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# The Trading Potential of Eastern Europe

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## I. Introduction

The liberalisation of Eastern Europe has introduced a series of major new players into the world trading system. Naturally this has raised questions about what and how much they might trade – both their potential to compete with existing producers and exporters and their potential as new markets for existing traders. After so long a period of suppression and distortion, and with such poor data to describe the current situation, these are not trivial questions. They have spawned a considerable literature already but, as an early contribution [CEPR, 1990] observed, with such uncertainty surrounding them there is much to be said tackling them in a variety of ways. This paper explores the potential volume and direction of Eastern-bloc trade using an unsophisticated but apparently robust approach – the gravity model.

## II. The Gravity Model

The use of the gravity model in international trade research stems from Linnemann [1966], who proposed it as a pragmatic way of combining three sets of determi-

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nants of the size of a bilateral international trade flow: the importer's demand, the exporter's supply and the costs of doing business. Its theoretical foundations have never be made entirely secure – see below – and yet it has great intuitive appeal and has been used since 1966 for a wide range of tasks – e.g. Aitken [1973], Bergstrand [1985], Slama [1983], and Brada and Mendez [1985]. We use it here to characterise the trading patterns of a large sample of market economies and then assume that eventually Eastern Europe will slot into the same pattern.

The gravity model refers to countries' total trade and may be estimated on cross section data referring to a single year or period. It is best thought of as providing a long-run equilibrium view of trading patterns and thus in the present context entirely avoids the issues of what Eastern Europe will trade and how (and how rapidly) it will progress from its present position to the estimated equilibrium.

The gravity model describes the trade flow from a particular origin ($i$) to a particular destination ($j$) in terms of the following equation:

$$X_{ij} = B\, Y_i^{\beta_1}\, N_i^{\beta_2}\, Y_j^{\beta_3}\, N_j^{\beta_4}\, D_{ij}^{\beta_5}\, A_{ij}^{\beta_6} \prod_k P_{kij}^{\gamma_k} \qquad (1)$$

where

$X_{ij}$ is the value of the trade flow from country $i$ to country $j$,
$Y_m$ is the Gross National Product (GNP) of country $m$,
$N_m$ is the population of country $m$,
$D_{ij}$ is the distance between countries $i$ and $j$,
$A_{ij}$ is a dummy reflecting the adjacency of $i$ and $j$,
$P_{kij}$ is a dummy variable representing the $k$th preference relationship between countries $i$ and $j$, and
$B$, $\beta_m$ and $\gamma_k$ are parameters.

Country $i$'s potential supply of exports depends on its national product and on the ratio of its production for export to total production. The former is represented by GNP, while the latter – the openness ratio – shows a strong tendency to vary with population. The population variable proxies the physical size of the economy – the extent to which it might satisfy its own needs under autarky. Writers such as Kuznets [1973], Chenery and Syrquin [1975] and Balassa [1986], all show that population has a strongly negative effect on the openness ratio, which is most plausibly justified in terms, first, of economies of scale and, second, of the positive

correlations between population and geographical size and between the latter and natural resource endowments.

Very similar arguments pertain to the import side of the equation. Higher income suggests higher demand, while higher population suggests greater self-sufficiency. Overall, therefore, we would expect $\beta_1, \beta_3 \geq 0$ and $\beta_2, \beta_4 \leq 0$.

The remaining variables reflect trade resistance – both natural obstacles and artificial impediments. The main natural obstacles to international trade are transaction costs and the cost of transportation. These comprise not only actual transportation costs, but also the time involved in transportation and the *economic horizon* of a country. If people are better informed about conditions prevailing in near-by countries, propinquity leads to better business information, greater familiarity with laws, institutions, habits, and language of the partner country, and greater similarity in the way of life and in preference patterns. All these effects are proxied by the distance between the two trade partners. This is supplemented, however, by an adjacency dummy which is non-zero if $i$ and $j$ share a common land border. This reflects reductions in both cultural and transportation frictions between adjacent countries over and above the effect of distance.

The principal artificial obstacles to trade are trade policies; we cannot estimate directly the effects of tariff and/or non-tariff barriers to trade because of the difficulties involved in collecting the data, especially from developing countries. The critical issue, however, is the extent to which such barriers affect flows differentially and hence it probably suffices (a) to omit from the estimation any trade flows that are known to be distorted for political reasons (e.g. Iran-Iraq, China and Eastern Europe), and (b) to make allowance for explicitly preferential trading arrangements. The latter is done by including a series dummy variables.

The gravity model analyses imports or exports for many countries at a single point in time, and being based on cross-section data excludes price variables. This exclusion stems from the general equilibrium nature of analysis, in which prices are endogenous and merely adjust to equate supply and demand. As Leamer and Stern [1970] observe, this does not imply that prices are not effective in allocating resources. On the contrary, prices are assumed to adjust quickly and demand and supply are assumed to be responsive enough to prices to bring about an equilibrium rapidly.

