

Transaction Costs and the Pattern of International Trade

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Abstract

Trade models featuring imperfect competition, increasing returns and transaction costs usually predict that the country with the larger home market will be the net exporter of manufacturing goods and the net importer of agricultural goods. This result is known as the "home market effect". However, virtually all these models do not care much about the specific characteristics of the transaction sector. The purpose of this paper is to close this gap. Based on Ottaviano et al. (2002), we introduce a separate transaction sector that features increasing returns, Cournot competition and entry barriers which are determined by regulatory policy. Moreover, not only export sales, but also local sales involve some transaction costs. We show that the usually predicted pattern of trade disappears, if the economically small country has a sufficiently more liberalized transaction sector than the large country or if the economically small country is also of sufficiently small geographical size.

1 Introduction

Models of imperfect competition and increasing returns reveal an important role of transaction costs, i.e. those costs involved in transferring goods (or services) from producers to consumers, in determining the pattern of trade. Krugman (1980) shows that in case of two identical countries, except for market size, the country with the larger home market for (manufacturing) goods subject to scale economies will be the net exporter of these goods, but only if transaction costs

are neither too low (zero) nor too high (prohibitive).¹ He calls this the "home market effect".² The reason for its existence is straightforward. Increasing returns to scale induce firms to establish production in a single place and in order to minimize transaction costs, they prefer to locate near the larger market.

The home market effect forms also a building block in the "new economic geography" launched by Krugman (1991a).³, and the same holds for some new trade models of linear demand.⁴ Recently, Head, Mayer and Ries (2002) have shown that the home market effect is quite robust to alternative model specifications.⁵ However, virtually all these models do not care much about the specific characteristics of the transaction sector with respect to production technology or regulatory policy. Within the new economic geography transaction services are produced via a so-called "iceberg technology". That is, only part of the freight arrives at the customer, while some goods melt on the way to their destination.⁶ Consequently, there does not exist a separate transaction sector.⁷ In case of linear models, Krugman and Venables (1990) take the price for transaction services as exogenously given. Furthermore, Ottaviano et al. (2002) assume that the transaction sector is perfectly competitive, using the same constant returns production technology as the agricultural sector.

Obviously, these are simplifying assumptions primarily designed for the sake of modeling convenience. The actual provision of transaction services is expected to look somewhat different.⁸ Given the fundamental role transaction costs play in models of increasing returns and imperfect competition, other (more plausible) specifications probably neutralize or even reverse the home market effect. In other words, new trade theory still lacks a more careful treatment of transaction costs. The purpose of our paper is to close this gap.

In the next section, we develop a (linear) model of international trade, including the basic elements of the new trade theory. However, instead of an iceberg transaction technology, we introduce a separate transaction sector that is characterized by increasing returns and Cournot competition. Moreover, not only export sales, but also local sales involve transaction costs. Using numerical simulations, we show in section 3 that the home market effect appears, if there

¹Zero transaction costs imply that the composition of trade is indeterminate, since scale economies are not location-specific. Whereas very high transaction costs eliminate trade and bring about an autarkic situation.

²See also Helpman and Krugman (1985), pp. 205-209.

³Krugman and Venables (1995) and Venables (1996) present models of international trade as part of this field. Excellent reviews of recent contributions within new economic geography are given by Ottaviano and Puga (1998) and Puga (2002).

⁴See Krugman and Venables (1990) and Ottaviano, Tabuchi and Thisse (2002).

⁵There are only two exceptions: Davis (1998) shows that the home market effect disappears if the usual assumption of zero transaction costs in the (agricultural) sector subject to constant returns to scale is relaxed, and transaction costs for agricultural goods are sufficiently high. Markusen and Venables (1988) assume differentiation of manufacturing products at the country level (place of origin) instead of the firm level. Their model indicates that the home market effect reverses if national varieties of manufacturing products are poor substitutes.

⁶This concept goes back to Samuelson (1954).

⁷Neary (2001, pp. 548-552) gives an overview of several shortcomings of new economic geography models.

⁸See Krugman (1995), p. 1273 and Krugman (1998), p. 165.

is free entry into the transaction sector and both countries are of the same geographical size. But if the entry into the transaction sector is restricted and/or countries differ in geographical size, the home market effect probably disappears. This happens, if the economically small country has a sufficiently more liberalized transaction sector than the large country and/or the economically small country is of sufficiently small geographical size.

