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Entrepreneurship and Intra-Industry Trade

By Z. Yu

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The Authors

Zhihao Yu is a Lecturer in the School of Economics, University of Nottingham.

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Abstract

The paper introduces entrepreneurs into the theories of intra-industry trade and investigates the role of a country's ``entrepreneurship" in international trade. It is shown that the relative entrepreneurship between countries determines the terms of trade but the welfare effects are not obvious. Among other things, it is found that 1) an increase in exports improves terms of trade and 2) an increase in country size is not always beneficial.

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1. Introduction
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Non-Technical Summary

A common assumption in all trade theories is that goods are traded internationally on ``well-organized'' markets. It is also well-known, however, that few manufactured products are traded on organized exchanges compared to primary products. The reason is simply that the prices of manufactured products do not reveal much information because of the great heterogeneity in their complex characteristics and quality. Therefore, it is emphasized by Rauch (1996, 1999) that the importance of ethnic ties and entrepreneurship in international commodity trade, especially trade in differentiated goods. This view is also consistent with the empirical finding on the pro-trade effects of immigration (e.g. Head and Ries, 1998a). This current paper is an attempt to introduce ``entrepreneurs'' into the theories of intra-industry trade and gain some insights about the role of a country's ``entrepreneurship'' in international trade.

The main feature of our model, which follows a standard model of intra-industry trade with differentiated products (Krugman, 1980), is to assume that firms must hire a certain amount of entrepreneurs, who are relatively scarce in the labor force, to sell their products in a foreign market (e.g. for re-tooling and marking products in a foreign country). The scarcity of entrepreneurs generates a dichotomy among firms in trade: exporters and non-exporters. The purpose of this paper, however, is not to endogenize ``entrepreneurship'' in a country's labor force. Rather, we focus on how the relative entrepreneurhship between countries may affect their terms of trade and economic welfare.

Our main findings are as follows. First, the {\it relative} entrepreneurship affects the terms of trade between the two countries. A country with relatively high entrepreneurship, {\it ceteris paribus}, is able to export more {\it varieties} of its products and thus has a better terms-of-trade. Also, it is interesting that an increase in the volume of total exports in our model is positively (rather then negatively) associated with an improvement of terms-of-trade. Second, the welfare effects are not obvious, however. In particular, an increase in a country's entrepreneurship has two effects. On the one hand, it improves its terms of trade. On the other hand, it reduces the level of varieties produced at home. There are two reasons for the latter: 1) trade re-allocates resources from non-traded goods to traded goods and 2) less labor is available for production when entrepreneurs are employed in exporting activities. Therefore, the net welfare effect of higher entrepreneurship depends on the magnitudes of these two opposing forces. Among other things, we also find that an increase in country size (i.e., population) has the effects of ``market size'', ``congestion'', and ``entrepreneurs''. The first two effects are contained in the standard model of monopolistic competition (though it has never been identified in this way before), but the effect of market size always dominates the effect of congestion leading to the result that an increase in country size is always beneficial. In our model, the effect of market size does not always dominate the effect of congestion because the latter becomes larger when there are rents for exporting activities. Therefore, an increase in its population might not always be beneficial to the country.

1. Introduction

A common assumption in all trade theories is that goods are traded internationally on "well-organized" markets. It is also well-known, however, that few manufactured products are traded on organized exchanges compared to primary products. The reason is simply that the prices of manufactured products do not reveal much information because of the great heterogeneity in their complex characteristics and quality. Therefore, it is emphasized by Rauch (1996, 1999) that the importance of ethnic ties and entrepreneurship in international commodity trade, especially trade in differentiated goods. This view is also consistent with the empirical finding on the pro-trade effects of immigration (e.g. Head and Ries, 1998a). This current paper is an attempt to introduce "entrepreneurs" into the theories of intra-industry trade and gain some insights about the role of a country's "entrepreneurship" in international trade.

