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The Economics of Trade in Variety

by

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Abstract

This paper develops a two-country general equilibrium model to examine the costs and benefits of trade in differentiated products. It focuses on how the relative ability in exporting variety determines the welfare of each country. While the analysis suggests a new rationale for export-promotion, it also shows the possibility of overprovision of export variety. It is shown that the variety of consumption goods for a country could be less in free trade than in autarky and, more surprisingly, free trade is not necessarily superior to autarky. Even when trade increases the variety of consumption goods for both countries, the equilibrium of economic integration could be welfare reducing as long as trade cost is positive.

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1 Introduction

Does trade of differentiated products always increase the variety of consumption goods? When it does, can the gain from the increase in variety always compensate the loss of the decrease in the consumption (quantity) of each good? Most studies of trade in differentiated products would say yes to these questions. The reason for such an answer to the first question is that they usually assume all firms in the same industry become exporters in trade. However, a casual observation would tell us that this assumption does not reflect the reality. Often only a fraction of firms in an industry is exporters. As well, export growth in many countries is due not only to an increase in exports from current exporting firms but also to an increase in the number of exporting firms.¹ By capturing this feature, the paper develops a simple two-country general equilibrium model to focus on how the relative ability in exporting variety determines the welfare of each country. While the analysis suggests a new rationale for export-promotion, it also shows the possibility of over-provision of export variety. It is shown that the variety of consumption goods for a country could be less in free trade than in autarky and, more surprisingly, free trade is not necessarily superior to autarky. Even when trade increases the variety of consumption goods for both countries, the equilibrium of economic integration could be welfare reducing as long as trade cost is positive.

A primary feature of this model of trade in differentiated products is that a monopolistically competitive firm must hire entrepreneurs to export its good - a fixed cost is required to market its good in a foreign market. The relative scarcity of entrepreneurs generates a dichotomy of firms in trade: exporters and non-exporters. Such a dichotomy between exporters and non-exporters in a country affects the total population of firms as well as its terms of trade. Trade allows some firms to become larger (i.e. exporters) but it also eliminates some relatively small firms (i.e. non-exporters). The latter effect is reinforced by the presence of trade costs

When a country increases its export variety (relative to the export variety of the other country), it can improve its terms of trade because the relative demand for its goods increases - consumers in the other country will consume all the new varieties. However, if

¹ For example, using panel data from Colombia, Morocco, and Mexico, Roberts, Sullivan and Tybout (1995) find that a large number of new exporting firms contributed to the rapid export growth in these countries.

more entrepreneurs are used to increase exports, less labour is available for domestic production and the variety of domestic goods declines. The former is the terms-of-trade effect and the latter is the variety effect. When the terms-of-trade effect is dominant, a country can gain by having more export varieties. This result might suggest a rationale for those export-promotion programs that aim to help domestic firms become new exporting firms or enter new foreign markets. When the variety effect is dominant, however, a further increase in its export variety could make the country worse off. As a result, a country overprovides export variety and, moreover, it might end up with less variety of consumption goods in trade than in autarky and might not gain from opening trade. The reason for this inefficiency is the combination of the co-ordination failure across firms and the presence of trade costs. More surprisingly, when trade increases the variety of consumption goods for both countries, the equilibrium of economic integration could be welfare reducing for both of them. In this case, the gain from the increase in variety could not compensate the loss of the decrease in the consumption of each good, because the former effect is reduced by the presence of the fixed cost of trade. More strikingly, when the love-of-variety preference is not very strong, the welfare-reducing equilibrium could happen for any level of fixed cost of trade.

Perhaps the only study that does not assume symmetric firms in a monopolistic competition model is Venables (1994). Unlike this paper, the dichotomy between exporters and non-exporters in his model relies on the heterogeneity in demand functions of domestic and foreign goods. Venables shows that due to the adverse effect on the total population of firms, the gains from economic integration (a reduction in trade costs) are smaller than in the standard model of monopolistic competition. This paper shows, however, that a country might over-provide export variety in trade and the equilibrium of economic integration could be welfare-reducing for both countries. A similar kind of welfare-reducing equilibrium is also found in the reciprocal-dumping model of Brander and Krugman (1983), where firms' perception of segmented-markets and their strategic interaction are crucial. The results in this paper do not rely on any of these.

The remainder of the paper is organised as follows. Section 2 formally describes the structure of the model. Section 3 discusses the comparative static results and their welfare implications. Section 4 provides some further welfare implications for economic integration. Section 5 concludes the paper.