2 The Model

Our model relies on Ottaviano et al. (2002). Its basic characteristics are the following: There are two countries. Each country has two (consumer) goods markets, called manufacturing and agriculture, and two factors of production, namely labor and capital. Both factors move across sectors, but not across borders. The agricultural sector produces a homogeneous good under perfect competition, while the manufacturing sector fabricates a large variety of differentiated products. It features imperfect competition and increasing returns to scale due to some fixed costs. On the demand side, individuals share the same quasi-linear quadratic utility function, implying that demand for goods is linear. There is also love of variety with respect to manufacturing products.

As opposed to Ottaviano et al. (2002), we introduce a (separate) transaction sector that features increasing returns and Cournot competition. Similar to manufacturing goods, transaction services are produced by using labor and capital. However, the production technology, i.e. input coefficients, may differ between the two sectors. Entry barriers to the transaction sector, proxied by a fixed number of service providers, are determined by regulatory policy.⁹ Lower barriers, i.e. stronger competition, leads to price cutting. For the sake of simplicity, it is assumed that the supply of agricultural goods do not require any transaction services. But export sales as well as local sales of manufacturing goods require some transaction services, where the quantity of services needed to complete business transactions depends on (national and international) distance. It is obvious that in a bilateral relationship each country faces the same international distance, while the two countries may differ in national distance. Moreover, since we understand distance in a broad sense as a proxy for the difficulty of transferring (manufacturing) goods from producers to consumers, distance also affects the amount of fixed (capital) input requirements in the transaction sector.

For ease of presentation, we focus exclusively on the economically small country 1. The corresponding equations for country 2 can be constructed analogously.

2.1 Goods Markets

In this subsection we derive demand for and supply of the agricultural good and the manufacturing product. We start with the demand side of the economy. The

⁹In case of free market entry, the number of service providers is endogenously determined.

utility function U is the same for all individuals in both countries. It depends on the consumption of the homogenous agricultural good Y and the consumption of varieties of the differentiated manufacturing product, $x_1 \dots x_N$, where N is the total number (mass) of varieties. In accordance with Ottaviano et al. (2002), preferences are described by a quasi-linear quadratic utility function:

$$U = \alpha \int_{i=0}^N x_i di - \frac{\beta - \delta}{2} \int_{i=0}^N x_i^2 di - \frac{\delta}{2} \left(\int_{i=0}^N x_i di \right)^2 + Y \quad (1)$$

$$0 < \alpha \text{ and } 0 < \delta < \beta$$

The parameter α denotes the intensity of preferences for the manufacturing product, and $\delta < \beta$ indicates that individuals love dispersed consumption of manufacturing varieties. For a given value of β , the parameter δ measures the substitutability between varieties.¹⁰

The budget constraint of any individual is given by

$$E = \int_{i=0}^N p_i x_i di + qY \quad (2)$$

E represents the income, p_i is the (delivered) price for variety i of the manufacturing product, and q is the price for the agricultural good. We choose the agricultural good as the numéraire, i.e. $q = 1$.

At first, let us consider the simplest case that all manufacturing varieties have the same price, so that subscript i can be dropped. Maximizing the utility function (1) subject to the budget constraint (2) yields the following linear demand function for any manufacturing variety:

$$x = a - bp \quad a = \frac{\alpha}{\beta + (N - 1)\delta} \quad b = \frac{1}{\beta + (N - 1)\delta} \quad (3)$$

We obtain the corresponding indirect utility function V by solving the budget constraint (2) for Y , putting the result into the utility function (1) and substituting the demand function (3) into equation (1):

$$V = \frac{a^2 N}{2b} - aNp + \frac{b + cN}{2} Np^2 - \frac{c}{2} N^2 p^2 + Y \quad (4)$$

$$c = \frac{\delta}{(\beta - \delta)[\beta + (N - 1)\delta]}$$

Suppose now the more general case that prices for varieties of manufacturing goods differ from each other. Then we have to rewrite the indirect utility function (4) into

$$V = \frac{a^2 N}{2b} - a \int_{i=0}^N p_i di + \frac{b + cN}{2} \int_{i=0}^N p_i^2 di - \frac{c}{2} \left[\int_{i=0}^N p_i di \right]^2 + Y \quad (5)$$

¹⁰The larger the value of δ , the higher the degree of substitutability. For $\beta = \delta$, varieties of manufacturing goods are perfect substitutes. See Ottaviano et al. (2002), p. 413.

