WHO GAINS THE MOST IN PREFERENTIAL TRADE AGREEMENTS?[*]

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Using recent extensive data of bilateral trade in manufacturing, we study the relations between trade flows, each country's technological levels, and geographic barriers. Then, we calibrate the equilibrium of a general equilibrium model to explore how a Trans-Pacific Partnership affects each country's welfare and trade flows. We decompose the total change of trade flows from member countries into income effects and substitution effects, and investigate the factors that affect trade flows. We demonstrate that a positive coalition externality could exist in that some nonmember countries could gain more than member countries and further investigate under which circumstances it arises.

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1. INTRODUCTION

In many areas of economics, we compare equilibrium allocations arising from independent decision by agents with those achieved by coordination between agents. Then, one may further ask a question: would coordination harm or benefit each agent involved or agent not involved in coordination? This question is especially important in the area of international trade. We believe that a promising approach is to embed this question in a coherent general equilibrium framework because consequences from policy coordination between countries are linked through fundamental economic variables such as prices of exports and imports.

Along with a surge in the number of preferential trade agreements (PTAs) during the past two decades,[1] the effect of PTAs on welfare has been attracting considerable attention from not only economists but also the general public. The theoretical analysis of the effect on welfare originated with Viner (1950), where he indicates that a member country does not necessarily experience a welfare improvement because of both trade creation and trade diversion effects, while nonmember countries are harmed unambiguously by trade diversion.

Existing empirical studies typically use one of two distinct approaches to estimate PTA effects. The ex post approach uses a log-linear gravity equation and compares trade flows with and without PTAs following Tinbergen (1962)[2] (e.g., Baier and Bergstrand, 2007;

[1] As of 15 January 2012, the World Trade Organization (WTO) had been notified of 511 PTAs, with 319 of them currently in force. All WTO members, except for Mongolia, participate in at least one PTA, and on average, a country belongs to six of them.

[2] The theoretical foundation of the gravity equation was first provided in Anderson (1979) and Bergstrand (1985). Following the Armington model, Anderson and van Wincoop (2003) derive the estimation equation of the gravity model and show that trade costs have nonlinear effects on bilateral trade flows through general equilibrium channels, which is mostly ignored in previous studies.

Helpman et al., 2008; Magee, 2008). Under this approach, it is difficult to measure the welfare effect of PTAs because of data limitations; therefore, these studies estimate the effect of PTAs on trade flows instead. The ex ante approach uses computable general equilibrium (CGE) models to evaluate potential PTAs (e.g., Brown, Deardorff and Stern, 1994; Kehoe and Kehoe, 1994). Most of these studies follow the Armington (1969) model and assume increasing returns to scale. However, this approach has been criticized because of its poor fit to the data, sensitivity to the model assumptions, and the complexity and difficulty in interpreting the results.

Our objective of this paper is to investigate changes in trade flows and welfare of member and nonmember countries under PTAs and analyze the relationship between these changes and the fundamental variables including economic distance, technologies, prices and wages/employment. Recently, Eaton and Kortum (2002) (hereafter EK) build a theoretical model that incorporates geographic features and different technologies into a general equilibrium framework by extending the Ricardian model to a continuum of goods with many countries. Alvarez and Lucas (2007) study the EK model with balanced trade and establish the existence and uniqueness of the equilibrium. Fabinger (2012) presents an analytic solution framework applicable to a wide variety of general equilibrium international trade models, including the EK model. We study changes in trade flows and welfare due to tariff changes under a PTA with explicitly introduced tariffs into the EK framework, conduct comparative statics of the equilibrium and disentangle the factors that affect trade flows within a canonical general equilibrium framework.

Arkolakis et al., (2012) show that in a Ricardian model with balanced trade, a price change is the only factor to determine a welfare change due to labor market clearing and the budget constraint of the representative agent. Thus, independently of their micro-level data implications, the welfare prediction only depends on two factors: the share of expenditure on

domestic goods and the elasticity of imports. Under no assumption of balanced trade, however, our analysis demonstrates that labor mobility between tradable and nontradable sectors could be an additional feature to affect welfare and thus countries' incentives to join a PTA.

To conduct welfare analysis, we consider the Trans-Pacific Partnership (TPP) using the data of 38 countries in the year 2005 including both OECD and ASEAN countries.[3] The TPP aims to further liberalize the economies of the Asia–Pacific region. These ongoing negotiations include an expanded version of agreements and encompass a larger number of countries.[4] The negotiations have drawn criticism and support from various public groups, yet the welfare consequences remain unclear and uncertain. To study the welfare consequences, we investigate each country's heterogeneity such as relative competitiveness, openness, and technological level.[5] Our calibration shows how differences in geographical distance, technological level, wages, or size of the labor force affect trade flows and welfare under several scenarios of the TPP. To further study changes in trade flows under each scenario, we decompose the total change of trade flows from member countries into income effects and substitution effects using classical consumer theory.

[3] We could not include Brunei, Cambodia, Lao PDR, and Myanmar because of a lack of data. Furthermore, we could not include Singapore, as we could not separate trade flows into what is consumed within the country from what is just transferred from the country.

[4] The TPP was previously known as the Pacific Three Closer Economic Partnership. New Zealand, Chile, Singapore, and Brunei were the initial members in 2005. In 2012, the US, Australia, Peru, Vietnam, Malaysia, Mexico, and Canada took part in the negotiations for the TPP. Potential new negotiators include Japan and the Republic of Korea.

[5] A country's competitiveness and openness in our paper are respectively comparable to outward and inward multilateral resistance in Anderson and van Wincoop (2003).

We numerically demonstrate that there exists a positive coalition externality in which a number of nonmembers gain from the TPP even when the member countries' trade policies against them do not change, unlike in a Vinearian world where nonmember countries suffer from trade diversion. The positive externality can arise because our model includes intermediate goods, which generate additional gains from trade through general equilibrium channels by changing prices of not only member but also nonmember countries.[6] In the literature, a coalition externality can be assumed exogenously (e.g., Aghion et al., 2007). Our calibration shows that the externality could arise as an equilibrium property within a general equilibrium framework. On the other hand, the inclusion of intermediate goods in our analysis also generates additional welfare gains to member countries that now import goods from the rest of the world at lower prices as well as from the partner country.

The role of intermediate goods is also emphasized in Caliendo and Parro (2012) which extend the EK model by introducing sectoral linkages. As trade in intermediate goods has effects across industries, trade policies are evaluated in each sector capturing the pattern of comparative advantage across sectors. They use their model to evaluate NATFA and show that Mexico gained the most from NAFTA. While they focus on only the member countries' welfare changes, our scope is extended to include the welfare effects on nonmember countries, which are also affected by the changes in prices of all their trading partners through the general equilibrium channel because of the existence of intermediate goods.

The remainder of the paper is structured as follows. Section 2 summarizes the model on which our analysis is based. Section 3 describes the data while Section 4 explores the trade–

[6] The importance of intermediate goods has been increasing in international trade. Feenstra and Hanson (1996) show that the share of imported intermediate inputs in the US increased from 5.3% to 11.6% between 1972 and 1990. Hummels et al., (2001) find that vertical specialization accounts for 21% of some OECD countries and emerging markets and it increased by around 30% between 1970 and 1990.

price relationship empirically. Section 5 provides our main empirical result and Section 6 concludes.

2. THE MODEL

In this section, we describe the theoretical framework. There are N countries in our economy with the set of countries being denoted by N. The cost of a bundle of inputs is assumed to be the same across commodities within a country. Countries have differential access to technology. Thus, the efficiency of producing each good varies across countries. The cost of one unit of an input bundle for manufacturing production in country i is denoted by c_i. The efficiency with which one input bundle is converted into a manufacturing good is denoted by $z_i(j)$. With constant returns to scale, the cost of producing a unit of good j in country i is $\frac{c_i}{z_i(j)}$. The cost c_i consists of the cost of labor and of intermediate inputs.

Suppose $\overline{d}_{ni}$ is the geographical distance between countries n and i, which determines the cost involved in transporting goods from country i to country n. Under Samuelson's iceberg assumption, the cost of one unit of a good delivered from country i to country n requires $\overline{d}_{ni}$ units of the good to be produced in country i. Let t_{ni} denote the tariff rate imposed on imports from country i by country n. We assume that $t_{nn} = 0$ for all n.

Final expenditure on one unit of good j made in country i and delivered to country n includes tariffs imposed by country n on imports from country i. Suppose tariffs are ad valorem. If $\overline{p}_{ni}(j)$ is the before-tariff price of one unit of good j made in country i and delivered to country n, tariffs payable are $t_{ni}\overline{p}_{ni}(j)$, and then the price of one unit of the good to the final end buyer is the sum of the cost of the good itself (inclusive of delivery) and the tariff, which is $(1+t_{ni})\cdot\overline{p}_{ni}(j)$.

Therefore, we define $d_{ni} = (1 + t_{ni}) \cdot \bar{d}_{ni}$ to be the distance measure incorporating both tariffs and transportation costs. We make the assumption that delivering a unit from country i to country n requires producing d_{ni} units in country i. Set $d_{ii} = 1$ for all i.

Delivering a unit of good j produced in country i to country n costs the unit production cost multiplied by the geographic barrier. Under perfect competition, $p_{ni}(j)$ is what buyers in country n would pay if they chose to buy good j from country i. But shopping around the world for the best deal, the price they actually pay for good j is the lowest across all source countries i:

$$p_n(j) = \min\{p_{ni}(j) : i = 1, \cdots, N\}. \quad (1)$$

Suppose that country i's efficiency in producing good j is the realization of a random variable Z_i, which is drawn independently for each j from its country-specific probability distribution, $F_i(z) = \Pr[Z_i \leq z]$.

We assume that the law of large numbers holds and thus $F_i(z)$ is also the fraction of goods for which country i's efficiency is below z. The cost of purchasing a particular good from country i in country n is the realization of the random variable $P_{ni} = \frac{c_i}{z_i} \cdot d_{ni}$ and by (1) the lowest price is $P_n = \min\{P_{ni} : i = 1, \cdots, N\}$.

