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Country Size and the Gains from Trade Bloc Enlargement: an Empirical Assessment for the European Community*

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Abstract

Modern trade theory suggests that size matters in determining the allocation of the gains from enlarging a trade bloc among its members. Casella (1996), as a prominent example, postulates that small members gain relatively more. In this paper we provide a comprehensive assessment for the case of European integration, using aggregate and sectoral trade data over the period 1960–90. The Casella hypothesis of a general small country bonus is rejected; a possible interpretation is the coexistence of economic forces favoring large countries (due to group ties and advantages in absolute factor endowments), which partly offset or even dominate the small country bonus.

1. Introduction

How are the gains from enlarging a trade bloc shared among its Member States? Are there forces that systematically favor small or large countries? If the distribution of political power within the trade bloc agreement is influenced by the perceived distribution of economic gains, this question is not without policy relevance. Despite its potential importance, economic theory is largely silent on this issue. The neoclassical literature on international trade in the tradition of the Heckscher–Ohlin model, based on the assumption of constant returns to scale, leaves little room for country size to influence trade patterns or the gains from moving from autarky to integration.

In the last two decades, two important lines of research have emerged where increasing rather than constant returns to scale are an important assumption: new economic geography and trade theory (Helpman and Krugman, 1985; Krugman and Venables, 1990) and new growth theory (Romer, 1990; Grossman and Helpman, 1991; Aghion and Howitt, 1998). Assuming increasing returns to scale, the size of firms (countries) becomes an important factor and provides a framework to investigate the research question of this paper. Two indirect conclusions can be drawn from these two lines of theory. New geography—new trade theory models mainly predict that large countries tend to be net exporters in scale-intensive industries. Similarly, new growth models often predict that the absolute endowment with human capital drives innovation (Romer, 1990), giving large countries a dynamic comparative advantage if knowledge does not flow freely across borders. Consequently, large countries tend to be net exporters in R&D-intensive sectors. Torstensson (1998) presents a model

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summarizing these two arguments and finds some supporting evidence for a sample of OECD countries.

Along these lines one might conclude that large countries should gain more from integration, because the existence of economies of scale and the relevance of absolute factor endowment makes them more competitive so that they can exploit the removal of tariff barriers better than small countries. It should be noted, however, that these arguments are only indirectly related to the issue how gains from trade bloc enlargement are distributed among the old member countries. Actually, there appears to be only one model (Casella, 1996), that deals explicitly with this question, which is more specific than that of the gains from integration in general. The conclusion arising from this model is quite different: Casella argues that the assumption of a large country bonus is a mistaken view, because it ignores the original cause of the difference in the economic performance of large and small countries: the importance of the domestic market. Enlarging a trade bloc increases the size of the market to which all countries have easy access; this increase will be more significant for firms located in small countries, whose own domestic market is small. This means that the increases in competitiveness are relatively larger for (firms in) small countries, so that the entry of new members in a trade bloc will favor particularly small countries. Casella also tests this proposition for the case of the EC enlargement by Portugal and Spain, but obtains mixed results.

Given the theoretical ambiguity and the lack of evidence, both more theoretical and empirical work is required on the important question, whether there are systematic asymmetries in the gains from enlarging a trade bloc with respect to country size. In this paper we extend the few empirical tests carried out so far along several lines and provide a comprehensive assessment for the case of European integration. The results suggest that size matters; the direction, however, is not unambiguous. A possible interpretation is the coexistence of several economic forces, some of which tend to favor small countries, some of which tend to favor large countries. A compelling argument of a small country bonus is provided by Casella (1996). On the other hand, the potential relevance of absolute factor endowments (human capital), larger market power and better group ties as stressed by Casella and Rauch (2002, 2003), e.g. due to relatively more multinational enterprises, may pose an advantage for large countries.

The remainder of the paper is organized as follows. Section 2 sets up the empirical model based on Casella (1996) and discusses several extensions of the empirical tests conducted so far. Section 3 presents the results of the estimation. Finally, section 4 summarizes the results and concludes.

2. Theoretical Background and the Empirical Model

Since the model provided by Casella (1996) is the only model that is tailored to address our research question, it provides the natural reference point for our empirical analysis. Before turning to the empirical model and suggesting some extensions, we briefly review the theoretical model.

In the model by Casella, which builds on the Krugman-type model by Baldwin (1993), the world consists of N countries, part of them belonging to the trade bloc. Economies of scale allow firms with a larger domestic market to produce at lower costs. Obstacles to trade are equal to zero at the domestic market, take a positive value within the trade bloc, and are highest for trade with countries outside the trade bloc. Two factors are employed in the production of K different goods: skilled labor (immobile) and unskilled labor (mobile within the trade bloc). The presence of fixed costs implies

that each firm specializes in the production of one variety. An equilibrium of this model specifies all prices of the goods, the distribution of low-skilled workers among the countries in the trade bloc, wages and profits such that all markets clear, consumers maximize their utility, firms maximize profits, and no low-skilled workers can benefit from migration within the trade bloc.

What happens now, if a number of countries previously outside the bloc enter the trade agreement? The changes in equilibrium are triggered by the possibility of migration and changes in consumer prices. For a detailed discussion of the model see Casella (1996). Nevertheless, as Casella argues, the main lessons the model teaches can be read more broadly, the economic intuition being as follows: enlarging a trade bloc increases the size of the market that a firm can reach with relative ease. This increase will be more significant for firms located in small countries, whose own domestic market is small. This means that the increases in competitiveness are relatively larger for (firms in) small countries, so that the entry of new members in a trade bloc will favor particularly small countries. This conclusion is reached by Casella both analytically as well as in a number of numerical simulations. This theoretical result, which we call the "Casella effect," lends itself directly to empirical testing by the study of the development of relative sales (export) volumes.