Applying Roy's Identity to indirect utility (5) brings about a new demand function that slightly differs from equation (3):

$$x_i = a - (b + cN)p_i + c \int_{j=0}^N p_j dj \quad (6)$$

Of course, in case of equal prices for all varieties, equation (3) is equivalent to equation (6).

Since we want to keep things as simple as possible, we assume that there are only two different manufacturing prices in each country: the first one for domestic and the second one for foreign varieties. Consequently, any manufacturing firm located in country 1 faces the following two individual demand functions:

$$x_{11} = a - (b + cN)p_{11} + cP_1 \quad P_1 \equiv n_1p_{11} + n_2p_{21} \quad (7)$$

$$x_{12} = a - (b + cN)p_{12} + cP_2 \quad P_2 \equiv n_2p_{22} + n_1p_{12} \quad (8)$$

where x_{11} (x_{12}) represents the demand of any individual in country 1 (2) for any variety produced in country 1,¹¹ and n_1 (n_2) denotes the number or mass of manufacturing varieties originating from country 1 (2). In line with Ottaviano et al. (2002, p. 416), we interpret P_1 and P_2 as price indices. Demand for a certain variety x_{11} (x_{12}) increases if its own price p_{11} (p_{12}) decreases absolutely or relatively to the average price $\frac{P_1}{N}$ ($\frac{P_2}{N}$).

We assume that all individuals have the same factor endowment: one unit of labor (and a certain amount of capital). The number of individuals is therefore equal to the quantity of labor. Using the assumption of symmetry between varieties, we can simply calculate aggregate demand by multiplying individual demand with the corresponding number of varieties, n_1 or n_2 , and individuals, \bar{L}_1 or \bar{L}_2 . In case of country 1, aggregate domestic and export demand for manufacturing goods is given by

$$X_{11} = x_{11}n_1\bar{L}_1 = [a - (b + cn_2)p_{11} + cn_2p_{21}]n_1\bar{L}_1 \quad (9)$$

$$X_{12} = x_{12}n_1\bar{L}_2 = [a - (b + cn_2)p_{12} + cn_2p_{22}]n_1\bar{L}_2 \quad (10)$$

Note that demand for the manufacturing goods does not depend on income. Thus, demand for the agricultural good, Y_{D1} , is determined as a residual. It arises from the difference between income and expenditure on manufacturing goods. For simplicity, let us suppose that the equilibrium income (wages and capital profits) is the same for all individuals of the same country, and that it is sufficiently large to ensure positive consumption of the agricultural good.¹²

¹¹Subscripts can easily be read, if one keeps in mind that the first number always depicts the place of origin, while the second number shows the place of destination. For example, p_{11} represents the price of any manufacturing variety produced and sold within country 1, while p_{21} is the price of any variety produced in country 2, but sold in country 1.

¹²This assumption obviously imposes some restrictions on the choice of parameter values, such that preferences for the manufacturing good should not be too strong. It therefore implies some loss of generality, but the model is simplified.

Next, we turn to the supply side of the economy. Beginning with agriculture, there are only variable, but no fixed costs. Labor is the only input, paid by wages, w_1 , and a_{LY} denotes the unit labor input coefficient in agriculture. Perfect competition brings about marginal cost pricing: $q_1 = a_{LY}w_1$. There are no differences in productivity across borders, i.e. a_{LY} is the same in both countries. We set $a_{LY} = 1$. Prices (and, hence, wages) equalize internationally due to costless trade in agricultural goods. Furthermore, the agricultural good has been chosen as the numéraire, so we obtain $q_1 = q_2 = w_1 = w_2 = 1$.