Suppose that each F_i for $i \in N$ is given by $F_i(z) = \exp(-T_i z^{-\theta})$, where $T_i > 0$ and $\theta > 1$. This distribution is the Fréchet distribution and the country-specific parameter T_i determines the location of the distribution. Therefore, we can think of T_i as country i's state of technology as it determines the productivity of country i. Then, country i presents country n with a distribution of prices:

$$G_{ni}(p) = 1 - \exp(-T_i (c_i d_{ni})^{-\theta} p^{\theta}). \quad (2)$$

Hence, the distribution of what country n actually buys is given by:

$$G_n(p) = \Pr\left[P_n \le p\right] = 1 - \prod_{i=1}^{N}\left[1 - G_{ni}(p)\right]. \tag{3}$$

Let $\Phi_n := \sum_{i \in N} T_i (c_i d_i)^{-\theta}$; then, inserting (2) into (3) yields:

$$G_n(p) = 1 - \exp(-\Phi_n p^{\theta}). \tag{4}$$

Let π_{ni} denote the probability that country i's price turns out to be the lowest for country n. In other words, π_{ni} is the likelihood that country i supplies a particular good to country n. More formally:

$$\pi_{ni} = \Pr\left[P_{ni} \le \min\left\{P_{ns} : s \ne i\right\}\right]. \tag{5}$$

By (2) and (3), we can calculate the probability π_{ni}, which is given by:

$$\pi_{ni} = \frac{T_i (c_i d_{ni})^{-\theta}}{\Phi_n}. \tag{6}$$

Buyers purchase individual goods in amounts $q(j)$ according to the following maximization problem:

$$\max\ U = \left[\int_0^1 q(j)^{(\sigma-1)/\sigma} dj\right]^{\sigma/(\sigma-1)}, \tag{7}$$

subject to a budget constraint that aggregates across buyers in country n to country n's total spending X_n.

The exact price index for the CES objective function described in (7) with $\sigma < 1 + \theta$ (for more detailed derivation, see Eaton and Kortum, 2002 or Cheong et al., 2012) is given by:

$$p_n = \left[\Gamma\left(\frac{\theta + 1 - \sigma}{\theta}\right)\right]^{1/(1-\sigma)} \Phi_n^{-1/\theta}, \tag{8}$$

where Γ is a gamma function. For simplicity of notation, we write $\gamma = \Gamma\left(\frac{\theta+1-\sigma}{\theta}\right)$.

Let X_{ni} denote country n's spending on imports of good j from country i. Then, $\sum_{i\in N} X_{ni} = X_n$ and country n's tariff revenue is $TR_n = \sum_{i\in N} TR_{ni} = \sum_{i\in N} \frac{t_{ni}}{1+t_{ni}} X_{ni}$. Let Q_{ni} denote total income earned by country i from country n and $\sum_{n\in N} Q_{ni} = Q_n$. Let w_i and L_i denote the manufacturing wage and manufacturing labor in country i, respectively. Let β denote the labor share. We assume that this β is the same across countries. Suppose that $c_i = w_i^{\beta} p_i^{1-\beta}$ and $\beta Q_i = w_i L_i$. Then, note that:

$$Q_i = \sum_{n\in N} Q_{ni} = \sum_{n\in N} \frac{X_{ni}}{1+t_{ni}}. \tag{9}$$

Let α denote the average demand for final manufactures as a fraction of GDP. Then, total manufacturing expenditures are:

$$X_n = \frac{1-\beta}{\beta} w_n L_n + \alpha Y_n. \tag{10}$$

As there is a continuum of goods, this probability is also the fraction of goods that country n buys from country i. Country n's average expenditure per good does not vary by source and thus the fraction of goods that country n buys from country i, π_{ni}, is also the fraction of its expenditure on goods from country i. Therefore, we obtain:

$$\pi_{ni} = \frac{X_{ni}}{X_n}. \tag{11}$$

When we calibrate the model, we consider two cases: mobile and immobile labor. When we assume that labor is mobile in the sense that labor workers are free to move between the manufacturing and nonmanufacturing sectors within a country (but not between countries), we assume that at equilibrium, wages in manufacturing and nonmanufacturing are equal within the same country, for otherwise, there would be incentives for workers to move to the

industry providing higher wages. When labor is immobile, wages in manufacturing are determined in equilibrium. We explain the two cases in Section 5 in more detail.

Next, we describe how we estimate each parameter. The following description is basically a summary of the methodology presented in Eaton and Kortum (2002). To establish a link between trade flows and price differences between countries, we use π_{ni}. Notice that:

$$\frac{\pi_{ni}}{\pi_{ii}} = \frac{X_{ni}/X_n}{X_{ii}/X_i} = \frac{\Phi_i}{\Phi_n} \cdot d_{ni}^{-\theta} = \left(\frac{p_i d_{ni}}{p_n} \right)^{-\theta}. \tag{12}$$

The first goal is to obtain θ. To do so, we define a price index D_{ni}. Now, define a relative price by $r_{ni}(j) = \ln p_n(j) - \ln p_i(j)$. Suppose that in the data there are J commodities. Then, let $M_{ni} := \sum_{j=1}^{J} \frac{p_n(j)/p_i(j)}{J}$. Let $\max 2$ denote the second highest value. Then, we define the price index by:

$$D_{ni} = \ln \frac{\max 2_j \left\{ r_{ni}(j) \right\}}{M_{ni}}. \tag{13}$$

We measure $\ln\left(\frac{p_i d_{ni}}{p_n}\right)$ by (13). Now consider a figure of the relation between $\ln\left(\frac{X_{ni}/X_n}{X_{ii}/X_i}\right)$ on the vertical axis, which is indeed $-\theta \ln\left(\frac{p_i d_{ni}}{p_n}\right)$ and D_{ni} on the horizontal axis. We obtain the slope of this relation and set this value equal to θ.

The second goal is to present the trade equation to be used for our estimations. We start with (6) and (11). By modifying them, we obtain:

$$\frac{X_{ni}}{X_{nn}} = \frac{T_i}{T_n} \left(\frac{w_i}{w_n} \right)^{-\theta\beta} \left(\frac{p_i}{p_n} \right)^{-\theta(1-\beta)} d_{ni}^{-\theta}, \tag{14}$$

$$\text{and } \frac{p_i}{p_n} = \frac{w_i}{w_n} \left(\frac{T_i}{T_n} \right)^{-1/(\theta\beta)} \left(\frac{X_i/X_{ii}}{X_n/X_{nn}} \right)^{-1/(\theta\beta)}. \tag{15}$$

Let $\ln X'_{ni} \coloneqq \ln X_{ni} - \left[(1-\beta)/\beta\right]\ln\left(X_i/X_{ii}\right)$ and $S_i = \left(1/\beta\right)\ln T_i - \theta \ln w_i$. Taking logarithms of (14) and substituting (15) into it, we obtain:

$$\ln \frac{X'_{ni}}{X'_{nn}} = -\theta \ln d_{ni} + \frac{1}{\beta}\ln \frac{T_i}{T_n} - \theta \ln \frac{w_i}{w_n} = -\theta \ln d_{ni} + S_i - S_n . \tag{16}$$

Following the gravity model, the distance between countries d_{ni} can be proxied by:

$$\ln d_{ni} = d_k + b + l + e_h + m_n + \delta_{ni} . \tag{17}$$

Here, d_k (k=1,$\cdots$,6) denotes the effect of the distance between country n and i lying in the k -th interval. We also denote border sharing by b , preferential trade agreement by e, shared language by l, and the error term by δ_{ni}. To capture potential reciprocity in geographic barriers, we assume that the error term δ_{ni} consists of two components: δ^1_{ni} and δ^2_{ni}. The country-pair-specific component δ^2_{ni} with variance σ_2^2 affects two-way trade as $\delta^2_{ni} = \delta^2_{in}$, while δ^1_{ni} with variance σ_1^2 affects one-way trade. Imposing this specification and substituting (17) into (16), we obtain the following:

$$\ln \frac{X'_{ni}}{X'_{nn}} = S_i - S_n - \theta \cdot m_n - \theta \cdot d_k - \theta \cdot b - \theta \cdot l - \theta \cdot e_h + \theta \cdot \delta^2_{ni} + \theta \cdot \delta^1_{ni} . \tag{18}$$

We consider S_i as a source country's "competitiveness," and θm_n as a destination country's effect (openness). The estimation results of (18) are reported and discussed in Section 4.

3. DATA

3.1. *The Data Description.* Table 1 shows the summary statistics on the imports, income, and labor data for the manufacturing sector in 2005 for the sample countries.

< Insert Table 1 >

The first column shows the share of manufacturing goods in total imports for each country. It varies significantly across countries. More than 90% of the imports by Belgium are manufacturing goods, compared with only 11% by Japan. The second column reports how much each country imports from the other sample countries as a share of total imports. More than half of the sample countries import around 90% of their manufacturing goods from the other sample countries, and for the other countries, this figure is also substantial. It indicates that even though the sample countries are limited to OECD and ASEAN countries, our results would not be affected significantly by the inclusion of other countries.

The third column shows the relative wages of each country compared with that of the US. Most Western European countries pay higher wages than the other countries and many of the Asian countries except Japan and South Korea pay significantly lower wages than the other countries. Eastern European countries such as the Czech Republic, Hungary, and Poland have similar wage levels, and they are higher than those of the Southeast Asian countries, Turkey, the Russian Federation, India, Mexico, Chile, and China, but are lower than those of the remaining countries.

The fourth column reports the human-capital-adjusted wages, which are calculated by multiplying the wage in country i by $0.06H_i$, where $0.06H_i$ is the average years of schooling and 0.06 represents the return to education suggested by Bils and Klenow (2000). The ranking and difference in magnitude are the same as the third column.

The fifth column shows human-capital-adjusted employment calculated by multiplying the employment in country i by $\exp(0.06H_i)$. China is the only country that has higher employment than the US in the manufacturing sector. The last column shows the labor share of GDP in the manufacturing industries. Vietnam and Germany have relatively high labor shares of GDP in the manufacturing sector, whereas for China and India, the share is only

about 2%. However, the other countries' labor share of GDP is not very different from one another even though it varies across countries.

< Insert Table 2 here >

Table 2 shows the average MFN tariffs for the year 2006. The data for the tariff rate are a simple average rate under the principle of MFN treatment and we use the data from "Tariff Profiles 2006" (from the World Trade Organization and the International Trade Centre).

3.2. *Price Index.* As described in the previous section, we can obtain the comparative advantage parameter θ using the price data and countries' normalized import share. Before we obtain θ, we first measure D_{ni}. The price measure, $\exp(D_{ni})$ shows the price index in destination country n for a buyer who purchases everything from source country i relative to the actual price index in destination country n.

