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A MONOPOLY REASON WHY AUTARKY MIGHT BE BEST FOR A LARGE COUNTRY*

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Will all countries gain from free trade? Two countries, one with a large and the other a small population, are modeled. Once trade is opened, real income rises in the small country and falls in the large one. The intuition is that, without trade, the large country's local monopoly makes profits at the expense of its consumers. With trade, the foreign duopolist earns some of the profits, even though the industry profits are smaller. Average home consumption falls, even though all the home citizens, except the producer, benefit. This can explain the objections to the lifting of economic barriers.

1 Introduction

Why are US citizens reluctant to sign a free trade agreement with Mexico? Who gains from an opening of the borders between two neighboring countries? Will any country lose as borders are opened? Is it the small country or the large country that benefits most? Will Western Europe benefit more than the former Soviet bloc? South Korea more than North Korea and China? Israel more than the Arab countries?

This paper focuses on two economies that initially share the same technology and per capita income, but differ in population size. The intuition is that, without trade, the large country's monopoly makes profits at the expense of its consumers. With trade, the profit of the duopolist in the large country is reduced, to the benefit of the new duopoly firm in the small country. The foreign duopolist earns some of the profits, even though total industry profits are smaller. Since the foreign producer receives more of the producer surplus, average home consumption falls, even though all the home citizens, except the producer, are better off.

This paper may be viewed as taking an initial step in studying the effects of the transition from a world of war and trade barriers to a world of peace,

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open borders and free trade. The peace process and open border policy lead to a higher degree of international integration. However, this process is not necessarily beneficial to all countries involved. Whereas some economies will experience an increase in income as a result of opening the borders, others may suffer a decrease in their wealth. The threat of breaking the monopoly power and the resulting reduction in profits might be a reason why producers in the large country oppose free trade. This may explain why one country would want to open trade with high barriers while another country would prefer low barriers.

Economists have been nearly unanimous in their condemnation of protectionism (e.g. Samuelson, 1962; Rassekh, 1994), yet protectionism seems more powerful than ever (Krugman, 1987; Batra, 1992). While protectionism may benefit the larger country at the expense of its home citizens as well as the foreign producer, the welfare of the world may benefit if export subsidies are financed by distortionary taxation (Collie, 1997). However, the optimal taxation policy is a function of country size (Ohsawa, 1999). Once a symmetric equilibrium is reached, a subsidy may be optimal for price competition (Fujimoto and Park, 1997).

An industrial organization framework is used to generate results in the direction of the classical interpretation of international trade (Brander and Spencer, 1985). Thus, while the approach of this paper mimics the analytical tool of the industrial organization approach, the conclusions are classical in nature.

On one hand, the classical international trade literature has long advocated trade liberalization and open borders, claiming that open borders help everyone if proper compensation schemes are implemented. Furthermore, when studying the specific issue of large versus small countries, these theorists conclude that small countries always gain, whereas large countries do not necessarily gain from opening their borders. On the other hand, the new industrial-organization-oriented literature on international trade is very mixed in its opinions of whether free trade benefits the big or the small country. Moreover, the new approach rationalizes protectionist policies imposed by the small country.[1]

This paper is organized in the following way. Section 2 describes a noncooperative Nash model in which a closed border is opened for trade. Within this model the effects of equilibrium prices and sales are determined in each country. Section 3 investigates the properties of the Nash equilibrium, and presents a numerical example. Section 4 discusses some implications of the model and summarizes the results.

[1]A survey of the literature is Krugman (1989) and an exhaustive treatment of the subject is given by Helpman and Krugman (1985, 1989) and Brander (1995). See also Krugman and Obstfeld (2002).

2 The Model

This paper studies the implications of abolishing the wall against trade between two neighboring countries. In particular, the effects of the population size of the two countries are investigated. Initially, before free trade is introduced, consumers in each country are subject to a monopoly firm. The firm is located near the residence of the consumers (multi-store monopoly). Citizens of each country share the same per capita income. However, consumers in one country differ in one important dimension from consumers in the other country; namely, they are members of either a country with a large population or a country with a small population. Within each country, the population density is uniform, but it differs numerically between the two countries.

Opening the borders and lifting trade barriers transforms these countries of different size into an internationally global oligopolistic market. Now, consumers are able to buy not only domestically but can expand their horizons and exploit the opportunity to travel abroad and buy in the foreign country. The producer at home can now sell not only to his own citizens, but he may gain from his competitor across the border. By the same token, the local producer may lose customers due to their shopping abroad.