The supply of the agricultural good, Y_{S1} , just like demand, Y_{D1} , is again a residual. Full employment implies that the agricultural sector absorbs those workers not employed in the manufacturing or transaction sector. That is, the labor market equilibrium defines the (equilibrium) output of agricultural goods, Y_{S1} .¹³

In contrast to agriculture, the manufacturing sector features imperfect (monopolistic) competition and increasing returns to scale due to some fixed costs. Manufacturing firms produce a large variety of differentiated goods. The number of firms corresponds to the number of varieties. That is, every single firm produces a different variety.¹⁴ Fixed costs result exclusively from the employment of capital. The (fixed) capital input requirement is given by F_X . It does not differ between firms producing either in country 1 or country 2. Capital is rewarded by operating profits, π_X . Hence, in order to attract some capital, π_X has to be strictly positive. The profits arise from a markup manufacturing firms impose over their marginal costs. A firm located in country 1 maximizes its (operating) profits according to

$$\pi_{X1} = (p_{11} - \kappa - d_{11}t_{11})x_{11}\overline{L}_1 + (p_{12} - \kappa - d_{12}t_{12})x_{12}\overline{L}_2 \quad (11)$$

where $\kappa = a_{LX}w$ is the marginal cost of producing manufacturing goods. As in the case of agricultural production, labor is the only variable input. We assume that the unit labor input coefficient in the manufacturing sector, a_{LX} , does not differ across countries. Since wages are equalized across countries, i.e. $w_1 = w_2 = w$, we obtain $\kappa_1 = \kappa_2 = \kappa$. In addition to production costs, manufacturing firms bear the costs of some services they need in order to transfer the goods from the factory to the consumers. These services are supplied by a separate transaction sector. Local sales, X_{11} , as well as exports, X_{12} , require them. The quantity of services demanded increases with distance, d , whereby d_{11} (d_{22}) denotes the national distance within country 1 (2), while $d_{12} = d_{21}$ stands for the international distance between the two countries.¹⁵ National as

¹³See equation (20) on page 9.

¹⁴This holds because individuals love variety and the number of potential varieties is unbounded. Obviously, producing a variety that is already available from another firm leads to lower profits than supplying a unique variety, since in the former case the firm has to share the market for that variety with a competitor.

¹⁵We understand distance as a synonym for all difficulties of transferring goods. Thus, it includes not only physical distance and other non-influenceable factors such as cultural or linguistic differences between business partners, but also influenceable (political) factors, e.g. the quality of transport and communication infrastructure, administrative barriers etc. That is, within limits, distance can be reduced by policy measures.

well as international distance is assumed to be always positive, i.e. $d > 0$, but not prohibitively large for trade to take place. The prices for transaction services, denoted by t , are per unit of distance and per unit of the manufacturing good transferred from the producer to the consumer. In other words, t_{11} (t_{22}) is the price for the local transfer of one unit of the manufacturing good per unit of distance within country 1 (2), and t_{12} (t_{21}) is the price for the cross-border transfer of one unit of the manufacturing good from country 1 (2) to country 2 (1) per unit of international distance. Correspondingly, $d_{11}t_{11}$ ($d_{22}t_{22}$) determines the marginal cost of transferring local manufacturing goods within country 1 (2), while $d_{12}t_{12}$ ($d_{21}t_{21}$) defines the marginal cost of transferring export goods from country 1 (2) to country 2 (1).

Each manufacturing firm maximizes its profits, taking transaction prices as given and also neglecting the (relatively small) impact of their price decision over price indices P_1 or P_2 . Because of positive transaction costs, firms can segment markets, i.e. they are able to set market specific prices. Differentiating equation (11) with respect to own prices, p_{11} and p_{12} , yields the equilibrium prices of any country 1 manufacturing firm:

$$p_{11} = \frac{a + (\kappa + d_{11}t_{11})(b + cN) + cn_2p_{21}}{2b + c(N + n_2)} \quad (12)$$

$$p_{12} = \frac{a + (\kappa + d_{12}t_{12})(b + cN) + cn_2p_{22}}{2b + c(N + n_2)} \quad (13)$$

The manufacturing prices, p , include all transaction costs, hence, they are in fact delivered (not mill) prices. Of course, these delivered prices increase with distance, i.e. the level of transaction costs. More interestingly, the spatial distribution of manufacturing firms across countries affects the delivered prices. Substituting the corresponding equilibrium prices of country 2 manufacturing firms, p_{21} and p_{22} , into equation (12) and (13), and differentiating with respect to n_1 and n_2 (holding the total number of firms, N , constant) shows that reducing n_1 (raising n_2) leads to an increase in p_{11} , if $d_{21}t_{21} > d_{11}t_{11}$, whereas reducing n_2 (raising n_1) leads to an increase in p_{12} , if $d_{12}t_{12} > d_{22}t_{22}$. In both cases, the reduction in the number of competitors which are located relatively close to the sales market (more precisely, which have relatively low transaction costs) induces p_{11} and p_{12} to increase.

