

WELFARE IMPACT OF A BILATERAL TRADE AGREEMENT

1. INTRODUCTION

Right from its inception there has been debate about the benefit of preferential trading agreement (PTA). The opposition of PTA comes from the theory of second best, which shows that, in the presence of multiple distortions in the market, a piecemeal movement toward the first best solution could, in fact, be welfare lowering. Although the welfare impacts of such arrangements are still being debated, the appetite for the formation of such a trading block seems to be growing. Theoretically, there are two basic results available. The first one, the so called concertina rule, shows that if the highest *ad valorem* tariff is lowered to the second highest level, then the outcome is welfare enhancing assuming that all goods are net substitutes. The second result suggests that uniform proportional cuts in tariffs should raise the welfare. While most of the exports of developing countries involve intermediate goods, the assumption of net substitute does not seem to be plausible as challenged by Lopez and Panagariya (1992). Bhagwati (1993) suggests that a common tariff set at the minimum of the pre customs union level can be seen as welfare enhancing. Ju and Krishna (1996) have shown that the creation of Free Trade Areas without Rules of Origin can reduce the welfare of the members of a customs union. McMillan (1993) suggests that neither the members of a customs union nor the rest of the world is hurt if trade volume rises after the formation of such a trading block. Krugman (1991) challenges the theory of second best and argues that, if all trade took place within a geographic area, then the removal of trade barriers within this area is first best and must increase welfare. However, Krugman's arguments are also challenged by Bhagwati and Panagariya (1996). They argue that, in the wake of large imports from a trading partner prior to the formation of the trading block, the trade agreement can result in a substantial loss in tariff revenue and could have negative impact on the welfare in the absence of redistribution within the member

countries. The support for the natural trading block arguments comes from the so called Volume of Trade hypothesis conceptualized by Lipsey (1970). To him, as the tariff on imports from union partners is eliminated following the formation of a union, it tends to bring the relative price between imported goods and domestic goods in conformity with the real rate of transformation and, therefore, raise the welfare on one hand, and on the other hand, existing tariff on the imports from non-union members pushes the relative price between the imports from union members and the imports from non-union members away from the real rate of transformation. The later effect tends to lower the welfare. But, if the proportion of trade with union members is larger than the volume of trade with non-union members, then the positive welfare effect is likely to outweigh the negative effect.

Based on Lipsey's argument, this study intends to develop and test an empirical model to analyze the impact of U.S.-Australia Trade Agreement on U.S. welfare. To our knowledge, Lipsey's argument has not been tested empirically. Therefore, this study will be a significant contribution to the trade literature. Also, there have been some studies on the impact of various trade agreements signed by the U.S. on various aspects of U.S. economy: two studies by Adhikari (2003; 2006) examine the impact of North American Free Trade Agreement on the welfare of the member countries; one study by Adhikari (mimeo) examines the impact of Central American Free Trade Agreement (CAFTA) on U.S. welfare; other studies mostly deal with the impact of NAFTA on certain sectors of U.S. economy, for example, one study by U.S International Trade Commission (1997) on employment, one by U.S. Department of Agriculture (1997) on agriculture, one by Dejanvry (1996) on auto and textile industries and U.S. trade balance, one by U.S. Department of Agriculture (1999) on U.S. trade and industrial structure, and one by Trela and Whalley (1994) on welfare gains to U.S. focused only on the textile trade. So far, none of the studies address the issue of the impact of U.S.-Australia Trade Agreement on U.S. welfare. Our study also aims to fill this gap and make a contribution to the trade literature.

This study lays out the model and derives the sufficient conditions for welfare improvement in section 2, discusses the empirical model, data and methodology in section 3, presents the analyses and empirical findings in section 4, and summarizes and concludes the findings in section 5.

2. THE MODEL

Suppose country A produces x_1 at home and imports x_2 and x_3 from country B and C respectively. Let p_i^* and p_i be the world and domestic prices of commodity x_i respectively, where $i = 1, 2, 3$. Assume that there is an *ad valorem* tariff rate of t_i on import, where $i = 2, 3$. Therefore, the domestic price of the commodity is given by $p_i^*(1+t_i)$. Let the utility function of the representative consumer be given by $U = U(x_1, x_2, x_3)$. Under a balance budget assumption, the consumer's income, I , equals his total expenditure of $p_1x_1 + p_2x_2 + p_3x_3$. The consumer's equilibrium condition requires that the ratio of marginal utilities of two commodities be equal to the price ratio, which implies the following:

$$\frac{\partial U / \partial x_1}{\partial U / \partial x_2} = \frac{p_1}{p_2} \quad (1)$$

$$\frac{\partial U / \partial x_1}{\partial U / \partial x_3} = \frac{p_1}{p_3} \quad (2)$$

$$\frac{\partial U / \partial x_2}{\partial U / \partial x_3} = \frac{p_2}{p_3} \quad (3)$$