## III. The Theory of the Gravity Model

It is frequently argued that the gravity model suffers from the absence of a cogent derivation based on economic theory. As Deardorf [1984] notes, it tells us something important about *what* happens in international trade, but not *why*. Several authors have tried to provide the model with a theoretical underpinning, notably Anderson [1979], Bergstrand [1985] and Helpman and Krugman [1985], but none of them generates a model exactly as formulated in the equation above. For our purposes the important issue is the empirical application of the model to trade flows between countries, and hence we are more concerned with the model's empirical robustness than with its theoretical purity. Nonetheless, theoretical soundness is comforting, if not essential, and so we briefly review some of the theoretical structures that have been proposed to explain the gravity model.

Anderson [1979] uses a simple Cobb-Douglas expenditure system to underpin the gravity model. His approach requires three steps. In the first the Cobb-Douglas function's fixed expenditure shares make $X_{ij}$ proportional to $Y_j$ (the importer's GNP), and applying the balance of payments constraint also proportional to $Y_i$ (the exporter's GNP)[1]. The second step observes that there are large interregional and international variations in the shares of total expenditure accounted for by traded goods, and that these variations are related to income and population ($N$), even across regions or countries where spending patterns are reasonably similar. Anderson assumes that the traded-goods shares are log-linear functions of their arguments, allowing him to have $X_{ij}$ proportional to $i$'s and $j$'s expenditures on traded goods but to model these latter expenditures as constant (but non-unit) elasticity functions of $Y$ and $N$. Thus he obtains

$$X_{ij} = B(\phi_i Y_i)\ (\phi_j Y_j) \qquad (2)$$

where $\phi_m = a_m Y_m^{\sigma} N_m^{\epsilon}$ – which is specific to country $m$ – is the share of $m$'s income devoted to traded goods[2]

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1. This is essentially the point reached by Helpman and Krugman [1985] in their model of trade with differentiated products: $X_{ij} = s_i\ Y_j$ where $s_i$ is $y_i / \Sigma_k y_k$, i.e. $i$'s share of world expenditure.
2. We ignore here an adjustment Anderson makes for unbalanced trade.

Anderson's final step allows for trade frictions.[3] With consumers having fixed expenditure shares for goods from each supplier, cost-increasing trade frictions reduce the amount of trade observed: the greater the friction, the higher the proportion of the given expenditure that goes on costs rather than the good itself. If trade frictions were log-linearly related to distance, such that $(1-\pi_{ij}) = D_{ij}^{-\beta_5}$, where $\pi_{ij}$ represents the proportional wastage between expenditure on flow $ij$ and observed trade $X_{ij}$, distance is easily introduced into (2). Clearly trade preferences could be treated similarly.

While this argument takes us from first principles to the gravity model it is not entirely satisfactory as a foundation for the latter. Anderson himself shows that once stochastic errors and/or multiple commodities are introduced, the derivation is no longer precise – the log-linear relationship between aggregates is difficult to support. In addition, Anderson does not rationalise the relationship between openness and population, or, more importantly, between openness and GNP or GNP per head.

A related derivation of a *generalised* gravity model is due to Bergstrand [1985, 1989]. Bergstrand derives a semi-reduced form equation for bilateral trade flows from a general equilibrium model based on non-homothetic Stone-Geary utility functions and products differentiated by both place of production and place of sale. His object is to integrate the Heckscher-Ohlin model with a model of bilateral trade and he obtains [1989] a final equation describing bilateral flows of a good from *i* to *j* as a multiplicative function of: *i*'s income measured in units of capital, *j*'s income and income per head, trading cost variables, complex price terms, and various endowment and factor intensity variables. The importer's population enters via its income per head, which, in turn, appears because of the non-homotheticity of demands; the exporter's population enters only via its labour endowment variable.

Bergstrand's model is only loosely related to the gravity model as specified in equation (1); the exporter's income and population enter only via related variables (capital and labour endowments); the equation applies only to a subset of goods (trade in the numeraire implicitly varies according to different determinants and total trade will not reflect gravity factors alone); the importer's population enters Bergstrand's equation differently from in (1), and Bergstrand includes prices in his model.

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3. This representation is not Anderson's, although it is based on his.

The inclusion of prices raises two difficulties: first it undermines the model's long-run equilibrium nature, for it implies that a country's price level determines its trade in a way quite foreign to the tradition of barter models usually employed for the long run. Second, it raises almost insoluble measurement difficulties. As specified, Bergstrand's predictions depend on the relative prices charged by different suppliers at a single point of time, but he can measure, and uses in his estimation, only the changes in prices through time measured for each country independently. Hence in explaining trade in, say, 1966 he uses the wholesale price index for 1966 with 1960 base – essentially each country's inflation since 1960. There is no way in which such data can say whether the absolute prices of different suppliers are converging or diverging or whether one exceeds another. Hence their role is spurious.[4]

## IV. The Data

To ensure the widest possible country coverage, we use data from the years 1984-86.[5] They have been averaged over three years in order to reduce the effects of temporary disequilibria and other temporary shocks. For a variety of reasons we cannot include all the countries of the world in our estimation, but our sample contains 76 countries, 19 industrial and 57 developing – see Appendix Table 1 which account for about 80 percent of total world trade. Since the purpose of this exercise is to characterise market economies' trade, the East European countries and China are not included in the estimation sample.[6] Oil exporting countries are the other main exclusion.

