

WIFO

ÖSTERREICHISCHES INSTITUT
FÜR WIRTSCHAFTSFORSCHUNG

 **WORKING PAPERS**

**MARKET POWER, MULTINATIONALITY
AND INTRA-EU INDUSTRY EXPORTS
IN THE 1990S**

PETER EGGER

167/2001

MARKET POWER, MULTINATIONALITY AND INTRA-EU INDUSTRY EXPORTS IN THE 1990S

PETER EGGER

WIFO Working Papers, No. 167
November 2001

Market Power, Multinationality and Intra-EU Industry Exports in the 90's

Peter Egger*

November 21, 2001

Abstract

This paper assesses the impact of market power and multinationality in EU12 manufacturing industries on EU integration in goods trade in the 90ies. An increase in the market concentration exhibits a positive impact on bilateral exports, while an increase in multinationality works in the opposite direction. Both effects are in accordance with the theoretical hypotheses. As a result, goods trade between the member countries was *polarised* in terms of a relative disintegration of southern Europe.

Key words: Integration; International Trade; Multinational firms; Panel econometrics

JEL classification: C33; F14; F15

*Austrian Institute of Economic Research and University of Innsbruck, Department of Economics, Universitätsstrasse 15, A-6020 Innsbruck, Austria. Phone: +43-512-507-7404; E-mail: Peter.Egger@uibk.ac.at.

1 Introduction

The importance of imperfect competition and of multinational activity on trade have both attracted a large amount of research in the last decades. In general, the theoretical models obtain the result that more competition in terms of the number of active firms fosters trade. The now standard models of trade and multinationals (MNEs; compare Helpman, 1984, Markusen and Venables, 1998, 2000, Baldwin et al., 1999) come up with the basic result that vertical MNE activity fosters trade (complementarity), whereas horizontal MNE activity mitigates trade (substitution; see Caves, 1996, for an overview).

This paper analyses the impact of both market concentration - measured by the EU12 market share of the largest five firms active on this market - and multinationality (Davies and Lyons, 1996) - measured by the distribution of production activities of an industry's large MNEs across EU12 member countries - on bilateral intra-EU12 manufacturing goods exports in a unified framework. The main hypotheses are based on a partial equilibrium bilateral dumping Cournot model of trade and horizontal multinationals. In this theoretical model, the relationship between market concentration and trade is not clear-cut but it *inter alia* depends on the relative cost advantage of the source country and transport costs. Consequently, the role of market concentration remains an empirical question. Multinationality should exert a negative impact on industry exports.

This is investigated in a panel of bilateral NACE 3-digit intra-EU12 manufacturing industry trade flows. There is strong evidence, that an increase in concentration in the EU12 area has fostered intra-EU12 trade. In contrast, an

industry's intra-EU12 multinationality has exerted a negative impact. The simulation analysis illustrates that the observed change in market concentration and in multinationality have mitigated intra-EU12 manufacturing goods trade activity. The change in concentration has induced an *equalisation effect* on trade shares in terms of a redistribution of trade activity away from the core countries. However, the change in multinationality is responsible for a *polarisation* of trade activity within the EU12, improving the importance of trade (i.e. trade shares) of the northern EU economies at the expense of their the southern counterparts. In sum, the *polarisation effect* is stronger and outweighs the *equalisation effect*. Hence, the change in concentration and multinationality altogether have favoured the goods export activity within and between the core EU and the northern EU periphery at the cost of the southern EU periphery economies.

2 Theoretical Background

The theoretical literature on imperfect competition and trade is organised around models of oligopolistic and (mostly) monopolistic competition. The former are mainly analyzed in a partial equilibrium framework with two countries and a single standardised commodity (compare Brander, 1981, and Markusen, 1981, as two prominent examples). Most monopolistic competition models are analysed in a general equilibrium context and consider firms competing in differentiated varieties of a particular commodity class (see Krugman, 1979, 1980, for the earliest examples).

The theoretical hypotheses to be tested in the empirical section are de-

rived from a partial equilibrium Cournot model of trade and multinationals (compare Martin, 1993, for a similar model in the duopoly case). However, I do not discuss the question of entry and focus on a short-term perspective. In the long-run, a co-existence of MNEs and exporters is more difficult to establish.