The main feature of our model, which follows a standard model of intra-industry trade with differentiated products (Krugman, 1980), is to assume that firms must hire a certain amount of entrepreneurs, who are relatively scarce in the labor force, to sell their products in a foreign market (e.g. for re-tooling and marking products in a foreign country). The scarcity of entrepreneurs generates a dichotomy among firms in trade: exporters and non-exporters. The purpose of this paper, however, is not to endogenize "entrepreneurship" in a country's labor force. Rather, we focus on how the relative entrepreneurhship between countries may affect their terms of trade and economic welfare.

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trade. On the other hand, it reduces the level of varieties produced at home. There are two reasons for the latter: 1) trade re-allocates resources from non-traded goods to traded goods and 2) less labor is available for production when entrepreneurs are employed in exporting activities. Therefore, the net welfare effect of higher entrepreneurship depends on the magnitudes of these two opposing forces. Among other things, we also find that an increase in country size (i.e., population) has the effects of "market size", "congestion", and "entrepreneurs". The first two effects are contained in the standard model of monopolistic competition (though it has never been identified in this way before), but the effect of market size always dominates the effect of congestion leading to the result that an increase in country size is always beneficial. In our model, the effect of market size does not always dominate the effect of congestion because the latter becomes larger when there are rents for exporting activities. Therefore, an increase in its population might not always be beneficial to the country.

The related research in the literature is very limited. Recent studies have found empirical evidences on trade effects of ethnic tie/network (e.g. Rauch and Trindale, 1999). Also, a number of empirical studies have found the evidences that immigration has positive effects on the exports of the immigrants' host countries (to the immigrants' home countries),[1] including Gould (1994), Head and Ries (1998), Dunlevy and Hutchinson (1999), and Girma and Yu (2000). Therefore, it seems that the composition of a country's labor force could have effects on its exports.

A few papers have also introduced (constant) fixed cost of export into the monopolistic-competition framework, including Venables (1994), Yu (1998), and Jean (2000). Schmitt and Yu (2000a, 2000b) further model the heterogeneity of the fixed cost of export, in which firm's profits are associated with their efficiency in export. Such link between profit and efficiency is also identified by Montagna (1995, 2001) and Jean (2000), although they all focus on the heterogeneity in the marginal cost of production. Using a framework very different from ours, Rauch and Casella (1998) formally (and rigorously) model the

[1]Such effects are also found for the imports of the host country.

network/search view of international trade by developing a model that focuses on matching in international trade. They analyze how incomplete information in international markets could affect trading equilibrium and economic welfare. Unlike their paper, we focus on how the relative "entrepreneurship" affects the terms of trade and economic welfare within a standard model of intra-industry trade.

The remainder of the paper is organized as follows. Section 2 describes the basic structure of the our model. Section 3 derives the relationship between the relative entrepreneurship and the terms of trade. Section 4 examine the welfare effects. Section 5 investigates the welfare implications of country size. Section 6 concludes the paper.

2. The Model

The model is developed from the monopolistic-competition framework of Krugman (1980) and Dixit and Stiglitz (1977). In the model each firm produces only one good because there are no economies of scope, and each good is only produced by one firm because there are increasing returns to scale. Therefore, a firm is identified with a good.

Assume that the world consists of only two countries, Home and Foreign, and domestic goods are differentiated from foreign goods. Production technologies of the two countries are identical and to produce x units of a good requires l units of labor:

$$l = \alpha + \beta x, \ \alpha, \beta > 0, \tag{1}$$

where α and β are the fixed and variable costs of production (we will interpret α in a different way shortly). Therefore, if firm i in the home country sells goods only to domestic consumers, its profit is

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

where x_{id} and p_{id} are the output and price of good i; 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 (f and e will be used to indicate foreign markets and

exporters). Under free entry, this profit will become zero and this will be true for all non-exporters.