3.3. *Comparative Advantage.* We consider the relationship between D_{ni} and logarithms of normalized import share. They are negatively correlated and thus trade share and price are negatively correlated as the model predicts. We can also obtain the comparative advantage parameter θ from the slope of the relationship between D_{ni} and logarithms of normalized import share using a simple method-of-moments estimation.

3.4. *Summary of Parameters.* Table 3 summarizes the parameters we use to calibrate the model.

< Insert Table 3 here>

To compute α, we use the following method. Let IMP_n denote manufacturing imports, EXP_n denote manufacturing exports, and Y_n denote total GDP for country n. Then, we obtain the following relationship:

$$X_{nn} + IMP_n = (1-\beta)(X_{nn} + EXP_n) + \alpha Y_n.$$

The left-hand side of the relationship is total expenditure in country n and the right-hand side is the sum of intermediate consumption and the demand for final manufacturing goods. As these two terms need to be balanced, we obtain the above relationship. One may wonder why we take an average for all the countries rather than applying distinct α s for each country. The drawback is that some countries (China, Malaysia, and the Philippines) have negative values of α as we assume that the world consists of the countries that we consider in this paper and these countries are relatively large exporters compared with importers. In other words, these countries produce a large quantity of manufacturing goods. Therefore, to avoid this problem, we take an average of the countries whose α is not negative.

4. ESTIMATION

We proceed in the following manner to evaluate how the TPP affects welfare and trade flows. First, we have estimated the trade equation using data on bilateral trade in manufactures. Next, we compute the equilibrium parameters in a baseline world in which countries are engaged in the existing PTAs and impose current most favored nation (MFN) average duty rates on countries that do not participate in any PTA with our sample countries. Then, we conduct a counterfactual analysis of the TPP under three scenarios in which several countries join or participate in the negotiation.

4.1. *Trade Equation Estimation.* The estimation of the trade equation with source effects using (18) is reported in Table 4.

< Insert Table 4 here >

The first six rows of the upper panel show how distance reduces trade volumes between countries. The changes in trade flows monotonically decrease as the distances between the country pairs increase. In the next three rows, we see that all of the estimated coefficients of

shared border, shared languages, and PTA are positive and statistically significant at the 5% level. PTA has a slightly larger impact than a shared border or language on intra-bloc trade.

The first two columns of the lower panel show the relative competitiveness of each country compared with the other sample countries, which is estimated as the coefficient of S_i in (18), and the last two columns of the lower panel report the relative openness of each country compared with the other sample countries, which is estimated as the coefficient of $-\theta m_i$ in (18), where $\theta = 8.29$.

From the estimates of S_i, the most competitive countries are China, the US, and Japan. Apart from Germany, the competitiveness of European countries is relatively low compared with the US and Japan. South Korea is followed by Italy, France, the UK, and the Netherlands. Malaysia and Thailand are as highly competitive as the Netherlands, and more competitive than Canada, Spain, Sweden and Switzerland, whose competitiveness is slightly higher than average. The competiveness of Australia and some other Western European countries such as Ireland, Finland, Austria, and Denmark is below average, and most Eastern European countries including Poland, the Czech Republic, and Hungary, and Mexico and Chile are even less competitive. Iceland, Greece, and New Zealand are the least competitive countries in our sample. It is worth noting that relative competiveness is not strongly correlated with the level of development of countries as implied in the Ricardian model because it depends on both absolute advantage measured by the state of technology and relative wages. In the next subsection, we estimate the state of technology for each country and identify the main source of its competitiveness.

The most open country in 2005 was China, and it is far more open than the next most open countries, namely Belgium and the US. Japan, the Philippines, Malaysia, and South Korea are relatively open Asian countries, and are more open than most Western European countries apart from Belgium and Germany. At first glance, it may be surprising especially

given their low import share shown in Table 1 and lower average MFN tariffs in Table 2. However, it is worth noting that (18) accounts for both the geographical distance and the price level as reflected by the price parameter. It implies that at a given level of imports, the more remote a country is from the rest of world, and as the price level in the domestic economy increases, the country's openness increases. Thus, the proximity to other countries and relatively lower exports to the rest of world might be the reason why Western European countries are estimated to be less open relative to some Asian countries. Eastern European countries are among the least open countries. Despite its remoteness from the rest of world, New Zealand is one of the least open countries in the sample, unlike Australia. The least open country is Iceland, followed by Greece and Chile.

4.2. *Estimates of States of Technology.* In Section 2, S_i is defined by $S_i = (1/\beta)\ln T_i - \theta \ln w_i$. Given the estimate of θ, S_i, and β in our results, we can estimate the state of technology T_i using wage data. We find that most European countries including Germany, Denmark, Austria, Switzerland, Belgium, the UK, France, Finland, and Norway have a higher absolute advantage than the US in terms of technology, whereas the state of technology of the other European countries apart from Greece and Portugal is comparable to that of the US. Other industrial countries such as Australia, Canada, and Japan have slightly lower levels of absolute advantage than the US. A number of Asian countries including China, India, Indonesia, the Philippines, Vietnam, and Thailand have relatively low absolute advantage. Eastern European OECD countries including Poland, the Czech Republic, and Hungary have higher states of technology than Chile and Mexico.

< Insert Table 5 here >

By comparing the results from Table 4 and Table 5, we can also tell whether the high competitiveness of a country comes from a relatively high state of technology or low wages.

Given that China has the lowest state of technology amongst the sample countries, the higher competitiveness of China relative to other countries is due to its lower wages. On the one hand, the high competiveness of Germany and the US is attributed to their absolute advantage, while the source of the low competiveness of many Western European countries including Denmark, Austria, Switzerland, Finland, and Norway seems to be relatively high wages. On the other hand, as expected, the relatively high competiveness of East Asian countries such as South Korea, Malaysia, and Thailand is mainly due to their relatively low wages. It can be seen that all Western European countries have higher states of technology than Eastern European countries and the Asian countries, excluding South Korea, Mexico, and Chile, and the gap is significant.

5. CALIBRATION RESULTS

In this section, we calibrate the model to allow comparative statics analysis. From the results, we can examine how changes in tariffs affect the equilibrium outcomes. To do so, we consider two cases: mobile and immobile labor. In what follows, we explain how we solve for equilibrium in those two cases.

5.1. *Mobile Labor*. As the total population and wages in country n are fixed and because labor is the only income-earning factor of production, total income in country n is:

$$Y_n = TR_n + w_n \bar{L}_n = TR_n + Y_n^L , \tag{19}$$

where Y_n^L is labor income and $\bar{L}_n$ is the total labor supply in country n. Substituting (19) into (10) yields:

$$w_i L_i = \beta \sum_{n=1}^{N} \frac{\pi_{ni}}{1+t_{ni}} \left((1-\beta) w_n L_n + \alpha\beta \cdot TR_n + \alpha\beta \cdot Y_n^L \right). \tag{20}$$

To solve for the variables in equilibrium in this case, (6), (8), and (11) are used to obtain the equilibrium prices and trade shares given exogenous wages and then manufacturing employment is obtained from them with (20).

5.2. *Immobile Labor*. Suppose that labor is immobile in the sense that workers cannot move between manufacturing and nonmanufacturing sectors. The wage w_n given by productivity in manufacturing and nonmanufacturing income denoted by Y_n^O is fixed. Then, total income in each country is:

$$Y_n = Y_n^O + TR_n + Y_n^M = Y_n^O + TR_n + w_n L_n . \tag{21}$$

By substituting (21) into (10), we obtain:

$$w_i L_i = \sum_{n=1}^{N} \frac{\pi_{ni}}{1+t_{ni}} \left(\left(1-\beta+\alpha\beta\right) w_n L_n + \alpha\beta \cdot Y_n^O + \alpha\beta \cdot TR_n \right). \tag{22}$$

We simultaneously solve (6), (8), (11), and (22) to obtain equilibrium prices, trade shares, and wages.

5.3. *Calibration Results*. Under these two assumptions related to labor mobility, we compute the equilibrium variables in a baseline world in which countries form currently existing PTAs and impose current MFN average duty rates on countries that do not have a PTA with them. Table 6 lists the groups of countries which are engaged in PTAs in 2005 and Table 7 shows the equilibrium price of each country in a baseline world.

< Insert Table 6 here >

< Insert Table 7 here >

We are interested in the welfare effects and changes in trade flows after the establishment of a new PTA, especially the TPP. We consider the following three scenarios where each pair of countries forms a PTA:

Scenario 1: Chile and NZ;

Scenario 2: countries in Scenario 1 and Australia, Malaysia, Japan, the US, and Vietnam;

Scenario 3: countries in Scenario 2 and Canada and Mexico.

Before we proceed, one problem that we have encountered should be mentioned. Our estimation of the economic distance between countries shows that country n's distance to country i is smaller than country n's distance to itself (i.e., $d_{ni} < d_{ii} = 1$) for the following three pairs: n = Belgium and i = the Netherlands; n = China and i = Vietnam; and n = the US and i = Canada. To avoid the problem that a triangle inequality does not hold for these pairs, we assume that these pairs have a distance to their own country plus a tariff rate between the two countries. In other words, we assume that country n's distance to country i is the distance to their own country plus $(1+t_{ni})$.

5.3.1. *Income Effects and Substitution Effects.* Changes in prices result in changes in purchasing power even when nominal expenditures remain unchanged. To conduct a more detailed analysis of changes in trade flows under each scenario, we decompose the total change in trade flows from member countries into the three terms proposed in Cheong et al., (2012), which use the income effects and substitution effects from classical consumer theory. In other words, to disentangle the various forces within the general equilibrium framework, we apply the notions of income and substitution effects in our setting. Here, we explain briefly how these terms can be derived.[7]

We denote the set of member countries in a PTA by A. We use the superscript 0 to denote a variable before a PTA is formed and the superscript 1 to denote a variable after a PTA is formed. We decompose changes in imports from a set of member countries of a PTA for each country into three components: substitution effects (SUB_n), income effects from

[7] Cheong et al., (2012) provide a more detailed theoretical justification for these terms.

changes in prices (INP_n), and income effects from changes in nominal expenditures (INX_n), that is:

$$\sum_{i \in A \setminus n} \left(X_{ni}^{1} - X_{ni}^{0} \right) = INX_n + INP_n + SUB_n. \tag{23}$$

Then, the left-hand side, which is the change in imports from member countries to country n, is the sum of these three effects.