Footloose, horizontal multinational firms (MNEs) run a single plant in each market. This implies that multinationals do not engage in trade. Markets are treated as segmented and the industry (inverse) demand curves are allowed to differ with respect to market size (a) across countries:

$$p_i = a_i - bY_i \quad i = A, B \quad (1)$$

$$= a_i - b[(n + m)q_i + nx_j], \quad (2)$$

where q denotes consumption of goods from plants, which are located at the same market as consumers, and x is consumption of goods from the foreign market (i.e. exports from there). Furthermore, n is the number of footlose exporters (exporting from both markets), and m is the number of MNEs. For simplicity, I assume that the number of exporters in each market is the same, since there is also no information available on this. Exporters in different markets only differ in terms of their sales and cost. Using the assumption that exporters and MNEs produce the same quantity for the market, where their plants are located (compare also Markusen and Venables, 1998, 2000), profits are given by

$$\pi_i^x = (p_i - c_i)q_i + (p_j - c_i - t)x_i \quad (3)$$

$$\pi_i^m = (p_i - c_i)q_i + (p_j - c_j)q_j, \quad (4)$$

with c denoting marginal cost. Solving the system of first order conditions gives solutions for all quantities of interest (q_i, q_j, x_i, x_j)

$$x_i = \frac{a_j - c_i + (n + m)(c_j - c_i - t) - t}{b(\tilde{n} + 1)} \quad (5)$$

$$q_i = \frac{(a_i - c_i) + n(c_j - c_i - t)}{b(\tilde{n} + 1)}, \quad (6)$$

with $\tilde{n} = 2n + m$. In the empirical part below, we are interested in the determinants of exports from country i to j at the industry level defined by

$$nx_i = \frac{(1 - \theta)\tilde{n}}{2b(\tilde{n} + 1)} \left(a_j - c_i - t + \frac{(1 + \theta)\tilde{n}}{2}(c_j - c_i - t) \right), \quad (7)$$

with $m = \theta\tilde{n}$ and $2n/\tilde{n} = (1 - \theta)$ so that $n = (1 - \theta)\tilde{n}/2$. According to (7), we can formulate the following proposition regarding the comparative statics for exports from country i to j .

Proposition 1 *An increase in foreign market size (a_j) or the cost difference in favour of country i ($c_j - c_i$) exerts a positive impact on nx_i . An increase in domestic marginal costs (c_i), the transport costs (t), or the share of multinationals (θ) in the overall number of firms (\tilde{n}) ceteris paribus affects nx_i negatively. Industry exports from country i to j are not uniquely related to changes in the overall number of firms (\tilde{n}).*

Proof. See the Appendix. ■

Of course, the overall number of firms (\tilde{n}) and the share of multinationals (θ) are not directly observable. However, we have information on the market concentration (the share of the largest five firms) in each industry on the EU12 market (C) and the multinationality (M) in each industry in terms of multi-plant activities within the EU12 market. The latter is approximated

by the entropy index of multinational production of the large firms (compare Davies and Lyons, 1996). Below, we associate an increase in C with a decrease \tilde{n} and an increase in M with an increase in θ .

Accordingly, we can formulate two propositions with respect to the relationship between \tilde{n} and θ on the one hand and C and M on the other.

Proposition 2 *An increase in the number of firms reduces C at any given level of M . Therefore, an increase in C (i.e. a decrease in \tilde{n}) is not uniquely related to bilateral exports, but it inter alia depends on the cost advantage of country i ($c_j - c_i$) and the transport costs (t). The larger $c_j - c_i$ (or the smaller t), the more likely is an increase in concentration (C) negatively related to bilateral exports (nx_i).*

Proof. Follows directly from the proof of Proposition 1. ■

Proposition 2 is motivated by the assumption that both exporters and MNEs similarly engage in Cournot competition (i.e. there is no price or quantity leadership in the model). The next proposition refers to the relationship between exports (nx_i) and multinationality (M), and the relationship between θ and M , all else equal.

Proposition 3 *For given parameter values ($a_i, a_j, b, c_i, c_j, \tilde{n}$), an increase in M (θ) is negatively related to bilateral industry exports (nx_i). However, the size of this impact inter alia depends on the cost advantage of country i ($c_j - c_i$) and the transport costs (t). A larger $c_j - c_i$ (or a smaller t) increases the marginal negative effect of an increase in multinationality (M) on bilateral exports (nx_i) in absolute terms.*

Proof. Follows directly from the proof of Proposition 1. ■

We can summarise the comparative static results derived in the appendix as follows. It is evident from (7) that industry exports from i to j are strictly positively determined by an increase in foreign market size (a_j) or the cost advantage of country i ($c_j - c_i$). An increase in trade costs (t) or multinationality (M) exerts a negative impact on industry exports. However, the marginal effect of M is stronger if country i 's cost advantage is large, and it is weaker if transportation costs are high. One reason behind this relationship is that a large cost advantage of country i is similar to a low level of transportation costs (t). Both result in a low *level* of multinational activity as compared to exports. Therefore, the *marginal* impact of a change in multinationality in such a situation is relatively strong.