2 The Model

The model is a development of the monopolistic-competition framework of Krugman (1980) and Dixit and Stiglitz (1977). In the model a firm is identified with a good/variety. Each firm produces only one good because there are no economies of scope and no two firms produce the same good because there are increasing returns to scale.

Assume that the world consists of only two countries, Home and Foreign, and that domestic goods are differentiated from foreign goods. Production technologies and consumer tastes are identical in both countries. To produce x units of a good requires l units of labour:

$$l = \alpha + \beta x, \quad \alpha, \beta > 0 \quad (1)$$

where α and β are the fixed and marginal costs of production. Workers require no special skills, so everyone in the economy can be a worker. Therefore, under free entry Home non-exporter i (producing non-traded good i in the home country) has profits

$$\pi_{ni} = p_{id} x_{id} - (\alpha + \beta x_{id}) w = 0 \quad (2)$$

where x_{id} is the output of good i and p_{id} is its price; w is the wage rate for workers in the home country. The subscript d indicates variables related to domestic markets. The subscript n refers to non-exporters.²

To sell a good abroad a firm must use a fixed amount of labour from domestic entrepreneurs, γ ($0 < \gamma < \alpha$), to market it in a foreign country (e.g., to set up a distribution channel).³ Although assuming heterogeneity of a fixed cost of export across firms is more realistic, the assumption of γ being constant allows us to simplify the analysis and highlight the underlying economic forces.

The stock of entrepreneurs in the economy, however, is not large since they require special skills (e.g., specific intelligence about a foreign market or a language). Therefore, under free entry the wage rate for the entrepreneurs must be equal to

² Similarly, f and e will be used to indicate foreign markets and exporters. The notation will be simplified later.

³ In the model we assume the fixed cost of exporting a good is smaller than the fixed cost of producing a good. It will become clear later that if γ is greater than α , autarky will be the equilibrium. Also, for simplicity we do not model that to export goods will probably require hiring of foreign entrepreneurs.

$$\{p_{jd}x_{jd} + p_{jf}x_{jf} - [\alpha + \beta(x_{jd} + x_{jf})]w\}/\gamma, \gamma > 0 \quad (3)$$

where x_{jd} and x_{jf} are the units of good j (produced by a typical Home exporter j) sold in the domestic and foreign markets, respectively; p_{jd} and p_{jf} are the respective prices that firm j charges in each market.

Since an entrepreneur can also do the job of a worker (that requires no special skills) the wage rate for the entrepreneur must be higher than that of workers. For ease of exposition, we assume that the wage for entrepreneurs consists of the basic wage rate and a share of the firm's "profits", i.e.,

$$w + \pi_{ej}/\gamma \quad (4)$$

where

$$\pi_{ej} \equiv p_{jd}x_{jd} + p_{jf}x_{jf} - [\alpha + \beta(x_{jd} + x_{jf})]w - \gamma w \geq 0 \quad (5)$$

The variables for the foreign country that correspond to (2), (4) and (5) can be obtained similarly.⁴

Consumers in the two countries have identical preferences, in which all consumption goods enter symmetrically. They love variety and would consume all the goods available. A consumer in the home country has utility given by

$$U = \sum_i c_{id}^\theta + \sum_j c_{jd}^\theta + \sum_l c_{lf}^\theta, 0 < \theta < 1 \quad (6)$$

where c_{id} is the consumption of non-traded good i ; c_{jd} is the consumption of domestic traded good j ; c_{lf} is the consumption of foreign traded good l .

Assuming domestic governments can redistribute income evenly, we focus on the welfare of a representative consumer (in each country) who owns an equal share of all domestic firms.⁵ Therefore, we have $x_{id} = Lc_{id}$, $x_{jd} = Lc_{jd}$, $x_{jf}^* = Lc_{jf}$, where L is the population (of consumers, or labour including both workers and entrepreneurs) in the home country.

A representative consumer in the home country maximises (6) subject to a budget constraint. Assume the number of goods is very large, so that the effect of the pricing

⁴ All variables for the foreign country will be starred.

⁵ We are interested in the welfare implications associated with trade in variety for the two countries, rather than the income-distribution effects between workers and entrepreneurs.

decision of any one firm on the marginal utility of income can be ignored. Therefore, the demand curve facing Home non-exporter i , the Home demand curve facing Home exporter j and the Home demand curve facing Foreign exporter l , have the same elasticity: $1/(1-\theta)$.