An important question is how an increase in relative exports may be related to gains from trade in terms of welfare. In the context of the model by Casella (1996), differences in the welfare of the trading bloc's countries are due to differences in aggregate utility of skilled workers (utility of unskilled workers is equal across countries in equilibrium). As Casella (1996, p. 405) shows, an improvement in relative sales is—under some technical assumptions regarding the elasticity of demand—always associated with an improvement in the relative welfare position; thus in the context of our reference model, it is indeed gains in terms of welfare that are considered. Of course, however, this interpretation hinges on the specific assumptions of the Casella model and cannot be generalized in terms of traditional welfare measures such as consumer and producer surplus. So if the message of the model is to be read more broadly, the conclusions have to be qualified: instead of gains in welfare it appears to be more appropriate to speak of relative enhancement of exports due to an improvement in the small countries' competitiveness over large countries, resulting from a relatively larger increase in market size.

Our point of departure is the testing strategy pursued by Casella, which is based on the following empirical model:

$$\ln \frac{X^j_{L,t}}{X^j_{S,t}} = \alpha + \beta_1 \ln \frac{GDP_{L,t}}{GDP_{S,t}} + \beta_2 \ln ER_{L,t} + \gamma D^C_{j,t} + u_t, \tag{1}$$

where $X^j_{L,t}$ ($X^j_{S,t}$) = real[1] exports from large country L (small country S) to the acceding country j, $GDP_{L,t}$ ($GDP_{S,t}$) = real GDP of large country L (small country S), $ER_{L,t}$ = real exchange rate of large country L, $D^C_{j,t}$ = dummy (zero before country j joined the trade bloc and 1 afterwards), t is a time index, and u_t is a standard error term.

The GDP ratio captures changes in the country size. The real effective exchange rate is included to control for variations in the competitiveness that are independent of the enlargement of the European Community (EC). Obviously, the model by Casella predicts that the parameter of $D^C(\gamma)$ is negative, reflecting the hypothesis that small countries of the trade bloc gain relatively more in trade with the new Member State than larger countries.

Casella puts forward three arguments for this specification in ratios: first, it induces stationarity in the data; secondly, it follows directly the implications of her model;[2] thirdly, it implicitly controls for shocks in the new Member States that have a similar effect on trade flows with the old members (e.g. the advent of democracy in the case of Spain). We follow this specification in ratios to obtain comparable results. However, it should be noted that equation (1), in ratios, is consistent with simple versions of the gravity equation where time-invariant determinants like distance are captured by the constant. Consequently, this specification provides a fairly general framework and of course also nests the hypothesis of a large country bonus, which would be indicated by a positive estimate of γ.

Casella uses the empirical model (1) with annual data over the time period 1975 to 1992 to test the predictions of her model for two cases: the EC accession of Portugal and Spain in 1986. Accordingly the dummy D^C takes values of zero for the period 1975–85, and of one for the period 1986–92. At this time the EC contained 10 Member States, four of which are considered as large countries (DE, FR, IT, UK), the rest as small (BE, DK, GR, IE, LUX, NL). As Casella excludes GR and LUX from the analysis she is left with 16 ratios of large to small countries' exports to Spain and Portugal, i.e. 32 single equations to test the predictions of her model reflected in the dummy D^C. The results are mixed: in 11 cases the coefficient is significant and takes the expected negative sign; in 14 cases it turns out insignificant; in seven cases it is significantly positive. Comparable results are obtained in a system approach for each large country (France, Germany, Italy, United Kingdom) in which the null of nonpositive dummies is rejected in two cases (Germany, Italy).

In this paper we extend the empirical tests of the Casella hypothesis conducted so far along four lines: (i) we use longer time series to add testable cases (as the first EC enlargement in 1973); (ii) we use a panel instead of a time-series approach in order to control for time-specific effects; (iii) we control for the intra-industry trade set-up in the Casella model; (iv) we account for the assumption of increasing returns.

(i) Given the availability of data it suggests itself to use longer time series in order to test the Casella hypothesis for the case of the first EC enlargement in 1973 by DK, IE, UK. Also note that at approximately the same time, from 1973 to 1977, the EC and the EFTA countries (AT, CH, IS, NO, PT, SE) and also FI liberalized their trade relationships with the EC by concluding free-trade agreements. In the theoretical model we refer to, joining a trade bloc means nothing more than a reduction of the joining country's trade costs *vis-à-vis* all "old" members of the trade bloc and, simultaneously, a joint reduction of these old members' trade costs *vis-à-vis* the joining country. Clearly, tariffs had been the major source of trade costs in the EC, in particular in the time before the Single Market was implemented in 1993.[3] Thus, further tests of the Casella hypothesis can be conducted considering the development of the export flows of the (original six) EC members to the EFTA members (of which we use only AT, PT, and SE) as well as FI. Table 1 summarizes all testable cases that emerge from the first three EC enlargements and the establishment of the free-trade area between the EC and the EFTA in the 1970s. Our sample with its large differences between large and small countries—GDP ratios (averages over the period 1960 to 1990) range from 1.8 (BLX/DK) to 36.0 (DE/IE)—offers a particularly valuable source to test for asymmetries in the gains from trade bloc enlargement, which might not show up empirically in trade blocs consisting of countries of similar size.