There is no clear-cut relationship between market concentration (C) and bilateral industry exports through the growing number of firms (compare also Pagoulatos and Sorensen (1975) for a discussion on this), but the effect depends again on country i 's relative cost position and the transport costs. If $c_j - c_i$ is large, an increase in concentration (C) very likely exerts a negative impact on country i 's exports. If t is large, the opposite holds true.

3 Empirical Analysis

The empirical literature on the relationship between competition and trade is relatively scarce and predominantly provides evidence for the US. Caves (1981) finds a negative correlation between (intra-industry) trade and market concentration (indirectly measured by scale economies), whereas Pagoulatos

and. Sorenson (1975, 1976) find a positive one. Martin (1991) observes a negative impact of US industry concentration on US imports and FDI. There is a large bulk of empirical research on the relationship between MNE activity and trade on both the aggregate and the industry level. Complementarity between multinational activity and trade has been found by Bergsten et al. (1978), Lipsey and. Weiss (1981), Blomström et al. (1988), Brainard (1997) and others. Pagoulatos and. Sorensen (1975), Caves (1981), and others find a negative relationship between multinational activity and (mostly intra-industry) trade (see Caves, 1996, for an overview). Blonigen (2001) mentions that substitution can easily be identified in disaggregated (product-level) data, and that previous papers (claiming complementarity) may have suffered from aggregation bias.

I use data on real bilateral trade within the EU12 region from UNO world trade statistics, which are reclassified from SITC 5-digit to NACE 3-digit following the commonly available correspondence sheet. For the construction of real data, unit values are used. Industry specific market size (a_{ikt}, a_{jkt}) is proxied by apparent consumption in the respective country.¹ As mentioned above, marginal cost is proxied by unit labour costs (nominal wage costs per unit of output, c_{ikt}). Data on industry specific EU12 market concentration of the largest five firms (C_{kt}) and on multinationality (M_{kt}) are available from Davies and. Lyons (1996) and Sleuwaegen and. Veugelers (2001), but only for 1987, 1993 and 1997. Since the data on multinationality are restricted

¹Real production minus real world exports plus real world imports minus real imports from country i (to avoid the endogeneity problem). (8) contains domestic market size in order to reduce the asymmetries between countries.

to only leading firms, there is some underrepresentation of multinational activity by smaller multinationals. Therefore, the empirical results should be interpreted with care.

I interpolate the series to obtain an estimate of C and M for 1990, which is the first year (reliable) trade data are available on. Additionally, the data on concentration and multinationality are collected for only 72 industries (aggregates of NACE 3-digits). I appropriately weight them to construct a data base, which can be imputed to come up with NACE 3-digit data. As usual, trade costs are proxied by the use of the relation between c.i.f. and f.o.b. figures from nominal bilateral trade data (t_{ijkt}). The database comprises three years, 1990, 1993, and 1997, it contains only cross-sectional units, which are observed in at least 2 years, and it is unbalanced. I use 1995 as the base year for the construction of real series. Due to the definition of the EU market in the available C and M measures, I focus on intra-EU12 trade relations. In sum, I come up with 21892 observations in the regression analysis.

The determination of industry exports demands for the inclusion of a couple of interaction effects between the involved exogenous determinants (compare the previous section). The estimated specification reads

$$\begin{aligned}
X_{ijkt} = & \beta_0 + \beta_1 a_{ikt} + \beta_2 a_{jkt} + \beta_3 c_{ikt} + \beta_4 d_{ijkt} + \beta_5 C_{kt} + \beta_6 M_{kt} + \beta_7 t_{ijkt} \\
& + \beta_8 C_{kt} \cdot d_{ijkt} + \beta_9 M_{kt} \cdot d_{ijkt} + \beta_{10} C_{kt} \cdot t_{ijkt} + \beta_{11} M_{kt} \cdot t_{ijkt} \\
& + \mu_{ijk} + \lambda_t + \varepsilon_{ijkt},
\end{aligned} \tag{8}$$

where X_{ijk} is the volume of exports from country i to j of industry k in year t (nx_{ijk}), and subscripts i , j , k and t refer to exporter country, importer

country, industry and year. $d_{ijkt} = (\log c_{jkt} - \log c_{ikt})$ is the difference in the log of unit labour costs at the two markets. μ_{ijk} is the individual bilateral and industry specific effect, which comprehensively accounts for time-invariant cross-sectional (observable and unobservable) influences, λ_t is the time effect, which wipes out all, e.g. cyclical, variation common for all cross-sectional units- for example, in 1993 the single market program came into effect - and ε_{ijkt} is the classical error term. All variables are in logs.