The profit-maximising prices for these three kinds of firms are:

$$p_{id} = w\beta/\theta; p_{jd} = w\beta/\theta; p_{lf}^* = w^*\beta/\theta \quad (7)$$

Notice that $p_{id} = p_{jd}$, that is, all Home firms, both non-exporters and exporters, set the same price in their domestic market.

Similarly, a representative consumer in the foreign country has utility

$$U^* = \sum_i c_{id}^{*\theta} + \sum_j c_{jd}^{*\theta} + \sum_l c_{lf}^{*\theta} \quad (8)$$

and the analogous profit-maximising prices are

$$p_{kd}^* = w^*\beta/\theta; p_{ld}^* = w^*\beta/\theta; p_{jf} = w\beta/\theta \quad (9)$$

From (7) and (9), we notice that all goods produced by the home country are priced at $w\beta/\theta$ and all goods produced by the foreign country are priced at $w^*\beta/\theta$.⁶ Therefore we can use p and p^* to denote these prices:

$$p \equiv p_{kd} = p_{ld} = p_{jf} = w\beta/\theta; p^* \equiv p_{kd}^* = p_{ld}^* = p_{jf}^* = w^*\beta/\theta \quad (10)$$

For most of our discussion, we assume that entrepreneurs are relatively scarce in the economy, so that they earn more than workers. This also means that not every firm can become an exporter and there exist both non-traded and traded goods in the economy.

When entrepreneurs are scarce, the variety of traded goods will be determined by the stock of entrepreneurs in each country. For example, the variety of traded goods in the home country (or the number of Home exporters) will be $n_e = L_e/\gamma$, where L_e is the stock of the entrepreneurs in the home country. We have implicitly assumed that each entrepreneur supplies only one unit of labour (and the same for each worker thereafter). Similarly, for the foreign country we have $n_e^* = L_e^*/\gamma^*$. However, when the stock of entrepreneurs is large,

⁶ The reason, of course, is that all the demand elasticities are the same. These differences are purposely ruled out in order to focus on the issue we care about in this paper.

the variety of traded goods will be determined by the zero-profit condition for exporting firms. We will analyse each of these two cases, though focusing on the first one.

The output of non-traded good i in the home country can be determined by solving (2) and (10), and is given by

$$x_{id} = \frac{\alpha\theta}{\beta(1-\theta)} \quad (11)$$

Then the consumption of non-traded good i by an individual in the home country is

$$c_{id} = \frac{x_{id}}{L} = \frac{\alpha\theta}{\beta(1-\theta)L} \quad (12)$$

From (10) the optimal consumption decision of an individual in the home country requires that $c_{jd} = c_{id}$ and $c_{jf} = c_{id}(p^*/p)^{1/(\theta-1)}$. Since the consumption of each domestic good is the same, we drop the subscripts i and j and use c_d to denote the consumption of each domestic good:

$$c_d \equiv c_{jd} = c_{id} = \frac{x_{id}}{L} = \frac{\alpha\theta}{\beta(1-\theta)L} \quad (13)$$

Furthermore, we can also use c_f to denote the consumption of each import good in the home country:

$$c_f \equiv c_{jf} = c_d \left(\frac{p^*}{p} \right)^{1/(\theta-1)} \quad (14)$$

From (13) the output of each good produced (by either an exporter or non-exporter in the home country) for its domestic market is the same, and accordingly can be denoted as x_d ,

$$x_d \equiv x_{jd} = x_{id} = c_d L = \frac{\alpha\theta}{\beta(1-\theta)} \quad (15)$$

Equations (10) and (15) imply that, similarly to a non-exporter, the revenue of an exporter from its domestic sales exactly covers the fixed cost of production.⁷ Therefore, the profit of each Home exporter can be written as [dropping the subscript j in (5)]

⁷ The reason that export sales do not have to subsidise domestic sales is that there still exist non-exporters in the domestic market - there is less competition among exporters since the stock of entrepreneurs is limited.

$$\pi_e = [px_d - (\alpha + \beta x_d)w] + [px_f - (\gamma + \beta x_f)w] = px_f - (\gamma + \beta x_f)w \quad (16)$$

where x_f is the output of an exporter for the foreign market and is equal to $L^* c_f^*$. The corresponding foreign variables (c_d^* , c_f^* and x_d^*) can be derived similarly.