As an additional issue it has to be borne in mind that in the 1970s several countries "joined" the EC at the same time. Casella (1996), analyzing the enlargement by only one country, is silent on whether it is more appropriate to consider separate export

Table 1. Overview of Testable Enlargements

Enlargements	*Large countries of EC (prior to accession)*	*Small countries of EC (prior to accession)*	*Tariff reductions (starting year)*[c]	*Number of equations*
First enlargement by DK, IE, UK in 1973	DE, IT, FR	BLX, NL	1973–77	$3 \times (3 \times 2) = 18$
Free-trade agreements of EC with EFTA countries AT, FI, SE, PT[a]	DE, IT, FR	BLX, NL	1973–77	$4 \times (3 \times 2) = 24$
Second enlargement by GR in 1981[b]	DE, IT, FR, UK, BLX, NL	DK, IE (BLX, NL)	1981–85	$1 \times (6 \times 2) = 12$ $(1 \times (4 \times 2) = 8)$
Third enlargement by ES (PT) in 1986[b]	DE, IT, FR, UK, BLX, NL	DK, IE, GR (BLX, NL)	1986–90	$1 \times (6 \times 3) = 18$ $(1 \times (4 \times 2) = 8)$
Total				88

Notes: Belgium and Luxembourg are treated as one country for reasons of data availability.
[a] The actual enlargement by these countries took place at a later point of time (PT: 86; AT, FI, SE: 95), but as outlined above, the free-trade arrangements of the 1970s can be treated as enlargements in the context of the theoretical model.
[b] BLX and NL can be considered both as large (relative to DK and IE) and small (relative to DE, IT, FR, and UK).
[c] For the first enlargement and the free-trade agreements, a transition period of five years was assumed, according to Breuss (1983) and El-Agraa (2001); the same timing was assumed for the accessions of Greece and Spain.

flows to each acceding country or aggregate exports to all acceding countries. None of these two variants can be preferred *a priori*; we will thus pursue both approaches and discuss this issue further in section 3 below.

(ii) There is always a problem with the use of dummies to capture any particular structural change. In particular, these dummies may be correlated with other unobserved variables, causing an omitted variable bias and invalidating inference. Including time dummies in the specification would partly solve this problem, but a time-series analysis would run out of degrees of freedom. This recommends the specification of a panel data model of (1) with cross-section invariant, time-specific effects included. On the other hand, cross-section-specific, time-invariant variables, common in gravity-type equations (such as distance, common border, common language, etc.) are captured in the cross-section-specific intercepts.

(iii) It is important to bear in mind that in Casella's set-up, trade is intra-industry. If trade is Heckscher–Ohlin, then the parameter of D^C could have any sign. In fact, it will depend on the relative factor endowment of the large and the small members, as well as that of the new member (and not the relative size of the member country). Countries with a larger capital–labor differential with respect to the new country would be expected to benefit more from enlargement. Thus, at least if aggregate trade flows are used, it is important to control for the relative capital–labor ratio (K/L) of the large and the small countries, where a positive sign would be expected; at the sectoral level, where a large share of trade may be considered as intra-industry, this control variable is probably less relevant.

(iv) For size to matter economies of scale must be present: with constant returns to scale there is no Casella effect. Since we cannot take it for granted that there are increasing returns at the aggregate level, we step down to the manufacturing level, where increasing returns are more likely to be prevalent in the European countries (see Henriksen et al., 2001).[4] Here we consider total manufacturing, as well as four subgroups: (1) food, beverages, and tobacco; (2) chemicals and related products; (3) machinery and transport equipment; (4) other manufactured goods. Table A1 in the Appendix shows the definition of the industry clusters in terms of the SITC and ISIC codes.

Finally we note that, generally, inflows of FDIs due to enlargement may also affect a country's competitiveness and thus the relative export performance. However, FDIs are not dealt with in the Casella model; moreover, there is no comprehensive data on FDIs for our period of investigation. Given the fairly limited role for FDIs in the 1970s (when most of the considered enlargements took place), the omission of this potentially important control variable appears to be justifiable.

Since the analysis is carried out at six different levels of aggregation (aggregate, total manufacturing, and four subsectors of manufacturing), we have six separate panel data models, each of which takes the following form:

$$\ln \frac{X^{j}_{L,t}}{X^{j}_{S,t}} = \alpha_{LSj} + \beta_1 \ln \frac{GDP_{L,t}}{GDP_{S,t}} + \beta_2 \ln ER_{L,t} + \beta_3 \ln \frac{(K/L)_{L,t}}{(K/L)_{S,t}} + \gamma_{LS} D^{C}_{j,t} + \eta_t + u_{LSj,t}, \tag{2}$$

where α_{LSj} denotes the cross-section-specific fixed effects, η_t are the time-specific effects, and u_{LSj} is an i.i.d.$(0, \sigma_u^2)$ error term. A detailed description of the data used is given in the Appendix.

To simplify the notation we denote the relative variables (large to small countries) by superscript REL, which gives us

$$\ln X^{REL}_{i,t} = \alpha_i + \beta_1 \ln GDP^{REL}_{i,t} + \beta_2 \ln ER_{i,t} + \beta_3 \ln (K/L)^{REL}_{i,t} + \gamma_i D^{C}_{j,t} + u_{i,t}. \tag{3}$$

The parameter of the dummy $D^{C}(\gamma)$ is allowed to vary across the cross-section units i, which correspond to the 88 cases summarized in Table 1 ($i = 1, \ldots, 88$). Since no industry-level data for exports of Ireland are available, the cross-section dimension at the industry level is reduced to $i = 76$. The time period of our sample ranges from 1960 to 1990; due to data constraints the sample with the sectoral data starts in 1965.[5]

This means that, in sum, we have $(88 + 5 \times 76 =)$ 468 cases on which we test the Casella hypothesis. This will give a comprehensive picture of the gains in trade from enlargement and its distribution with respect to country size for the case of European integration.

3. Results of Estimation

Tables 2a and 2b summarize the results of the estimation of equation (3) for different levels of aggregation. Time-specific effects were included to control for unobserved country-invariant effects. A first observation is that the relative GDP (relative value-added at the sectoral level) enters with the expected positive sign in most of the cases. However, in two sectors (food, beverages, and tobacco; chemicals and related products) it turns out insignificant. This is difficult to explain since GDP of the sender country is an important determinant of trade in standard gravity models. Consequently, the results for these two sectors should not be overstressed.