We assume that to sell its goods abroad, a firm must hire a fixed amount of domestic entrepreneurs, γ, to re-tool products and set up a distribution network in a *foreign* market.[2] Since this extra cost is additional to that for the domestic sales, we assume $\alpha > \gamma$ (α includes the fixed costs of both production and domestic sales).[3]

Assuming firms export goods by themselves rather than through intermediate trading companies is probably a reasonable assumption for differentiated products, because they often require re-tooling for a foreign market. As mentioned earlier, Rauch (1999) finds that differentiated goods are traded much less through markets than homogeneous goods. There is also a growing empirical literature that focuses on the exports by manufacturing firms (e.g., Bernard and Jensen, 1999; Head and Ries, 1998b). Also, to assume heterogeneity of the fixed cost of export across firms would be more realistic but it does not add any extra insight to the questions we investigate in this paper.[4]

Suppose the entrepreneurship of the home country is indexed by e ($0 < e < 1$), the fraction (or percentage) of the labor in the home country that is entrepreneurs. Since entrepreneurs have special skills to open up a foreign market, they earn rent from export and the wage rate for them must be equal to

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

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 they can always do the job as workers (which requires no special skills), entrepreneurs must earn more than, or at least the same as, workers. For ease of exposition,

[2]For simplicity we do not model that export will also probably require foreign entrepreneurs.

[3]It will become clear later that this will ensure a trading (rather than autarkic) equilibrium. Otherwise, in one country firms would have no incentives to export goods and therefore autarky would be the equilibrium.

[4]In Schmitt and Yu (2000b) we focus on how the heterogeneity of fixed cost of export across firms could explain the gap between trade growth and production.

we divide the wage for entrepreneurs into two components: the wage rate for workers and a share of the firm's 'profits' - export rents:

$$w + \pi_{ej}/\gamma, \tag{4}$$

where

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

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

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, and their preference is given by

$$U = \sum v(c_i) \tag{6}$$

$$= \sum c_i^{\theta}, \ 0 < \theta < 1. \tag{7}$$

Although all goods are equally similar from consumers' point of view, it is useful to write (7) more specifically as

$$U = \sum_{i}^{n_n} c_{id}^{\theta} + \sum_{j}^{n_e} c_{jd}^{\theta} + \sum_{l}^{n_e^*} c_{lf}^{\theta}, \tag{8}$$

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; and n_n, n_e and n_e^* are the numbers of domestic non-traded goods, traded goods, and foreign traded goods, respectively.

We shall focus on the welfare of a representative consumer/household who owns an equal share of both the workers and entrepreneurs in the economy,[5] since the effects on income distribution is not the focus of this paper. Suppose that L is the units of the total households (as well as that of total labor force including entrepreneurs and workers, by choice of units) in the home country. We have $x_{id} = Lc_{id}$, $x_{jd} = Lc_{jd}$ and $x_{lf}^* = Lc_{lf}$.

A representative consumer/household in the home country maximizes (8) subject to a budget constraint. Assume the number of goods is very large, so that the effect of

[5] This is equivalent to assuming a 100% income tax which is redistributed equally among all agents.

the pricing 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-maximizing prices for these three kinds of firms are:

$$p_{id} = w\beta/\theta;\ p_{jd} = w\beta/\theta;\ p^*_{lf} = w^*\beta/\theta. \tag{9}$$

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/household in the foreign country has utility

$$U^* = \sum_k c^{*^\theta}_{kd} + \sum_l c^{*^\theta}_{ld} + \sum_j c^{*^\theta}_{jf} \tag{10}$$

and the analogous profit-maximizing prices are

$$p^*_{kd} = w^*\beta/\theta;\ p^*_{ld} = w^*\beta/\theta;\ p_{jf} = w\beta/\theta. \tag{11}$$

From (9) and (11), 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:

$$p \equiv p_{id} = p_{jd} = p_{jf} = w\beta/\theta;\quad p^* \equiv p^*_{kd} = p^*_{ld} = p^*_{lf} = w^*\beta/\theta. \tag{12}$$

The output of non-traded good i in the home country can be determined by solving (2) and (12), and is given by

$$x_{id} = \frac{\alpha\theta}{\beta(1-\theta)}. \tag{13}$$

Then the consumption of non-traded good i by a representative consumer/household in the home country is

$$c_{id} = \frac{x_{id}}{L} = \frac{\alpha\theta}{\beta(1-\theta)L}. \tag{14}$$

[6]The reason is that all the demand elasticities are the same. These differences are purposefully ruled out in order to focus on the issue we care about in this paper.