> Table 1 <

Table 1 presents within group (i.e. fixed effects or short-run, compare Pirotte, 1999) estimation results from a regression of (8) using the described data. Model 1 reflects the fixed effects coefficients from the full set-up as described in (8). Models 2 and 3 are parsimonious versions, where the insignificant coefficients of Model 1 are set to zero. According to the choice of a two-way panel, the estimated fixed effects coefficients can be interpreted as narrow within group impacts (similar to first difference analysis). Noteworthy, this is impossible in a four-way framework with industry, exporter, importer and time effects.

The parameter estimates are very robust and the majority of the estimated main coefficient signs is in accordance with our theoretical hypotheses. An increase in market power has a clear positive, direct impact on bilateral intra-EU industry exports in both the short-term and the long-term perspective. In contrast, a higher multinationality exerts an insignificant, negative (direct) impact on bilateral manufacturing exports in the EU12. Noteworthy, the interaction effects are fully in accordance with the priors from the

theoretical model above, compare (12) and (13). According to Propositions 2 and 3, we expect a lower positive or more negative impact of a change in concentration (a stronger negative impact of multinationality) on exports, the larger country i 's cost advantage is (d) is. Higher transport costs lead to a more positive (less negative) marginal effect of concentration and to a less negative one of multinationality on exports.

The parameter estimates for the variables involved in the interaction terms cannot be interpreted as the impact of a marginal increase in these variables on real bilateral manufacturing trade. Accordingly, marginal effects should be calculated, when inferring the overall marginal impact of the involved variables.

> Table 2 <

Table 2 presents the marginal effects of all variables evaluated at the variable means. Note that the effects are equivalent to those in Table 1, if a variable is included only once in specification (8), and if it is not used for the interaction terms, i.e. a_{ikt} , a_{jkt} , c_{ikt} . The marginal effects of the other variables are specific for each observation. I evaluate the marginal effects at the means of the involved variables and calculate the appropriate standard errors ($\sigma(\mu)$), which are not only a function of the variable means but also the variances and the covariances of the involved variables (compare Greene, 1997, pp.391f.). To provide more insights into the distribution of the marginal effects across the sample of observations, I report the standard error of the distribution of marginal effects (σ_μ) as an additional information. This just takes into account that each observation has its own marginal effect and that

the evaluation at the variable means is only a short-cut, which ignores this information (compare Greene, 1997).

To facilitate reading the table, "yes" indicates that the sign of a significant marginal effect does *not contradict* our theoretical priors. "No" means that the theoretical hypothesis is *rejected* by the empirical finding, and insignificant results are labelled by "?". An increase in the market share of the largest five firms (C) fosters bilateral manufacturing trade in the EU, which does not contradict our theoretical priors. An increase in multinationality (M) exerts the opposite effect, which is in accordance with the theoretical hypotheses. Implicitly, this indicates that multinational activities within the EU are predominantly of a horizontal type. Noteworthy, Andersson and Fredriksson (1996) provide an interesting result for exports from affiliates. Foreign subsidiaries export the more, the fewer the countries in which their parents have affiliates. This could also be related to our finding, although information on firm data cannot be exploited, here.

The marginal effects not only differ across industries but also across bilateral relations and years, due to the differences in the cost advantage (d) and transportation costs (t) across industries. Therefore, the impact of the observed change in concentration and multinationality deserves some additional assessment. We can ask, how intra-EU trade would have developed over the period 1990-1997 if either concentration or multinationality had not changed since 1990. Then, the difference between the predicted growth in manufacturing trade for the observed development and the simulated counterfactual scenario is attributable to the observed change in concentration (multinationality), exclusively.

> Table 3 <

Table 3 presents the results from the simulation analysis of the impact of the observed change in concentration (multinationality) on intra-group real bilateral volume of manufacturing trade (VT) growth using Model 2. Note that the predictions are only calculated for industry-country-pair cross-sections, which are not missing in both 1990 and 1997. The reported real growth rates of trade are based on these cross-sections. The difference between the predictions for the observed and counterfactual world data should be interpreted as short-term effects of the observed change in concentration or multinationality, respectively.

On average, VT grew by about 50% over the whole period (1990-1997). Columns 3 and 4 report figures of the observed growth of the cost advantage variable (d) and trade costs (t) for each integration group. Columns 5 and 6 of the table contain the percentage point differences in VT growth between the simulated, no-change counterfactual scenarios for concentration and multinationality and the prediction of the observed situation.

According to Table 3, intra-EU12 manufacturing growth was mitigated by about 0.5 percentage points (i.e. roughly one percent) by the change in concentration alone. This effect was most pronounced for VT between the peripheries (south: Greece, Portugal, Spain and north: Denmark, Ireland, UK) and intra-core-EU trade (EU6; i.e. trade between the founding members). However, the change in multinationality was much more important as compared to concentration. The observed change in multinationality mitigated intra-EU12 VT growth by about 2.3 percentage points (i.e. 4.7 percent). In terms of percentage points, multinationality accounted for the

strongest reduction in possible VT growth in trade relations of the southern EU economies with the other EU member states.

