research paper series

Globalisation, Productivity and Technology

Research Paper 2003/04

How Much Trade Contributes to the Formation of Market Structure

By D. Mirza

The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

Leverhulme Centre for Research on Globalisation and Economic Policy

The Authors

Daniel Mirza is a Research Fellow in the Leverhulme Centre for Research on Globalisation and Economic Policy (GEP), School of Economics, University of Nottingham

Acknowledgements

The author is grateful for financial support from the Leverhulme Trust under the Programme Grant F114/BF. He would like to thank David Greenaway, André Sapir and Yoaquim Oliveira-Martins for their useful remarks. He thanks David Hummels as well for sending some of his bilateral freight costs data.

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Abstract

Market structure is usually considered to be exogenous to trade flows in most empirical studies. This paper challenges this view by showing that the formation of market structure in an open economy is very closely related to trade quantities. We provide an original method, based on bilateral flows and activity data, that estimates the contribution of imports to national market structures in homogenous good industries. The method is based on a generalized Brander-Krugman framework. The results suggest that foreign contribution to concentration is around 30-50% for small European economies and 20-30% for bigger European countries. Market structure is less affected by openness however in the U.S and Japanese markets.

JEL classification: F12, F14, L13, L60

Keywords: Trade, openness, Market structure

Outline

Non-Technical Summary

In the studies on the nature and volume of trade flows, the empirical literature considers market structure to be exogenous in general. Very often indeed, market structure variables are used as explanatory variables in bilateral trade equations (Fontagné, Freudenberg and Peridy (1997), Greenaway, Hine and Milner (1995), Balassa and Bowen (1988) among others).

A new body of work aroused very recently however, trying to use trade data to assess the alternative performance of different types of markets in predicting the movements of goods. Head and Ries (2001), Davis and Weinstein (1999), Antweiler and Trefler (2002) and Evenett and Keller's (2002) work are part of that new literature that is interested in testing the validity of some models of trade with specific market structures against others. These studies consider implicitly that trade flows retain an information on the type of competition (i.e. market structure) behind their co-movements with factor endowments, structure of production or gravity type variables. In that respect, the market structure becomes a variable implicitly endogenous to trade.

This article goes one step further to show that trade flows can contribute in an explicit manner to the formation of market structure. Unlike the studies mentioned earlier which usually put the emphasis on perfect and monopolistic competition, we use here the Brander and Krugman theoretical framework: we thus combine elements of international trade as well as industrial economics to evaluate the contribution of foreign trade to market structures for industries producing homogenous goods in the OECD. In a world where all firms have symmetrical costs and the product sold is homogenous, we would define market structure by the number of sellers in the market. In a slightly different configuration where costs are heterogeneous among the sellers, market structure is better captured by indexes of concentration which inform on the distribution of market shares among firms in the marketplace.

Surprisingly, while penetration rates (i.e. market shares of foreign sellers) increased dramatically in the last two decades in most of the OECD markets, the empirical literature did not pay sufficient interest to the role of trade in defining market concentration. One reason is that firm level data are not usually available among foreign sellers to compute accurately concentration indexes and find how much trade contributes to the formation of the market structure in OECD countries.

In this article we show that it is possible to provide a measure of foreign contribution to market concentration in an open economy, without any need of firm level data. In fact, foreign contribution can be obtained instead from industry level data on trade and activity by using a two-steps procedure: 1/ we aggregate the Brander and Krugman (1983) expression of price cost margins to exports from the firm to the industry level and derive an estimate for export concentration. 2/ We show that there is a relation between that concentration and foreign contribution which allows, in return, to infer the degree of trade involvement in market structure.

We show that foreign OECD sellers contribute up to 40-50% to the formation of small European countries' market structures and 20-30% of bigger European economies. Without taking trade flows into account, the measure of the degree of market concentration and thereby the state of competition could be biased in those countries. However, the contribution of OECD sellers to the Japanese and American markets appears to be significantly lower (5-10% on average).

In the case of European economies at least, any study trying to use market structure variables as an explanation of the volume or nature of trade has to consider carefully the possible endogeneity between the two types of variables. Moreover, this article tends to reveal that the construction of market concentration measures from national surveys could be biased if market shares of foreign suppliers are not accounted for. Finally, as the degree of market concentration provides an indication on that of competition, any investigation to measure accurately the state of competition in an open economy has to account for trade flows as well.

1 Introduction

In the studies on the nature and volume of trade flows, the empirical literature considers market structure to be exogenous in general. Very often indeed, market structure variables are used as explanatory variables in bilateral trade equations (Fontagné, Freudenberg and Peridy (1997), Greenaway, Hine and Milner (1995), Balassa and Bowen (1987) among others).