2.2 Transaction Services Market

Demand of manufacturing firms for transaction services is only met by providers located in the country where the manufacturing goods are produced. Accordingly, in country 1 service providers face the (aggregate) demand for domestic services resulting from local sales, denoted by $Z_{11} = d_{11}X_{11}$, and the (aggregate) demand for cross-border services resulting from manufacturing exports from country 1 to country 2, denoted by $Z_{12} = d_{12}X_{12}$. Obviously, the larger the distance between the factory and the consumer, the more services the manufacturing firms need to complete the transaction.

Service providers are perfectly informed about how the (equilibrium) output of manufacturing firms react to changes in transaction prices. In other words, service providers know the aggregate demand functions for manufacturing goods, and also the price setting behavior of manufacturing firms. We obtain the aggregate demand for domestic transaction services as a function of their price by plugging equation (9) into $Z_{11} = d_{11}X_{11}$, using the information on the pricing behavior for domestic sales, equation (12), and the corresponding equation for p_{21} . This brings about the following linear demand function:

$$\begin{aligned} Z_{11} &= A_{11} - B_{11}t_{11} \\ A_{11} &= (2a - 2\kappa b + cn_2d_{21}t_{21})(cn_1 + cn_2 + b) \frac{d_{11}n_1\bar{L}_1}{2(2b + cn_1 + cn_2)} \\ B_{11} &= (2b + cn_2)(cn_1 + cn_2 + b) \frac{d_{11}^2n_1\bar{L}_1}{2(2b + cn_1 + cn_2)} \end{aligned} \quad (14)$$

Analogously, we can derive the demand function for international transaction services, resulting in:

$$\begin{aligned} Z_{12} &= A_{12} - B_{12}t_{12} \\ A_{12} &= (2a - 2\kappa b + cn_2d_{22}t_{22})(cn_1 + cn_2 + b) \frac{d_{12}n_1\bar{L}_2}{2(2b + cn_1 + cn_2)} \\ B_{11} &= (2b + cn_2)(cn_1 + cn_2 + b) \frac{d_{12}^2n_1\bar{L}_2}{2(2b + cn_1 + cn_2)} \end{aligned} \quad (15)$$

We suppose that transaction services are homogenous products. Nevertheless, there is imperfect competition, since the transaction sector is characterized by increasing returns as a result of fixed costs. Similar to manufacturing goods, transaction services are produced by employing labor and capital. Marginal costs are $\theta = a_{L_Z}w$, with a_{L_Z} representing the unit labor input coefficient in the transaction sector. Again, there are no differences in labor productivity across countries, implying that $\theta_1 = \theta_2 = \theta$. However, the production technology (labor input coefficients) may differ between sectors, i.e. $a_{L_X} \neq a_{L_Z}$.

As in the manufacturing sector, fixed costs arise only from the employment of capital. F_{Z1} denotes the (fixed) capital input requirement of a service provider located in country 1. In contrast to F_X (the corresponding capital input requirement in manufacturing), F_Z may differ across countries, because we assume that F_Z depends on distance (or the difficulty of transferring goods): $F_{Z1} = \phi(d_{11} + d_{12})$ and $F_{Z2} = \phi(d_{22} + d_{21})$.¹⁶ The larger the distance, the more capital has to be employed in the transaction sector. We have $d_{12} = d_{21}$ by definition, but countries usually differ from each other in national size. It is obvious that $d_{11} \neq d_{22}$ brings about $F_{Z1} \neq F_{Z2}$.