The condition of balance-of-trade for the home country requires that

$$pn_e L^* c_f^* = p^* n_e^* L c_f \quad (17)$$

where $pn_e L^* c_f^*$ is the total value of Home exports and $p^* n_e^* L c_f$ is the total value of Home imports. Noticing that $L c_d = L^* c_d^*$, we can derive the terms of trade for the home country,

$$\frac{p}{p^*} = \left(\frac{n_e}{n_e^*} \right)^{\frac{1-\theta}{1+\theta}} = \left[\left(\frac{L_e}{L_e^*} \right) \left(\frac{\gamma^*}{\gamma} \right) \right]^{\frac{1-\theta}{1+\theta}} \quad (18)$$

The equilibrium in the labour market requires

$$n_p (\alpha + \beta L c_d) + n_e (\gamma + \beta L^* c_f^*) = L \quad (19)$$

The first term is the labour requirement for the output for domestic consumption. The second term is the labour (including both workers and entrepreneurs) used up for exports. Therefore, the total number of goods produced in the home country is

$$n_p = \frac{L}{\alpha + \beta L c_d} - \frac{n_e (\gamma + \beta L^* c_f^*)}{\alpha + \beta L c_d} \quad (20)$$

From (6) and (20), we obtain the utility of a representative consumer in the home country as follows:

$$U = n_p c_d^\theta + n_e^* c_f^\theta \quad (21)$$

$$= \frac{L c_d^\theta}{\alpha + \beta L c_d} + \frac{n_e^* \alpha c_f^\theta}{\alpha + \beta L c_d} - \frac{n_e \gamma c_d^\theta}{\alpha + \beta L c_d} \quad (22)$$

Similarly, the utility of a representative consumer in the foreign country is

$$U^* = \frac{L^* c_d^{*\theta}}{\alpha + \beta L^* c_d^*} + \frac{n_e \alpha c_f^{*\theta}}{\alpha + \beta L^* c_d^*} - \frac{n_e^* \gamma^* c_d^{*\theta}}{\alpha + \beta L^* c_d^*} \quad (23)$$

3 Export Variety, Terms of Trade and Welfare

First, let us consider what determines the terms of trade between the two countries. From (18) we can have the following proposition immediately.⁸

Proposition 1: *The relative ability in exporting variety determines the terms of trade: the greater a country's export variety, the better are its terms of trade.*

The intuition is as follows. Since consumers prefer variety to quantity, they want to consume all varieties from a foreign country. Suppose the home country has more export varieties than the foreign country. For its consumers to consume all the varieties from the home country, the foreign country must sell more of each of its export varieties. However, the marginal utility decreases when the consumption level of each import good increases in the home country. In equilibrium the prices of Foreign goods must fall relative to those of Home goods. It is easy to show that a rise in the export variety of a country increases its total volume of exports. Therefore, we have the following corollary:

Corollary 1: *An increase in a country's exports, as a result of a rise in export variety, improves its terms of trade.*

Notice that this result might suggest an export-promotion policy that is very easy to implement. It requires little information, compared to those suggested by other studies. For example, in Feenstra (1986) an export subsidy can improve the imposing country's terms of trade and welfare but it requires the knowledge about the market linkage between different export goods. In a Ricardian model with a continuum of goods, Itoh and Kiyono (1987) show that export subsidies can improve the overall terms of trade and benefit the imposing country only if they are placed on the marginal goods. Under imperfect competition, where firms have market power and interact strategically, Brander and Spencer (1985) show that a country can benefit from an export subsidy because of the profit-shifting effect. In contrast, firms in this model have little market power and do not interact strategically.

However, the above result does not necessarily mean that a country can always benefit from having more export varieties. Whether a country benefits from having more export varieties depends on the cause of the increase in its export variety. If an increase in n_e is caused by a decrease in the fixed cost of export γ , it always benefits the home country. On the other

⁸ Krugman (1979) derives a similar result in a model of perfect competition but it depends on the size of the two countries.

hand, if the increase in n_e is caused by an increase in the stock of entrepreneurs relative to workers (taking the total population as given)⁹, welfare does not necessarily increase.

Proposition 2 (i) U is decreasing in γ , and increasing in L_e when $L_e < \tilde{L}_e$, where

$$\tilde{L}_e = n_e^* \left(\frac{\alpha^{1+\theta}}{\gamma^\theta} \right) \left(\frac{\theta}{1+\theta} \right)^{1+\theta}$$

(ii) U is decreasing in L_e when $L_e > \tilde{L}_e$.