The main reason behind the differences between the effects across integration groups is the difference in the observed levels and changes in the cost difference and, especially, trade costs. Noteworthy, the reported growth rates of these two variables are not weighted. Weighting them by concentration or multinationality (not reported) results in a shift of the growth rates, which on average is in favour of EU integration of the core and the North. Hence, mainly the difference in the level and change in trade costs drives the differences in the effects of concentration and multinationality. Changes in an industry's multinationality were strongest in those industries, where transportation costs are high.

> Table 4 <

In order to assess the effects on intra EU12 integration, the comparison of the 1997 intra-group VT shares from the observed and the counterfactual scenario in overall intra-EU12 trade is appropriate. It normalises the overall volume of trade and concentrates on the relative weight of the respective intra-group trade. Again, the simulations are drawn on the results from Model 2. The observed changes in the weights of the respective EU-country group shares are small, since the underlying period is relatively short. Therefore, Table 4 reports the difference in terms of signs between the respective group share in real manufacturing VT for the observed and the simulated scenario. ”-” indicates that the share was reduced according to the observed change in concentration (multinationality) since 1990, and ”+” means that

it was increased. Accordingly, Table 4 provides information about the redistribution of VT within the EU12 area, which is only due to the change in concentration (multinationality). From the second column of the table, we see that real VT within the core EU6 and between the peripheries (EU-North and EU-South) has lost importance in favour of trade within the peripheries and of the EU6 members with the peripheries because of the change in concentration, i.e. $a < (b + c + d + e + f)$ in terms of labels in Table 4. This could be interpreted as an *equalisation effect of concentration* in intra-EU exports. To some extent, the change in multinationality had the opposite effect and it dominates the impact of concentration. In general, the increase in multinationality has favoured the integration within and between the core and the North rather than the South, i.e. $(d + e + f) < 0$. This could be called the *polarisation effect of multinationality*. In sum, *polarisation* was stronger than *equalisation*, and the southern EU economies' intra-EU12 trade relations were reduced in relative terms due to the change in concentration and multinationality altogether. Hence, the increase in multinationality has reduced goods trade, and it has reallocated intra-EU12 trade activity from the southern EU economies to the core and the northern periphery.

4 Conclusions

For the first time, this paper provides insights in the importance of both market concentration and multinationality for intra-EU12 manufacturing goods trade flows. The results are widely in accordance with the bilateral reciprocal dumping model of trade and multinational activity. A marginal increase

in market concentration fosters bilateral intra-EU12 exports in the average industry, country and year. A marginal rise in multinationality has the opposite effect. Indirectly, this supports our view that intra-EU12 MNE activity is mainly horizontal and thereby substitutes trade. Taking the observed changes in both market concentration and multinationality between 1990 and 1997 as given, I undertake two simulations to figure out their overall effect on EU12 integration in terms of manufacturing goods trade. There is strong evidence that intra-EU12 trade growth has been mitigated because of both the change in market concentration and in multinationality with the latter much more important. Moreover, the change in market concentration has exerted an *equalisation effect* in terms of the relative importance of trade within and across the different country groups in the EU12 area, i.e. the core EU6 and the northern and southern peripheries, respectively. Nevertheless, we also observe a *polarisation effect* due to the change in multinationality, which outweighs the *equalisation effect*. Hence, the core countries' and the northern periphery's intra-EU goods trade activity were increased through this development at cost of the southern EU economies in relative terms. One main reason behind this development is that the southern EU periphery is specialised in industries, where transportation costs are high. According to both theory and evidence, a change in multinationality in such industries exerts a stronger negative impact than in their low-transport costs counterparts.

Due to missing data, the present research cannot resolve the question of whether increased transnational production activity of firms (i.e. integration in terms of multi-plant production) within the EU compensates the disin-

tegration in terms of trade of the southern EU. Consequently, the results cannot be interpreted in terms of welfare consequences. Nonetheless, the paper may contribute to the discussion about the effects of the trade cost reducing and multinationality enforcing measures such as intended by the *single market program* and provides insights that - at least in the short run - the interaction between trade cost reduction, market concentration and multinationality is important. It demonstrates, to which extent an EU12 country's specialisation in goods production, where transport costs are high and relatively persistent (such as in the southern EU) implies that trade volumes react more sensitive to increased EU-wide multinational activity.