Trade flows are expressed in $US millions and were obtained from the IMF's *Direction of International Trade*. Trade studies covering only merchandise trade have an obvious shortcoming, but bilateral data on trade in services are just not

4. Bergstrand argues that if their base year is relatively normal he can extract relative price information from price index numbers. Since he uses no other data referring to the base year anywhere in his equations this is incorrect. If, for example, he included base year trade he might then claim that differences in prices between 1960 and 1966 might explain changes in trade patterns between those two years. But he does not.
5. There are considerable delays in reporting data for many developing countries.
6. Yugoslavia is relatively well integrated into the west, and hence has been included in the sample.

good enough for inclusion.

Trade flows can be measured either at the point of export or at the point of import. Apart from the well-known differences in valuation and minor differences due to the time-lags between the recording of exports and imports the two measures should be identical. We have used import data on the grounds that the import statistics are likely to be more reliable because countries tend to pay more attention to their import records than to their export records. Where necessary, however, export data have been used to fill holes in the data. Very small trade flows are recorded as zero in DIT. This creates a problem in log-linear equations such as (1). The solution adopted here is to omit all flows recorded as zero – essentially estimating the size of a trade flow conditional on its being large enough to be recorded. An alternative is to substitute a small positive number for zero to reflect the expected value of a flow too small to be recorded explicitly.[7] In addition, for unreported reasons, some countries do not record any transactions with some of our 76 countries. We regarded these unreported data as missing observations and excluded them from the regression analysis.

GDP (measured in $US million) and population (in millions) are taken from *World Development Indicators* and are averaged over 1984-86. The distances in equation (1) are measured in nautical miles as the shortest navigable distance between countries main ports, plus the overland distance from the ports to the economic centres of the countries concerned. For countries in continental Europe, where overland communication is predominant, the direct rail or road distance is used. For continental Africa, road communication is quite poor, so that although the road distance between the economic centres of respective countries is much shorter than the nautical distance, the cost of overland transportation is probably higher than the cost of sea transportation. Hence sea distance is used in the analysis for these African countries. As noted above, distance is supplemented by an adjacency dummy, which takes the value 2 when countries share a land border and 1 otherwise.

The preference variables, which take the value 2 where a preference applies and 1 otherwise, refer to ex-colonial and economic integration preferences, unilateral preferences from industrial countries to developing countries and EC preferences to

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7. Wang and Winters [1991] gives some details of the alternatives, and Wang [1992] many. The results appear fairly robust with respect to the treatment of missing observations.

certain developing countries. The economic integration schemes included are the EC, European Free Trade Association (EFTA), the Economic Community of West African States (ECOWAS), the South African Developing Co-Ordination (SADCC), the Central American Common Market (CACM), the Andean Group (AG), Latin American Integration Association (LAIA) and Association of South East Asian Nations (ASEAN). This is the subset of arrangements defined in Greenaway and Milner [1990] for which our country coverage permitted us to identify effects statistically. For the ex-colonial preferences, we consider only the British and French colonies: although nearly all colonies have become independent, the trade links developed under colonialism appeared to continue long after independence – see for example, Kleiman [1976] and Livingstone [1976]. In addition, EC preferences for the African, Caribbean and Pacific developing countries under the Lomé Convention were included, as were all industrial countries' Generalised System of Preferences.

The final equation, which was estimated by least squares is:

$$\ln X_{ij} = a + \beta_1 \ln Y_i + \beta_2 \ln N_i + \beta_3 \ln Y_j + \beta_4 \ln N_j + \beta_5 \ln D_{ij} + \beta_6 \ln A_{ij} + \sum_k \gamma_k \ln P_{kij} + u_{ij} \quad (3)$$

## V. The Estimates

We conducted two series of estimations: one based on the full 76×75 trade matrix and the other based on 34×76 trade matrices of the trade of countries with income per capita in 1984-86 of above $2,000. Although the Chow test just rejects the hypothesis that these two estimations are the same, (the critical value is effectively unity with so many degrees of freedom), they produce very similar predictions of Eastern European trade flows. Since more observations imply more information and since recent information suggests that Eastern bloc incomes may be lower than we have assumed, our analysis below is based the results of the 76×75 trade matrix.

The estimates, given in Table 1, confirm our hypotheses above. All the coefficients except for two dummy variables – EFTA and ECOWAS – have the expected signs, and most, including all those on the non-dummy variables are statistically different from zero. The proportion of the variance explained – 70% – is also very

***Table 1***
***Coefficients of the Estimation (without zeros)***
***(All Sample)***

| Constant | $Y_i$ | $Y_j$ | $N_i$ | $N_j$ | $D$ |
|---|---|---|---|---|---|
| –12.49 | 1.02 | 1.17 | –0.22 | –0.38 | –0.75 |
| (32.42) | (42.75) | (58.19) | (8.19) | (15.67) | (22.28) |

| *A* | *PEEC* | *PEFTA* | *PUK* | *PFRANCE* | *PACP* | *PGSP* | *PAID* |
|---|---|---|---|---|---|---|---|
| 0.78 | 0.70 | –0.02 | 1.91 | 0.73 | 1.05 | 0.35 | 0.89 |
| (3.27) | (2.17) | (0.05) | (4.96) | (1.24) | (5.27) | (2.92) | (4.20) |

| *PECOWAS* | *PSADCC* | *PCACM* | *PAG* | *PLAIA* | *PASEAN* |
|---|---|---|---|---|---|
| 0.31 | 1.25 | 2.10 | 0.38 | 0.96 | 2.25 |
| (0.34) | (0.97) | (1.32) | (0.55) | (2.85) | (5.15) |

No. of Observations: 4320 Goodness-of-fit index: 0.70

Note: 1. The definitions of all terms in the table are the same as in the text
2. t-statistics are in brackets
3. *PAID* refers to EEC aids to ACP countries. We believe that it encourages EEC exports to ACP countries

satisfactory.