A new body of work aroused very recently however, trying to use trade data to assess the alternative performance of different types of markets in predicting the movements of goods. Head and Ries (2001), Davis and Weinstein (1999), Antweiler and Trefler (2002) and Evenett and Keller's (2002) work are part of that new literature that is interested in testing the validity of some models of trade with specific market structures against others[1]. These studies consider implicitly that trade flows retain an information on the type of competition (i.e. market structure) behind their co-movements with factor endowments (Antweiler and Trefler), structure of production (Head and Ries, Davis and Weinstein) or gravity type variables (See Evenett and Keller). In that respect, the market structure becomes a variable implicitly endogenous to trade.

This article goes one step further to show that trade flows can contribute in an explicit manner to the formation of market structure. Unlike the studies mentioned earlier which usually put the emphasis on perfect and monopolistic competition, we use here the Brander and Krugman theoretical framework: we thus combine elements of international trade as well as industrial economics to evaluate the contribution of foreign trade to market structures for industries producing homogenous goods in the OECD. In a

[1]Head and Ries (2001) and Davis and Weinstein (1999) test models of perfect against those of monopolistic competition while Antweiler and Trefler (2002) evaluate the explanatory power of each of these market structures. On the other hand, Evenett and Keller (2002) confront markets structures with perfect specialisation to models with imperfect specialisation.

world where all firms have symmetrical costs and the product sold is homogenous, we would define market structure by the number of sellers in the market. In a slightly different configuration where costs are heterogenous among the sellers, market structure is better captured by indexes of concentration which inform on the distribution of market shares among firms in the marketplace.

Surprisingly, while penetration rates (i.e. market shares of foreign sellers) increased dramatically in the last two decades in most of the OECD markets, the empirical literature did not pay sufficient interest to the role of trade in defining market concentration. One reason is that firm level data are not usually available among foreign sellers to compute accurately concentration indexes[2] and find how much trade contributes to the formation of the market structure in OECD countries.

In this article we show that it is possible to provide a measure of foreign contribution to market concentration in an open economy[3], without any need of *firm* level data. In fact, foreign contribution can be obtained instead from *industry* level data on trade and activity by using a two-steps procedure: 1/ we aggregate the Brander and Krugman (1983) expression of price cost margins to exports from the firm to the industry level and derive an estimate for export concentration. 2/ We show that there is a relation between that concentration and foreign contribution which allows, in return, to infer the degree of trade involvement in market structure.

We show that foreign OECD sellers contribute up to 40-50% to the formation of small European countries' market structures and 20-30% of bigger

[2]In general, firm level data are provided from national surveys conducted on domestic producers (or foreign affiliates) only, whereas little information is found on firms located abroad and selling to that market.

[3]We represent market concentration by the Hirshmann-Herfindahl index as Golan *et al.* (1996) show that the latter contains more information about the concentration of an industry and thus, is preferable to other measures 'if only one measure [of concentration] is to be used'. Besides, Naldi (2003) show that this index is more consistent with Zipfs's law and thus has to be preferred to alternative measures of concentration.

European economies. Without taking trade flows into account, the measure of the degree of market concentration and thereby the state of competition could be biased in those countries. However, the contribution of OECD sellers to the Japanese and American markets appears to be significantly lower (5-10% on average).

2 A Strategy to Infer Foreign Contribution

Consider an open market of a homogenous good served by local and foreign firms. International markets are segmented so that foreign firms choose quantities to be sold independently from other markets (see Brander and Krugman (1983)) [4].

Let $x_{f,n}$ stand for quantities sold by a firm n originating from a foreign country f and $x_{h,n'}$ those sold by a home (h) firm n'. Let X_h and X_f be the total quantities sold by local and foreign firms. Finally, we define $X_. = X_h + X_f$ as total sales in the market. The herfindahl index of concentration on that market can then be written as:

$$H_. = \sum_{n=1}^{N_f} \left(\frac{x_{f,n}}{X_.} \right)^2 + \sum_{n'=1}^{N_h} \left(\frac{x_{h,n'}}{X_.} \right)^2 \quad (1)$$

This is an indicator of *overall* concentration in the sense that it accounts for both local and foreign sellers. We can construct in the same fashion concentration indices specific to each type of sellers. Let us define $H_f = \left(\frac{x_{f,n}}{X_f} \right)^2$ to represent concentration to exports (i.e. concentration of the market reserved to foreign sellers). By symmetry, define $H_h = \left(\frac{x_{h,n'}}{X_h} \right)^2$ as domestic concentration. Then, after some simple manipulation, we find that:

[4]The hypothesis of segmentation between national markets is arguable. After all, some markets could be perfectly integrated at least at the regional level. However, Ottaviano, Tabushi and Thisse (1999) report that the existence of border effects estimated by recent studies is consistent with this assumption. See for instance Mc Callum's (1995) and Head and Mayer's (2000) work conducted respectively on North American and European markets.