To set the scene, consider two countries, each producing a single output. Within each country the firms simultaneously set one price, the same for both domestic and foreign consumers.[2] Consumers in each country then choose where to buy. The two countries, home (h) and foreign (H), differ in their population size, where it is assumed that H is greater than h ($H > h$). The two countries lie on the interval [−1, +1] with a border between them at the origin. Within each country the population is distributed uniformly. Since the land size of both countries is assumed to be the same and the number of individuals in H is greater than the number in h, the space per citizen in the small home country is larger than in the large foreign country. Thus, the difference in population in the case analyzed here is the difference in the number of individuals and not the relative distance of the individual from the border. This last assumption is made for clarity; the main results are robust to different definitions of population sizes (see Shachmurove and Spiegel, 1995).

[2]Firms are assumed not to engage in price discrimination, charging the same prices at home and in foreign markets. This assumption is motivated by the World Trade Organization's (WTO) antidumping laws, which target international price discrimination. The GATT 1994 requires that 'imported products not be subject to internal taxes or other changes in excess of those imposed on domestic goods, and that imported goods in other respects be accorded treatment no less favorable than domestic goods under domestic laws and regulations, and establishes rules regarding quantitative restrictions, fees and formalities related to importation, and customs valuation' (WTO, 2003). In addition, the current Doha Round of WTO talks includes an initiative to reform the 1994 antidumping agreement by insisting on 'preserving the basic concepts, principles and effectiveness of [the Antidumping Agreement] and [its] instruments and objectives' (Lindsey and Ikenson, 2002). See also the paper by Finger (1992).

This last assumption regarding the definition of population size is also used by Kanbur and Keen (1993). For simplicity, following Kanbur and Keen (1993), it is further assumed that in all other senses, other than residence conditions, all consumers are identical: they have identical tastes and each consumer buys only one unit of output. Since the quantity demanded by each consumer is one, it follows that in the autarky regime, the real level of production is h in the small home country and H in the large foreign country. Under a free trade regime, the quantity produced by each country may change because of the possibility of cross-shopping. As for the supply side, it is assumed to be perfectly elastic, and there is no constraint on the nations' production functions; thus, any quantity demanded can be satisfied by the unbounded availability of the economy's resources. This is a regular assumption in macroeconomics where it is assumed that the aggregate supply curve in the short run is horizontal. The implication of this assumption is that the number of units produced in each country depends only on the quantity demanded in each entity and every increase in the demand for the product can be met without an increase in the marginal cost. This assumption indicates that the marginal cost of producing the output is assumed to be equal for each unit in both countries, and for simplicity it is assumed to approach zero. The price that an individual in h faces is p, and in H the price is P. If these prices are less than or equal to his reservation price, the consumer buys one unit of output, and none otherwise. In these single product autarky markets, in each country, the price paid by an individual is the same. The response functions of the two countries are derived shortly, under the assumptions that reservation prices approach infinity.[3]

Each consumer has some stock of money that he saves domestically. Saving is assumed to be a non-tradable good. The price of one unit of saving is assumed to be equal to one, and it serves as the numeraire. The consumer uses his money either to save or to buy the tradable good either at home or abroad.

Once borders are opened and the world economy becomes integrated, the consumers' consumption possibilities frontier may be expanded. Every consumer in the small country may choose either to buy one unit at his nearby store at the price p, saving all transportation costs, or to travel across the border, incur transportation costs, and buy the one unit at a price P. It is assumed that traveling back and forth entails both explicit and implicit transport costs of $\delta s > 0$, where δ is transport costs per mile per unit and s is the distance traveled by the marginal consumer from the border. The term δ is expressed in dollar terms of forgone time, traveling costs etc.[4]

[3]Alternatively, the consumers' reservation prices can be finite, but high enough so they do not limit the corresponding producer in their price-setting policies.

[4]This assumption regarding the transportation costs follows Kanbur and Keen (1993) and is made for simplicity. Furthermore, although we consider in this paper movement of people between countries for the sake of buying goods, it is possible to think of δ

Given the above assumptions the scene is set to pose the following question: when will the cross-borders process take place?