Proof. Notice that U in (22) can be written as

$$U = \frac{Lc_d^\theta}{\alpha + \beta Lc_d} + \frac{n_e^* \alpha c_f^\theta}{\alpha + \beta Lc_d} - \frac{L_e c_d^\theta}{\alpha + \beta Lc_d}$$

After taking the derivative with respect to γ , we have

$$\begin{aligned} \frac{dU}{d\gamma} &= \frac{\partial U}{\partial n_e} \frac{dn_e}{d\gamma} \\ &= - \left(\frac{c_d^\theta}{\alpha + \beta Lc_d} \right) \left[\frac{\alpha \theta}{1 + \theta} \left(\frac{n_e^*}{n_e} \right)^{\frac{1}{1+\theta}} \right] < 0 \end{aligned}$$

Similarly, after taking the derivative with respect to L_e we obtain

$$\begin{aligned} \frac{dU}{dL_e} &= \frac{\partial U}{\partial n_e} \frac{dn_e}{dL_e} \\ &= \left(\frac{c_d^\theta}{\alpha + \beta Lc_d} \right) \left[\left(\frac{\theta}{1 + \theta} \right) \left(\frac{\alpha}{\gamma} \right) \left(\frac{n_e^*}{L_e/\gamma} \right)^{\frac{1}{1+\theta}} - 1 \right] \end{aligned}$$

From the first-order condition $\partial U / \partial L_e = 0$ we can derive L_e . Also we can show that the second-order condition for a maximum is satisfied: $\partial^2 U / \partial L_e^2 < 0$. *Q.E.D.*

⁹ Given a fixed population, an increase in L_e requires training some workers to be entrepreneurs. This allows us to isolate the effects of a change in a country's export ability from those of any change in the size of the country.

The intuition is as follows. First, a decrease in the fixed cost of export (γ) increases the variety of Home exports, which improves the home country's terms of trade. The total fixed cost of export, however, is the same (i.e., $n_e\gamma = L_e$). Therefore, it always benefits the home country. Second, an increase in the stock of entrepreneurs L_e has two effects. On the one hand, it improves the terms of trade for the home country: on the other hand, its total fixed cost of export rises, which reduces the variety of non-traded goods in the home country. Whether the home country can benefit from an increase in L_e depends on how large the (positive) terms-of-trade effect is relative to the (negative) variety effect. The variety effect on U is linear but the terms-of-trade effect is concave. When L_e is small, the terms-of-trade effect dominates the variety effect; when L_e is large, the variety effect dominates the terms-of-trade effect.

Part (1) of Proposition 2 provides a rationale for export promotion. A country can benefit from a reduction in the fixed cost of export as well as from having more people become entrepreneurs. In particular, the result provides some rationale for the export-promotion programs in many countries that aim to help domestic firms become new exporters or enter new foreign markets in which these firms have little market power. Part (ii), however, raises the possibility that the home country can end up with over-provision of export variety if its stock of entrepreneurs is greater than \tilde{L}_e . We will return to this issue later at the end of this section.

The critical value \tilde{L}_e , which characterises the optimal stock of entrepreneurs for the home country, deserves further discussion. First, \tilde{L}_e is increasing in α and decreasing in γ . When the fixed cost of production is large and the fixed cost of export is small, trade becomes more beneficial. Therefore, it is good to have a large stock of entrepreneurs. Second, it is not difficult to show that \tilde{L}_e is increasing in θ for $\theta \in (0,1)$. When θ is large, consumers do not care about variety as much as they otherwise might (though they still prefer variety to quantity), because the elasticity of substitution between domestic and foreign goods is high.¹⁰ Therefore, the home country can benefit from further trading variety for quantity, which requires a larger stock of entrepreneurs, *ceteris paribus*. Third, \tilde{L}_e is increasing in n_e^* . When the import variety is large, the consumption of each import good is low and the marginal utility of consumption of import goods is high. Then, more

¹⁰ The elasticity of substitution is equal to $1/(1 - \theta)$. When θ becomes equal to one, all goods become perfect substitutes.

entrepreneurs would be very beneficial for the home country because this will improve its terms of trade (by increasing export variety) and increase the consumption of imported goods. Now suppose that the foreign country represents the ‘rest of the world’. In this case the number of import varieties for the home country (n_e^*) is likely to be very large and so is its optimal stock of entrepreneurs. In this case it is likely that the home country can always benefit from exporting more varieties to the world market.¹¹

The next question that naturally follows is how does an increase in one country’s export variety affect welfare in the other country? First, from Proposition 1 we know that an increase in the home country’s export variety worsens the terms of trade for the foreign country. However, it also increases the variety of imports for the foreign country, which benefits its consumers. We can show that the second effect (variety effect) dominates the first (terms-of-trade effect).

