01	0.07	0.41	0.78
Structures Stock to real GDP ratio	-0.01	0.03	0.27	0.77
Machinery capital per Unskilled worker	0.04	0.43	1.12	2.15
Structures capital per Unskilled worker	0.04	0.39	0.98	2.14
Residential Housing Stock to GDP ratio	-0.01	-0.23	-0.38	-0.17
Skilled to Unskilled Labour ratio	0.04	0.24	0.47	1.29
Trade Indicators				
Real Exchange Rate	-0.17	-0.09	-0.16	-0.16
Terms of Trade	-0.26	-0.06	-0.15	-0.24
Trade Volume US-Australia	5.02	5.54	6.12	6.59
Trade Volume Australia-ROW	-0.37	-0.01	0.18	0.44
Openness Ratio Australia	0.44	0.78	0.67	0.51
Trade Surplus as percent of value of GDP (measured as level variable)	1.36	1.79	1.77	1.75

Table4

Investment plus Productivity Gain

Investment impact on Machinery and Structures Only (8 basis case)

Sectoral Output Changes

(percentage change relative to steady state benchmark)

	1 year	5 years	10 years	Steady State
Agriculture	0.65	0.72	0.85	0.98
Minerals	-0.77	0.24	0.70	1.37
Lowtech Manufactures	-0.33	0.03	0.34	0.74
Intermediate Manufactures	-0.78	0.3	0.66	1.16
Durable Manufactures	-2.81	0.21	0.60	1.02
Traded Services	0.14	0.03	0.39	0.91
Construction	0.05	0.51	0.85	1.18
Non Traded Services	0.23	0.00	0.32	0.77
Public Sector	0.11	0.02	0.24	0.70
Housing	0.07	-0.04	0.17	0.65
Education	0.94	1.53	1.39	0.86

Table 5

Value of AUSFTA in Event of a

Global Trade War Starting Year 11

(percentage change with AUSFTA relative to trade war scenario)

	1 year	5 years	10 years	Steady State
Welfare Indicators				
Real GDP per capita	0.02	0.15	0.29	1.02
Real Consumption per capita	0.36	-0.20	-0.12	0.37
Cumulative GDP gains as percent of base GDP	0.02	0.42	1.49	35.65
Investment-Output ratios				
Machinery Investment to GDP	-0.05	0.36	0.59	-0.09
Structures Investment to GDP	0.19	0.62	0.96	0.24
Residential Investment to GDP	-0.22	0.16	0.48	-0.41
Educational Output to GDP ratio	0.81	1.26	1.56	-0.36
Real Factor Prices				
Machine Rental	-0.15	-0.02	-0.2	-0.67
Structures Rental	-0.19	0.08	-0.09	0.10
Residential Rental	0.51	-0.21	-0.25	0.11
Skilled wage	0.07	0.12	0.22	0.85
Unskilled wage	-0.02	0.23	0.34	0.96
Land Rental	0.46	-0.04	-0.02	0.69
Resource Stock Rental	-0.48	0.17	0.20	0.38
Skilled-Unskilled wage ratio	0.09	-0.10	-0.13	-0.11
Factor Endowment Indicators				
Machine Stock to real GDP ratio	-0.02	0.07	0.26	0.61
Structures Stock to real GDP ratio	-0.02	0.04	0.24	0.16
Machinery capital per Unskilled worker	0.04	0.32	0.74	1.94
Structures capital per Unskilled worker	0.04	0.29	0.71	1.49
Residential Housing Stock to GDP ratio	-0.02	-0.15	-0.15	-0.50
Skilled to Unskilled Labour ratio	0.04	0.20	0.45	0.95
Trade Indicators				
Real Exchange Rate	-0.16	-0.10	-0.12	-0.72
Terms of Trade	-0.21	-0.04	-0.1	-0.25
Trade Volume US-Australia	5.05	5.45	5.94	31.57
Trade Volume Australia-ROW	-0.33	-0.08	0.00	-0.40
Openness Ratio Australia	0.50	0.79	0.77	4.83
Trade Surplus as percent of value of GDP (measured as level variable)	1.36	1.79	1.77	1.75

Table 6

Temporary Global Trade War Years 1-5

Impact of AUSFTA relative to being outside both Blocs

	Year 1	Year 5	Year 10
Welfare indicators			
Real GDP per capita	0.39	0.52	0.15
Real Consumption per capita	-0.05	0.06	0.03
Cumulative GDP gains as percent of base GDP	0.39	2.23	2.69
Real Factor Prices			
Machine Rental	0.44	-0.19	-0.34
Structures Rental	0.35	0.59	0.09
Residential Rental	0.08	0.35	0.14
Skilled wage	0.41	0.68	0.28
Unskilled wage	0.47	0.5	0.12
Land Rental	0.39	0.62	0.23
Resource Stock Rental	0.06	0.21	0.03
Skilled-Unskilled wage ratio	-0.06	0.18	0.15
Trade Indicators			
Real Exchange Rate	-0.55	-0.70	-0.20
Terms of Trade	-0.22	-0.14	-0.07
Trade Volume US-Australia	29.89	30.44	5.83
Trade Volume Australia-ROW	-0.81	-0.70	-0.10
Openness Ratio Australia	4.93	4.96	0.78

Table 7

US-Australia Bilateral Temporary Trade War Scenario

AUSFTA relative to Bilateral Trade War Years 1-5

	Year 1	Year 5	Year 10
Welfare indicators			
Real GDP per capita	0.37	0.5	0.15
Real Consumption per capita	-0.03	0.05	0.05
Cumulative GDP gains as percent of base GDP	0.37	2.11	2.65
Real Factor Prices			
Machine Rental	0.43	-0.21	-0.33
Structures Rental	0.28	0.52	0.08
Residential Rental	0.13	0.3	0.13
Skilled wage	0.38	0.67	0.27
Unskilled wage	0.45	0.5	0.13
Land Rental	0.49	0.65	0.24
Resource Stock Rental	-0.07	0.09	0.02
Skilled-Unskilled wage ratio	-0.07	0.16	0.14
Trade Indicators			
Real Exchange Rate	-0.54	-0.68	-0.20
Terms of Trade	-0.16	-0.10	-0.07
Trade Volume US-Australia	29.81	30.24	5.83
Trade Volume Australia-ROW	-0.79	-0.68	-0.10
Openness Ratio Australia	3.43	3.40	0.77