Consider first the case when $p > P$; then all foreign consumers prefer naturally to buy in the large foreign country. In addition, some home consumers will cross the border to satisfy their need by buying abroad. This will increase the foreign country's production of the single good, and as a result will lead to an increase in the total net revenue of the foreign country. This is true for every consumer who belongs to home, and who finds that his final price for buying abroad, including traveling costs, is cheaper than buying at home. Formally, if

$$p > P + \delta s \tag{1}$$

then a fraction of size s from the h consumers residing in the small, home country will prefer to cross the border and shop in the large country. Clearly, s can be negative, i.e. some fractions of foreign consumers cross the border and shop in the home country. Thus, s is constrained between –1 and 1. Since the population is distributed uniformly and all the home consumers reside in the interval [–1, 0], a fraction $0 < s < 1$ of these h consumers who live at a distance of s from the border prefer to cross the border and shop in the neighboring large foreign country. Home residents who live farther than distance s from the border continue to prefer to buy at the nearby store. Using equation (1), s is also constrained to be

$$s < (p - P)/\delta \tag{2}$$

In other words, $s^1 h$ of home's residents will cross the border and the remaining $(1 - s^1)h$ will continue to shop at home at the price p, where s^1 solves equation (2) with equality. In other words, s^1 is the fraction of home residents who will cross the border, given that p, P and δ are exogenous.

Consider now the opposite case where the price in the foreign large country is higher than the price at home. If $P > p$, then a proportion of s^0 from H will cross from the foreign country and shop in the small home country, i.e. $s^0 H$ will cross the border to h. The remaining foreign residents, $(1 - s^0)H$, will continue to buy in the large foreign country, where s^0 satisfies

$$s^0 = (P - p)/\delta \tag{2'}$$

as the cost of moving the good from one country to the other as a function of the distance from the mutual border. This is just another implication of Samuelson's iceberg; see also Krugman and Elizondo (1992). Moreover, the main results are not sensitive even if transportation costs do exist within each country as well as between the two countries (see Shachmurove and Spiegel, 1995). Transportation costs which do not depend on the distance traveled result in *all* large-country consumers buying in one country, either their own or the other country. Transportation costs by the importing country are assumed away. Including such transportation costs causes the gaps in per capita income and per capita revenues for the two countries to increase, further strengthening the results in the text.

The objective of the home country is to maximize the total net revenue function, TR_h, where the decision maker chooses a contingent policy that takes into account the price-setting reaction function of the other country as given. Each country must choose a price as a response to the price that the other country has chosen. Each consumer is faced with the exogenous price vector (p, P), and equipped with this information he must determine whether he wants to shop at home or abroad. The total net revenue function (the gross domestic product in national accounts terms) for the small country is as follows:

$$TR_h = \begin{cases} ph(1-s^1) = ph[1-(p-P)/\delta] & \text{if } p > P \quad (3) \\ ph + pHs^0 = ph + pH[(P-p)/\delta] & \text{if } p < P \quad (4) \end{cases}$$

Similarly, the objective function of the large country is to maximize its total net revenue function TR_H as follows:

$$TR_H = \begin{cases} PH + Phs^1 = PH + Ph[(p-P)/\delta] & \text{if } p > P \quad (5) \\ pH(1-s^0) = PH[1-(P-p)/\delta] & \text{if } p < P \quad (6) \end{cases}$$

Now, the scene is set to prove that for $h < H$ the price at home, the small country, is lower than the price in the large foreign country: $p < P$, if we assume a one-cycle Bertrand game in prices.

To prove the above, we need to construct the reaction function of the home country, RC_h, and the reaction function of the foreign country, RC_H, using equations (3)–(6).

First, maximizing equations (3) and (4) with respect to p, taking as given the values of P and δ and equating the derivatives to zero, determines p endogenously as a function of P, and generates the response function of the small home country, denoted by RC_h. Similarly, differentiation of equations (5) and (6) with respect to P, taking as given the values for p and δ and equating the derivatives to zero, determines P endogenously as a function of p, and generates the response function for the large foreign country, denoted by RC_H. These two reaction curves are represented by

$$RC_h = \begin{cases} p = (P+\delta)/2 & \text{if } p > P \quad (7) \\ p = \delta h/2H + P/2 & \text{if } p < P \quad (8) \end{cases}$$

$$RC_H = \begin{cases} P = \delta H/2h + p/2 & \text{if } p > P \quad (9) \\ P = (p+\delta)/2 & \text{if } p < P \quad (10) \end{cases}$$