Now we consider the change in the demand for goods from country i when only prices change and total expenditures are constant. First, let X_{ni}^{c} denote the compensated manufacturing expenditure at which the optimized utility level is equal to the initial optimized utility level before a PTA. Then, given that the numeraire is expenditure on nonmanufacturing goods, the normalized expenditure before a PTA is $\frac{X_n{}^0}{p_n^0}$. Thus, X_n^c is given by:

$$X_n^c = \frac{p_n^1}{p_n^0} X_n^0. \tag{24}$$

The variable X_n^c is the amount of expenditure required to keep utility at the same level after the price level changes to p_n^1 as it was prior to the formation of a PTA. From this, the change in imports from member countries because of the substitution effects is given by:

$$\begin{aligned} SUB_n &= \sum_{i \in A \setminus \{n\}} (X_{ni}^c - X_{ni}^0) \\ &= \frac{X_n^0}{p_n^0} \cdot \left(\sum_{i \in A \setminus \{n\}} (p_n{}^1 \pi_{ni}^1 - p_n{}^0 \pi_{ni}^0) \right). \end{aligned} \tag{25}$$

On the other hand, changes in demand from member countries because of the income effects of price changes could be calculated as the difference between the total change in demand given changes in prices holding nominal expenditures constant and the substitution effects of the price changes. Let X_{ni}^{u} denote demand given changes in prices holding nominal expenditures constant. After a PTA, the share of demand for goods from country *i* becomes π_{ni}^1. Thus, X_{ni}^{u} is given by:

$$X_{ni}^{u} = \pi_{ni}^{1} X_{n}^{0}. \tag{26}$$

The variable X_{ni}^{u} gives us the expenditure on goods from country i when only the demand share changes. From this, the income effects derived solely from the changes in prices facing country n, INP_n, are given as follows:

$$\begin{aligned} INP_n &= \sum_{i \in A \setminus \{n\}} (X_{ni}^{u} - X_{ni}^{0}) - SUB_n \\ &= X_{n}^{0} \left(1 - \frac{p_n^1}{p_n^0} \right) \sum_{i \in A \setminus \{n\}} \pi_{ni}^{1}. \end{aligned} \tag{27}$$

Then, we can see that the total effects from changes in prices are given by:

$$INP_n + SUB_n = \sum_{i \in A \setminus \{n\}} (X_{ni}^{u} - X_{ni}^{0}).$$

Finally, the last term is the change in imports from member countries due to increases in nominal manufacturing expenditures, which is given by:

$$\begin{aligned} INX_n &= \sum_{i \in A \setminus \{n\}} (X_{ni}^{1} - X_{ni}^{u}) \\ &= (X_{n}^{1} - X_{n}^{0}) \cdot \sum_{i \in A \setminus \{n\}} \pi_{ni}^{1}. \end{aligned} \tag{28}$$

Now, the results of calibration including welfare changes and those effects under the three scenarios in both cases are presented in Table 8 to Table 13.[8] All numbers are presented as percentage changes. In each table, underlined countries form PTAs under the scenario concerned.

[8] Our calibration is obtained from the programs that are developed from the codes at http://home.uchicago.edu/kortum/papers/tgt/tgtprogs.htm for our purposes.

5.3.2. *Change in variables*. The results show that prices and own trade share decrease in all countries after a PTA is established (in the case of both mobile and immobile labor). In a sense, this shows that a PTA diversifies trade across countries.[9]

In the calibration results, for most countries including member and nonmember countries, surprisingly, the substitution effects are negative in almost all cases. As we can see from (25), the magnitude of the substitution effects is determined by two factors: changes in prices and change in trade shares with member countries. As mentioned above, upon establishment of a PTA, prices decrease. As the changes in prices and the changes in domestic share are relatively large, as observed in the tables, it is understandable that the changes in prices tend to be larger than the changes in trade shares with member countries.

An implication of this result is that the expenditure required to keep the utility level at the same level as prior to the establishment of a PTA is lower because prices decrease, and as long as these price changes are larger than the change in import shares from member countries, then the substitution effects are negative. As more countries join the PTA, the price changes are larger, and as a result, the substitution effects become negative for more countries as observed in Table 8 through Table 13. In other words, what we observe in Table 8 is that when only Chile and New Zealand form a PTA, the price change is smaller for almost all the countries (except for Australia) compared with the demand change for goods from these two countries. In the case of immobile labor, the price changes tend to be smaller than those in the case of mobile labor as wages could change together with prices. We observe that even in Scenario 1, most countries show a negative substitution effect in the case of immobile labor as in Table 9.

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[9] This result is proved theoretically in the case of mobile labor in Cheong et al., (2012) and our results coincide with their results, even in the case of immobile labor.

5.3.3. *Welfare effects and trade flows in nonmember countries*. It may be surprising that the welfare of all countries increases once a PTA is formed. This is partly because the value of α that we use is relatively high as we eliminate countries with negative values of α, and therefore the size of the welfare gain is sensitive to the value of α. However, which countries gain the most does not depend on the value of α as this value is common across all countries. Interestingly, we observe that some nonmember countries gain even more than member countries. For example, Table 8 shows that when labor is mobile, Iceland and Vietnam gain more than member countries, Chile and New Zealand. Interpreting a PTA as a coalition of these two countries, we see that Iceland and Vietnam experience the largest (positive) coalition externality under this scenario.

These two countries share two common features. One feature is that the labor supply increases significantly in the two countries, with a 580.40% increase in Iceland and a 215.20% increase in Vietnam. The second feature is that the imports from member countries increase significantly: 3400.77% in Iceland and 1299.84% in Vietnam. From Table 8, we can see that these effects are mainly driven by INX_n. Along with an increase in labor and production, expenditure rises as indicated in (10) .

Then, the question becomes why their expenditures and labor supply change significantly in these two countries. The key factor is the distance between these two countries. From Table 4, Iceland has the lowest source country effect as well as the lowest destination country effect. This results in a large distance to other countries and the highest prices of all countries. In our calibration, Iceland's price standard is 1.473 relative to 1 in the US as presented in Table 7.

On the other hand, Vietnam does not have a particularly small source country effect or destination country effect. However, Vietnam's MFN rate is 15.70%, which is the highest among our sample countries. This results in a large distance to other countries and the

relatively high prices compared with other countries. Greece and Portugal have higher price levels among nonmember countries than Vietnam. However, as these two countries have a PTA with Chile as in Group 5 (see Table 6), the distance is not as large as that with Vietnam. In this way, we observe that two different effects, one from high tariff rates and the other from low competitiveness, result in a large distance and subsequent welfare gains from a coalition externality.

Next, we compare the results in Table 8 (the case of mobile labor) with those in Table 9 (the case of immobile labor). Iceland and Vietnam still gain in the case of immobile labor, although Iceland gains more in this case than Vietnam. Table 8 shows that the increase in wages is significant in Iceland. This illustrates the point that we have made in the case of mobile labor. The increase in wages increases expenditures as in (10). In Iceland, this effect is significant as evidenced by their high INX_n. On the other hand, in Vietnam the increase in trade flows (192.04%) is not as large as that in Iceland (371.83%) or even Greece (261.78%). However, Vietnam's increase in GDP, ΔY_n, is 27.20%, which is the highest among all countries. As discussed before Vietnam's tariff rate is the highest and as such even the trade flow does not increase as much as the other two countries, still GDP increases the most in Vietnam. Iceland's increase in GDP, ΔY_n, is 24.45%, which is the second highest after Vietnam. As in (21), tariff revenue is directly related to GDP. Therefore, we can see that the welfare increase in Vietnam is high due to the high initial tariff. As in (19), the same observation also applies in the mobile labor case, as tariff revenue increases GDP.

5.3.4. *Trade flows in member countries*. From Table 8 through Table 13, we can see that all member countries except for Canada in both Table 12 and Table 13 experience an increase of trade flows after the establishment of a PTA. Comparing Canada's $TOTAL_n$ in Table 10 through Table 13, we find that although Canada's $TOTAL_n$ is negative when Canada joins as

in Table 12 and Table 13, compared with the numbers in Table 10 and Table 11, it experiences a smaller decrease from joining than from not joining. Comparing the three effects to Canada, we find that the result is driven by SUB_n. As in (24) and (25), the important factor in SUB_n is the changes in prices and trade shares with a set of member countries. The results show that member countries' trade share decreases significantly compared with the price changes in Canada after the establishment of a PTA in Scenarios 2 and 3.

Next, we look at the results in Scenario 1. We observe that Canada's imports from a set of member countries increase after the establishment of a PTA, and also that INP_n is an important factor in both the mobile and immobile labor cases. Notice that Canada's important trading partner, the US, joins a PTA in both Scenarios 2 and 3 but not in Scenario 1. Table 14 shows our estimation of trade shares in equilibrium for the pair of Canada and the US.

Table 15 shows Canada's change in imports from member countries excluding the US. Indeed, when Canada joins a PTA under Scenario 3, imports from other member countries, except for the US, increase. As mentioned before, our distance estimation shows that the US is as close to Canada as it is to the US and the distance from Canada to the US is also estimated to be quite small. As Table 13 shows, Canada's trade share with the US is higher than their domestic share in the baseline equilibrium. As pointed out in the change in variables section (Section 5.2.1.), the domestic share decreases after the establishment of a PTA. Therefore, if we consider the US and Canada as a "paired country" as the distance is so close, the result shows that Canada's trade share for the pair of the US and Canada decreases under Scenario 3. Indeed, similarly to the other member countries, the results show that Canada's trade is more diversified to outside the pair than within the pair after the establishment of a new PTA.

5.3.5. *Trading partner*. Table 10 through Table 13 show another interesting observation about the US and Canada. In the case of mobile labor, Canada is better off by not joining as the welfare increases by 15.84% by joining, compared with 15.51% by not joining. This is quite intuitive because if a trading partner joins a PTA, a nonmember country can benefit from the trade with this member trading partner (as both a seller and a buyer) and still keep tariff revenue from other countries that joined a PTA.