Several of the dummy variables are not significantly different from zero, but we retain them in the equation to ensure that their absence does not bias the estimates of the main parameters.

We would not wish to make too much out of the precise sizes of the dummy co-efficients, and neither shall we make use of them below. Nevertheless it is worth considering their general implications for Eastern European trade.

The strongest and best-defined effect refers to a regional grouping of relatively small countries (South East Asia) but the co-efficients on the other regional groupings are disappointing in their degree of definition or the size of their effects. Hence while history and geography may encourage some thoughts of Eastern European co-operation, it is not clear that such a group would emulate ASEAN rather than ECOWAS. Moreover, the gravity model can not distinguish between trade creation and trade diversion, so that one certainly can not generalise from the increases in intra-bloc trade recorded in Table 1 to increases in welfare.

Turning to the main co-efficients, we find strong income effect on trade, with

elasticities exceeding unity, and mild but well defined population effects. The signs accord well with Linnemann's original interpretation of the gravity model, which stresses inter-industry trade, but also with more modern ones, which stress intra-industry trade. Reparameterising the equation in terms of income per head and a size variable shows that each affects trade positively. The first components of Table 1 may be equivalently written as either:

$$\ln X_{ij} = 1.17 \ \ln(Y_i / N_i) + 0.79 \ \ln N_i + 1.02 \ \ln(Y_j / N_j) + 0.80 \ \ln N_j$$

or

$$\ln X_{ij} = 0.38 \ \ln(Y_i / N_i) + 0.79 \ \ln Y_i + 0.22 \ \ln(Y_j / N_j) + 0.80 \ \ln Y_j$$

Each suggests that richer economies can afford to trade more – see, for example, Barker's [1977] variety approach in which foreign goods are luxuries because higher incomes predispose consumers to pay the fixed costs of trade more readily. They also suggest that, as they grow larger, economies produce more varieties and hence generate greater demand for their goods, i.e. trade more – see, for example, Krugman [1989].

### *A. Eastern European Trade*

Assuming that the co-efficients in Table 1 describe the main determinants of market economies' trade patterns, we may apply them to Eastern European data to predict those countries' trade potential in 1985. The fundamental determinants of trade patterns have not changed much since then, so the figures generated will give a strong indication of these countries' potential over the near future. We can not predict how long it will take to realise this potential, however, and so, rather than look to any particular future year, we ask what East European trade would have been if that potential had been realised in the mid-1980s. This has the additional attraction of obviating Bikker's [1987] concern that unless, fortuitously, $\beta_1 + \beta_3 = 1$ the gravity model exhibits money illusion, for it means that we are making predictions at the same prices as are used in estimation.

Even for the mid-1980s, however, there is huge uncertainty about the true current-price level of GNP in Eastern Europe, see, for example, CEPR [1990] or Collins and Rodrik [1991]. For the sake of simplicity, we proceed on the basis of Summers and Heston's [1988] estimates, which refer to 1985, the central year of

our sample and are based on a sound methodology and adequate data. Wang and Winters [1991] briefly explores alternative bases. We take population and distance data from the same sources as for the market economies and assume that Eastern Europe benefits from no preferential trade arrangements. The GDP and population data are given in Appendix Table 2.

Some of the data on actual trade are also subject to a severe reservation. For Hungary, Poland and Romania we take trade from the *Direction of International Trade*, as we do for market economies, and we presume that these countries' coverage and valuation conventions are much the same as those for market economies. For the remaining Eastern European countries, however, while we use the DIT wherever a market economy, Hungary, Poland or Romania is involved, we are thrown back on to data from various issues of *PlanEcon* for mutual trade. The *PlanEcon* data for these countries' trade with market economies and for Hungary, Poland and Romania's total trade appear to match the DIT data reasonably well, and so this appears to be a reasonable procedure. It does, however, depend on two potentially very distorted exchange rates. Intra-CMEA trade is reported in terms of transferable roubles and we are obliged to convert these first into local currency and then into dollars according to conversion factors provided by *PlanEcon*.

Two features make us suspicious of the exchange rate conversion factors reported to *PlanEcon*. First, the implied exchange rates between the transferable rouble and the dollar vary strongly by country. For Hungary and Poland, the countries most integrated with the west and able to meet IMF statistical standards, the rates for a dollar were R1.94 (Hungary) and R2.16 (Poland), but for the others they were R0.64 (Bulgaria), R1.38 (Czechoslovakia) and R0.63 (East Germany). Second, the value of dollar trade suggested by these conversion factors seems huge for these last three countries – see Tables 2 and 3. Thus Bulgaria appears to have nearly twice the total trade of Hungary, an economy of roughly equal size. For now, however, we are obliged to accept these data at face value, as do Collins and Rodrik [1991], whose data show a similar tendency to ours.