Proposition 3 *Although it worsens the terms of trade for the foreign country, an increase in the export variety of the home country raises welfare in the foreign country.*

Proof. Taking the derivative of (23) with respect to n_e , we find

$$\frac{dU^*}{dn_e} = \left(\frac{\alpha c_d^{*\theta}}{(\alpha + \beta L^* c_d^*)(1+\theta)} \right) \left(\frac{n_e^*}{n_e} \right)^{\frac{\theta}{1+\theta}} > 0. \text{ Q.E.D.}$$

This result is actually not surprising given that consumers prefer variety to quantity. From (23) we can also see that the gain is first order in n , but the loss is second order.

The next result, however, is more surprising and it might provide an rationale for encouraging trade with more developed countries that can provide great variety. Suppose that the populations of two countries are the same and the consumers in both have the same utility level in autarky. We can show that a country always gains more from opening to trade than the other country if the latter has relatively more export varieties. This occurs regardless of the cause of the additional export varieties: more entrepreneurs or lower fixed cost of export. This result can be stated in the following proposition:

¹¹ A more rigorous discussion would require that the fixed cost of export depends on the size (or population) of foreign markets.

Proposition 4 If $n_e > n_e^*$ due to either $L_e > L_e^*$ or $\gamma < \gamma^*$ then $U^* > U$.

Proof. Since $L = L^*$, we have $c_d = c_d^*$. Then [using (22) and (23)],

$$\begin{aligned} U^* - U &= \frac{1}{\alpha + \beta L c_d} \left[\alpha (n_e c_f^{*\theta} - n_e^* c_f^\theta) + (n_e \gamma c_d^\theta - n_e^* \gamma^* c_d^\theta) \right] \\ &= \frac{1}{\alpha + \beta L c_d} \left\{ \alpha n_e^* c_f^\theta \left[\left(\frac{L_e \gamma^*}{L_e^* \gamma} \right)^{\frac{1-\theta}{1+\theta}} - 1 \right] + [L_e - L_e^*] c_d^* \right\} \end{aligned}$$

Therefore, $U^* > U$ either if $\gamma < \gamma^*$ and $L_e > L_e^*$, or if $L_e = L_e^*$ and $\gamma < \gamma^*$. *Q.E.D.*

The reason for the result is the following. The benefit (if any) received by the home country in having more export varieties comes from the improvement in the terms-of-trade; the benefit received by the foreign country, however, comes from the increase in variety. It is not surprising that the variety effect is greater than the terms-of-trade effect, given that consumers love variety more than quantity.

Now let us come back to Part (ii) of Proposition 2 again. From there we know that over-provision of export variety could occur if the stock of entrepreneurs is larger than the optimal level. But what will happen to a country's overall gain from trade in the presence of over-provision of export variety? To answer this question, first notice that each exporter makes positive profits when L_e is at the optimal level \tilde{L}_e . Substituting \tilde{L}_e into (16), we obtain

$$\pi_e = p L^* c_f^* - \beta L^* c_f^* w - \gamma w = \frac{\gamma w}{\theta} > 0$$

Therefore, as long as there are still non-exporters in the home country and exporters can make positive profits, an increase in the stock of entrepreneurs will bring more firms into the foreign market. If the stock of entrepreneurs in the home country is very large, *ceteris paribus*, the profits of exporters will fall to zero and entrepreneurs in the end earn the same wage as workers.¹² The number of exporters in the home country under this equilibrium is

¹² Notice that this is an equilibrium because those entrepreneurs who work as entrepreneurs in this equilibrium have no incentive to switch jobs, even though their income in this case is the same as that of workers - it does not require any extra cost for them to work as entrepreneurs.

determined by the zero profit condition for exporters. Setting (16) to zero, we obtain the equilibrium number of exporters,

$$\bar{n}_e = n_e^* \left(\frac{\alpha}{\gamma} \right)^{1+\theta} \quad (25)$$

Accordingly, the equilibrium number of entrepreneurs who work as entrepreneurs in the home country is

$$\bar{L}_e = \bar{n}_e \gamma = \frac{n_e^* \alpha^{1+\theta}}{\gamma^\theta} \quad (26)$$

Therefore, we will have this equilibrium when the stock of entrepreneurs in the home country (L_e) is greater than \bar{L}_e .¹³ The corresponding level of utility of a representative consumer in the home country, therefore, can be derived by substituting h, into (22) and is obtained as follows:

$$U = \frac{L c_d^\theta}{\alpha + \beta L c_d} \quad (27)$$

which is equal to the utility level in autarky.