However, this effect is reversed for Canada in the case of immobile labor, where welfare increases by 15.90% by not joining compared with 16.04% by joining. The important factor is the change in wages. When the price changes are large compared with other countries, the trade share of Canada with other countries increases and this results in an increase in expenditures in Canada. This increases production and the wage. In this way, we observe that immobile labor adds one more channel to the welfare change.

A similar result exists for Australia and New Zealand. Comparing welfare increases in Table 8 through Table 11, we can see that when New Zealand joins a PTA, Australia is better off by not joining in the case of mobile labor. In the case of mobile labor, Australia's welfare increases by 17.53% by joining, compared with 17.93% by not joining, whereas in the case of immobile labor, Australia's welfare increases by 20.66% by joining, compared with 20.58% by not joining. Similar to the Canada's case, the wage increases more when Australia joins the PTA (37.2% compared to 39.59%).

5.3.6. *Welfare effects between joining and not joining*. Finally, we make further remarks about the welfare effects from the establishment of a PTA. Table 8 through Table 15 show that Vietnam is better off by not joining the TPP. The important message here is that if Vietnam joins the TPP, it loses tariff revenue. This effect is noticeable by comparing Table 8 and Table 10. On the other hand, when Vietnam's trading partner countries form the TPP (as

shown in Table 8), imports from TPP countries increase and as a result tariff revenue increases.

6. CONCLUDING REMARKS

In this paper, using the data of 38 countries in the year 2005 including both OECD and ASEAN countries, we study changes in trade flows and welfare due to tariff changes under several scenarios of the TPP with explicitly introduced tariffs into the EK framework, numerically conduct comparative statics of the equilibrium and disentangle the factors that affect trade flows within a canonical general equilibrium framework.

Our calibration results show that labor mobility between tradable and nontradable sectors could be an important feature to affect welfare and thus countries' incentives to join a PTA. Our analysis also indicates unlike in the previous literature, the existence of a positive coalition externality in the sense that nonmember countries could gain in terms of welfare with the existence of intermediate goods.

Furthermore, we consider how a PTA relates to trade flows and decompose the change of imports into substitution effects, income effects from a price change, and income effects from an expenditure change. We also demonstrate how these changes could relate to welfare improvement.

Our study suggests a direction for future research. Aghion et al., (2007) use a dynamic bargaining model of negotiating PTAs and define a coalition externality as a property of the value function. Our analysis indicates that the coalition externality could arise as an equilibrium outcome within a general equilibrium model. An interesting study would be to consider how to define coalition stability within the current framework and investigate under what conditions coalition stability is established.[10]

[10] Burbidge et al., (1997) also take a similar approach to analyze a PTA.

APPENDIX: DATA DESCRIPTION

Trade Variables and Prices. We have obtained price data for 2005 at BH (basic heading) levels from the International Comparison Program, World Bank. As we examine trade in manufactured goods, we need to use manufacturing sector variables. To do so, we convert BH codes to OECD codes, then OECD codes to COICOP codes, then COICOP codes to CPC codes, then CPC codes to ISIC ver.3, and then ISIC ver.3 to ISIC ver.2. We choose BH codes that are associated with the ISIC codes for manufacturing. These codes are directly comparable. We look closely at the definitions of the OECD codes and we choose BH codes that are closely related to manufacturing for inclusion in our analysis. Regarding the trade data, we start with the Comtrade Data from UN Data. We use ISIC ver.2 codes and select the items associated with manufacturing.

Gross Output in Manufacturing. We begin with INDSTAT data on gross output in manufacturing from the United Nations Industrial Development Organization. As data were not available for Canada and Thailand, we used data from their National Accounts. Lastly, because we were not able to obtain data for China, we computed the value using total GDP and the ratio between total GDP and manufacturing sector output from the National Accounts data.

Labor Share in Costs and Manufacturing Share. Our handling of labor share in costs is more involved. There are several data sources, however, no one source provides a complete data set. If necessary, we used government statistics office data. First, we start with National Accounts Official Country Data from the United Nations Statistics Division. We obtained compensation and wages for employees in manufacturing for Australia, India, Japan, Korea, the Philippines, Thailand, the UK, and the US. The data for Canada are for 2004 and we used the inflation rate data from the IMF as a proxy of labor costs.

The data for workforce are obtained from Labor STAT in the ILO, which are labeled "Total Employment." We obtain the data labeled "Total Paid Employment" for India because "Total Employment" was not available. The data for wages are obtained from the US Bureau of Labor Statistics (BLS). For the countries whose wage data are not available in the US BLS except for Vietnam, the data are obtained from Labor STAT in the ILO. The data for wages and employments for Vietnam are from their government's statistical office.

The data on average years of schooling are taken from educational attainment of the total population data by Barro and Lee (v.2.0, 07/10). We use data on regional trade agreements and PTAs from the WTO.[11]

[11] http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx.

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Table 1

TRADE, LABOR, AND INCOME DATA

Country	Imports as % of mfg. spending	Imports from sample as % of all imports	Mfg. wage (US = 1)	Human-capital-adj. Mfg. wage (US = 1)	Human-capital-adj. Mfg. labor (US = 1)	Mfg. labor % share of GDP
Australia	27.45	84.34	0.9694	0.9823	0.0658	9.13
Austria	56.67	91.63	1.2381	1.4619	0.0348	16.79
Belgium	93.38	93.75	1.2357	1.3619	0.0380	13.76
Canada	47.65	94.92	0.9015	0.9492	0.1290	10.83
Chile	18.88	71.24	0.0837	0.0966	0.0414	3.41
China	60.28	60.14	0.0245	0.0321	1.5108	2.17
Czech Rep.	52.72	89.67	0.2448	0.2353	0.0766	14.55
Denmark	53.23	91.07	1.3117	1.4986	0.0228	13.34
Finland	37.81	88.46	1.1338	1.3024	0.0222	14.77
France	33.10	92.08	1.0874	1.2416	0.2043	11.82
Germany	36.24	90.22	1.2838	1.3032	0.4614	21.57
Greece	42.44	89.55	0.4929	0.5625	0.0223	5.56
Hungary	55.76	87.86	0.2209	0.2290	0.0409	8.54
Iceland	54.20	93.82	0.8668	0.9762	0.0011	6.37
India	15.54	74.4	0.0306	0.0477	0.3427	2.11
Indonesia	34.30	62.4	0.0266	0.0389	0.5021	6.86
Ireland	83.83	94.11	1.1130	1.1705	0.0148	8.57
Israel	40.82	89.62	0.4728	0.4963	0.0206	7.64
Italy	24.05	87.53	0.9334	1.1135	0.2107	13.20
Japan	10.96	84.2	0.8594	0.9033	0.6843	13.66
Malaysia	51.40	67.52	0.1490	0.1721	0.1059	13.37
Mexico	68.05	91	0.1197	0.1495	0.2577	4.58
Netherlands	76.38	88.91	1.1718	1.2654	0.0552	10.93
New Zealand	31.27	90.5	0.5595	0.5479	0.0180	9.13
Norway	45.67	94.59	1.4136	1.3925	0.0160	7.41
Philippines	84.30	79.1	0.0356	0.0439	0.1537	6.87
Poland	37.42	91.11	0.1893	0.2517	0.1045	8.72
Portugal	45.18	95.68	0.3144	0.4116	0.0401	8.90
Rep. of Korea	20.07	84.73	0.5087	0.5280	0.2510	16.84
Russian Fed.	21.66	83.01	0.0578	0.0673	0.6490	5.74
Spain	33.01	92.24	0.6910	0.7966	0.1451	10.23
Sweden	44.23	92.75	1.1500	1.1914	0.0366	11.80
Switzerland	59.06	91.9	1.2098	1.4006	0.0357	13.53
Thailand	39.32	79.33	0.0555	0.0761	0.2401	10.42
Turkey	29.57	85.12	0.1533	0.2148	0.1478	6.64
UK	39.94	89.83	1.0676	1.2690	0.1969	11.20
USA	22.43	86.22	1.0000	1.0000	1.0000	8.12
Vietnam	37.63	72.41	0.0383	0.0561	0.2220	23.66

All data except GDP are for the manufacturing sector in 2005. Spending on manufactures is gross manufacturing production less exports of manufactures plus imports of manufactures. Imports from the other 36 countries exclude imports of manufactures from outside our sample of countries. To adjust the manufacturing wage and manufacturing employment for human capital, we multiply the wage in country i by $\exp(-006H_i)$ and employment in country i by $\exp(006H_i)$, where H_i is the average years of schooling in country i as proposed in the EK analysis. EK used this measure by Kyriacou (1991). See the Appendix for a complete description of all data sources.

Table 2

TARIFF (MFN APPLIED, SIMPLE AVERAGE)

	MFN Applied		MFN Applied
Australia	3.90	**Japan**	2.80
Austria	3.90	**Malaysia**	7.90
Belgium	3.90	**Mexico**	13.30
Canada	3.70	**Netherlands**	3.90
Chile	6.00	**NZ**	3.20
China	9.00	**Norway**	3.90
Czech Rep.	3.90	**Philippines**	5.80
Denmark	3.90	**Poland**	3.90
Finland	3.90	**Portugal**	3.90
France	3.90	**Korea, Rep.**	6.60
Germany	3.90	**Russian Fed.**	11.10
Greece	3.90	**Spain**	3.90
Hungary	3.90	**Sweden**	3.90
Iceland	2.40	**Switzerland**	2.10
India	10.10	**Thailand**	8.20
Indonesia	6.80	**Turkey**	4.70
Ireland	3.90	**UK**	3.90
Israel	4.90	**USA**	3.30
Italy	3.90	**Vietnam**	15.70

Table 3

SUMMARY OF PARAMETERS

Parameter	Value	Definition
α	0.12	Final manufacturing demand share of GDP
β	0.19	Labor share of costs
θ	8.29	Comparative advantage

Table 4

TRADE EQUATION ESTIMATION

Variable	est.	s.e.
Distance 1	–1.68	0.07
Distance 2	–1.89	0.05
Distance 3	–1.99	0.04
Distance 4	–2.18	0.04
Distance 5	–2.59	0.02
Distance 6	–2.73	0.02
Shared border	0.14	0.05
Shared language	0.17	0.04
PTA	0.25	0.04