Since $p_i = p_i^*(1+t_i)$ and tariff on domestic commodity is zero, the above equations amount to:

$$\frac{\partial U / \partial x_1}{\partial U / \partial x_2} = \frac{p_1}{p_2^*(1+t_2)} \quad (4)$$

$$\frac{\partial U / \partial x_1}{\partial U / \partial x_3} = \frac{p_1^*}{p_3^*(1+t_3)} \quad (5)$$

$$\frac{\partial U / \partial x_2}{\partial U / \partial x_3} = \frac{p_2^*(1+t_2)}{p_3^*(1+t_3)} \quad (6)$$

These equations can be rewritten as:

$$\frac{\partial U}{\partial x_1} - \frac{p_1^*}{p_2^*(1+t_2)} \frac{\partial U}{\partial x_2} = 0 \quad (7)$$

$$\frac{\partial U}{\partial x_1} - \frac{p_1^*}{p_3^*(1+t_2)} \frac{\partial U}{\partial x_3} = 0 \quad (8)$$

$$\frac{\partial U}{\partial x_3} - \frac{p_3^*(1+t_3)}{p_2^*(1+t_2)} \frac{\partial U}{\partial x_2} = 0 \quad (9)$$

Since $t_2 > 0$ and $t_1 = 0$, the equation (7) implies the following inequality:

$$\frac{\partial U}{\partial x_1} - \frac{p_1^*}{p_2^*} \frac{\partial U}{\partial x_2} < 0 \quad (10)$$

Since country A forms a trading block with country B and lowers the tariff on import from country B, we assume that t_3 (tariff on imports from country C) is greater than t_2 (tariff on imports from country B). Thus equation (9) implies the following:

$$\frac{\partial U}{\partial x_3} - \frac{p_3^*(1+t_3)}{p_2^*(1+t_2)} \frac{\partial U}{\partial x_2} > 0 \quad (11)$$

Total differentiation of the utility function and the budget equation with respect to t_2 yields:

$$\frac{\partial U}{\partial t_2} = \frac{\partial U}{\partial x_1} \frac{\partial x_1}{\partial t_2} + \frac{\partial U}{\partial x_2} \frac{\partial x_2}{\partial t_2} + \frac{\partial U}{\partial x_3} \frac{\partial x_3}{\partial t_2} \quad (12)$$

$$p_1^* \frac{\partial x_1}{\partial t_2} + p_2^* \frac{\partial x_2}{\partial t_2} + p_3^* \frac{\partial x_3}{\partial t_2} = 0 \quad (13)$$

Substituting equation (13) into (12) yields:

$$\frac{\partial U}{\partial t_2} = \left[\frac{\partial U}{\partial x_1} - \frac{p_1^*}{p_2^*} \frac{\partial U}{\partial x_2} \right] \left[\frac{\partial x_1}{\partial t_2} \right] + \left[\frac{\partial U}{\partial x_3} - \frac{p_3^*}{p_2^*} \frac{\partial U}{\partial x_2} \right] \left[\frac{\partial x_3}{\partial t_2} \right] \quad (14)$$

For the formation of a trading block with country B to be welfare improving, it is necessary that

$$\frac{\partial U}{\partial t_2} < 0$$

Since the terms in the first and the third square brackets on the right-hand side of the equation (14) are negative (-) and positive (+) respectively the sufficient conditions for the formation of a trading block to be welfare-enhancing boils down to the following:

Sufficient Condition:

$$\frac{\partial x_1}{\partial t_2} > 0 \text{ and } \frac{\partial x_3}{\partial t_2} < 0$$

Intuitively, for the formation of a trading block or for a preferential trade agreement to be welfare-enhancing, the real domestic production of the home country must increase and the real import from the countries outside the trading block must decrease following the formation of the trading block. Next we develop an empirical model to test the sufficient condition.

3. EMPIRICAL MODEL, DATA, AND METHODOLOGY

The United States and Australia signed a Free Trade Area (FTA) agreement effective January 1, 2005 (see <http://www.ustr.gov>). The agreement provides for the elimination of more than 99 percent of tariffs on industrial goods between the two countries. We intend to test if this agreement has helped enhancing U.S. welfare. Thus, our sufficient condition boils down to testing if U.S. real GDP has increased and if U.S. real import from the rest of world (other than Australia) has decreased following the agreement (i.e. since 2005). In order to avoid any arbitrary choice of two periods: before and after the agreement, for welfare comparison, we compute two unconditional (long-run) mean values of these test variables (U.S. real GDP, and U.S. import from rest of the world): one for the period before 2005 and one for the period since 2005. Then we compare the two mean values for each of our test variables. To compute the mean values we specify two time series models with one-period lag, one for each, as following:

$$\text{USRGDP}_{t_t} = a_0 + a_1 \text{USRGDP}_{t-1} + a_2 D1_t + u_t \quad (15)$$

$$\text{USRESTIMPORT}_t = b_0 + b_1 \text{USRESTIMPORT}_{t-1} + b_2 D2_t + v_t \quad (16)$$

Where USRGDP is the U.S. real GDP, USRESTIMPORT is the U.S. real import from rest of the world, and D1 and D2 are trade dummies which take a value of 0 for the observations before the year 2005 and 1 otherwise. The models (15) and (16) can be solved as:

$$\text{USRGDP}_t = (a_0 + a_2 D1_t)/(1-a_1) + u_t/(1-a_1) \quad (17)$$

$$\text{USRESTIMPORT}_t = (b_0 + b_2 D2_t)/(1-b_1) + v_t/(1-b_1) \quad (18)$$

Thus $a_0/(1-a_1)$ and $(a_0 + a_2)/(1-a_1)$ give the unconditional mean values of U.S. real GDP before and after the trade agreement

respectively. Similarly, $b_0/(1-b_1)$ and $(b_0 + b_2)/(1-b_1)$ give the unconditional mean values of U.S. real import from rest of the world before and after the trade agreement respectively. Thus testing our sufficient conditions for the trade agreement to be welfare improving amounts to testing if $a_2 > 0$ and $b_2 < 0$.