From (25) notice that $n_e > n_e^*$ because $\gamma < \alpha$. This also means that $p > p^*$ and $c_f > c_d$. Therefore, given that $U = U_a$, it is straightforward to show that in this equilibrium the variety of consumption goods (including both domestic and imported goods) in the home country is less than in autarky.

Proposition 5 *If its stock of entrepreneurs is greater than \bar{L}_e , where $\bar{L}_e = n_e^* \alpha^{1+\theta} / \gamma^\theta$,*

- (i) *the home country is indifferent between free trade and autarky;*
- (ii) *the equilibrium variety of consumption goods in the home country is less than that in autarky.*

¹³ Also notice that in deriving \bar{n}_e and \bar{L}_e , we assume that there exist non-traded goods in the home country. This is equivalent to assuming that L must be large and satisfy the following implicit restriction: $n_p > \bar{n}_e$.

This result might seem odd at first sight. One presumes that if a large fraction of people in the economy are able to work as either workers or entrepreneurs, then the country should have some advantages. But notice that people employed as entrepreneurs do not produce goods. As a result, the variety of non-traded goods decreases. When the import variety is limited for a country, its benefit from an increase in trade only comes from consuming more quantity but not variety. Consequently, the benefit from more trade is constrained.

The above results are derived from an asymmetric case where the import varieties for the home country is constrained. Therefore, ironically trade in this case might lead to a reduction in the varieties of consumption goods available in the home country. The lower the value of θ , the more likely it is for the home country to over-provide export variety.

Notice that in this economy the source of “inefficiency” in the over-provision of export variety, lies in the combination of the fixed cost of export and a lack of co-ordination among a large number of firms selling similar products in one foreign market. The latter exists in the monopolistic competition model in general [as Matsuyama (1995) points out] and its adverse effect is exacerbated in this model by the presence of the fixed cost of export.

4 Economic Integration and Welfare

In the previous section, the term-of-trade effect plays a crucial role in determining the welfare of the two countries. In this section we will further examine the welfare effects of economic integration, where the terms-of-trade effect is not present. Suppose both the fixed cost of export and the stock of entrepreneurs are the same in the two countries (i.e., $L_e = L_e^*$ and $\gamma = \gamma^*$). The welfare implications of the integration of these two economies critically depends on whether there exist both exporters and non-exporters in the economy. We consider two simple cases.

4.1 Case One

In Case One the stock of entrepreneurs is small so that not every firm can become an exporter. Since $L_e = L_e^*$ and $\gamma = \gamma^*$, the two countries have the same number of exporters (i.e. $n_e = n_e^*$). Then, it is straightforward to show that

$$p = p^*, c_f = c_d, c_f^* = c_d^*$$

Since the relative price is equal to one, consumers have the same consumption level for both domestic or imported goods. Therefore, the utility of a representative consumer in the home country becomes

$$U = \frac{L}{\alpha + \beta L c_d} c_d^\theta + \frac{n_e(\alpha - \gamma)}{\alpha + \beta L c_d} c_d^\theta \quad (28)$$

The gain from trade in this case comes from the fact that $\gamma < \alpha$. Trade plays the role of another means of production. It saves labour by amount $\alpha - \gamma$ for each good. There is no trade-off between quantity and variety in consumption - the consumption level of each good is unchanged. The saving in the labour requirement increases the variety of consumption goods to $[L + n_e(\alpha - \gamma)]/[\alpha + \beta L c_d]$. Not surprisingly, in this case an increase in export variety in both countries is beneficial to everyone in the two countries, as described in the following proposition.

Proposition 6 *Both countries gain from opening trade and benefit from a further economic integration through either*

- (i) *a decrease in both γ and γ^* , or*
- (ii) *an increase in both L_e and L_e^* ,*

Sketch of Proof. Both (i) and (ii) increase the export variety. From (28), U is increasing in the number of exporters. This is also true for U^* . *Q.E.D.*

4.2 Case Two

Now let the stocks of entrepreneurs (in both countries) in Case One increase. When they are sufficiently large all firms become exporters and make zero profit. This is a case of a fully integrated economy. A simple case would be that everyone in the economy can be employed as either an entrepreneur or a worker, though it is not necessary.¹⁴ The equilibrium of this fully-integrated economy is equivalent to the case where there is population growth and an increase in the fixed cost of production in autarky. To simplify, suppose that two countries are the same size ($L = L^*$). Then, the utility level for each individual in the home country, for example, becomes

¹⁴ The stock of entrepreneurs must satisfy the following restriction: $L_e > \gamma L / (\alpha + \gamma + \beta L c_d)$. Notice that L_e does not have to be very large if γ is small.