$$H_{.} = \left(\frac{X_h}{X_{.}}\right)^2 H_h + \left(\frac{X_f}{X_{.}}\right)^2 H_f \tag{2}$$

Hence, *overall* concentration is the sum of domestic concentration and concentration to exports, weighted by squared market shares. Let us normalise this index with respect to domestic concentration. We have,

$$\frac{H_{.}}{H_h} = \left(\frac{X_h}{X_{.}}\right)^2 + \left(\frac{X_f}{X_{.}}\right)^2 \frac{H_f}{H_h} \tag{3}$$

We define foreign contribution to market structure as the part of market concentration that is solely explained by foreign sellers. That is,

$$FC = \frac{H_f \left(\frac{X_f}{X_{.}}\right)^2}{H_{.}}$$

Dividing the numerator and the denominator by H_h, and accounting for equation 3, we can reexpress FC like the following:

$$FC = \frac{\frac{H_f}{H_h}\left(\frac{X_f}{X_{.}}\right)^2}{\left(\frac{X_h}{X_{.}}\right)^2 + \left(\frac{X_f}{X_{.}}\right)^2 \frac{H_f}{H_h}} \tag{4}$$

We have access to data on industry level market shares $\frac{X_f}{X_{.}}$ and $\frac{X_h}{X_{.}}$. Then, all what is needed in order to infer foreign contribution is an estimate for relative concentration to exports $\frac{H_f}{H_h}$.

2.1 Concentration to exports

Assume an oligopoly framework with a fixed number of firms in the market. Profit maximisation leads firm n originating from country *f*, to set its marginal revenue equal to its marginal cost. Let $c_{f,n}$ be the marginal cost of the firm. Let g_f be a parameter designating transport cost from the iceberg type. That is, a proportion g_f of the quantities is lost during transport (see Brander and Krugman (1983)). Some extra manipulation leads to the traditional price cost margins relation for firm n:

$$L_{f,n} = \frac{p - \frac{c_{f,n}}{g_f}}{p} = \frac{1}{\epsilon}\frac{x_{f,n}}{X_.} \tag{5}$$

where ϵ stands for the price elasticity of demand that prevails on the market. $X_.$ represents the total quantity consumed in the market.

Let $X_f = \sum_n x_{f,n}$ stand for total exports and $\overline{c_f}$ be the weighted average of marginal costs for the f-firms. Furthermore, let $\tau_f = 1 - g_f$. Consequently, we can interpret τ_f as the freight cost rate in value terms or the share of imports that served for paying freight costs ($0 < \tau_f < 1$). Considering equation 5 summing over all the firms exporting from f, and weighting by the corresponding market shares $\frac{x_{f,n}}{X_f}$, we obtain the Lerner index expression from the sole activity of exporting at the industry level (i.e. average mark-up to export):

$$L_f = \frac{pX_f - \overline{\frac{c_f}{1-\tau_f}}X_f}{pX_f} = \frac{1}{\epsilon}H_f\frac{X_f}{X_.} \tag{6}$$

This expression shows that export mark-ups are related on average, to the elasticity of demand ϵ, concentration to exports H_f, and total market share of foreign sellers. Patterson and Abott (1994) obtain a similar export mark-up formulation. However, they do not include freight costs when computing mark-ups. Since one of the factors that may lead to international market segmentation is precisely the existence of transport costs we account for these specific trade costs in our export mark-up relation (Greenhut, Ohta, and Sailors 1985).

The same type of relation could be obtained for local producers:

$$L_h = \frac{1}{\epsilon}H_h\frac{X_h}{X_.} \tag{7}$$

Dividing expression 6 by its counterpart 7 relative to local sellers and log-linearizing gives:

$$\log\left(\frac{L_f}{L_h}\right) = \log\left[\frac{H_f}{H_h}\right] + \log\left[\frac{X_f}{X_h}\right] \tag{8}$$

Relation 8 states that the average industry mark up of foreign sellers, when normalized by that of local sellers, is a linear function of their relative share and relative export concentration. If the data contains no errors so that we can compute a good measure of the Lerner indexes, then an estimation of the relative concentration to exports can be directly deduced from 8: $\log\widetilde{\left[\frac{H_f}{H_h}\right]} = \log\left(\frac{L_f}{L_h}\right) - \log\left[\frac{X_f}{X_h}\right]$. However, as discussed later in the text, some data to use in order to construct the Lerner indexes are in fact observed with errors. Hence, accounting for time variation and noting $\log[H_f/H_h] = \psi_{fh}$, the empirical counterpart of equation 8 gives:

$$\log\left(\frac{L_{f,t}}{L_{h,t}}\right) = \psi_{fh} + \log\left(\frac{X_{f,t}}{X_{h,t}}\right) + u_{fh,t} \tag{9}$$