	Source Country		Destination Country	
Country	est.	s.e.	est.	s.e.
Australia	–0.06	0.05	0.07	0.08
Austria	–0.15	0.05	–0.21	0.08
Belgium	0.23	0.05	1.26	0.08
Canada	0.22	0.05	0.28	0.08
Chile	–0.69	0.06	–0.87	0.1
China	1.34	0.05	1.86	0.08
Czech Rep.	–0.39	0.05	–0.46	0.08
Denmark	–0.23	0.05	–0.18	0.08
Finland	–0.11	0.05	–0.26	0.08
France	0.53	0.05	0.19	0.08
Germany	0.97	0.05	0.81	0.08
Greece	–1.09	0.05	–1.23	0.08
Hungary	–0.48	0.05	–0.58	0.08
Iceland	–2.13	0.05	–2.04	0.08
India	0.19	0.05	–0.15	0.09
Indonesia	0.12	0.05	0.17	0.08
Ireland	–0.08	0.05	0.53	0.08
Israel	–0.62	0.05	–0.74	0.08
Italy	0.55	0.05	0.11	0.08
Japan	1.22	0.05	0.71	0.08
Malaysia	0.34	0.05	0.58	0.08
Mexico	–0.29	0.05	0.09	0.09
Netherlands	0.35	0.05	0.95	0.08
New Zealand	–0.78	0.05	–0.66	0.09
Norway	–0.57	0.05	–0.64	0.08
Philippines	–0.2	0.05	0.67	0.08
Poland	–0.33	0.05	–0.63	0.08
Portugal	–0.6	0.05	–0.77	0.08
Korea, Rep.	0.84	0.05	0.51	0.08
Russian Fed.	0.03	0.05	–0.43	0.09
Spain	0.17	0.05	–0.09	0.08
Sweden	0.15	0.05	0.04	0.08
Switzerland	0.13	0.05	0.11	0.08
Thailand	0.32	0.05	0.35	0.08
Turkey	–0.32	0.05	–0.59	0.08
UK	0.47	0.05	0.39	0.08
US	1.32	0.05	1.24	0.08
Vietnam	–0.37	0.05	–0.37	0.08

Total sum of squares	1406	Error variance:	
Sum of squared residuals	124.64	Two-way ($\theta^2\sigma_2^2$)	0.089
Number of observations	1406	One-way ($\theta^2\sigma_1^2$)	0.023

Table 5

STATE OF TECHNOLOGY

	State of Technology		State of Technology
Australia	0.76	**Japan**	0.87
Austria	1.18	**Malaysia**	0.11
Belgium	1.17	**Mexico**	0.08
Canada	0.77	**Netherlands**	1.10
Chile	0.04	**New Zealand**	0.33
China	0.02	**Norway**	1.03
Czech Rep.	0.13	**Philippines**	0.02
Denmark	1.20	**Poland**	0.15
Finland	1.04	**Portugal**	0.25
France	1.11	**Korea, Rep.**	0.43
Germany	1.28	**Russian Fed.**	0.03
Greece	0.32	**Spain**	0.62
Hungary	0.13	**Sweden**	0.98
Iceland	0.51	**Switzerland**	1.18
India	0.02	**Thailand**	0.04
Indonesia	0.02	**Turkey**	0.12
Ireland	0.92	**UK**	1.13
Israel	0.31	**US**	1.00
Italy	0.98	**Vietnam**	0.03

Table 6

Existing PTAs[12]

Group 1	Australia & New Zealand
Group 2	Canada & Chile
Group 3	Canada & Israel
Group 4	Chile & Mexico
Group 5	[Austria, Belgium, Denmark, Finland, France, Czech Republic, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK] & each of [Chile, Iceland, Israel, Mexico, Norway, Switzerland, Turkey]
Group 6	[Chile, Israel, Mexico, Turkey], & each of [Iceland, Norway, Switzerland]
Group 7	Turkey & Israel
Group 8	US & Chile
Group 9	US & Israel
Group 10	US & Canada & Mexico
Group 11	US & Australia

[12] [A, B, C] & each of [D, E] means that Countries A, B and C have a PTA with Country D, and again, the three countries have a PTA with Country E.

Table 7

EQUILIBRIUM PRICES IN A BASELINE ECONOMY

	Prices		Prices
Australia	1.185	**Japan**	1.060
Austria	1.152	**Malaysia**	1.130
Belgium	0.968	**Mexico**	1.156
Canada	1.101	**Netherlands**	1.005
Chile	1.339	**NZ**	1.314
China	0.961	**Norway**	1.227
Czech Rep.	1.193	**Philippines**	1.114
Denmark	1.153	**Poland**	1.221
Finland	1.177	**Portugal**	1.257
France	1.080	**Korea, Rep.**	1.107
Germany	1.006	**Russian Fed.**	1.221
Greece	1.325	**Spain**	1.143
Hungary	1.225	**Sweden**	1.132
Iceland	1.473	**Switzerland**	1.100
India	1.222	**Thailand**	1.149
Indonesia	1.192	**Turkey**	1.227
Ireland	1.066	**UK**	1.063
Israel	1.256	**US**	1.000
Italy	1.104	**Vietnam**	1.250

Table 8

SCENARIO 1 IN THE CASE OF MOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	ΔL	$\Delta \pi_{nn}$
Australia	179.97	143.95	-36.49	287.43	-69.39	17.93	2.16	108.80	-85.11
Austria	167.04	452.25	106.47	725.76	-68.66	16.94	1.60	27.80	-84.61
Belgium	-195.63	323.52	77.29	205.18	-64.60	13.18	-0.21	-42.10	-81.48
Canada	18.47	347.70	68.96	435.13	-67.30	15.75	1.08	4.10	-83.50
Chile	1684.23	419.26	56.67	2160.15	-72.80	20.74	3.11	394.40	-87.77
China	-38.35	238.26	31.68	231.60	-64.40	13.19	-0.14	-15.90	-81.30
Czech Rep.	369.12	448.22	95.47	912.81	-69.63	18.58	2.62	62.20	-85.43
Denmark	182.19	434.93	98.37	715.49	-68.68	16.86	1.51	31.90	-84.66
Finland	313.80	406.36	80.44	800.60	-69.25	17.79	2.10	58.80	-85.10
France	-138.61	490.20	143.80	495.39	-66.79	14.76	0.40	-22.90	-83.05
Germany	-255.18	424.26	128.39	297.47	-65.01	13.70	0.11	-44.30	-81.56
Greece	1049.35	436.59	65.84	1551.79	-72.47	19.41	2.12	223.80	-87.49
Hungary	541.10	415.20	74.82	1031.12	-70.37	20.25	3.76	103.30	-86.01
Iceland	2927.24	431.22	42.31	3400.77	-75.19	25.67	6.12	580.40	-89.48
India	368.10	278.33	17.72	664.16	-70.28	19.01	2.72	156.50	-85.89
Indonesia	465.37	250.84	9.53	725.75	-69.61	21.96	5.56	158.20	-85.36
Ireland	-42.81	338.77	69.68	365.64	-66.63	14.80	0.49	-9.40	-83.15
Israel	678.88	396.61	61.62	1137.12	-71.05	19.16	2.53	141.30	-86.49
Italy	-41.87	456.22	120.77	535.12	-67.39	15.18	0.55	-7.50	-83.52
Japan	-76.64	360.74	85.24	369.34	-66.07	14.43	0.37	-17.80	-82.38
Malaysia	289.95	249.36	16.50	555.81	-68.16	24.53	8.40	86.30	-84.28
Mexico	175.98	296.73	35.15	507.87	-68.71	17.07	1.69	55.40	-84.65
Netherlands	-164.45	359.54	91.77	286.86	-65.22	13.79	0.11	-33.50	-81.92
New Zealand	1533.45	360.06	38.14	1931.66	-72.27	25.28	7.23	363.00	-87.34
Norway	493.67	433.98	82.47	1010.11	-70.40	17.67	1.52	96.70	-85.97
Philippines	199.97	227.61	8.16	435.74	-67.79	18.87	3.61	66.80	-84.08
Poland	468.32	445.86	88.72	1002.90	-70.26	18.64	2.41	87.00	-85.86
Portugal	703.17	413.02	68.24	1184.42	-71.06	19.06	2.44	141.30	-86.46
Rep. of Korea	124.87	313.91	51.51	490.29	-67.45	17.72	2.74	30.20	-83.59
Russian Fed.	468.72	408.62	73.13	950.47	-70.24	20.90	4.38	107.30	-85.80
Spain	102.58	402.53	86.15	591.26	-68.38	15.84	0.74	21.20	-84.33
Sweden	129.36	399.19	86.22	614.77	-68.19	16.16	1.10	24.90	-84.27
Switzerland	-30.26	453.05	119.19	541.99	-67.39	15.13	0.50	-5.10	-83.66
Thailand	296.59	254.12	16.29	567.00	-68.61	23.09	6.96	89.50	-84.63
Turkey	513.46	458.68	92.99	1065.13	-70.38	17.72	1.57	99.50	-85.93
UK	-128.92	407.21	106.19	384.48	-66.39	14.44	0.27	-25.60	-82.73
USA	-131.24	293.63	60.95	223.34	-64.59	13.54	0.11	-41.70	-81.15
Viet Nam	942.00	324.57	33.27	1299.84	-70.89	83.21	57.74	215.20	-86.34