Assuming Cournot competition and segmented markets for domestic and international transaction services it is straightforward to calculate the equilibrium transaction prices and quantities. In case of country 1, the prices are

¹⁶Note that ϕ measures how strong (national and international) distance affects the quantity of capital required by the service providers.

$$t_{11} = \frac{2(a - \kappa b) + \theta m_1 d_{11} (2b + cn_2) + d_{21} t_{21} cn_2}{d_{11} (2b + cn_2) (m_1 + 1)} \quad (16)$$

$$t_{12} = \frac{2(a - \kappa b) + \theta m_1 d_{12} (2b + cn_2) + d_{22} t_{22} cn_2}{d_{12} (2b + cn_2) (m_1 + 1)} \quad (17)$$

while the (aggregate) equilibrium quantities are

$$Z_{11} = \frac{(b + cn_1 + cn_2) [2(a - \kappa b) - \theta d_{11} (2b + cn_2) + d_{21} t_{21} cn_2] m_1 d_{11} n_1 L_1}{2(m_1 + 1) (2b + cn_1 + cn_2)} \quad (18)$$

$$Z_{12} = \frac{(b + cn_1 + cn_2) [2(a - \kappa b) - \theta d_{12} (2b + cn_2) + d_{22} t_{22} cn_2] m_1 d_{12} n_1 L_2}{2(m_1 + 1) (2b + cn_1 + cn_2)} \quad (19)$$

The number of service providers in country 1 is described by m_1 . Note that the transaction sector may be subject to regulatory policy, i.e. the government can restrict the number of service providers. As usual in the case of Cournot competition, raising entry barriers lead to higher equilibrium prices because of lower competition.

2.3 Factor Markets

The supply of factors in both countries is exogenously fixed. In other words, we have a constant number of individuals (factor owners), each of them endowed with one unit of labor and some capital. Factors can move freely between sectors, but not across borders. \bar{L}_1 represents the quantity of labor (and, hence, the number of individuals) located in country 1. The total amount of capital available in country 1 is denoted by \bar{K}_1 .

Since the agricultural good has been chosen as the numéraire, wages are already determined by $w = 1$.¹⁷ However, assuming full employment, the labor market equilibrium reveals the (equilibrium) output of agricultural goods, Y_{S1} , because the agricultural sector absorbs those workers not employed elsewhere. The equilibrium is given by

$$\bar{L}_1 = a_{L_X} (X_{11} + X_{12}) + a_{L_Z} (Z_{11} + Z_{12}) + Y_{S1} \quad (20)$$

The right hand side of equation (20) describes the aggregate labor demand, resulting from the demand of manufacturing firms, service providers and the residual, which is employed in agriculture.

Demand for capital arises only from the manufacturing and transaction sector. We can write the equilibrium condition on the capital market of country 1

¹⁷See page 6.

as following:

$$\overline{K_1} = n_1 F_X + m_1 F_{Z1} \quad (21)$$

with $n_1 F_X$ representing aggregate demand of the manufacturing sector and $m_1 F_{Z1}$ representing aggregate demand of the service sector.

Capital is rewarded by profits. We denote the sectoral rates of return per unit of capital by

$$r_{X1} = \frac{(p_{11} - \kappa - d_{11}t_{11})X_{11} + (p_{12} - \kappa - d_{12}t_{12})X_{12}}{n_1 F_X} \quad (22)$$

$$r_{Z1} = \frac{t_{11}Z_{11} + t_{12}Z_{12} - \theta(Z_{11} + Z_{12})}{m_1 F_{Z1}} \quad (23)$$

where r_{X1} is the rate of return per unit of capital in the manufacturing sector of country 1, and r_{Z1} depicts the corresponding rate of return in the transaction sector. Since capital is intersectorally mobile, in the case of free market entry in both sectors (manufacturing as well as transaction services) the capital market equilibrium requires that the sectoral rates of return equalize:¹⁸

$$r_{X1} = r_{Z1} \quad (24)$$

But equation (24) holds only as long as there is free entry into the transaction sector. If, however, there are restrictions on the entry into the transaction market, the number of service providers is exogenously fixed by the government. This, in turn, brings about $r_{X1} \neq r_{Z1}$. In that case, the capital not used in the transaction sector is absorbed by the manufacturing sector.

2.4 Trade Balance

Overall trade (in goods and services) between the two countries must be balanced, since we do not allow for international capital flows. The trade balance of country 1 is described by

$$TB_1 = TB_{A1} + TB_{X1} = Y_{S1} - Y_{D1} + p_{12}X_{12} - p_{21}X_{21} \equiv 0 \quad (25)$$

The difference between supply and demand of agricultural goods ($Y_{S1} - Y_{D1}$) brings about the agricultural trade balance, TB_{A1} . If $Y_{S1} > Y_{D1}$, country 1 exports the surplus of agricultural production over domestic consumption to country 2. Conversely, if $Y_{S1} < Y_{D1}$, country 1 is an importer of agricultural goods. Subtracting the (delivered) value of manufacturing imports (including transaction costs), $p_{21}X_{21}$, from the corresponding value of exports, $p_{12}X_{12}$, yields the manufacturing trade balance, TB_{X1} . Since trade has to be balanced, the net exporter of manufacturing goods will be a net importer of agricultural goods and vice versa.