From (12) the optimal consumption decision requires that $c_{jd} = c_{id}$ and $c_{lf} = c_{id}(p^*/p)^{1/(\theta-1)}$. 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:

$$c_d \equiv c_{jd} = c_{id} = \frac{\alpha\theta}{\beta(1-\theta)L}. \tag{15}$$

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

$$c_f \equiv c_{lf} = c_d(\frac{p}{p^*})^{1/(1-\theta)}. \tag{16}$$

From (15) 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,

$$x_d \equiv x_{jd} = x_{id} = c_d L = \frac{\alpha\theta}{\beta(1-\theta)}. \tag{17}$$

This is an important feature of this model with traded and non-traded goods. Eqs.(12) and (17) imply that, similar 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)]

$$\pi_e = px_f - (\gamma + \beta x_f)w, \tag{18}$$

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.

3. Entrepreneurship and the Terms of Trade

As mentioned earlier, it is not the purpose of this paper to endogenize a country' entrepreneurship.[8] Our purpose is to examine how the relative extrepreneurship between countries and changes in a country's entrepreneurship affect the equilibrium of intra-industry trade in terms of

[7] The reason that export sales do not have to subsidize 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.

[8] possible extention along this direction is discussed in Section 6.

the terms-of-trade and economic welfare. Notice that the amount of entrepreneurs in an economy will affect the way that the number of exporting firms is determined. When entrepreneurs are scarce, the number of exporting firms will be determined by the stock of entrepreneurs in the economy. For example, the number of exporting firms in the home country n_e will be equal to eL/γ. Similarly, for the foreign country we have $n_e^* = e^*L^*/\gamma$ (we do not assume any difference in the fixed cost of export for the two countries in order to focus on the difference in their "entrepreneurship"). When the stock of entrepreneurs is large, however, the number of exporting firms will be determined by the zero-profit condition for them. These are the natural outcome and also the reason for assuming two types of labour in our model. We will discuss both cases but starting from the former, in which not every firm can become an exporter, and non-traded and traded goods are both present in the economy.

Terms of trade can be derived by the balance-of-trade conditions. For example, the balance-of-trade for the home country requires that

$$pn_eL^*c_f^* = p^*n_e^*Lc_f, \tag{19}$$

where $pn_eL^*c_f^*$ is the total value of Home exports and $p^*n_e^*Lc_f$ is the total value of Home imports. Noticing that $Lc_d = L^*c_d^*$, we can derive the "terms of trade" (p/p^*) or, more precisely, the "factor price terms-of-trade" $(w/w*)$, for the home country,

$$T \equiv \frac{w}{w^*} = \frac{p}{p^*} = (\frac{eL}{e^*L^*})^{\frac{1-\theta}{1+\theta}}. \tag{20}$$

Notice that eL and e^*L^* are the amount of entrepreneurs in the home and foreign countries, respectively. Therefore, we have the following proposition.

Proposition 1 *Terms-of-trade is determined by the relative amount of entrepreneurs in the two countries, ceteris paribus. The home country's terms-of-trade is increasing in the relative entrepreneurship, e/e^*, and the relative country size, L/L^*.*

The intuition for this result is associated with the love-of-variety preference. For example, an increase in e and/or L will result in more traded goods, which the foreign consumers would like to consume. To achieve this, the foreign country must sell more of each of its

traded goods. However, the marginal utility decreases when the consumption level of each imported good is increasing in the home country. To restore trade balance the prices of Foreign products must fall relative to those of Home. The terms-of-trade in this model is determined by the relative export varieties and, when the fixed costs are the same, it is then determined by the relative amount of entrepreneurs. A result in the same spirit could be found in the 'product-cycle' model (Krugman, 1979), where innovation of products can increase relative wages. However, unlike the present paper, Krugman's result is derived in a model of perfect competition.