Tables 2 and 3 report our estimated potential trade flows for each Eastern country along with estimates of actual trade flows for 1985. Consider, first, trade within the Eastern bloc. Reported trade substantially exceeds our predicted potential trade for East Germany, Bulgaria and Czechoslovakia, the countries with the most serious data problems, but Poland seems not to have achieved its potential, while Hungary and Romania appear to be roughly in trading equilibrium with their eastern part-

*Table 2*
*East European Countries' Exports, 1985*[1]
*(Actual and Potential)*

($US millions)

| | EC | EFTA | Other Ind. | Dev. | Sum[4] | EE |
|---|---|---|---|---|---|---|
| Bulgaria[2] | 402 | 61 | 71 | 582 | 1,117 | 9,855 |
| | 2,521 | 602 | 1,741 | 742 | 5,606 | 2,652 |
| Czechoslovakia | 1,532 | 596 | 201 | 1,998 | 3,327 | 12,541 |
| | 15,221 | 2,198 | 4,175 | 1,707 | 23,301 | 7,411 |
| E. Germany[3] | 4,726 | 698 | 149 | 1,149 | 6,722 | 25,003 |
| | 23,631 | 4,061 | 6,391 | 2,196 | 36,279 | 8,992 |
| Hungary | 1,326 | 749 | 262 | 892 | 3,229 | 4,464 |
| | 6,505 | 923 | 2,364 | 1,204 | 10,996 | 4,103 |
| Poland | 2,502 | 688 | 344 | 1,356 | 4,890 | 5,998 |
| | 12,653 | 2,630 | 5,922 | 2,004 | 23,209 | 9,154 |
| Romania | 2,595 | 302 | 778 | 1,942 | 5,617 | 4,018 |
| | 5,247 | 1,282 | 3,105 | 1,506 | 11,140 | 4,361 |
| Total | 13,086 | 3,094 | 1,805 | 7,919 | 25,206 | 61,879 |
| | 65,778 | 11,696 | 23,698 | 9,359 | 110,531 | 36,673 |

Note: 1. The GDP data come from Heston-Summers [1988].
2. The first line is actual trade, the second one is potential.
3. E. Germany data with W. Germany are collected from *PlanEcon*
4. Sum of trade with 76 partner countries identified in gravity model.

Source: Actual: IMF, *Direction of International Trade*, 1989
*PlanEcon*, 1987
Predicted: Our calculations

ners. Overall, we infer from this that while COMECON caused a huge increase in the share of intra-CMEA trade in total trade, it probably did not increase the absolute level of intra-bloc trade much above *normal* levels. On the other hand, until the valuation of CMEA trade can be put on a sounder footing such a conclusion must remain very tentative.

Turning to trade with market economies it is plain that Eastern European trade falls dramatically short of its potential. We can record data only for our sample of

***Table 3***
***East European Countries' Imports, 1985*** [1]
***(Actual and Potential)***

($US millions)

| | EC | EFTA | Other Ind. | Dev. | Sum[4] | EE |
|---|---|---|---|---|---|---|
| Bulgaria[2] | 1,338 | 383 | 277 | 696 | 2,694 | 10,071 |
| | 2,707 | 694 | 1,989 | 618 | 6,008 | 2,661 |
| Czechoslovakia | 1,642 | 522 | 194 | 567 | 2,925 | 13,360 |
| | 15,678 | 2,384 | 4,591 | 1,329 | 23,982 | 7,172 |
| E.Germany[3] | 4,289 | 497 | 312 | 1,140 | 6,238 | 24,075 |
| | 23,895 | 4,339 | 6,794 | 1,712 | 36,740 | 8,394 |
| Hungary | 1,756 | 840 | 440 | 718 | 3,754 | 4,034 |
| | 6,898 | 1,061 | 2,658 | 981 | 11,598 | 4,076 |
| Poland | 2,074 | 562 | 448 | 1,057 | 4,141 | 6,372 |
| | 13,934 | 3,074 | 6,918 | 1,714 | 25,640 | 9,512 |
| Romania | 835 | 168 | 433 | 1,644 | 3,080 | 3,706 |
| | 5,840 | 1,529 | 3,679 | 1,307 | 12,355 | 4,564 |
| Total | 11,934 | 2,972 | 2,104 | 5,822 | 22,832 | 61,618 |
| | 68,952 | 13,081 | 26,629 | 7,661 | 116,323 | 36,379 |

Note: 1. The GDP data come from Heston-Summers [1988].
2. The first line is actual trade, the second one is potential.
3. E.Germany data with W.Germany are collected from *PlanEcon*.
4. Sum of trade with 76 partner countries identified in gravity model.

Source: Actual: IMF, *Direction of International Trade*, 1989
*PlanEcon*, 1987
Predicted: Our calculations

countries but that is complete enough not to be misleading. On average the actual trade of Eastern-bloc countries with market economies is just below one-quarter of its potential, but there are differences between countries. Hungary – the most open relative to potential – manages about 30% of potential, while Romania achieves 25% for imports and 50% for exports. The latter discrepancy reflects the draconian import compression imposed by Ceaucesceu as he sought to pay off Romanian debt, but does not obscure the fact that Romania's trading ties with the West are

generally stronger than are those of others in Eastern Europe.