¹⁸The equalization of the two rates of return implies that the number of service providers and manufacturing firms, m_1 and n_1 , is determined endogenously.

3 Results

The model turns out to be quite complex. That is, the system of equations is difficult to solve analytically. Therefore, we rely on numerical (computer) simulations, in order to reveal the impact of transaction costs on the pattern of trade.

In the first scenario, we adopt the basic assumptions of the standard model in new trade theory. Countries may differ in economic size, as measured by the number of individuals (i.e. the quantity of labor, \bar{L}), but not in the relative factor endowment (the ratio of capital to labor). Moreover, there is free entry into the transaction sector and national distance is the same in both countries. Given these assumptions, figure (1) shows that our model brings about the same results as the standard model. Thus, if country 1 is the (economically) small country relative to country 2, as measured by the number of individuals (i.e. $\bar{L}_1 < \bar{L}_2$), it is the net importer of manufacturing goods. In contrast, if country 1 is the relatively large country ($\bar{L}_1 > \bar{L}_2$), it is the net exporter of manufacturing goods. In other words, we observe the well-known home market effect. Note that trade in manufacturing goods is balanced, if both countries have the same size, $\bar{L}_1 = \bar{L}_2$.

In the second scenario, national distance is still the same for country 1 and 2, but we assume that the number of service providers in country 2 is restricted to half of the number that would result in the case of free entry into the transaction sector. Moreover, country 1 is assumed to be the (economically) small country (varying sizes, ranging from 5% to 100% of country 2). Suppose now that the entry into the transaction sector in country 1 is also restricted. However, the government of country 1 gradually liberalizes the transaction sector by raising the number of service providers. The degree of liberalization is given by

$$DL_1 = \frac{m_{1(\text{restricted entry})}}{m_{1(\text{free entry})}} \quad m_{1(\text{restricted entry})} \leq m_{1(\text{free entry})} \quad (26)$$

Liberalizing the transaction sector leads to an increase in competition so that the transaction prices decline. This, in turn, increases the international competitiveness of manufacturing firms located in country 1. Given that country 1 is (economically) not too small, figure (2) shows that country 1 turns into a net exporter of manufacturing goods, if it has a sufficiently more liberalized transaction sector than country 2. To put it differently, if the advantage of fiercer competition in the transaction sector outweighs the disadvantage of a smaller domestic market, the home market effect disappears. However, if the liberalization of the transaction sector goes too far, the surplus in the manufacturing trade balance of country 1 will decline or even turn into a deficit. The reason lies in the limited availability of capital. The Liberalization process induces capital to flow from the manufacturing to the transaction sector as long as the latter offers higher profits than the former. This brings about a smaller number of manufacturing firms, so that the competition in the manufacturing sector declines. Hence, there is an upward pressure on manufacturing prices. Actually, liberalizing the transaction sector produces two countervailing effects. On the

one hand, the competitiveness of manufacturing firms increases due to declining transaction prices. On the other hand, their competitiveness is reduced by lowering the competition in the manufacturing sector. If the second effect over-compensates the first effect, the surplus in the manufacturing trade balance of country 1 declines. Note that the relatively small country never turns into a net exporter of manufacturing goods by liberalizing the transaction sector, if the difference in country size is very large.

In the third scenario, we relax the assumption of equal national distances, while market entry into the transaction sector is free in both countries. In the first two cases, we reduce, respectively, international distance and national distance of country 1. Figure (??) reveals that even in the presence of large differences in economic size, country 1 will turn into the net exporter of manufacturing goods, if its geographical size (as measured by national distance) is sufficiently smaller than that of country 2. Of course, the larger the difference in economic size, the larger must be the difference in geographical size, to transform the economically small country from the net importer into the net exporter of manufacturing goods. Reducing the national distance of the small country implies a decreasing capital input requirement in the transaction sector of country 1, while the capital input requirement in the transaction sector of country 2 remains unchanged. That is, only country 1 saves on capital. This leads to an increasing number of manufacturing firms as well as service providers, so that prices decline due to fiercer competition. Country 1 gains an advantage in the transaction sector that translates into the manufacturing sector. If the (geographical) advantage of small distance over-compensates the market size disadvantage, country 1 becomes a net exporter of manufacturing goods. In other words, if economic smallness comes along with geographical smallness, the home market effect probably disappears.