The relative capital–labor ratio is only (weakly) significant (close to the 10% level) at the aggregate level; using more disaggregated data, it turned out insignificant and/or

Table 2a. Results for Separate Trade Flows (*dependent variable:* $\ln X_i^{REL}$)

	Aggregate	*Manufacturing*	*Food, beverages, and tobacco*	*Chemicals and related products*	*Machinery, transport equipment*	*Other manufacturing goods*
$\ln GDP_i^{REL}$	1.768**	0.463**	—	—	0.904**	0.836**
	(11.37)	(2.71)	—	—	(6.44)	(7.79)
$\ln ER_i$	—	—	—	—	0.644**	0.266*
	—	—	—	—	(3.84)	(2.51)
$\ln(K/L)_i^{REL}$	0.190	—	—	—	—	—
	(1.61)	—	—	—	—	—
D_j^C	Cross-section-specific coefficients of D_j^C are given in Table 2b					
Regression statistics						
Adj. R^2	0.967	0.972	0.893	0.912	0.956	0.945
SEE	0.249	0.205	0.461	0.559	0.414	0.313
N	88	76	76	76	76	76
T	31	26	26	26	26	26
No. of observations	2728	1976	1976	1976	1976	1976

Note: *t*-Values in parentheses.

Table 2b. Cross-section-specific Coefficients of Casella Dummy D_j^C

Ratio	Trade flow	Aggregate	Manufacturing	Food, beverages, and tobacco	Chemicals and related products	Machinery, transport equipment	Other manufacturing goods
DE/BLX	DK	0.053	–0.010	–0.129	–0.806***	–0.362***	0.519***
	IE	0.228*	–0.033	–1.450**	0.252	0.056	0.071
	UK	0.218**	–0.035	0.503**	–0.914**	0.185*	0.290**
	AT	–0.024	–0.181**	0.321*	–0.459	–0.338**	0.318**
	FI	0.015	–0.142**	0.240	–0.335	–0.418**	0.385**
	SE	0.042	0.003	0.251*	–0.513*	–0.112	0.410**
	PT	0.157	–0.050	–0.573*	–0.833**	0.356*	0.356**
	GR	0.304**	0.175**	1.855**	–0.446	0.023	0.669**
	ES	–0.035	–0.066	0.307	–0.516	–0.571**	0.509**
DE/NL	DK	–0.094*	–0.169**	–0.267*	–0.426	0.202*	–0.067
	IE	0.061	–0.084	–0.049	–0.290	0.128	0.255**
	UK	0.608**	0.320**	0.986**	–0.358	0.513**	0.322**
	AT	0.195**	0.081**	0.095	–0.629**	0.198**	0.445**
	FI	0.032	–0.173**	0.071	–0.295	–0.027	0.020
	SE	0.221**	–0.070	0.182	–0.375	–0.051	0.158**
	PT	–0.320**	–0.502**	–0.342*	–0.589*	–0.280*	–0.407**
	GR	–0.457**	–0.576**	1.619**	–0.391	–0.320*	–0.270**
	ES	0.047	0.050	0.265**	–0.169	0.113	0.178*
DE/DK	GR	–0.580**	–0.558**	1.278**	–0.274	–0.169	–0.778**
	ES	0.056	0.058	0.862**	–0.147	0.255*	–0.491**
DE/IE	GR	–0.851**	—	—	—	—	—
	ES	–0.328**	—	—	—	—	—
DE/GR	ES	0.246*	–0.394**	0.386	–0.769**	–2.267**	–0.752**
FR/BLX	DK	0.104	0.167*	–0.404**	–0.325	–0.228	0.585**
	IE	0.720**	0.520**	–1.481**	0.544*	0.806**	0.535**
	UK	0.160*	0.191**	–0.371*	–0.177	0.542**	0.480**
	AT	–0.056	–0.030	0.375*	–0.231	–0.141	0.369**
	FI	–0.014	0.065	–0.594**	–0.051	–0.066	0.444**
	SE	0.237**	0.288**	0.157	–0.109	0.262	0.572**
	PT	0.535**	0.439**	–0.822**	–0.052	0.936**	0.594**