Table 9

SCENARIO 1 IN THE CASE OF IMMOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	Δw	$\Delta \pi_{nn}$
Australia	25.38	56.08	-73.12	8.35	-67.60	20.58	4.13	37.20	-90.17
Austria	35.34	175.22	-13.06	197.50	-66.84	20.32	4.01	14.32	-86.40
Belgium	-27.97	122.11	-27.18	66.96	-62.64	6.73	-5.54	-15.08	-73.78
Canada	12.28	132.78	-29.93	115.13	-65.46	16.05	1.01	6.83	-83.79
Chile	162.75	167.46	-32.22	297.98	-71.19	25.78	7.45	90.69	-95.23
China	-3.59	92.61	-43.95	45.07	-62.30	12.42	-0.20	-3.67	-78.23
Czech Rep.	61.66	173.98	-17.63	218.02	-67.87	26.01	8.16	25.32	-88.88
Denmark	37.01	168.42	-16.52	188.91	-66.86	20.23	4.02	15.76	-86.72
Finland	52.34	157.95	-23.79	186.49	-67.45	23.69	6.65	23.83	-88.41
France	-13.79	188.84	2.26	177.31	-64.87	13.23	-0.79	-5.69	-79.64
Germany	-41.33	164.61	-3.09	120.19	-62.94	8.97	-3.85	-17.44	-72.53
Greece	121.26	170.44	-29.92	261.78	-70.86	24.46	6.31	62.88	-93.72
Hungary	78.07	161.63	-26.16	213.55	-68.64	25.99	7.95	36.27	-90.66
Iceland	242.83	168.86	-39.86	371.83	-73.74	48.06	24.45	117.15	-96.67
India	46.91	108.54	-50.17	105.28	-68.53	18.57	1.99	48.33	-91.77
Indonesia	58.73	97.92	-53.53	103.12	-67.82	23.96	5.95	48.34	-91.46
Ireland	0.56	130.35	-28.92	101.99	-64.71	14.20	0.06	0.22	-81.64
Israel	89.95	154.52	-31.73	212.74	-69.36	25.67	7.97	45.58	-91.89
Italy	1.77	176.82	-6.81	171.77	-65.49	14.55	0.09	0.64	-82.14
Japan	-7.82	140.47	-21.21	111.44	-64.07	13.22	-0.50	-4.50	-79.20
Malaysia	42.73	97.65	-50.28	90.10	-66.26	28.35	8.93	30.61	-88.75
Mexico	30.29	114.61	-43.30	101.61	-66.90	17.32	1.80	23.34	-88.00
Netherlands	-21.02	136.89	-20.49	95.38	-63.26	10.51	-2.51	-10.66	-76.37
New Zealand	145.08	136.98	-43.07	238.99	-70.64	34.13	13.50	85.69	-94.84
Norway	72.63	168.86	-22.97	218.52	-68.67	21.53	4.73	34.60	-90.45
Philippines	31.51	88.86	-53.98	66.39	-65.88	22.14	5.66	25.45	-87.86
Poland	70.98	173.44	-20.34	224.08	-68.53	22.13	5.04	32.07	-90.08
Portugal	93.10	160.83	-28.98	224.95	-69.37	25.64	7.67	45.52	-91.87
Rep. of Korea	24.61	121.73	-36.01	110.32	-65.55	19.40	2.95	14.42	-85.51
Russian Fed.	66.70	159.11	-26.83	198.98	-68.50	20.93	3.05	36.98	-90.60
Spain	23.28	156.13	-21.47	157.94	-66.54	16.61	1.50	11.67	-85.62
Sweden	27.74	154.91	-21.38	161.27	-66.33	18.28	2.80	12.97	-85.83
Switzerland	6.30	174.21	-8.35	172.16	-65.53	15.15	0.66	2.48	-82.83
Thailand	43.50	99.22	-50.58	92.14	-66.75	25.82	7.12	31.72	-89.16
Turkey	74.72	178.62	-18.45	234.90	-68.65	20.42	3.79	35.19	-90.49
UK	-14.46	156.99	-13.39	129.14	-64.44	12.74	-0.95	-7.11	-78.74
USA	-21.86	114.97	-30.90	62.21	-62.46	11.67	-1.10	-16.76	-72.24
Viet Nam	108.98	126.66	-43.59	192.04	-69.19	68.48	27.20	60.38	-92.97

Table 10

SCENARIO 2 IN THE CASE OF MOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	ΔL	$\Delta \pi_{nn}$
Australia	101.62	72.64	-68.84	105.42	-69.98	17.53	1.57	123.00	-85.57
Austria	36.07	126.54	-43.32	119.29	-69.06	17.05	1.53	21.60	-84.93
Belgium	-58.79	91.29	-50.93	-18.44	-65.04	13.32	-0.24	-45.20	-81.85
Canada	-0.22	47.00	-77.61	-30.84	-67.73	15.84	0.99	-0.60	-83.85
Chile	402.71	88.70	-67.98	423.43	-73.47	19.19	1.47	450.60	-88.26
China	-11.78	59.38	-67.86	-20.26	-64.88	13.29	-0.21	-19.70	-81.69
Czech Rep.	89.62	125.32	-46.37	168.57	-70.03	18.65	2.52	54.30	-85.73
Denmark	40.84	122.84	-45.03	118.65	-69.09	16.97	1.45	25.40	-84.98
Finland	75.58	113.22	-50.67	138.14	-69.65	17.88	2.01	51.10	-85.41
France	-47.04	143.37	-30.07	66.25	-67.22	14.92	0.39	-26.80	-83.40
Germany	-75.81	119.32	-37.02	6.48	-65.45	13.86	0.09	-47.10	-81.93
Greece	272.64	122.49	-54.31	340.82	-72.83	19.52	2.05	208.30	-87.75
Hungary	136.07	116.03	-52.05	200.06	-70.76	20.05	3.42	93.50	-86.30
Iceland	611.56	95.81	-68.93	638.44	-75.51	25.65	5.94	548.10	-89.70
India	91.30	75.18	-68.80	97.68	-70.67	18.98	2.54	144.50	-86.18
Indonesia	114.35	66.99	-71.31	110.03	-70.01	21.72	5.18	146.40	-85.67
Ireland	-17.80	95.79	-52.94	25.05	-67.06	14.93	0.45	-13.90	-83.50
Israel	138.94	88.81	-64.48	163.27	-71.43	19.28	2.47	129.80	-86.77
Italy	-19.66	133.85	-36.47	77.72	-67.81	15.34	0.52	-12.10	-83.86
Japan	-15.17	137.02	-31.70	90.15	-66.73	14.39	0.10	-9.30	-82.93
Malaysia	196.74	108.05	-52.38	252.41	-69.41	19.48	3.49	138.60	-85.26
Mexico	29.95	58.31	-73.95	14.32	-69.12	17.21	1.65	48.20	-84.98
Netherlands	-50.81	101.53	-46.90	3.82	-65.66	13.94	0.09	-36.90	-82.29
New Zealand	359.64	73.81	-72.51	360.93	-72.86	23.16	5.14	419.40	-87.77
Norway	124.92	122.44	-49.47	197.88	-70.79	17.80	1.47	87.20	-86.26
Philippines	45.10	58.19	-72.89	30.40	-68.22	18.62	3.23	59.30	-84.43
Poland	117.20	125.23	-47.98	194.46	-70.65	18.57	2.19	77.90	-86.15
Portugal	188.09	121.01	-51.61	257.49	-71.44	19.15	2.36	129.70	-86.75
Rep. of Korea	22.23	69.84	-66.95	25.12	-67.88	17.57	2.44	24.30	-83.94
Russian Fed.	107.98	104.24	-56.66	155.56	-70.63	20.71	4.05	97.40	-86.09
Spain	23.20	126.55	-42.59	107.16	-68.79	15.99	0.71	15.30	-84.66
Sweden	27.37	112.30	-48.61	91.06	-68.61	16.29	1.05	18.80	-84.60
Switzerland	-17.24	133.22	-36.78	79.20	-67.82	15.28	0.48	-9.80	-84.00
Thailand	67.17	64.00	-71.28	59.89	-69.03	22.60	6.36	81.00	-84.96
Turkey	117.66	116.94	-51.71	182.88	-70.77	17.84	1.51	89.90	-86.22
UK	-41.21	114.57	-43.11	30.25	-66.82	14.60	0.25	-29.30	-83.09
US	-62.53	153.52	-18.20	72.80	-65.24	13.64	-0.03	-38.30	-81.69
Vietnam	723.89	139.59	-48.32	815.17	-72.98	52.85	30.42	400.80	-87.87

Table 11

SCENARIO 2 IN THE CASE OF IMMOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	Δw	$\Delta \pi_{nn}$
Australia	34.76	72.99	-65.89	41.86	-68.15	20.66	4.40	39.59	-90.70
Austria	21.82	123.56	-39.76	105.62	-67.22	19.88	3.53	12.60	-86.33
Belgium	-21.33	86.61	-49.32	15.96	-63.09	6.32	-5.99	-16.32	-73.66
Canada	3.30	47.52	-75.36	-24.54	-65.86	15.90	0.76	5.12	-83.67
Chile	87.96	85.80	-66.33	107.43	-71.82	25.89	7.95	96.75	-95.62
China	-3.21	58.32	-65.35	-10.24	-62.73	12.46	-0.28	-5.20	-78.07
Czech Rep.	40.01	122.62	-42.94	119.69	-68.24	25.42	7.55	23.43	-88.82
Denmark	23.32	119.90	-41.61	101.61	-67.25	19.84	3.57	14.02	-86.64
Finland	33.69	110.95	-47.39	97.25	-67.84	23.20	6.13	21.96	-88.34
France	-12.66	139.11	-26.03	100.42	-65.28	13.15	-0.98	-7.09	-79.53
Germany	-31.14	116.58	-32.64	52.80	-63.38	8.78	-4.13	-18.68	-72.39
Greece	82.03	120.60	-51.23	151.40	-71.20	24.31	6.07	60.40	-93.68
Hungary	51.61	113.89	-48.85	116.65	-69.01	25.56	7.50	34.21	-90.61
Iceland	131.78	94.70	-66.80	159.68	-74.04	47.40	23.75	113.83	-96.65
India	30.24	73.81	-66.69	37.35	-68.90	18.59	1.89	46.04	-91.72
Indonesia	37.07	65.28	-69.55	32.80	-68.19	23.72	5.67	46.02	-91.41
Ireland	-1.59	93.00	-50.20	41.20	-65.13	13.88	-0.33	-1.28	-81.54
Israel	48.17	87.46	-62.01	73.62	-69.72	25.37	7.58	43.35	-91.84
Italy	-1.30	130.74	-32.32	97.12	-65.89	14.43	-0.13	-0.88	-82.04
Japan	-2.13	127.30	-30.56	94.61	-64.70	13.48	-0.15	-1.38	-80.81
Malaysia	64.74	107.69	-48.30	124.13	-67.56	27.69	12.69	43.50	-90.92
Mexico	13.93	57.72	-71.94	-0.29	-67.29	17.28	1.65	21.42	-87.92
Netherlands	-16.69	97.28	-44.54	36.04	-63.69	10.29	-2.82	-11.98	-76.25
New Zealand	87.42	75.71	-69.46	93.68	-71.26	34.63	14.89	94.49	-95.37
Norway	48.38	120.13	-46.13	122.38	-69.04	21.35	4.46	32.56	-90.39
Philippines	18.46	56.71	-71.15	4.02	-66.28	21.70	5.23	23.50	-87.78
Poland	46.89	122.82	-44.55	125.16	-68.89	21.88	4.72	30.07	-90.02
Portugal	65.13	118.85	-48.40	135.58	-69.73	25.34	7.30	43.32	-91.82
Rep. of Korea	12.05	68.27	-64.75	15.57	-65.95	19.05	2.58	12.64	-85.42
Russian Fed.	40.30	102.40	-53.71	88.98	-68.87	20.82	2.88	34.89	-90.54
Spain	15.71	123.75	-38.85	100.62	-66.93	16.50	1.28	9.98	-85.54
Sweden	16.99	109.83	-45.24	81.59	-66.73	17.98	2.43	11.26	-85.75
Switzerland	1.86	128.99	-33.35	97.50	-65.93	14.82	0.26	0.96	-82.74
Thailand	25.35	62.16	-69.58	17.92	-67.14	25.30	6.66	29.68	-89.09
Turkey	45.01	114.85	-48.45	111.40	-69.02	20.31	3.57	33.13	-90.43
UK	-12.24	111.47	-39.61	59.61	-64.86	12.66	-1.14	-8.51	-78.63
US	-21.01	120.41	-29.49	69.91	-63.07	11.81	-1.02	-15.47	-73.61
Vietnam	178.27	141.34	-43.47	276.14	-71.43	61.77	42.06	93.36	-95.38