This equation will serve as a basis for our first step empirical estimation. From it, we are then able to derive an estimate for the relative export concentration $\widetilde{\frac{H_f}{H_h}} = exp(\psi_{fh})$. As we have access to activity and trade data, we can easily compute market shares and thereby deduce a measure for foreign contribution as shown by equation 4:

$$\widetilde{FC_t} \quad = \quad \frac{\widetilde{\frac{H_f}{H_h}}\left(\frac{X_{f,t}}{X_{h,t}}\right)^2}{\left(\frac{X_{h,t}}{X_{.}}\right)^2 + \left(\frac{X_{f,t}}{X_{.,t}}\right)^2 \widetilde{\frac{H_f}{H_h}}} \tag{10}$$

3 Data availability and estimation

So far, we have considered a simplified model with two types of sellers from two different countries, h and f, exporting to a single market h. We can extend this model to F countries ($F > 2$) exporting to H partners ($H > 2$).

For the equation 9 to be tested, and expression 10 to be inferred, we thus need activity and bilateral trade data.

We assemble a panel of 14 countries exporting to 13 partners for 11 industries over the period 1984-1994. As our framework is based on the hypothesis of homogenous goods, we have chosen 11 industries classified as homogenous good producers in the Rauch (1996) and/or Oliveira-Martins classifications (1994) [5]. The data are taken from the STAN (OECD) and FLUBIL (INSEE) databases. The STAN-OECD annual database provides manufacturing activity data such as value added, total imports and exports, total wages and salaries as well as the number of employees. Some countries like Belgium and the Netherlands known as important re-exporters were removed from the sample.

Bilateral trade data is provided in the FLUBIL database from the French Statistical Institute INSEE and shows to be perfectly consistent with total trade values reported in STAN [6]. Imports are valued on the basis of importers' declarations rather than that of exporters. Then, in addition to freight and insurance costs, prices may include tariff and non-tariff barriers components that were neglected by the theoretical model. However, as we work on a sample including in majority European countries (11 out of 14) with no or little tariffs between them during the given period, this must not significantly affect our results.

3.1 Measuring the Mark-up to Export

Some remaining factors that enter the cost function of exports are not observable. We assume constant returns to scale production functions. Then, marginal costs of production at the industry level can be represented by ob-

[5] For a comparaison of the two classifications see Erkel Rousse and Mirza (2002).

[6] The sum of bilateral values proved to be quasi identical to STAN total trade values (imports as well as exports).

servable average costs.[7] In theory, average costs $\overline{c_{f,t}}$ can be written as the ratio of labour costs $w_{f,t}l_{f,t}$ to total quantities produced $Y_{f,t}$. Let $V_{f,t} = p_{f,t}Y_{f,t}$ express the value added. Hence, considering equation 6, the average mark-up to export L_f from country f to any given market h can be measured as:

$$\begin{aligned} L_{fh,t} &= \frac{p_{h,t}X_{fh,t} - \frac{\overline{c_{f,t}}}{1-\tau_{fh}}X_{fh,t}}{p_{h,t}X_{fh,t}} \\ &= 1 - \frac{\overline{c_{f,t}}}{(1-\tau_{fh})p_{h,t}} = 1 - \frac{w.l_{f,t}}{V_{f,t}}\frac{1}{1-\tau_{fh}}\frac{p_{f,t}}{p_{h,t}} \end{aligned} \quad (11)$$

Three components constitute the price-cost margins of exports: average production costs, transport costs and relative prices. The freight cost rate τ_{fh}, is not directly provided by the data. However, a simple regression enables to estimate this variable. Let $\tau_{f,usa}$ the freight cost rate relative to the imports of the U.S from its partners, provided by Hummels (1998)[8] and $d_{i,usa}$ a measure of the geographical distance between the U.S and its partners computed as in as in Head and Mayer (2000). The first step is to run the following fixed effects regression for 1990, pooled over all partners and industries (indexed by k):

$$Log(\tau_{f,usa,k}) = \delta Log(d_{f,usa}) + \alpha_k + \xi_{i,usa,k} \quad (12)$$

Having access to the distance between pair of partners from Erkel Rousse and Mirza (2002) and Head and Mayer, and after estimating δ and α_k from the equation above, we can then predict the freight cost variable between

[7] We assume moreover that capital is a fixed cost variable that does not enter the mark-up equation.