It is also interesting to note and not difficult to show that an increase in exports in this model actually can improve a country's terms of trade.

Proposition 2 *An increase in exports, as a result of a rise of entrepreneurship, improves terms of trade.*

An increase in e reduces the export of each firm due to more exporters competing in the same foreign market. The total volume of exports of the home country increases, however. At the same time, as found in Proposition 1, the terms-of-trade of the home country also improves. In traditional models, an increase in its export usually will not improve a country's terms of trade.

To solve for the other equilibrium results, we need the condition of full employment in the labor markets. Labor demand equal supply means that,

$$n_n(\alpha + \beta L c_d) + n_e[(\alpha + \beta L c_d) + (\gamma + \beta L^* c_f^*)] = L. \tag{21}$$

The total number of goods produced in the home country is

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

From (8) and (22), we obtain the utility of a representative household in the home country as follows:

$$U = (n_n + n_e)c_d^\theta + n_e^* c_f^\theta \tag{23}$$

$$= \frac{L c_d^\theta}{\alpha + \beta L c_d} - \frac{n_e(\gamma + \beta L^* c_f^*)c_d^\theta}{\alpha + \beta L c_d} + n_e^* c_f^\theta. \tag{24}$$

The first term in (24) is the utility equal to the autarkic level; the second term is the consumption loss due to the fact that labor (entrepreneurs) is engaging in non-productive activities; the last term is the consumption gain due the access of foreign goods. These terms are important when we analyze the welfare effects in the next section.

The expression in (24) can be simplified as follows:

$$U = \frac{Lc_d^\theta}{\alpha + \beta Lc_d} + \frac{e^* L^* \alpha c_f^\theta}{\gamma(\alpha + \beta Lc_d)} - \frac{eLc_d^\theta}{\alpha + \beta Lc_d}. \tag{25}$$

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

$$U^* = \frac{L^* c_d^{*\theta}}{\alpha + \beta L^* c_d^*} + \frac{eL\alpha c_f^{*\theta}}{\gamma(\alpha + \beta L^* c_d^*)} - \frac{e^* L^* c_d^{*\theta}}{\alpha + \beta L^* c_d^*}. \tag{26}$$

The rest of the paper will focus on the welfare effects for the two countries.

4. Entrepreneurship and Economic Welfare

The welfare effect of an increase in a country's entrepreneurship can be obtained from (25) and (26) by taking derivatives with respect to e. The effect of an increase in e on the home country' welfare is

$$\frac{dU}{de} = \frac{\partial U}{\partial c_f}\frac{dc_f}{de} + \frac{\partial U}{\partial e} \tag{27}$$

$$= (\frac{Lc_d^\theta}{\alpha + \beta Lc_d})[(\frac{\theta}{1+\theta})(\frac{\alpha}{\gamma})(\frac{e^* L^*}{eL})^{\frac{1}{1+\theta}} - 1]. \tag{28}$$

The first term in the square brackets is the 'terms-of-trade effect'. A rise in e will increase the consumption of each imported variety due to the improvement of the terms of trade. The second term is the 'variety effect'. A rise in e also means that more labor is engaging in non-productive activities, which means that less domestic variety is produced.

Setting (28) equal to zero gives us $\tilde{e}$ and the second-order condition for a maximum is satisfied. Therefore, we have the following proposition.