Table 12

SCENARIO 3 IN THE CASE OF MOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	ΔL	$\Delta \pi_{nn}$
Australia	118.22	79.48	-66.36	131.33	-70.26	17.41	1.36	131.40	-85.79
Austria	32.09	132.31	-41.31	123.10	-69.27	17.07	1.46	18.40	-85.09
Belgium	-62.73	94.55	-49.69	-17.86	-65.27	13.37	-0.27	-46.70	-82.03
Canada	6.43	54.89	-74.39	-13.07	-68.19	15.51	0.53	9.40	-84.21
Chile	381.77	86.71	-68.99	399.49	-73.66	19.21	1.40	438.10	-88.39
China	-13.73	62.94	-66.28	-17.07	-65.12	13.34	-0.25	-21.70	-81.89
Czech Rep.	86.50	130.99	-44.48	173.01	-70.23	18.64	2.42	50.30	-85.88
Denmark	36.87	127.62	-43.45	121.04	-69.29	17.00	1.39	22.10	-85.14
Finland	72.78	118.41	-48.90	142.29	-69.86	17.89	1.93	47.20	-85.57
France	-51.29	146.20	-29.40	65.51	-67.44	15.00	0.37	-28.70	-83.58
Germany	-81.21	124.50	-34.95	8.33	-65.68	13.93	0.07	-48.50	-82.12
Greece	273.21	127.92	-52.73	348.41	-73.02	19.55	1.99	200.40	-87.88
Hungary	134.19	121.25	-50.37	205.07	-70.96	19.95	3.25	88.50	-86.45
Iceland	610.15	98.78	-68.26	640.68	-75.68	25.56	5.78	531.50	-89.81
India	92.23	79.55	-67.30	104.48	-70.87	18.97	2.44	138.30	-86.33
Indonesia	116.81	71.62	-69.62	118.82	-70.22	21.60	4.99	140.30	-85.83
Ireland	-21.50	99.71	-51.51	26.70	-67.28	14.98	0.41	-16.20	-83.67
Israel	137.45	92.26	-63.44	166.27	-71.62	19.33	2.43	124.00	-86.92
Italy	-24.30	139.19	-34.59	80.30	-68.03	15.40	0.50	-14.40	-84.04
Japan	-10.98	142.35	-29.94	101.43	-67.02	14.42	0.02	-6.50	-83.16
Malaysia	218.08	110.79	-51.98	276.89	-69.76	18.57	2.56	150.70	-85.53
Mexico	88.98	88.21	-62.88	114.31	-70.38	16.20	0.26	97.60	-85.95
Netherlands	-55.33	106.03	-45.10	5.60	-65.88	14.00	0.06	-38.60	-82.48
New Zealand	396.41	78.51	-71.11	403.80	-73.10	22.69	4.63	436.10	-87.94
Norway	122.12	127.08	-48.06	201.13	-70.99	17.84	1.42	82.30	-86.41
Philippines	44.99	62.38	-71.23	36.13	-68.44	18.49	3.03	55.40	-84.59
Poland	114.91	130.87	-46.15	199.63	-70.85	18.54	2.08	73.30	-86.30
Portugal	184.63	124.81	-50.57	258.86	-71.63	19.17	2.28	123.80	-86.89
Rep. of Korea	21.04	75.86	-64.46	32.43	-68.10	17.49	2.29	21.20	-84.11
Russian Fed.	107.68	109.93	-54.73	162.89	-70.83	20.61	3.88	92.40	-86.24
Spain	19.12	129.70	-41.73	107.08	-69.00	16.05	0.69	12.30	-84.83
Sweden	23.74	116.79	-47.08	93.45	-68.82	16.33	1.00	15.70	-84.76
Switzerland	-21.98	136.63	-35.80	78.85	-68.03	15.35	0.45	-12.20	-84.17
Thailand	68.43	69.23	-69.24	68.42	-69.24	22.34	6.04	76.50	-85.12
Turkey	117.03	123.34	-49.55	190.81	-70.97	17.91	1.49	85.00	-86.37
UK	-45.47	119.22	-41.40	32.35	-67.04	14.68	0.23	-31.10	-83.27
US	-45.81	109.27	-42.42	21.04	-65.49	13.72	-0.04	-39.60	-81.90
Vietnam	803.35	141.10	-48.90	895.55	-73.41	47.86	25.92	443.10	-88.18

Table 13

SCENARIO 3 IN THE CASE OF IMMOBILE LABOR

Country	*INX*	*INP*	*SUB*	*TOTAL*	Δp	ΔW	ΔY	Δw	$\Delta \pi_{nn}$
Australia	38.06	76.75	-64.51	50.31	-68.38	20.83	4.60	41.41	-90.99
Austria	20.73	124.71	-39.65	105.79	-67.39	19.70	3.33	11.88	-86.30
Belgium	-21.84	86.22	-49.96	14.42	-63.27	6.15	-6.18	-16.83	-73.62
Canada	5.51	52.50	-73.23	-15.21	-66.23	16.04	1.18	7.96	-84.63
Chile	82.39	81.68	-68.16	95.90	-71.95	25.83	7.84	95.39	-95.60
China	-3.69	59.86	-64.71	-8.54	-62.91	12.47	-0.31	-5.83	-78.01
Czech Rep.	38.94	123.74	-42.84	119.84	-68.40	25.17	7.30	22.65	-88.80
Denmark	22.13	120.21	-41.89	100.44	-67.41	19.67	3.39	13.30	-86.62
Finland	32.74	112.02	-47.28	97.49	-68.00	23.00	5.91	21.18	-88.32
France	-13.46	136.81	-27.81	95.54	-65.46	13.12	-1.07	-7.68	-79.49
Germany	-32.07	117.16	-32.85	52.24	-63.56	8.71	-4.24	-19.19	-72.34
Greece	81.18	121.66	-51.15	151.69	-71.35	24.25	5.96	59.38	-93.67
Hungary	50.66	114.91	-48.77	116.81	-69.16	25.39	7.31	33.36	-90.59
Iceland	129.46	94.33	-67.16	156.63	-74.17	47.13	23.47	112.46	-96.64
India	30.23	75.48	-66.18	39.53	-69.06	18.60	1.85	45.10	-91.70
Indonesia	37.49	67.56	-68.72	36.33	-68.35	23.62	5.55	45.07	-91.39
Ireland	-2.42	93.33	-50.41	40.49	-65.30	13.75	-0.49	-1.90	-81.51
Israel	47.21	87.75	-62.16	72.81	-69.87	25.24	7.42	42.44	-91.82
Italy	-2.38	131.20	-32.60	96.22	-66.06	14.39	-0.22	-1.51	-82.00
Japan	-0.36	128.65	-30.53	97.76	-64.93	13.63	-0.03	-0.26	-81.35
Malaysia	67.71	107.20	-49.21	125.71	-67.85	27.93	13.41	45.96	-91.28
Mexico	28.81	81.33	-62.37	47.77	-68.37	17.53	2.50	32.48	-90.04
Netherlands	-17.50	97.78	-44.70	35.59	-63.87	10.19	-2.94	-12.53	-76.21
New Zealand	91.19	77.41	-69.06	99.55	-71.45	34.91	15.24	96.70	-95.50
Norway	47.11	120.38	-46.41	121.08	-69.20	21.27	4.34	31.72	-90.37
Philippines	18.47	58.87	-70.28	7.06	-66.45	21.53	5.05	22.70	-87.75
Poland	45.91	123.94	-44.45	125.40	-69.05	21.78	4.59	29.24	-90.00
Portugal	63.35	118.36	-48.98	132.73	-69.88	25.21	7.15	42.40	-91.80
Rep. of Korea	11.90	71.71	-63.25	20.36	-66.12	18.91	2.43	11.91	-85.39
Russian Fed.	39.95	104.31	-53.19	91.07	-69.03	20.78	2.81	34.02	-90.52
Spain	14.42	122.37	-39.98	96.81	-67.09	16.46	1.19	9.27	-85.51
Sweden	15.95	110.22	-45.46	80.70	-66.90	17.86	2.28	10.56	-85.72
Switzerland	0.70	127.62	-34.56	93.76	-66.10	14.69	0.09	0.33	-82.70
Thailand	25.74	65.12	-68.37	22.49	-67.30	25.09	6.47	28.84	-89.06
Turkey	44.57	116.99	-47.87	113.70	-69.18	20.26	3.48	32.28	-90.41
UK	-13.10	111.86	-39.87	58.89	-65.04	12.63	-1.22	-9.09	-78.58
US	-15.75	87.14	-49.37	22.02	-63.25	11.83	-1.06	-16.07	-73.52
Vietnam	184.41	139.34	-45.24	278.50	-71.79	62.26	44.41	98.58	-95.66

Table 14

EQUILIBRIUM TRADE SHARES IN BASELINE ECONOMY

	Canada	US
Canada	0.171645	0.397215
US	0.077685	0.416425

Table 15

Canada's Change in Imports from Member Countries Except For the US

	Mobile Labor Case	Immobile Labor Case
Scenario 2	23.11%	15.77%
Scenario 3	36.57%	24.31%