Acknowledgements

I should like to thank Jeff Bergstrand, Wilhelm Kohler, Michael Pfaffermayr and Reinhilde Veugelers for helpful comments and Irene Langer for excellent assistance in the organisation of the database.

5 References

Andersson, Thomas and Torbjörn Fredriksson (2000), Distinction between Intermediate and Finished Products in Intra-Firm Trade, *International Journal of Industrial Organization* **18**, pp. 773-792.

Baldwin, Richard E., Rikard Forslid and Henrik Braconier (1999), Multinationals, Endogenous Growth and Technological Spillovers: Theory and Evidence, CEPR Discussion Paper No. 2155.

Bergsten, Fred C., Thomas Horst and Theodore H. Moran (1978), *American Multinationals and American Interests* (Washington: Brookings Institution).

Blomström, Magnus, Ksenia Kulchycky and Robert E. Lipsey (1988), US and Swedish Direct Investment and Exports, in Robert E. Baldwin (ed.), *Trade Policy Issues and Empirical Analysis* (Chicago and London: University of Chicago Press), pp. 259-297.

Blonigen, Bruce A. (2001), In Search of Substitution between Foreign Production and Exports, *Journal of International Economics* **53**, pp. 81-104.

Brander, James A. (1981), Intra-industry Trade in Identical Commodities, *Journal of International Economics* **11**, pp. 1-14.

Caves, Richard E. (1981), Intra-industry Trade and Market Structure in the Industrial Countries, *Oxford Economic Papers* **33**, pp. 203-223.

Caves, Richard E. (1996), *Multinational Enterprise and Economic Analysis*, 2nd edition (Cambridge: Cambridge University Press).

Davies, Stephen and Bruce Lyons, eds., (1996), *Industrial Organization in the European Union: Structure, Strategy, and the Competitive Mechanism* (Oxford: Oxford University Press).

Greene, William H. (1997), *Econometric Analysis*, 3rd edition (London: Prentice-Hall).

tice Hall, Inc.).

Helpman, Elhanan (1984), A Simple Theory of Trade with Multinational Corporations, *Journal of Political Economy* 92, pp. 451-471.

Krugman, Paul R. (1979), Increasing Returns, Monopolistic Competition, and International Trade, *Journal of International Economics* 9, pp. 469-479.

Krugman, Paul R. (1980), Scale Economies, Product Differentiation, and the Pattern of Trade, *American Economic Review* 70, pp. 950-959.

Lipsey, Robert E. and Merle Y. Weiss (1981), Foreign Production and Exports in Manufacturing Industries, *Review of Economics and Statistics* 63, pp. 488-494.

Markusen, James R. (1981), Trade and the Gains from Trade with Imperfect Competition, *Journal of International Economics* 11, pp. 531-551.

Markusen, James R. and Anthony Venables (1998), Multinational Firms and the New Trade Theory, *Journal of International Economics* 46, pp. 183-203.

Markusen, James R. and Anthony Venables (2000), The Theory of Endowment, Intra-industry and Multi-national Trade, *Journal of International Economics* 52, pp. 209-234.

Martin, Stephen (1991), Direct Foreign Investment in the United States, *Journal of Economic Behaviour and Organization* **5**, pp. 71-89.

Pagoulatos, Emilio and Robert Sorensen (1975), Two-way International Trade: An Econometric Analysis, *Weltwirtschaftliches Archiv* **111**, pp. 454-465.

Pagoulatos, Emilio and Robert Sorensen (1976), Domestic Market Structure and International Trade: An Empirical Analysis, *Quarterly Review of Economics and Business* **16**, pp. 45-59.

Pirotte, Alain (1999), Convergence of the Static Estimation toward the Long Run Effects of Dynamic Panel Data Models, *Economics Letters* **63**, pp. 151-158.

Sleuwaegen, Leo and Reinhilde Veugelers (coord.) (2001), *Determinants of Industrial Concentration, Market Integration and Efficiency in the European Union*, Study on behalf of DG Economic and Financial Affairs, European Commission, Brussels.

6 Appendix

6.1 Proof of Proposition 1

This can be seen from the first derivatives of (7) with respect to the variables of interest:

$$\frac{\partial nx_i}{\partial a_j} = \frac{(1-\theta)\tilde{n}}{2b(\tilde{n}+1)} > 0 \quad (9)$$

$$\frac{\partial nx_i}{\partial(c_j - c_i)} = \frac{(1-\theta)(1+\theta)\theta\tilde{n}^2}{4b(\tilde{n}+1)} > 0 \quad (10)$$

$$\frac{\partial nx_i}{\partial t} = -\frac{(1-\theta)\tilde{n}(2+\tilde{n}(1+\theta))}{4b(\tilde{n}+1)} < 0 \quad (11)$$