The data on U.S. nominal GDP is obtained from "International Financial Statistics" published by International Monetary Fund (IMF) and that on U.S. import is obtained from an IMF publication called "Direction of Trade Statistics". The real GDP is computed by multiplying the nominal GDP for each year by the GDP deflator for the base year (2000) then dividing the product by the GDP deflator for the respective year. Similarly, the real import is computed by multiplying the nominal import for each year by the import price index (IPI) of the base year (2000) then dividing the product by the IPI of the respective year. We use annual data for year 1985 to 2007 for our analysis.

4. EMPIRICAL FINDINGS

Estimation of (15) and (16) yields the following results:

$$\text{USRGDP}_{pt} = 408.2763 + 0.988974 \text{ USRGDP}_{t-1} + 86.11365 \text{ D1}_t \quad (19)$$

(3.271001) (61.92215) (0.617957)

$$R^2 = 0.996189; \quad F\text{-statistics} = 2221.703; \quad \text{Prob. (F)} = 0.0$$

$$\text{USRESTIMPORT}_t = 14746.84 + 1.056648 \text{ USRESTIMPORT}_{t-1} - 13254.23 \text{ D2}_t \quad (20)$$

(0.6020) (36.38753) (-0.290811)

$$R^2 = 0.989749; \quad F\text{-statistics} = 820.6560; \quad \text{Prob. (F)} = 0.0$$

Both of these models turned out to be significant as indicated by their respective R^2 values. The coefficient associated with trade dummy D1 is positive and that associated with trade dummy D2 is negative as hypothesized. That means the unconditional mean of U.S. real GDP has increased and the unconditional mean of U.S. real import from rest of the world has decreased following the implementation of U.S.-Australia trade agreement. This finding fulfills the sufficient conditions, as laid out in the model, for the trade agreement to be welfare-enhancing for the U.S. However, since the t-statistics associated with the trade dummies are not very significant, the result must be interpreted with a caution. Also, these are only sufficient conditions. As such, failure to meet these

conditions does not imply that the U.S.-Australia trade agreement is not welfare-enhancing for the U.S.

5. SUMMARY AND CONCLUSION

In this study, we develop a general equilibrium model and derive sufficient conditions for a trade agreement to be welfare-enhancing for a country. Our sufficient conditions require that the unconditional mean of the real GDP of the domestic country be higher and the unconditional mean of the total real import of the domestic country from the countries outside the trading block be lower following the trade agreement. To compute and compare the unconditional means of these test variables, we use the so-called Intervention Analysis. We apply the model on U.S.-Australia trade agreement. Our results show that the unconditional mean of U.S. real GDP has, in fact, increased and that of the U.S. real import from the countries outside the trade agreement has decreased after the implementation of the trade agreement. This finding meets our sufficient conditions. Therefore, we conclude that the U.S.-Australia trade agreement has helped enhancing U.S. welfare. However, there is a caution in order. Since we did not have enough observations following the year of the trade agreement, we suggest that the sufficient conditions be tested over a longer period of time.

DEERGHARAJ ADHIKARI

University of Louisiana at Lafayette, Lafayette, Louisiana, USA

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ABSTRACT

We develop a general equilibrium model and derive sufficient conditions for a trade agreement to be welfare-enhancing for a country. Our sufficient conditions require that the unconditional mean of the real GDP of the domestic country be higher and the unconditional mean of the total real import of the domestic country from the countries outside the trading block be lower following the trade agreement. We apply the model on U.S.-Australia trade agreement. Our results meet the sufficient conditions. Therefore, we conclude that the U.S.-Australia trade agreement has helped enhancing U.S. welfare.

Keywords: NAFTA, Revealed-preference, Trade-reform, Welfare, Intervention-analysis

JEL Classification: F1

RIASSUNTO

L'impatto sul welfare di un accordo commerciale bilaterale

In questo studio si sviluppa un modello di equilibrio economico generale e si individuano le condizioni sufficienti affinché un accordo commerciale migliori il benessere di un paese. Tali condizioni richiedono che la media non condizionale del PIL reale del paese considerato deve aumentare e le importazioni in termini reali dai paesi esterni al blocco commerciale devono diminuire come conseguenza dell'accordo commerciale. Il modello viene applicato all'accordo USA-Australia. I risultati mostrano il verificarsi della condizione sufficiente. Pertanto si conclude che l'accordo commerciale USA-Australia ha contribuito ad aumentare il benessere degli USA.