[8] Hummels (1998) computes freight costs at the 2-digit SITC industry level. Whereas some of the industries that are 2-digit SITC match directly with some at 3 or 4-digit ISIC nomenclature that we use, we were constrained to compute simple means estimates to match SITC data with the ISIC-OECD for the remaining industries.

pair of countries τ_{fh}. Table 1 presents the weighted average of freight costs across industries for the 14 countries in our sample.[9]

Relative prices $\frac{p_{h,t}}{p_{f,t}}$ depend on relative costs in theory. As demonstrated in appendix A, equilibrium relative prices are expressed by the relative sum of costs weighted by the size and freight of each exporting country. This expression of prices is quite similar to a relative market potential equation since it says that prices must be relatively low in countries located near central regions, both in terms of geography and economic size [10]. Assuming that the relative size can be approximated by relative exports to domestic sales, the relative price proxy can then be easily computed.

4 Econometric specification

We run a Fixed Effect estimation based on equation 9 for each market. The market is defined by the couple "import country-industry". Put differently, we run regressions by importer and industry, thus allowing for a variability across exporters and years to estimate the fixed effects coefficients. As ex-

[9]Estimated freight costs seem to be rather low between trading partners but they show to be very close to those computed by Hummels (1998) for the U.S. and its partners for comparable distances. For instance, freight costs between Canada and its European partners are very close to those relative to the U.S *vis-â-vis* the same partners. Moreover, within country freight costs are particularly significant in the US and Canada, most of times reaching higher values than between European countries freight costs which is very plausible due to very large internal distances between the main cities in the north American countries. Note that one of the few shortcomings of this freight costs estimations is that the effect of distance on transport costs is assumed to be the same whatever the two trading partners considered and thus do not depend on the type of transport between countries. For instance, most of merchandise transportation is done *via* land type transporters such as trucks or trains within European countries whereas it is obviously not the case between a European country and a north American partner where most of commodities are shipped by sea. However, if freight costs are evaluated with some error, it appears to be very small relative to total costs that are supported, as estimated freight costs relative to imports account for 1 to 2% on average within regions (North America, Europe) and up to 8% between regions. The import distribution is not the same for each partner among industries which causes the weights to differ between countries when computing weighted average freight costs. This explains why the results shown in the table are not symmetric within couple of partners.

[10]See Krugman (1992) for more development on the market potential concept.

pected by theory, the obtained estimations should inform about the relative concentration to exports.

We thus estimate 13 parameters for each of the 14 importing countries and 11 industries. All these estimates are not reported here for sake of simplification[11]. Instead, we present in table 2 some statistics concerning these results. It is worth noting however that the R-squared of the Fixed Effects estimations were very high, lying systematically within the range [0.87; 0.98]. We obtain a very large proportion of positive and statistically significant estimates of ψ_{fh}, which suggests a value of concentration of the market specific to foreign sellers that is very often higher than that of domestic concentration (i.e. $H_{fh}/H_{hh} = \exp \overline{\psi_{fh}}$ superior to 1). This result does not come as a surprise: if all the firms where symmetrical (i.e. similar costs), this would suggest that fewer foreign than domestic firms serve usually the domestic market.

5 Estimating Foreign Contribution

From earlier estimates and observed market shares, we can now infer an estimation for the foreign contribution of trade flows to concentration in each of the 14 host countries from generalising equation 10 to the case of F foreign countries ($F > 2$). This gives,

$$\widetilde{FC_{t,h}} = \frac{\sum_{f=1...F}\left[\frac{\widetilde{H_f}}{H_h}\left(\frac{X_{f,t}}{X_{h,t}}\right)^2\right]}{\left(\frac{X_{h,t}}{X_{\cdot}}\right)^2 + \sum_{f=1...F}\left[\left(\frac{X_{f,t}}{X_{\cdot,t}}\right)^2\frac{\widetilde{H_f}}{H_h}\right]} \qquad (13)$$

Table 3 provides the average contribution of foreign countries to national market structures estimated over the period 1984-1994. For most of the countries this contribution appears to be significant. Some basic statis-

[11]Results are available upon request.

tics show that in open small countries such as Sweden or Norway, foreign contribution is around 40 to 50% on average. Moreover, exporters account for nearly 35% of seller concentration in the United Kingdom, Portugal and Canada, while in France and Germany the average contribution is around 20-25% which is still a high ratio. However, market structures in countries like Japan and to a minor extent the U.S do not seem to be altered by foreign exporters. Hence, domestic concentration in these countries could be good representatives of *overall* concentration. However, the Japan result reinforces the well known idea that the latter is relatively hermetic to other OECD countries' goods (Harrigan 1996).

Foreign contribution seems to depend on the characteristics of the Industries as well. In Food or Beverages, for instance, the average contribution of trade is relatively small and varies very little across countries (10-15%). This might be due to the existence of higher barriers to entry in these industries disregard from the nationality of the market. On the opposite, the average contribution is around 40% in Textile, Rubber and Glass but the variance across national markets is also high for these industries.