Proposition 3 *U is increasing in e when $\frac{e}{e^*} < (\frac{\tilde{e}}{e^*})$ but decreasing in e when $\frac{e}{e^*} > (\frac{\tilde{e}}{e^*})$, where*

$$(\frac{\tilde{e}}{e^*}) = \frac{L^*}{L}[(\frac{\theta}{1+\theta})(\frac{\alpha}{\gamma})]^{1+\theta};$$

The intuition is as follows. An increase in the entrepreneurship of the home country has two effects. On the one hand, it improves its terms of trade. On the other hand, it reduces the variety of non-traded goods in the home country because the total fixed costs of export increase and therefore the resource is pulled away from non-traded goods. Whether the home country can benefit from an increase in e depends on how large the (positive) terms-of-trade effect is relative to the (negative) variety effect. Since the sub-utility function is concave, the terms-of-trade effect dominates the variety effect when e/e^* is relatively small. When e/e^* is relatively large, the variety effect dominates the terms-of-trade effect.

From Proposition 1 notice that $T = [(eL)/(e^*L^*)]^{(1-\theta)/(1+\theta)}$ is the terms-of-trade for the home country. Therefore, Proposition 3 can also be written as follows:

U is increasing in e when $T < \tilde{T}$ but decreasing in e when $T > \tilde{T}$, where $\tilde{T} = [(\frac{\theta}{1+\theta})(\frac{\alpha}{\gamma})]^{1-\theta}$.

$\tilde{T}$ is the optimal level of the terms-of-trade for the home country and it is increasing in θ and α/γ. 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.[9] Therefore, the home country would benefit from further trading domestic variety with foreign quantity, which improves its terms-of-trade. Also, trade becomes more beneficial when α/γ is large (or γ is small relative to α).

From Proposition 3 it is interesting to notice that, although entrepreneurs can also work as workers, it may not be good for a country to have a very large number of them. To push the result one step further, we substitute $(e/e^*) = (L^*/L)\tilde{T}^{(1+\theta)/(1-\theta)}$ into (18) and obtain

$$\begin{aligned} \pi_e &= pL^*c_f^* - \beta L^* c_f^* w - \gamma w \\ &= \frac{\gamma w}{\theta} > 0. \end{aligned}$$

Therefore, the profits of the exporting firms are positive when the terms-of-trade of the home country is at the optimal level. A rise of entrepreneurship will bring more firms

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

into the foreign market as long as there are still non-exporters in the home country and exporters make positive profits. If e is very large, *ceteris paribus*, the profits of exporters from the home country will fall to zero and entrepreneurs in the end do not earn any rent from export.[10]

The number of exporters in the home country is then determined by the zero profit condition for exporters. Assuming there still exist non-traded goods (i.e., L is large) and setting (18) to zero, we obtain

$$(\frac{\bar{e}}{e^*}) = (\frac{L^*}{L})(\frac{\alpha}{\gamma})^{1+\theta} \tag{29}$$

Therefore, we will have this outcome when the relative entrepreneurship is greater than $(\frac{\bar{e}}{e^*})$. The corresponding level of utility of a representative household in the home country can be obtained by substituting $(\frac{\bar{e}}{e^*})$ into (25) and it becomes,

$$U = \frac{Lc_d^\theta}{\alpha + \beta L c_d}. \tag{30}$$

Surprisingly, it is equal to the level of utility in autarky.

Using (16), (20), and (29) it is straightforward to show that $p > p^*$ and $c_f > c_d$. Therefore, given that $U = U_a$, the equilibrium variety of consumption goods (including both domestic and imported goods) in the home country must be less than that in autarky. We summarize these results in the following proposition.

Proposition 4 *If* $\frac{e}{e^*} > (\frac{\bar{e}}{e^*})$, *where* $(\frac{\bar{e}}{e^*}) = (\frac{L^*}{L})(\frac{\alpha}{\gamma})^{1+\theta}$,

(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.

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

[10]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. The reason for this is that it does not require any extra cost for them to work as entrepreneurs.

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. Proposition 4 certainly illustrates an extreme case. However, as Proposition 3 shows, as long as $\frac{e}{e^*}$ is greater than the optimal level ($\frac{\tilde{e}}{e^*}$), an increase in its entrepreneurship lowers the home country's welfare.