$$\begin{aligned} \frac{\partial nx_i}{\partial \tilde{n}} &= \frac{1-\theta}{2b(\tilde{n}+1)^2} \left(a_j - c_i - t + \frac{\tilde{n}(\tilde{n}+2)(1+\theta)}{2}(c_j - c_i - t) \right) \\ &\stackrel{\geq}{\leq} 0 \end{aligned} \quad (12)$$

$$\frac{\partial nx_i}{\partial \theta} = -\frac{\tilde{n}}{2b(\tilde{n}+1)} (a_j - c_i - t + \theta\tilde{n}(c_j - c_i - t)) > 0, \quad (13)$$

since positive exports ($nx_i > 0$) require

$$a_j - c_i - t > -\frac{(1+\theta)\tilde{n}}{2}(c_j - c_i - t) \quad (14)$$

and $\frac{\partial nx_i}{\partial \theta} > 0$ requires

$$a_j - c_i - t > -\theta\tilde{n}(c_j - c_i - t). \quad (15)$$

The latter holds true for all $\theta > 0$, since

$$\frac{(1+\theta)\tilde{n}}{2} > \theta\tilde{n}. \quad (16)$$

As (12) indicates, exports from i to j are the more likely increasing with the number of firms, the lower the cost *disadvantage* of country i firms with

respect to country j ones and/or the lower the transportation costs. This motivates the interaction terms in the empirical analysis. If the countries are symmetric (i.e. there are no cost differences), an increase in \tilde{n} (i.e. a decrease in C) unambiguously fosters bilateral exports.

Moreover, (13) is strictly positive. The smaller the cost *advantage* of country i ($c_j - c_i$) or the higher trade costs (t) are, the less are bilateral exports decreasing in the share of multinationals (θ). In other words, the higher trade costs are or the lower the cost advantage of country i is, the less exports are decreasing in the multinationality (M), at a given number of firms (\tilde{n}) and rate of market concentration (C). ■

Table 1: The Determinants of Intra-EU12 Industry Exports (1990, 1993, 1997)
Dependent Variable is Real Bilateral Nace 3-Digit Industry Exports

Independent Variables	Fixed Effects Models		
	Model 1	Model 2	Model 3
Constant	8.022 ***) (0.269)	8.050 ***) (0.211)	8.041 ***) (0.207)
Domestic apparent consumption (a_{ikt})	-0.002 (0.029)	- -	- -
Foreign apparent consumption (a_{jkt})	0.226 ***) (0.027)	0.221 ***) (0.027)	0.223 ***) (0.027)
Domestic unit labor costs (c_{ikt})	0.000 (0.046)	-0.003 0.042	- -
Difference in unit labor costs (d_{ijkt})	1.257 ***) (0.370)	1.095 ***) (0.365)	0.643 ***) (0.170)
EU12 market share of largest 5 firms (C_{kt})	0.581 ***) (0.132)	0.568 ***) (0.130)	0.569 ***) (0.129)
Multinationality on the EU12 market (M_{kt})	-0.133 (0.119)	-0.143 (0.119)	-0.143 (0.119)
Transport costs (t_{ijkt})	-0.591 ***) (0.117)	-0.612 ***) (0.115)	-0.608 ***) (0.115)
Interaction terms:			
$d_{ijkt} * C_{kt}$	-1.238 ***) (0.327)	-1.078 ***) (0.320)	-1.114 ***) (0.291)
$d_{ijkt} * M_{kt}$	-0.908 *) (0.558)	-0.811 0.556	- -
$t_{ijkt} * C_{kt}$	0.259 **) (0.117)	0.297 ***) (0.113)	0.314 ***) (0.112)
$t_{ijkt} * M_{kt}$	0.291 *) (0.180)	0.352 *) (0.176)	0.344 *) (0.175)
Observations	21649	21892	21892
Cross-sections	7349	7382	7382
R^2	0.999	0.999	0.998
Time effects ^{a)}	274.54 ***)	291.46 ***)	291.55 ***)
Bilateral-industry effects ^{b)}	15.09 ***)	20.38 ***)	20.42 ***)
Hausman test ^{c)}	821.35 ***)	346.95 ***)	338.39 ***)

a) Distributed as F(2,14287) in Model 1, as F(2,14498) in Model 2 and as F(2,14500) in Model 3. - b) Distributed as F(7348,14287) in Model 1, as F(7381, 14498) in Model 2 and as F(7381,14500) in Model 3. - c) Distributed as $\chi^2(13)$ in Model 1, as $\chi^2(12)$ in Model 2 and as $\chi^2(10)$ in Model 3.

Standard errors in parentheses. - ***) significant at 1%; **) significant at 5%; *) significant at 10%.