We estimate the Foreign contribution to each market more accurately by running a parametric estimation where the foreign contribution index is regressed on a set of importer dummies, industry dummies and time dummies. The results are shown in table 4. The figures associated with each dummy are thus interpreted as deviations from the intercept where the latter represents the estimated average contribution across countries, sectors and years. Hence, on average trade accounts for 26% of the formation of market structure in the OECD (see intercept coefficient). Again, from the parametric study (table 4) one can derive the same qualitative and quantitative conclusions than those obtained from table 3: European market economies are more concerned than the Japanese or the U.S markets by openness to imports. Controlling for countries specific effects, the estimated contributions by industry remain very close to the simple average contributions shown in table 3. Thus, not only the size of the economies matter for understanding the degree of foreign contribution to the market structure's formation. It is also affected by industry specific aspects. Finally, the results show that the variable of interest follows an U-shaped curve over the period. Trade involvement in market structure experienced a non-monotonous increase of 5 points between 1984 and 1994: from 30% in 1984, it reaches a minimum estimated level of 21% in 1988 before increasing to its highest level of 35% in 1994.

6 Conclusion

In this article, we have shown that trade can participate actively to the formation of market structures in homogenous good industries. An original method has been developed to quantify the contribution of trade flows to the formation of market structures. In small European markets, trade contribution was found to be very high 40-50%, followed by big European Economies where it accounts for 20-30% of national market structures. Nevertheless, market structure is less affected by openness in the U.S and Japanese markets. Trade's contribution to market structure is also affected by industry specific features and is shown to have varied over the period.

In the case of European economies at least, any study trying to use market structure variables as an explanation of the volume or nature of trade has to consider carefully the possible endogeneity between the two types of variables. Moreover, this article tends to reveal that the construction of market concentration measures from national surveys could be biased if market shares of foreign suppliers are not accounted for. Finally, as the degree of market concentration provides an indication on that of competition, any investigation to measure accurately the state of competition in an open economy has to account for trade flows as well.

References

Antweiler, W. and D. Trefler (2002). Increasing Returns and All That: a View From Trade. *American Economic Review 92*(1), 93–119.

Balassa, B. and L. Bauwens (1987). Intra Industry Specialisation in a Multi Country and Multi Industry Framework. *Economic Journal 97*, 923–939.

Brander, J. and P. Krugman (1983). A 'Reciprocal Dumping' Model of International Trade. *Journal of International Economics 15*, 313–321.

Davis, D. and D.Weinstein (1999). Economic Geography and Regional Production Structure. *European Economic Review 43*(2), 379–407.

Erkel-Rousse, H. and D. Mirza (2002). Import Price-Elasticity: Reconsidering the Evidence. *Canadian Journal of Economics 35*(2), 282–306.

Evenett, S. and W. Keller (2002). On Theories Explaining the Sucess of the Gravity Equation. *Journal of Political Economy 110*, 281–316.

Fontagné, L., M. Freudenberg, and N.Peridy (1997). Trade Patterns Inside the Single Market. *CEPII Working paper, n.07-1997*.

Golan, A., J. Georges, and J. Perlof (1996). Estimating the Size Distribution of Firms Using Government Summary Statistics. *Journal of Industrial Economics 44*(1), 69–80.

Greenaway, D., R. Hine, and C. Milner (1995). Vertical and Horizontal Intra-Industry Trade: a Cross Industry Analysis for the United Kingdom. *Economic Journal 105*.

Greenhut, M., H. Ohta, and J. Sailors (1985). Reverse Dumping: a Form of Spatial Price Discrimination. *Journal of Industrial Economics XXXIV*(2), 167–181.

Harrigan, J. (1996). Openness to Trade in Manufactures in the OECD. *Journal of International Economics 40*, 23–39.

Head, K. and T. Mayer (2000). Non-Europe: the Magnitude and Causes of Market Fragmentation in the EU. *Weltwirtschaftliches Archiv 2*.

Head, K. and J. Ries (2001). Increasing Returns versus National Product Differentiation as an Explanation for the Pattern of US-Canada Trade. *American Economic Review 91*(4).

Hummels, D. (1998). Toward a Geography of Trade Costs. *mimeo*.

Krugman, P. (1992). A Dynamic Spatial Model. *NBER Working Papers*. N 4219.

McCallum, J. (1995). National Borders Matter: Canada-US Regional Trade Patterns. *American Economic Review 85*, 615–623.

Naldi, M. (2003). Concentration indices and Zipf's Law. *Economics Letters 78*(3).

Oliveira Martins, Y. (1994). Market Structure, Trade and Industry Wages. *OECD Economic Studies 22*, 131–154.