Now, we will show that $p > P$ is not a feasible solution. To proceed, substitute equation (9) into equation (7) to get

$$-\delta + 2p = \delta H/2h + p/2$$

Thus,

$$p = 2\delta/3 + \delta H/3h \quad (11)$$

Using equations (9) and (11), it can be shown that:

$$P = \delta H/2h + \delta/3 + \delta H/6h$$
$$= 2\delta H/3h + \delta/3 \tag{12}$$

Since H is assumed to be greater than h, it follows that H/h is greater than one, which implies

$$P - p = \delta H/3h - \delta/3 = (\delta/3)(H/h - 1) > 0 \tag{13}$$

However, the last expression contradicts the constraint placed on equations (7) and (9), namely that $p > P$. Thus, the conclusion is that it is not possible that $P < p$. ■

From the above solution, it follows that a non-cooperative Nash solution is not feasible when equations (7) and (9) are satisfied. Now we show that if $p < P$, it is possible to derive the stable Nash equilibrium point which expresses the values of p and P as functions of the underlying parameter as follows:

$$3P/4 = (\delta h)(4H) + \delta/2 \tag{14}$$

which yields

$$p = 2\delta h/3H + \delta/3 \tag{15}$$

and

$$P = \delta h/3H + 2\delta/3 \tag{16}$$

The above two equations imply that the difference $P - p$ is greater than zero (under the maintained assumption of $h < H$). To show this formally, subtract equation (15) from equation (16) to get

$$P - p = \delta/3 - \delta h/3H = (\delta/3)(1 - h/H) > 0 \tag{17}$$

■

Hence, using equations (8) and (10), we can get a consistent solution.

Given the above, it has been shown that the Nash equilibrium prices, p^N and P^N, are equal to

$$p^N = \delta/3 + 2\delta h/3H = \delta(1/3 + 2\theta/3) \tag{15'}$$

and

$$P^N = 2\delta/3 + H/3h = \delta(2/3 + \theta/3) \tag{16'}$$

where θ is defined as $\theta \equiv h/H$.

It is useful to summarize the above result. The Nash equilibrium price in the small country, p^N, is lower than the Nash equilibrium price in the large country, P^N.

When borders are opened, the number of units produced and sold by the small country's producer increases. The result is an increase in the flow

of revenues from the large to the small country. The shift in revenue and wealth from the large to the small country, increases inequality, by increasing the utility and welfare of the small country's residents and by decreasing the utility of the large country's inhabitants.

3 Properties of the Nash Equilibrium

In this section the properties of the Nash equilibrium are studied. This is done via the following propositions

Proposition 1: The number of cross-border shoppers from H to h is *proportional* to the difference in the population size of the two countries.

Proof: Using equations (15′), (16′), (17) and (2′), the number of cross-shoppers from the large to the small country is equal to s^0, where the value of s^0 at the Nash equilibrium point is equal to

$$\begin{aligned} s^0 &= \left(P^{\mathrm{N}} - p^{\mathrm{N}}\right)/\delta = (\delta/3\delta)(1 - h/H) \\ &= (1/3)[(H - h)/H] \end{aligned} \tag{18}$$

Since s^0 is the proportion of those consumers who cross-shop and thus it is constrained to be between zero and one, the total number of people who cross-shop is equal to s^0H, which is equal to

$$s^0 H = (1/3)[(H - h)/H]H = (1/3)(H - h) \tag{19}$$

■

Equation (19) reveals that the number of cross-border shoppers is *proportional* to the difference in the sizes of the two countries' populations. Under the above condition, exactly one-third of the difference in the populations crosses the border. The above result is interesting because the number of cross-border shoppers depends not on the size of the population in each country, but on the difference in the population sizes. Again, the reason is because the monopoly/duopoly, when deciding its new price, takes into account on the one hand the lost revenue from its existing customers caused by the lower price and on the other hand the increase in revenue from new customers. The firm decreases its price if the profit from the new consumers is higher than the loss from the existing consumers. As a result the revenue per capita grows in the small country and declines in the country with the large population. The changes are discussed in the following proposition.

Proposition 2: Opening the border leads to a significant positive increase in real income for the small country. The large country suffers a reduction in its real income.