	GR	0.309**	0.293**	0.396**	−0.267	0.109	0.696**
	ES	0.029	0.069	0.062	−0.368	−0.412**	0.623**
FR/NL	DK	−0.043	−0.067	−0.542**	0.055	0.195*	−0.140*
	IE	0.553**	0.395**	−0.079	0.001	0.738**	0.580**
	UK	0.549**	0.472**	0.112	0.378	0.729**	0.373**
	AT	0.163**	0.158**	0.149	−0.402	0.255**	0.358**
	FI	0.003	−0.040	−0.763**	−0.011	0.185	−0.060
	SE	0.416**	0.141**	0.087	0.030	0.181*	0.182**
	PT	0.057	−0.086	−0.591**	0.191	0.158	−0.308*
	GR	−0.452**	−0.492**	0.160	−0.212	−0.269**	−0.334**
	ES	0.111	0.173**	0.020	−0.021	0.291*	0.248*
FR/DK	GR	−0.575**	−0.474**	−0.181	−0.095	−0.118	−0.842**
	ES	0.120	0.181**	0.617**	0.001	0.433**	−0.421**
FR/IE	GR	−0.853**	—	—	—	—	—
	ES	−0.264**	—	—	—	—	—
FR/GR	ES	0.306*	−0.271*	0.141	−0.621*	−2.089**	−0.681**
IT/BLX	DK	0.032	−0.084	−0.711**	−0.647**	−0.636**	0.324**
	IE	0.581**	0.221	−1.088**	0.329	−0.069	0.383**
	UK	−0.094	−0.217**	−0.777**	−0.871**	−0.192*	0.034
	AT	−0.032	−0.119*	−0.423*	−0.230	−0.691**	0.520**
	FI	0.315**	0.104*	−0.791**	−0.204	−0.434**	0.643**
	SE	0.003	0.012	−0.387**	−0.360	−0.108	0.190*
	PT	0.493**	0.163*	0.212	−0.610*	0.337*	0.459**
	GR	0.339**	0.157**	0.747**	−0.391	0.015	0.739**
	ES	0.062	−0.058	0.272	−0.572*	−0.657**	0.722**
IT/NL	DK	−0.115	−0.243**	−0.850**	−0.267	−0.072	−0.262*
	IE	0.414**	0.170*	0.314*	−0.214	0.003	0.567**
	UK	0.296**	0.138**	−0.294**	−0.316	0.136	0.066
	AT	0.187**	0.143**	−0.649**	−0.401	−0.155	0.647**
	FI	0.333**	0.073	−0.960**	−0.164	−0.042	0.278**
	SE	0.181**	−0.060	−0.456**	−0.221	−0.047	−0.062
	PT	0.015	−0.288**	0.443	−0.366	−0.300*	−0.304*
	GR	−0.422**	−0.594**	0.512**	−0.336	−0.328*	−0.200*
	ES	0.144**	0.058	0.230*	−0.225	0.027	0.391**

Table 2b. Continued

Ratio	Trade flow	Aggregate	Manufacturing	Food, beverages, and tobacco	Chemicals and related products	Machinery, transport equipment	Other manufacturing goods
IT/DK	GR	–0.545**	–0.576**	0.171	–0.219	–0.177	–0.708**
	ES	0.153	0.066	0.827**	–0.203	0.169*	–0.278**
IT/IE	GR	–0.815**	—	—	—	—	—
	ES	–0.231*	—	—	—	—	—
IT/GR	ES	0.333*	–0.386**	0.351	–0.825**	–2.353**	–0.539**
UK/BLX	GR	0.050	–0.087	–0.132	–0.421	0.069	0.599**
	ES	–0.046	–0.121	–0.228	–0.355	–0.421**	0.400**
UK/NL	GR	–0.711**	–0.838**	–0.368*	–0.366	–0.274	–0.340**
	ES	0.035	–0.006	–0.270	–0.008	0.264*	0.069
UK/DK	GR	–0.834**	–0.820**	–0.709**	–0.249	–0.123	–0.848**
	ES	0.044	0.003	0.327**	0.014	0.405**	–0.601**
UK/IE	GR	–1.100**	—	—	—	—	—
	ES	–0.340**	—	—	—	—	—
UK/GR	ES	0.235	–0.449**	–0.149	–0.607*	–2.117**	–0.861**
NL/DK	GR	–0.054	–0.013	–0.274*	–0.031	0.386	–0.514**
	ES	0.108	0.014	0.732**	–0.073	0.319*	–0.673**
NL/IE	GR	–0.472**	—	—	—	—	—
	ES	–0.413**	—	—	—	—	—
NL/GR	ES	0.288*	–0.438**	0.256	–0.695*	–2.203**	–0.933**
BLX/DK	GR	–0.815**	–0.763**	–0.510**	0.024	–0.086	–1.506**
	ES	0.189**	0.130*	0.690**	0.274	0.942**	–1.029**
BLX/IE	GR	–1.076**	—	—	—	—	—
	ES	–0.199*	—	—	—	—	—
BLX/GR	ES	0.383**	–0.322*	0.214	–0.348	–1.580**	–1.289**
Negative		23	24	27	15	22	27
Insignificant		34	30	29	60	32	8
Positive		31	22	20	1	22	41
Total		88	76	76	76	76	76

Note: ***, **, * indicate significance at the 1%, 5%, 10% level, respectively.

showed the wrong sign. The straightforward interpretation is that trade in manufacturing is largely of intra-industry type, leaving no significant role for differences in endowments to explain trade patterns. We thus excluded the relative capital–labor ratio from the sectoral models.

Finally, the real effective exchange rate, used as a measure of changes in competitiveness irrespective of the enlargement, enters with the expected positive sign in only two cases. The overall fit of the models ranges from 89% to 96% in terms of the adjusted R^2.

The coefficients of the "Casella dummy" D^C, our variable of particular interest, are given in Table 2b. Overall, evidence for a small country bonus (i.e. a negative coefficient of D^C) shows up in only 29% of all 468 cases; equally often, a positive sign was obtained, suggesting a large country bonus. In 42% of the cases, however, D^C is insignificant, indicating no asymmetries in the effects of integration with respect to country size. Also note that there is no tendency for the number of negative coefficients to increase, as we move down to the sectoral level; this is also true for the sector "machinery and transport equipment," where we can expect pronounced economies of scale according to the results by Henriksen et al. (2001) (see above).

Also note that there is no apparent difference in the results if we restrict our attention to only the cases of true enlargement in Table 2b. In this case, of the 324 coefficients, 32% are negative, 28% positive, the rest insignificant. This similarity rules out that the conflicting results are due to the application of the bloc enlargement model to the free-trade agreements.

A first conclusion arising from these results is that the hypothesis of a general small country bonus as suggested by the Casella model is clearly rejected, given that the majority of the coefficients (some 70%) is inconsistent with the theoretical predictions, despite the fact that important control variables (such as the relative capital–labor ratio) are included and the sample is selected to match with the assumption of increasing returns. Nevertheless, there are a number of significant (positive and negative) coefficients. If one does not assume that this is a purely accidental outcome, this suggests that there may be country-size-related asymmetries in the effects of integration, where the direction is unclear. To put it differently: the model by Casella may describe an important aspect of reality, but it may draw only an incomplete picture of the forces that determine how the gains from integration are distributed between large and small countries. Hence, the Casella effect might coexist with forces favoring large countries.