Within the market economies one sees the impact of politics on trade: trade is currently least restricted relative to potential with developing countries, followed by EFTA, (in which Finland is strongly represented) the EC and other industrial countries in that order. In fact, it is striking that Eastern European trade with developing countries broadly matches its potential, while the shortfalls with other industrial countries, of which the USA and Japan are the principal components, include factors of 13 and 15.

Table 4 extends the results to the major industrial countries individually and summarises the results from these countries' points of view. The relative success of West Germany in Eastern Europe is evident, the ratio of actual to potential exports for Germany exceeds the corresponding ratio for the EC as a whole for every partner. The corollary of this success is that German exports will benefit proportionately less from liberalisation than will those from other countries. Not too much

***Table 4***

***Increase in Exports to and Imports from Eastern Europe (Potential-Actual)***

| | France | Germany | Italy | U.K. | Japan | U.S.A. |
|---|---|---|---|---|---|---|
| Exports | | | | | | |
| Difference (Potential-Actual $US millions) | 9,956 | 18,136 | 8,341 | 7,326 | 3,880 | 17,886 |
| Difference as multiple of actual trade | 9.7 | 2.5 | 7.4 | 7.7 | 5.9 | 17.6 |
| Difference as percentage of exporter's total exports in 1985 | 9.8 | 9.9 | 10.6 | 7.0 | 2.2 | 8.4 |
| Imports | | | | | | |
| Difference (Potential-Acutal $US millions) | 9,322 | 16,804 | 7,553 | 7,069 | 3,674 | 15,454 |
| Difference as multiple of actual trade | 8.1 | 3.4 | 4.3 | 5.9 | 14.0 | 12.1 |
| Difference as percentage of importer's total imports in 1985 | 8.6 | 10.6 | 8.3 | 6.5 | 2.8 | 4.3 |

should be made of this observation, however, for as a large economy close to Eastern Europe, Germany's trade with the East is already large absolutely. Hence in absolute terms and relative to her total trade Germany records the largest gains in the West.

Of course, some of West Germany's recorded increases will now count as internal trade – see below – but they are still real enough and even without them Germany can expect formidable increases in her international trade. Indeed we show below that while German unification reduces potential trade with the rest of Eastern Europe below the sum of the potential trade of East and West Germany separately, it increases potential trade with the EC and EFTA.

Turning to the other countries in Table 4 it is striking how large an interest the USA has in Eastern European liberalisation. This is perhaps not wholly commensurate with its willingness to play second fiddle to the EC politically. Equally striking is the relative paucity of Japan's gains – which is a result of her location.

It is notable that the model projects broadly balanced trade for the eastern bloc both in total and with individual partners. The income effects in Table 1 ensure that, as the Eastern economies grow, exports will expand slightly faster than imports unless population growth is much faster in the East than elsewhere. Thus as the Eastern economies begin to recover from the ravages of socialism we should expect their small deficits to change into small surpluses. Note, however, that we are here referring to equilibrium relationships, not actual values which will respond to cyclical and other factors in addition to those identified by this exercise.

To put these figures in perspective, our data suggest that rather than accounting for a mere 3.5% of world merchandise trade, Eastern Europe could, even at their current levels of income have accounted for 9% (after adjusting our results for missing countries and zero trade flows [8]). Moreover, if, as one hopes and expects, liberalisation boosts Eastern incomes, their trade potential will increase corre-

8. The first factor entails scaling Eastern countries' actual trade with the excluded countries by the growth factors between predicted and actual trade calculated for similar included countries. The second factor reduces our estimates of exports to developing countries to recognise that while we are estimating positive exports to all partners, experience suggests that at least some flows will actually be zero. Between 11% and 45% of the exports we predict going from each Eastern exporter to developing countries are to countries to which actual exports were reported as zero in 1985. In our sample overall 32% of potential flows to developing countries were zero; hence we reduce our flows by 32 $x/y$% where $x$ is the proportion of the predicted trade corresponding to actually null flows, and $y$ is the proportion of flows (not trade) that were actually null. $x$ and $y$ are calculated separately for each Eastern exporter.

spondingly. Every 1% on GNP will boost imports by 1% and exports by 1.2%, so that had these countries realised Western European levels of incomes in the mid-1980s their shares of world trade would have been much higher than our tables suggest.

### *B. Alternative Estimates*

With predictions of the kind offered here no appeal to actual outcomes can be made to establish their credibility. It is interesting, however, to compare them with similar predictions. CEPR [1990] did not forecast total Eastern European trade potential, although it did foresee major increases in the excess supply of tradables such as agriculture and energy. Collins and Rodrik [1991], on the other hand, do conduct an exercise similar to our own. In its first step, they fit an openness relationship across ninety-one countries, regressing the exports-to-GNP ratio on GNP, log (GNP), log (population) and a series of dummies, and then apply this to the estimates of GNP from *PlanEcon*. Once we adjust our results – see footnote 8 – the predicted trade levels are very similar, although because their results refer to 1988, after a substantial dollar devaluation, they see Eastern Europe providing a smaller *share* of world trade than we do. See Wang and Winters [1991] for details.