5. Country Size and Economic Welfare

In the standard model of monopolistic competition (*á la* Krugman, 1980), an increase in country size is always beneficial, whether in autarky or free trade. That is, a rise of L would always increase U. However, this is no longer true in our model. To find out about this, using (25) we take derivative with respect to L and obtain

$$\begin{aligned}\frac{dU}{dL} &= \frac{1}{L}\{\underbrace{\frac{Lc_d^\theta}{\alpha+\beta Lc_d}}_{(1)} - \underbrace{[\frac{\theta Lc_d^\theta}{\alpha+\beta Lc_d} - \frac{eL\theta c_d^\theta}{\alpha+\beta Lc_d} + \frac{\theta e^* L^* \alpha c_d^\theta}{\gamma(\alpha+\beta Lc_d)L}(\frac{eL}{e^*L^*})^{\frac{\theta}{(1+\theta)}}]}_{(2)} \\ &\quad + \underbrace{e(\frac{Lc_d^\theta}{\alpha+\beta Lc_d})[(\frac{\theta}{1+\theta})(\frac{\alpha}{\gamma})(\frac{e^*L^*}{eL})^{\frac{1}{1+\theta}} - 1]\}}_{(3)} \end{aligned} \tag{31}$$

The above expressions can be simplified if we write them in terms of percentage changes:

$$\frac{L}{U}\frac{dU}{dL} = \frac{U_a}{U} - \theta + \frac{e}{U}\frac{dU}{de}, \tag{32}$$

where $U_a = \frac{Lc_d^\theta}{\alpha+\beta Lc_d}$ is the utility level in autarky.

An increase in L has three effects. The first term is the "effect of market size" and is less than one. A larger economy means more varieties of domestic goods. The second is the "effect of congestion" but the magnitude is also less than one. For a given level of output of each variety, a larger population means less consumption for each individual. The last term is the "effect of entrepreneurs". From Proposition 3, whether the effect of entrepreneurs is positive, zero or negative depends on whether $\frac{e}{e^*}$ is less, equal or greater than ($\frac{\tilde{e}}{e^*}$).

Obviously, in general dU/dL could be either positive or negative. Actually, as the next proposition shows, dU/dL could be positive or negative even in the absence of the effect of entrepreneurs.

Proposition 5 *When* $\frac{e}{e^*} = (\frac{\tilde{e}}{e^*})$, $\exists\ \tilde{\theta} \in (0,1)$, *where* $\tilde{\theta} = U_a/U$, *such that* $dU/dL > 0$ *if* $\theta < \tilde{\theta}$ *and* $dU/dL < 0$ *if* $\theta > \tilde{\theta}$.

This is an important result. In the standard model where all goods are traded and all firms make zero profits, the effect of market size always dominates the effect of congestion although these two effects have not been identified in such a way before. In this model with both traded and non-traded goods, since there are positive rents from exports, an increase in population also means less rents for each household. Therefore, the effect of market size is not always dominant.

6. Concluding Remarks

This paper introduces entrepreneurs into a standard model of intra-industry trade to investigate how the relative entrepreneurship between countries affects the terms of trade and economic welfare. The dichotomy of firms generated in this way provides us new insight into the standard model of trade in differentiated products. Among other things, we find that in contrast to the standard result from the model of monopolistic competition, it is not always good for a country to become larger.

This attempt, however, is only a first step toward a right direction. In this paper we take a country's entrepreneurship, or the composition of its labour force, as exogenous. There are some factors that could affect this composition. For example, immigration possibly is one of the factors. The percentage of a country's labour force that is immigrants certainly matters. Second, the amount of people in the labour force who can speak another foreign language is probably another factor that could affect this composition. Also, a country's history of immigration/emigration could matters as well.

To endogenize the composition of a country's labour force, one could extend this model into a dynamic set-up where individuals can choose to become workers or entrepreneurs

(investing in the first period) as in an over-lapping generation model, for example. As another possible extension, we could also allow government policy to affect the composition of the labour force and the fixed cost of export. Given that our set-up is made relatively simple and close to the standard model of intra-industry trade, it is possible to achieve the above and other extentions.

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