Conventional economic wisdom suggests that these forces may be due to high market power and related terms-of-trade effects, advantages in competitiveness due to economies of scale and larger absolute endowments (particularly with human capital), larger product varieties (reflecting the greater scope for specialization), and consequently technological advantages. Indirectly, a theoretical background for some of these arguments is provided by models of new geography and new trade theory (such as Helpman and Krugman, 1985; Krugman and Venables, 1990), where the assumption of economies of scale typically implies that large countries tend to be net exporters in scale-intensive industries. Similarly, new growth models often predict that the absolute level endowment with human capital drives innovation (Romer, 1990; Grossman and Helpman, 1997; Aghion and Howitt, 1998), giving large countries a dynamic comparative advantage if knowledge does not flow freely across borders. Consequently, a large absolute endowment with human capital leads to net exports in R&D-intensive sectors. Torstensson (1998) presents a model summarizing these two arguments and finds some supporting evidence for a sample of OECD countries. Given the absence of an explicit model that would motivate a large country bonus, however, a consistent interpretation in a unified framework is lacking.

A further interesting interpretation of the positive coefficients is provided by the existence of group ties (see Casella and Rauch, 2002, 2003). These models assume that it is more difficult in the international than in the domestic market to find suitable business partners (such as distributors for goods, partners for joint ventures, etc.). International information-sharing networks help economic agents to improve their "matching technology" and to find suitable trade or investment partners in other countries. The trade-promoting role of such business networks has been confirmed in several studies (see Rauch, 2001, for a survey). If large countries have relatively more such group ties with the markets of the acceding countries at the time of enlargement this would partly explain the positive sign of some of the coefficients of D^C. Better ties of the large countries may be due to having relatively more multinational enterprises with subsidiaries on the new markets. Network externalities may be another explanation: if the expected utility of each participant increases with the size of the network, large countries may have an advantage in building up such networks.

These issues, however, lead us to a further crucial point: building up new business relationships may also be interpreted as imposing a fixed component on trade costs. This would imply that when the enlargement occurs firms would rather concentrate on one or a subset of all markets. For the second and third EC enlargements (by only one country) this point is irrelevant; for the first EC enlargement in 1973, however, the consideration of separate trade flows to the joining countries (and EFTA countries) may give a distorted picture. This suggests that rather than considering the separate trade flows, one should focus on aggregate trade flows, i.e. the sum of exports to the new markets (DK, IE, and UK as well as AT, FI, SE, PT).[6]

Table 3 shows the results when equation (3) is estimated using aggregate trade flows of the six original EC members to the new markets (DK, IE, UK, AT, FI, SE, PT). Here the cross-section dimension is reduced to six ratios, since at the time of the first enlargement in 1973 we have only three large (DE, IT, FR) and two small (BLX, NL) EC members and consider only one aggregate trade flow.

As far as the coefficients of GDP (value-added) and the real effective exchange rate are concerned, the results are comparable with those of Table 2. For the food etc. and chemicals sector, no meaningful results for these variables are obtained. The other sectors show the expected results: relative GDP (value-added) enters significantly; differences in relative endowment matter only at the aggregate level, not at the industry level, where inter-industry trade no longer plays an important role. Moreover, the real effective exchange rate enters with the expected sign in most cases.

If we turn our attention to the coefficients of D^C (Table 3b) it is interesting to note that the share of positively significant coefficient increases to some 40% (compared with 29% in Table 2) while the share of negative coefficients drops to 22% (compared with 29% in Table 2). Only in the chemicals sector do the negative coefficients dominate; due to the problematic results of this sector, however, this should not be overstressed.[7] Of course the comparison with the overall results in Table 2 may be misleading, since the cases captured in Table 3 are only a subset of those in Table 2. If we compare the results in Table 3 with the corresponding results in Table 2 (i.e. only the first enlargement in 1973 and the free-trade agreements) the results turn out quite similar, whether aggregate or separate trade flows are used.[8] The shift towards this larger share is thus due to restricting our attention to the first enlargement round in the 1970s, where the large countries, particularly FR and also DE, appear to have gained over BLX and NL (see Table 3b).

Finally, we underline that—as for the analysis with separate trade flows in Table 2—our conclusions do not change, when only the true enlargements are considered, i.e. only the sum of exports to DK, IE, and UK are used in the estimation.

Table 3a. Results for Aggregate Trade Flows (dependent variable: $\ln X_i^{REL}$)

	Aggregate	*Manufacturing*	*Food, beverages, and tobacco*	*Chemicals and related products*	*Machinery, transport equipment*	*Other manufacturing goods*
$\ln GDP_i^{REL}$	1.433**	0.580**	—	—	0.845**	0.317*
	(5.92)	(4.07)	—	—	(6.15)	(2.21)
$\ln ER_i$	0.291**	0.312*	0.576**	—	0.422**	—
	(2.75)	(2.40)	(3.28)	—	(3.01)	—
$\ln(K/L)_i^{REL}$	0.565**	—	—	—	—	—
	(3.53)	—	—	—	—	—
D_j^C	Cross-section-specific coefficients of D_j^C are given in Table 3b					
Regression statistics						
Adj. R^2	0.989	0.987	0.973	0.983	0.985	0.973
SEE	0.067	0.072	0.145	0.114	0.092	0.101
N	6	6	6	6	6	6
T	31	26	26	26	26	26
No. of observations	186	156	156	156	156	156

Note: *t*-Values in parentheses.