Proof: In the closed economy case it was assumed that each individual in each country consumes one unit of output. Denote (y_h^M, Y_H^M) as the real output of the small and large countries respectively for the (monopoly) closed-border case, and let (y_h^N, Y_H^N) be the (Nash) open-border real output for each country respectively. Given these notations, it is possible to derive expressions for the ratio of output in the open economy to the output of the closed economy for the small country, y_h^N/y_h^M, and for the large country, Y_H^N/Y_H^M, as follows:

$$\begin{aligned} y_h^N/y_h^M &= \left[h+\frac{1}{3}(H-h)\right]\Big/h \\ &= \left(\frac{2}{3}h+\frac{1}{3}H\right)\Big/h \\ &= 1+(H-h)/3h \equiv 1+g \end{aligned} \tag{20}$$

where g represents the proportional increase in real income. Since no migration is allowed, the g term also represents per capita increase in income, which is generated from lifting the trade barriers. Equation (20) indicates that the value of g increases as the difference between H and h increases, especially when h is small.

Similarly, the decrease in the large economy's income when the border is open can be expressed as

$$Y_H^N/Y_H^M = \left[H-\frac{1}{3}(H-h)\right]\Big/H = 1-(H-h)/3H \equiv 1-b \tag{21}$$

where b denotes the proportional loss in real output of the large country. Examination of equation (21) makes it apparent that the value of b increases as the difference between H and h increases, and that the highest value of b is one-third of the original pre-trade output. This happens when h is very small relative to H. ■

4 Conclusions

This study focuses on the short-run effects on income levels and investigates the resulting distribution of income for the case of economic integration of countries. With homogeneous consumers but with different numbers of people in the countries, the results indicate a net gain in favor of the smaller country. Initially, the two autarkic countries are each subject to a monopoly environment, share the same per capita income and the same real economic activity per capita (GNP per capita), but differ in population size. The transition of these countries to an internationally oligopolistic market, as a result of opening their border, leads to an increase in income for the small country and to a decrease in income for the large country. The conclusion is

a second best result. Given the monopoly in the large country, autarky is desirable for the monopoly firm. The intuition is that without trade, the large country's monopoly makes profits at the expense of its consumers. With trade, the small country's duopolist gets some of the profits, even though the industry profits are smaller. Since the producer in the small country gets more of the producer surplus, average consumption in the large country falls.

It is by now a well-known result that opening the border for international trade decreases the monopolistic power of the single producer by establishing oligopolistic markets that are more competitive. This phenomenon leads to a decrease in prices, which the individual consumer faces. What is unique to our discussion is that we introduce a model in which the monopolistic power generally decreases significantly for a small country relative to a big country. We showed that the price differences are proportionally related to the difference in the populations' sizes.

Moreover, for a small country the decline in monopoly power of the producer is compensated, to some extent, by the increase in real output (i.e. units sold). As a result, the total net revenue for the large country decreases relative to the closed-border case, because there is a decrease both in prices and in the number of units sold. Thus, the real income per capita decreases in the large country. For the small-population country, the resulting total nominal net revenue is ambiguous because two competing forces are in effect: the decline in prices against the increase in total output.

Small countries are more likely to be, *in the short run*, the net gainers of the newly established open borders policy, while the large countries are the losers. The model predicts that recent changes toward a freer economy may lead to an increase in the earnings of the small countries and to a decline in the income of the relatively larger countries, at least in the short run.

Even more importantly, the per capita total net revenue and per capita output, which may be considered as measures of welfare, are negatively affected in the large country. The effect is negative when measured by either the monetary value or by real output. This wealth inequality may be considerable and should be evaluated by policy makers. Trade policies, such as tariffs on the one hand and export subsidies on the other hand, can be justified by residents of the large country. Although these trade policies are distortional, the present paper lends a hand in support of such policies on the ground that it is worthwhile for the large country's policy makers to implement them. The shift of revenue from the large to the small country's producers is what justifies government intervention such as tariffs and other barriers to free trade. In this context, it is worth mentioning that an even better policy for the large country than autarky would be free trade along with anti-trust policy. That would reduce the price in the large country to

marginal cost, so the large country consumers would receive all the benefit, rather than part of it going to the foreign producer.

Another important implication of the model is that, as a result of free trade, part of the savings of the residents of the large country is directed towards consumption in the small country. This increase in the demand for output by residents of the large country creates an economic growth in the small country. Thus, opening the border to free trade creates economic growth in the small country both in terms of total output produced and in terms of per capita output. The results for the large country are the opposite, economic decline both in terms of total output and in terms of per capita output.

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