A more marked contrast between our results and those of Collins and Rodrik lies in the geographical distribution of trade. The latter estimate Western partners' shares in each Eastern European country's total exports and imports by updating a 1928 trade matrix. They estimate a regression model on trade shares from six comparator countries – Austria, Finland, Germany, Italy, Spain and Portugal – regressing partners' shares in these countries' totals in 1989 ($S_{ij}$) on a constant, the corresponding shares in 1928 ($S'_{ij}$) and a series of dummies for each partner ($d_j$). Thus

$$S_{ij} = \alpha + \beta S'_{ij} + \sum_{k=1}^{n} \delta_k d_k$$

where $d_k = 1$ if $k = j$, $j$ are partners and $i$ are comparator countries. They then apply this relationship to Eastern European trade shares in 1928 to predict their patterns in 1989. In terms of our own model, the 1928 share broadly captures the trade friction effects and the partner dummies the partners' growth of GNP and population since 1928; the effects of the country's own GNP and population are reflected in the estimates of its total trade as described above.

Collins and Rodrik predict relatively similar partner shares for each Eastern European country, because the co-efficients on the 1928 shares – the only variables that differ across these countries – have co-efficients ($\beta$) of 0.27 for import shares and 0.46 for export shares. Thus differences in trade patterns are necessarily compressed compared to 1928. The partner dummies also have to capture changes in institutions between 1928 and 1989, specifically the advent of the EC. Applying the same dummies and co-efficients to Eastern European trade implies that these countries too would have benefited from such integration to the same extent as the *average* comparator country did. As a result Collins and Rodrik predict a greater concentration of Eastern trade on the EC than we do. For example, Hungary, the least EC-dependent country for Collins and Rodrik trades 47% of its imports and sends 37% of its exports with the EC, compared with 35% for each flow in our exercise. For every other flow except one Collins and Rodrik have an EC share of one half or more, compared in our exercise with shares of 25%–35% except for Czechoslovakia where it is about 46%.[9]

Concomitant with the differences in predicted EC trade shares are those with other countries – especially Japan and the USA. While our approach suggests great potential for these countries in Eastern Europe, Collins and Rodrik are more restrained. Our predictions begin to approach Collins and Rodrik's if we allow, for preferences with the EC, but in that case our total volumes of trade exceed theirs.

Although our reasons for working with 1985 are sound enough – to improve the statistical basis of our work – it is interesting, to bring our results up to date in two ways. First, in Table 5 we imagine that East and West Germany had already unified in 1985. We sum their GNPs and population and take the union of their adjacency dummies but otherwise use the West German data for the unified Germany. In particular, we see the industrial centre as continuing in the Ruhr. The differences in the predicted trade with other countries are not surprising. In the absence of integration and adjacency effects the trade of the United Germany falls short of the sum of the trade of the two Germanies separately – the anti-trade consequences of size. This is evident in trade with *other industrial* countries. In Europe, however, unifying Germany extends the scope of the integration and adjacency effects. Thus,

9. To check our results we have compared actual and predicted trade for Collins and Rodrik's comparator countries: we overpredict Germany's trade by about 20% and underpredict Portugal's, but are almost exact for the others. If anything, this suggests that the results reported above will underpredict Eastern trade.

*Table 5*

***Predicted Exports of a United Germany* (national, 1985)***

($US millions)

| | EC | EFTA | Other Ind. | Dev. | Sum | EE | Total |
|---|---|---|---|---|---|---|---|
| W.Germany | 130,682<br>127,200 | 31,833<br>33,178 | 20,936<br>21,577 | 9,118<br>9,106 | 192,569<br>191,069 | 55,797[1]<br>50,636 | 248,366<br>241,765 |
| E. Germany | 22,631[1]<br>23,895 | 4,061<br>4,339 | 6,391<br>6,794 | 2,196<br>1,712 | 36,279<br>36,740 | 8,892<br>8,394 | 45,171<br>45,134 |
| Total | 143,417[2]<br>139,868 | 35,894<br>37,517 | 27,327<br>28,371 | 11,314<br>10,818 | 217,952<br>216,574 | 64,789[2]<br>59,030 | 282,741<br>275,604 |
| United Germany | 148,443<br>146,042 | 36,164<br>37,825 | 23,782<br>25,046 | 10,357<br>10,352 | 218,746<br>219,265 | 63,382<br>58,138 | 282,128<br>267,403 |

Note: *The first line refers to the predicted value of exports and second to imports.
1. Including mutual trade between East and West Germany.
2. Excluding mutual trade between East and West Germany.

for example, East German producers suddenly benefit from adjacency with Austria and from EC effects with Portugal (in the developing country aggregate) and other EC countries, while West German producers suddenly get adjacency advantages with Poland and Hungary.

The second extension is to compare Eastern European countries' trade in 1985 and 1989, the latter converted to 1985 dollars by the unit value index of world exports from *International Financial Statistics*. This comparison suggests that, except in Romania, which cut her trade significantly between 1985 and 1989, nothing fundamental had changed between the two years. Hence the gaps between actual and potential trade reported here refer as well to the present as to the mid-1980's.