Table 3b. Cross-section-specific Coefficients of Casella Dummy D_j^C

Ratio	*Trade flow*	*Aggregate*	*Manufacturing*	*Food, beverages, and tobacco*	*Chemicals and related products*	*Machinery, transport equipment*	*Other manufacturing goods*
DE/BLX	E	0.058	–0.019	0.372**	–0.747**	–0.370**	0.067
DE/NL	G	0.281**	0.138**	0.793**	–0.467**	–0.065	0.033
FR/BLX	+	0.245*	0.355**	0.061	–0.075	0.099	0.354**
FR/NL	E	0.468**	0.419	0.483**	0.207*	0.273**	0.267**
IT/BLX	F	0.128	–0.026	–0.500**	–0.566**	–0.491**	0.356**
IT/NL	TA	0.351**	0.131	–0.077	–0.293**	–0.186	0.322**
Negative		0	0	1	5	2	0
Insignificant		2	4	2	1	3	2
Positive		4	2	3	0	1	4
Total		6	6	6	6	6	6

Note: ***, **, * indicate significance at the 1%, 5%, 10% level, respectively.

4. Conclusions

How are the gains from enlarging a trade bloc shared among its Member States? Are there asymmetries with respect to the size of the countries? Theoretically both a large country and a small country bonus are conceivable, though there are hardly any models explicitly considering this question.

In this paper we provide comprehensive empirical evidence for the case of European integration. The conclusions that emerge from the empirical analysis are rather ambiguous. Our favored interpretation is that a small country bonus may well exist, but that it may be partly neutralized or dominated by other forces that tend to favor large countries. A force favoring small countries is the increase in competitiveness by attaining easier access to a larger market, as modeled in Casella (1996).

On the other hand, large countries may have advantages over small countries via relatively more group ties, high market power and related terms-of-trade effects, advantages in competitiveness due to economies of scale and larger absolute endowments (particularly human capital), larger product varieties (reflecting the greater scope for specialization), and consequently technological advantages.

More research is needed in order to identify more clearly the economic forces that lead to asymmetric effects of symmetrical economic arrangements. This is true for both theory, for example, by a generalization of the Casella model to provide a more complete picture of the competing economic forces which tend to favor small or large countries, as well as empirically, by considering the experience of trade blocs other than the European Community.

Appendix

Table A1. Industry Clusters in Manufacturing

Clusters used in estimation	*International trade by commodity (ITCS, SITC rev. 2)*	*Industry structural analysis (STAN, ISIC rev. 2)*
Total manufacturing	3000 Total manufacturing	Sum of 0, 1, 5, 6, 7, 8
Food, beverages, and tobacco	3100 Food, beverages, and tobacco	0 Food and live animals 1 Beverages and tobacco
Chemicals and related products	3500 Chemical products	5 Chemicals and related products
Machinery and transport equipment	3800 Fabricated metal products (mainly machinery and transport equipment)	7 Machinery and transport equipment
Other manufactured goods	3200 Textiles, apparel, and leather 3300 Wood products and furniture 3400 Paper, products, and printing 3600 Nonmetallic mineral products 3700 Basic metal industries 3900 Other manufacturing	6 Manufactured goods classified chiefly by material 8 Miscellaneous manufactured articles

Note: Though the correspondence is not absolutely exact (which could only be achieved by use of extremely disaggregated data), we regard the clustering using this level of aggregation as sufficient.

Data Sources and Definition of Variables

$X^{j}_{i,t}$ = real exports from country i to country j in million US$ (1990 prices, 1990 PPPs), aggregate data taken from IMF, *Direction of Trade Statistics*, and converted into real figures using the implied deflators of the position "imports (exports) of goods and services" from OECD, *National Accounts*. Sectoral data: from OECD, *Trade by Commodity* (ITCS); since no sector-specific deflators are available, the nominal figures were converted into real figures using the aggregate export deflator (see above).

$GDP_{i,t}$ = real gross domestic product of country i in million US$ (1990 prices, 1990 PPPs), taken from OECD, *National Accounts*. Sectoral data: real gross value-added (GVA), from OECD, *Industry Structural Analysis* (STAN) database.

$ER_{i,t}$ = aggregate index of real effective exchange rate (1990 = 1); constructed as

$$ER_{i,t} = \sum_{k=1}^{16} w_{ik,t} E_{ik,t} \frac{\sum_{k=1}^{16} w_{ik,t} CPI_{k,t}}{CPI_{i,t}},$$

where w_{ij} = share of exports to country k in total exports of country i, E_{ik} = exchange rate from country i against country k, CPI_i = consumer price index (taken from IFS and transformed so that 1990 = 100), $k = 1, \ldots, 16$: EU member states, JP, and rest of world ($-exchange rate). An increase in ER is associated with a real effective depreciation.

$D^{C}_{j,t}$ = level dummy, takes a value of zero before country j entered the trade bloc, and a value of one afterwards: for (relative exports to) DK, IE, UK: 1973; GR: 1981; ES: 1986; for AT, FI, SE, PT: 1973 (due to the establishment of the free trade between the EC and the EFTA, see the discussion in section 2). In most cases, tariffs were not eliminated at once but continuously over a transition period of some years (see Breuss, 1983; El-Agraa, 2001); this would suggest defining D^C to increase step-wise from zero to one after the enlargements. In practice, the results hardly differ when such a modification in the definition of D^C is made.

$K_{i,t}$ = real capital stock in million US$ (1990 prices, 1990 PPPs), calculated using a perpetual inventory method: $K_t = K_{t-1}(1 - \delta) + I_{t-1}$ where a uniform depreciation rate (δ) of 5% was assumed; initial value calculated according to $K_{1970} = I_{1970}/(g_{I,70-90} + \delta)$, where I_{1970} is investment in 1970, $g_{I,70-90}$ is growth of investment over the period 1970–90 (see Coe and Helpman, 1995). Investment data correspond to real gross fixed capital formation from OECD, *National Accounts*. Sectoral data: (nominal) gross fixed capital formation, taken from OECD, STAN, converted into real figures using the respective GVA deflator.