Ottaviano, G., T. Tabuchi, and J. Thisse (1999). Agglomeration and Trade. *mimeo*.

Patterson, P. and P. Abbott (1994, December). Further Evidence on Competition in the US Grain Export Trade. *Journal of Industrial Economics XLII*(4), 429–437.

Rauch, J. (1996). Networks Versus Market in International Trade. *NBER working paper*. n 5617.

A The relative price expression

From equation 5, we can obtain the expression of the exporter's market share:

$$\left(\frac{x_{fh,n}}{X_.}\right) = \epsilon_h \left(1 - \frac{c_{f,n}/(1-\tau_{fh})}{p_h}\right) \tag{14}$$

When summing this expression over all the competitors $N_. = \sum_f N_{fh}$, where N_{fh} expresses the number of exporters from f to h, we get the price expression at equilibrium:

$$p_h = \epsilon_h \frac{\sum_f \sum_n \frac{c_{f,n}}{1-\tau_{fh}}}{\epsilon_h N_. - 1} \tag{15}$$

We assume that the number of firms in the market h is sufficiently high so that the price expression at equilibrium is close to the mean exporting costs computed over domestic and foreign producers $\sum_f \sum_n \frac{c_{f,n}}{1-\tau_{fh}}$. As a result, the relative price can be written as:

$$\begin{aligned} \frac{p_{f,t}}{p_{h,t}} &\approx \frac{\sum_h \sum_n \frac{c_{h,n}}{1-\tau_{hj}}}{\sum_h \sum_n \frac{c_{h,n}}{1-\tau_{hf}}} \\ &\approx \frac{\sum_h \frac{N_{h,f}}{N_f} \frac{\overline{c_h}}{1-\tau_{hf}}}{\sum_h \frac{N_{h,f}}{N_h} \frac{\overline{c_h}}{1-\tau_{hf}}} \end{aligned} \tag{16}$$

with $h \in (1 \ldots H)$ and $\overline{c_h} = \sum_n \frac{c_{h,n}}{N_h}$ representing the average cost of production in the exporting country h. Hence, relative prices can be evaluated as the relative sum of costs weighted by the size and freight of each exporting country.

Table 1: Estimated freight costs as % of imports (weighted mean costs accross industries)

Import Country	*Export Country*													
	AUT	CAN	DEU	ESP	FIN	FRA	GBR	GRC	ITA	JPN	NOR	PRT	SWE	USA
AUT	0.4	7.32	0.88	2.02	2.1	1.2	1.4	2.13	1.03	4.46	2.16	2.38	1.53	5.61
CAN	3.95	1.49	3.97	5.2	4.02	5.15	4.09	7.6	4.76	5.6	3.6	5.75	3.63	1.77
DEU	1.15	6.31	0.72	2	3.08	1.11	1.05	1.97	1.15	5.57	1.69	2.63	2.09	5.3
ESP	2.27	5.98	1.58	1.03	4.98	1.42	1.7	3.27	1.37	6.74	3.57	1.59	3.11	4.77
FIN	1.67	4.89	1.61	3.56	0.48	2.46	1.88	2.46	1.97	4.66	1.31	2.81	0.77	4.69
FRA	1.65	5.76	1.02	1.59	3.9	0.87	0.99	2.05	1.28	5.89	2.51	2.7	2.7	4.83
GBR	1.74	5.17	1.02	2.37	3.44	1.14	0.53	3.41	1.67	6.34	2.01	2.17	2.35	4.91
GRC	1.98	8.51	1.59	2.69	4.18	2.28	2.19	0.65	1.22	6.05	4.15	3.32	3.51	5.54
ITA	1.42	6.75	1.15	2.4	4.09	1.44	1.5	1.86	0.99	7.01	2.78	3.16	2.95	5.41
JPN	5.14	8.59	4.41	8.07	8.15	5.99	5.1	7.49	4.96	0.75	5.74	8.25	4.52	6.08
NOR	1.47	3.36	1.35	3.08	1.38	2.08	1.48	2.16	1.69	6	0.44	2.65	0.81	4.53
PRT	2.02	4.46	1.82	1.24	4.12	1.57	1.64	3.16	1.5	6.22	4.18	0.27	3.1	4.66
SWE	1.54	5.45	1.23	2.97	0.93	1.97	1.56	2.23	1.75	5.38	0.82	2.94	0.4	4.83
USA	5.05	2.26	4.26	5.78	8.13	5.99	5.07	7.44	5.2	5.7	5.23	5.56	4.46	1.86

Table 2: Some statistics on the estimated log of Concentration to exports), (i.e: $Log(H_{fh}/H_{hh}) = \psi_{fh}$)