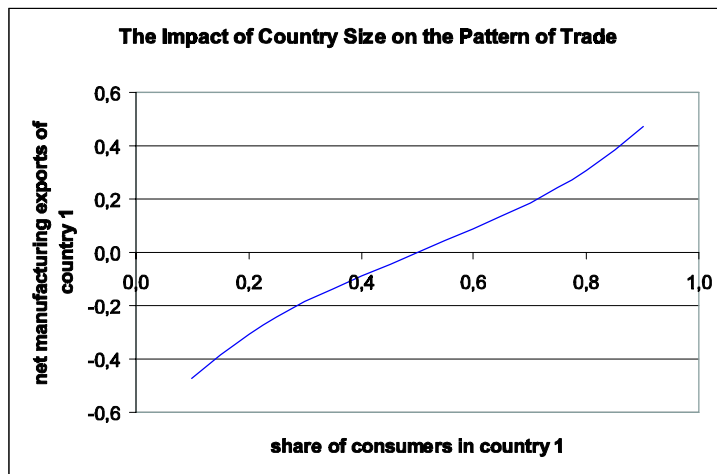


Figure 1: The Impact of Country Size on the Pattern of Trade

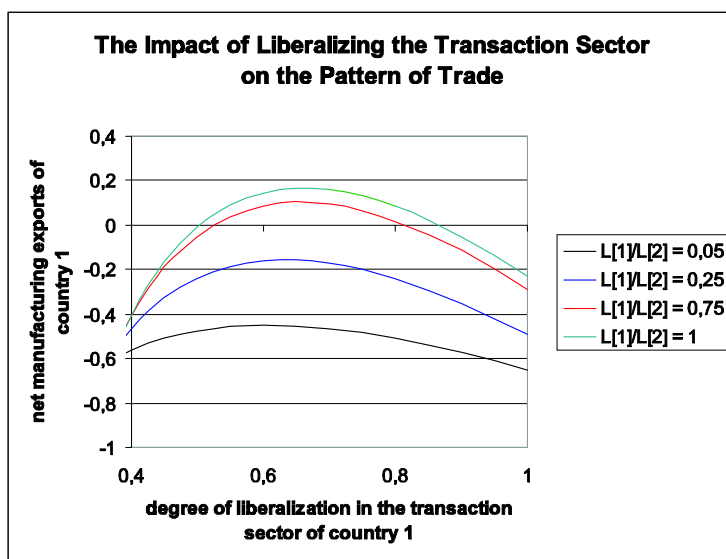


Figure 2: The Impact of Liberalizing the Transaction Sector on the Pattern of Trade

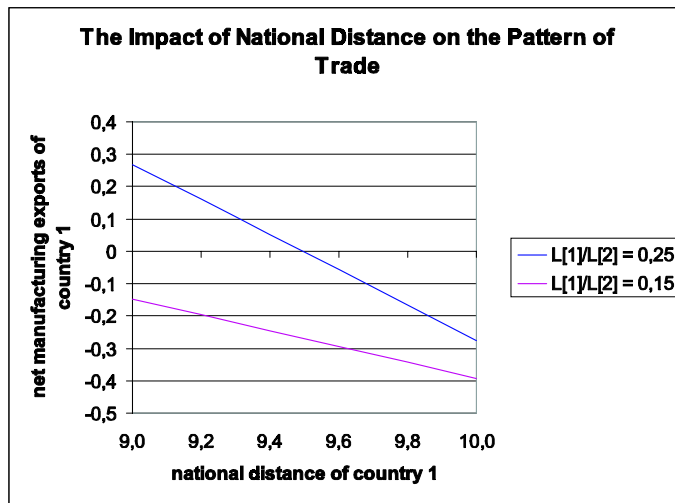


Figure 3: The Impact of National Distance on the Pattern of Trade

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