$$U = \frac{2L}{\alpha + \gamma + \beta L c_d} \left(\frac{c_d}{2} \right)^\theta \quad (29)$$

The utility level for each individual in autarky, on the other hand, is given by

$$U_a = \frac{L}{\alpha + \beta L c_d} c_d^\theta \quad (30)$$

Compared with autarky, in free trade the consumption level for each good is reduced from c_d to $c_d/2$. But the total variety of consumption goods increases from $L/(\alpha + \beta L c_d)$ to $2L/(\alpha + \gamma + \beta L c_d)$. Using (29) and (30) it is straightforward to show the following proposition:

Proposition 7 $\forall \gamma \in (0, \alpha), \exists \tilde{\theta} \in (0, 1)$ such that (i) $U > U_a$ when $\theta < \tilde{\theta}$; (ii) $U < U_a$ when $\theta > \tilde{\theta}$, where

$$\tilde{\theta} = 1 - \left[\ln \left(\frac{\alpha + \gamma + \beta L c_d}{\alpha + \beta L c_d} \right) \right] / \ln 2$$

This is a very surprising result, as it says that the welfare-reducing equilibrium could arise even when the fixed cost of export is small. Actually, the equilibrium of this fully-integrated economy is always welfare improving for both countries only when the fixed cost of export is zero.¹⁵

The intuition behind Proposition 7 still lies in the trade-off between quantity and variety in consumption, though it is quite different from that for the asymmetric cases. When trade has no extra cost, the gain from the increase in the variety of consumption in free trade always dominates the loss from the reduction in the quantity of consumption (of each good). However, when trade involves fixed costs, there will be less variety available in the trading equilibrium than otherwise. Whether trade is beneficial depends on how much consumers like variety. A small value of θ means that consumers care very much about variety, so they can benefit from trade. But consumers may find themselves worse off if θ is relatively large.¹⁶

¹⁵ Notice that $U > U_a$ always holds only when $\gamma = 0$ (i.e. $\tilde{\theta} = 1$).

¹⁶ Notice this is very different from the reasoning behind Proposition 5.

We have shown in the symmetric cases that a balanced increase in export variety can be beneficial to both countries. However, in free trade there still exists the possibility of over-provision of export variety for both countries. When the degree of love-of-variety in preferences is not very strong, welfare might decline in free trade.

The ‘negative’ results in this paper do not necessarily hinge on our assumption of the specific form of the cost of trade. It is not difficult to see that this kind of welfare-reducing equilibrium could also arise in Krugman’s (1980) model where trade requires iceberg-type transport cost. For example, in that framework when two countries are identical, variety will be doubled after opening to trade but the consumption of domestic goods is reduced to half. The presence of transport costs will not reduce the variety of consumption goods, but will reduce the consumption level of import goods. When transport costs are very large, the consumption of imports can be very low so that both countries may lose from opening to trade. Notice that the reason we end up with such kinds of welfare-reducing equilibrium is that the “free entry and no trade” position cannot be an equilibrium due to the economies of scale.

5 Concluding Remarks

We have shown in this paper that focusing on trade in variety rather than quantity provides some new insights for understanding the costs and benefits of trade in differentiated products. If some results are surprising, as we have mentioned above, they are the result of the combination of trade costs and the co-ordination failure across a large number of monopolistically competitive firms. It is overlooked in the literature that how the adverse effects of this co-ordination failure could be exacerbated by the presence of trade costs.

The presence of trade cost has been recognised in many studies on monopolistic competition for different kinds of reasons.¹⁷ Although many believe that the gains associated with intra-industry trade are less than the gains associated with inter-industry trade [e.g., Linder (1961) and Aquino (1978)],¹⁸ the possibility of losses from trade in differentiated goods has never been raised in the literature. An important point is that trade

¹⁷ For example, Krugman (1980, 1981) introduces iceberg-type transport cost to study the home-market effect and income-distribution effects between different groups.

¹⁸ Greenaway (1982) claims that no general statements can be made about the gains from intra-industry trade relative to inter-industry trade.

will occur in this model as long as consumers love variety and there are economies of scale in production. Such trade is beneficial if there are no trade costs. When trade involves costs and there is co-ordination failure across firms, the welfare outcomes depend on how consumers value variety relative to quantity (i.e., the value of θ).

In a closed economy of monopolistic competition, variety could be over-provided relative to the first-best optimal level. We have shown, however, the extent of over-provision of export variety in an open economy could reduce welfare to (or even below) the autarky level. The results of this paper have raised some theoretical concerns regarding the benefits

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