Country	$\psi_{fh} > 0$ and significant at 1%	$\psi_{fh} < 0$ and significant at 1%	not significant
AUT	0.99	0	0.01
CAN	0.99	0	0.01
DEU	1	0	0
ESP	1	0	0
FIN	0.98	0	0.02
FRA	1	0	0
GBR	1	0	0
GRC	0.97	0	0.03
ITA	1	0	0
JPN	1	0	0
NOR	0.96	0	0.04
PRT	0.99	0	0.01
SWE	0.99	0	0.01
USA	1	0	0

Table 3: Foreign contribution to market concentration (FC average values over 1984-1994

ISIC	Description	AUT	CAN	DEU	ESP	FIN	FRA	GBR	GRC	ITA	JPN	NOR	PRT	SWE	USA	Av.industry
313	**Beverages**	0.09	0.15	0.13	0.14	0.09	0.27	0.18	0.11	0.11	0.04	0.12	0.21	0.3	0.1	0.15
321	**Textiles**	0.64	0.32	0.41	0.25	0.59	0.38	0.45	0.27	0.1	0.07	0.81	0.31	0.66	0.08	0.38
331	**Wood**	0.18	0.21	0.2	0.21	0.1	0.16	0.42	0.14	0.1	0.09	0.35	0.21	0.11	0.04	0.18
341	**Paper**	0.45	0.3	0.3	0.37	0.12	0.37	0.5	0.31	0.22	0.08	0.44	0.35	0.19	0.1	0.29
355	**Rubber**	0.32	0.77	0.38	0.2	0.7	0.36	0.37	0.43	0.24	0.03	0.85	0.42	0.56	0.12	0.41
356	**Plastic**	0.32	0.25	0.12	0.06	0.38	0.17	0.17	0.22	0.11	0.01	0.44	0.26	0.41	0.04	0.21
362	**Glass**	0.31	0.53	0.15	0.21	0.56	0.3	0.7	0.48	0.15	0.02	0.67	0.49	0.6	0.15	0.38
369	**Non-Metallic**	0.2	0.17	0.1	0.1	0.17	0.15	0.08	0.16	0.09	0.01	0.25	0.12	0.22	0.07	0.14
371	**Iron/Steel**	0.69	0.4	0.17	0.23	0.24	0.29	0.31	0.52	0.15	0.16	0.72	0.55	0.49	0.15	0.36
372	**Non-Fer.Metals**	0.67	0.42	0.22	0.19	0.37	0.2	0.6	0.36	0.34	0.03	0.54	0.6	0.51	0.16	0.37
3112	**Food**	0.11	0.1	0.1	0.06	0.06	0.08	0.11	0.19	0.12	0.02	0.17	0.1	0.09	0.02	0.1
	Average country	0.36	0.33	0.21	0.18	0.31	0.25	0.35	0.29	0.16	0.05	0.49	0.33	0.38	0.09	0.27

Table 4: Estimated Foreign Contribution by Country, Industry and Year

Dummies	Parameters	Std.Error	Inferred contribution (intercept+specific effect)
Intercept (Average contribution)	0.27***	0.003	
Country effect			
AUT	0.092***	0.012	0.362
CAN	0.059***	0.012	0.329
DEU	-0.061***	0.012	0.209
ESP	-0.085***	0.012	0.185
FIN	0.038***	0.012	0.308
FRA	-0.022	0.012	0.27
GBR	0.085***	0.012	0.355
GRC	0.021	0.012	0.27
ITA	-0.112***	0.012	0.158
JPN	-0.219***	0.012	0.051
NOR	0.216***	0.012	0.486
SWE	0.108***	0.012	0.378
PRT	0.058***	0.012	0.328
USA	-0.177***	0.012	0.093
Industry effect			
Food	-0.174***	0.011	0.096
Beverage	-0.123***	0.011	0.147
Textiles	0.11***	0.011	0.38
Rubber	0.141***	0.011	0.411
Plastic	-0.058***	0.011	0.212
Wood	-0.092***	0.011	0.178
Paper	0.022**	0.011	0.292
Glass	0.111***	0.011	0.381
Non-Metallic	-0.134***	0.011	0.136
Iron/Steel	0.093***	0.011	0.363
Non-Fer. Metals	0.103***	0.011	0.373
Year effect			
1984	0.031***	0.011	0.301
1985	0.038***	0.011	0.308
1986	-0.017	0.011	0.27
1987	-0.04***	0.011	0.23
1988	-0.054***	0.011	0.216
1989	-0.026***	0.011	0.244
1990	-0.047***	0.011	0.223
1991	-0.02	0.011	0.25
1992	-0.002	0.011	0.27
1993	0.053***	0.011	0.323
1994	0.086***	0.011	0.356
Observations	1693		
R-Squared	0.58		
RMSE	0.14		
F-stat	79.96		

***significant at 1%, ** at 5%