$L_{i,t}$ = total employment in million persons, taken from OECD, *Economic Outlook*. Sectoral data: taken from OECD, STAN.

Data on gross value-added, investment, employment at the industry level are available only as of 1970 (STAN). Data for the period 1965 to 1969 were approximated as follows: for *GVA* and *L* the trend growth from 1970 to 1979 was used to extrapolate values backwards; for *K* the trend growth of the ratio of *K* to *GVA* was used (together with the *GVA* values) to extrapolate values backwards.

Country abbreviations: AT, Austria; BE, Belgium; BLX, Belgium and Luxembourg; DE, Germany; DK, Denmark; ES, Spain; FI, Finland; FR, France; GR, Greece; IE,

Ireland; IT, Italy; LUX, Luxembourg; NL, Netherlands; PT, Portugal; SE, Sweden; UK, United Kingdom; NO, Norway; CH, Switzerland; IS, Iceland; JP, Japan.

Data were converted into US$ using 1990 PPPs from the OECD (EKS method). Data were taken from the WIFO database (Austrian Institute of Economic Research, WIFO, http://www.wifo.ac.at/) and the SourceOECD database.

References

Aghion, Philippe and Peter Howitt, *Endogenous Growth Theory*, Cambridge, MA: MIT Press (1998).

Baldwin, Richard, "A Domino Theory of Regionalism," NBER working paper 4465 (1993).

Breuss, Fritz, *Österreichs Außenwirtschaft 1945–1982*, Wien: Signum (1983).

Casella, Alessandra, "Large Countries, Small Countries and the Enlargement of Trade Blocs," *European Economic Review* 40 (1996):389–415.

Casella, Alessandra and James E. Rauch, "Anonymous Market and Group Ties in International Trade," *Journal of International Economics* 58 (2002):19–47.

———, "Overcoming Informational Barriers to International Resource Allocation: Prices and Ties," *Economic Journal* 113 (2003):21–42.

Coe, David T. and Elhanan Helpman, "International R&D Spillovers," *European Economic Review* 39 (1995):859–87.

El-Agraa, Ali M., *The European Union*, *Economics & Policies*, London: Prentice Hall (2001).

Grossman, Gene and Elhanan Helpman, *Innovation and Growth in the Global Economy*, 2nd edn, Cambridge, MA: MIT Press (1997).

Helpman, Elhanan and Paul R. Krugman, *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy*, Cambridge, MA: MIT Press (1985).

Henriksen, Espen, Karen H. Midelfart-Knavrik, and Frode Steen, "Economies of Scale in European Manufacturing Revisited," CEPR discussion paper 2896 (2001).

Hsiao, Cheng, *Analysis of Panel Data*, 2nd edn, Cambridge: Cambridge University Press (2003).

Krugman, Paul R. and Anthony J. Venables, "Integration and the Competitiveness of Peripheral Industry," in Christopher Bliss and Jorge Braga de Macedo (eds), *Unity with Diversity in the European Economy*, Cambridge: Cambridge University Press (1990):55–77.

Rauch, James E., "Business and Social Networks in International Trade," *Journal of Economic Literature* 39 (2001):1177–203.

Romer, Paul M., "Endogenous Technological Change," *Journal of Political Economy* 98 (1990):71–102.

Smith, Alasdair and Anthony J. Venables, "Completing the Internal Market in the European Community: Some Industry Simulations," *European Economic Review* 32 (1988):1501–25.

Torstensson, Johan, "Country Size and Comparative Advantage: an Empirical Study," *Weltwirtschaftliches Archiv* 134 (1998):590–611.

Notes

1. Casella seems to use nominal exports: strictly speaking, this would only be justified if all countries had the same export deflators. Since all other variables in the empirical model are also specified in real terms and export deflators generally differ across countries, we use real rather than nominal exports.
2. A weakness of the Casella model, however, is that trade is not explicitly considered. Thus the ultimate conclusion concerning the gains in trade, which is tested empirically, emerges only indirectly from the model.
3. While the Single Market is likely to have led to a further reduction in trade costs, the extent of this reduction is not clear. Many equilibrium models (e.g. Smith and Venables, 1988) use the

assumption that the Single Market eliminated trade costs amounting to a tariff equivalent of 2.5%.

4. Henriksen et al. (2001) estimate (among others) internal economies of scale (firm/industry level) for DE, FR, IT, and UK, employing 18 three-digit manufacturing time series over the period 1970–95. Though their findings differ across sectors and countries, internal economies of scale are found in more than half of the 72 cases (four countries, 18 sectors); in the machinery and transport equipment sector, economies of scale show up in approximately two-thirds of all cases.

5. While trade data are available as of 1960, the STAN time series on gross value-added, investment, and employment start in 1970; for the five-year period 1965 to 1979 the variables had to be approximated using some reasonable assumptions (see the Appendix).

6. This also takes up one of Casella's explanations of her insignificant results, where she argues that, since size of enlargement itself plays a role, the increases in the trade bloc may have not been large enough in order to create statistically significant effects on the (relative) trade flows (see Casella, 1996, p. 411).

7. When aggregate trade flows are considered, endogeneity of the GDP variable might be an issue. The use of an instrumental variable approach in first differences and using lagged levels (or differences) as instruments (see, for example, Hsiao, 2003, p. 85f.), however, does not alter the conclusions: again no clear pattern of signs of the coefficients of the enlargement dummy emerges from the regressions.

8. Considering this subset of results in Table 2b, of the 210 coefficients, 16% are negative, 45% positive, and 39% insignificant.