Table 2: The Marginal Effects of Changes in Concentration and Multinationality on Intra-EU12 Manufacturing Industry Exports

Independent Variables	Fixed Effects Models					
	Model 1	Theory ¹⁾	Model 2	Theory ¹⁾	Model 3	Theory ¹⁾
Domestic apparent consumption (a_{ikt}): ²⁾						
μ	-0.0021	?	-		-	
$\sigma(\mu)$	(0.0290)		-		-	
Foreign apparent consumption (a_{jkt}): ²⁾						
μ	0.2256 ***)	yes	0.2209 ***)	yes	0.2228 ***)	yes
$\sigma(\mu)$	(0.0273)		(0.0270)		(0.0266)	
Domestic unit labor costs (c_{ikt}): ²⁾						
μ	-0.0005	?	-0.0031	?	-	
$\sigma(\mu)$	(0.0461)		(0.0423)		-	
Difference in unit labor costs (d_{ijkt}):						
μ	0.4050	?	0.3410	?	-0.2650 **)	no
$\sigma(\mu)$	(0.4232)		(0.4168)		(0.1648)	
σ_{μ}	0.2818		0.2472		0.2030	
EU12 market share of largest 5 firms (C_{kt}):						
μ	0.5648 ***)	yes	0.5490 ***)	yes	0.5495 ***)	yes
$\sigma(\mu)$	(0.1319)		(0.1296)		(0.1292)	
σ_{μ}	0.2332		0.2137		0.2221	
Multinationality on the EU12 market (M_{kt}):						
μ	-0.1511	yes	-0.1661 *)	yes	-0.1652 *)	yes
$\sigma(\mu)$	(0.1183)		(0.1178)		(0.1078)	
σ_{μ}	0.1872		0.1861		0.1974	
Transport costs (t_{ijkt})						
μ	-0.3508 ***)	yes	-0.3251 ***)	yes	-0.9517 ***)	yes
$\sigma(\mu)$	(0.1364)		(0.1341)		(0.3338)	
σ_{μ}	0.0686		0.0806		0.0823	

1) "yes" ("no") indicate, whether the significant empirical findings are in accordance with (rejecting) the theoretical priors; "?" indicates that the estimated effects are insignificant. - 2) The reported coefficients and standard errors are equivalent to those in Table 1, since the respective variables do not take part in the interaction terms.

Standard errors in parentheses. - ***) significant at 1 percent; *) significant at 10 percent.

Table 3: Assessing the Impact of the Change in Concentration and Multinationality on EU12 Integration in Terms of Real Trade Volume Growth (1990-1997; Model 2)

Integration Block	Observed growth in % of			Simulating the impact of	
	real trade volume	cost difference ^{a)}	trade costs	Concentration	Multinationality
	Simulated - observed growth ^{b)}				
Intra-EU-6	49.74	-0.02	-12.57	0.52	2.09
EU-6 with EU-North	49.79	-0.03	-4.64	0.41	2.07
Intra-EU-North	52.08	0.07	-1.66	0.38	2.06
EU-6 with EU-South	49.13	0.28	-9.70	0.43	2.61
Intra-EU-South	46.18	0.58	3.23	0.17	2.51
EU-North with EU-South	50.00	1.21	-11.35	0.98	2.94
Total Intra-EU-12	49.60	0.26	-8.06	0.50	2.35

a) This is the percentage point difference in the foreign to domestic country unit labour cost ratio. It is calculated on the basis of the foreign unit labour cost as percent of domestic unit labour cost. - b) The underlying increase in concentration in the average industry is 0.43% and that of multinationality is 13.10% (1990-1997).

Table 4: Concentration, Multinationality and the Change in Real Intra-Group Shares in EU12 Trade (1997; Model2)

Integration Block	Simulating the impact of	
	Concentration	Multinationality
	Observed - simulated 1997 share	
Intra-EU-6 (a)	-	+
EU-6 with EU-North (b)	+	+
Intra-EU-North (c)	+	+
EU-6 with EU-South (d)	+	-
Intra-EU-South (e)	+	-
EU-North with EU-South (f)	-	-

The *equalization effect of concentration* means: $a < (b+c+d+e+f)$. The *polarization effect of multinationality* means: $(d+e+f) < 0$.

© 2001 Österreichisches Institut für Wirtschaftsforschung

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • Wien 3, Arsenal,
Objekt 20 • A-1103 Wien, Postfach 91 • Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 •
<http://www.wifo.ac.at/> • Verlags- und Herstellungsort: Wien

Die Working Papers geben nicht notwendigerweise die Meinung des WIFO wieder

Verkaufspreis: ATS 100,- bzw. EUR 7,27