### *C. The Implications for the West*

It is worth reflecting briefly on the consequences of these potential changes in Eastern trading patterns on western economies. First, and most obviously, the long – term increases in western trade are huge – exports rise by 10% for West Germany,

8% for the USA. Second, our model suggests that given their current levels of income the Eastern countries should expect in equilibrium to have an excess of imports over exports – i.e. to run small trade deficits. As they grow relative to other countries, however, these will gradually correct themselves. Third, in view of their very small initial shares, Japan and the USA will increase their shares of East European trade at the expense of those of EFTA and the EC (especially Germany).

Fourth, a weakness of the gravity model is that the increased trade we predict between, say, the UK and Poland, has no implications in our model for the UK's other trade: it apparently neither diverts imports from other sources nor absorbs exports destined for elsewhere. This implies that the new imports displace only domestic sales, while the new exports are met by curtailing domestic sales or increasing output. This is not necessarily a bad approximation – see, for example, Winters [1984] or Brenton and Winters [1990] where UK producers are seen to absorb nearly all foreign country-specific shocks – but it is rather extreme. Hence overall we should expect some spillover from the growth of Eastern European trade to declines in intra-industrial country flows. That is, market economies may find that they face extra competition in export as well as home markets.

As obvious implication of the broadly balanced trade predication is that while the opening up of Eastern Europe offers great opportunities for industrial country producers to expand their sales, it offers those countries' consumers the corresponding opportunity to expand their purchases. Moreover these opportunities can not be decoupled. Any attempt by industrial countries as a whole to sell in Eastern markets without accepting their output in return in destined either to fail or to degenerate into the provision of goods in return for financial assets. Direct foreign investment will, of course, support some such imbalance, but not on the scale of our results, and there are no good arguments for financing an export boom on the basis of credits. Hence Western economies must offer decent market access to the East if either they themselves are to benefit from liberalisation, or if the East is to progress to new market institutions and levels of affluence. Moreover, decent access entails not only freeing markets now – including sensitive sectors such as agriculture and steel – but also accepting large volumes of imports of goods whose export we can not now even envisage. The consequent changes in the sourcing of western production and consumption will require a high degree of flexibility and adjustment in both exportable and importable industries. They will, however, be spread over long periods of time for it seems unlikely that Eastern countries could realise their

trading potential in less than two or three decades. Hence even for Germany and the USA we are looking at increasing the growth rate of exports and imports by only perhaps 1/2% per annum relative to what it would have been.

## VI. Conclusion

This paper has calculated the trading potential of Eastern Europe with the simple but robust gravity model. The potential is huge. Using estimates of Eastern national incomes in the middle of the published range, and taking account of likely errors in reported trade data, we find that intra-CMEA probably broadly matched its potential level in 1985. Trade with the market economies, on the other hand, fell increasingly below potential as we moved from developing countries, through EFTA and the EC to other industrial countries – mainly the USA and Japan. We hypothesise that these short – falls reflect pre-liberalisation political biases and that they also measure the potential for increased trade over the next decade or so. The latter view suggests that the West European share of Eastern European trade with industrial economies will fall while those of the USA and Japan will rise for quite natural reasons. On the other hand, the principal gainer from Eastern liberalisation in absolute terms is Germany, followed by the USA.

The potential increases in trade are huge – factors of four and five are common. But they refer to trade in both directions. If it wishes to expand its exports, or to help Eastern Europe to develop, the West must accept imports from the East. These will be cheap and at least, for a period, of low quality, but to exclude them from our markets in order to protect uncompetitive western producers of simple goods, will only prevent the producers of more sophisticated goods from gaining the market shares that they deserve in the East.

***Appendix Table 1***
***Sample Countries***

| Industrial Countries (19) | Developing Countries (57) | | | | |
|---|---|---|---|---|---|
| Industrial | Africa | Asia | Europe | Middle East | West Hemisphere |
| Canada | Algeria | Burma | Greece | Egypt | Argentina |
| U.S.A | Cameroon | HongKong | Portugal | Israel | Brazil |
| | Congo | India | Turkey | Kuwait | Chile |
| Austria | Ethiopia | Indonesia | Yugoslavia | Jordon | Colombia |
| Belgium-Luxmburg | Ghana | Korea | | Libya | Costa Rica |
| Denmark | Guinea | Malaysia | | Yemen, PDR | Dominican Rep |
| Finland | Kenya | Pakistan | | | Ecuador |
| France | Liberia | P.N.Guinea | | | Guatemala |
| Germany, Fed.Rep | Maturitius | Philippines | | | Haiti |
| Ireland | Morroco | Singapore | | | Jamaica |
| Italy | Mozambique | Sri Lanka | | | Mexico |
| Netherlands | Nigeria | Thailand | | | Nicaragua |
| Norway | Senegal | | | | Peru |
| Spain | Somalia | | | | Thinidad&Tobago |
| Sweden | S.Africa | | | | Uruguay |
| Switzerland | Sudan | | | | Venezuela |
| United Kingdom | Tanzania | | | | |
| | Tunisia | | | | |
| Australia | Zimbabwe | | | | |
| New Zealand | | | | | |
| Japan | | | | | |

***Appendix Table 2***
***East European Countries' GDP per Capita and Population***

| | Bulgaria | Czechoslovakia | E.Germany | Hungary | Poland | Romania |
|---|---|---|---|---|---|---|
| GDP ($US millions) | 5,113 | 7,424 | 8,740 | 5,756 | 4,913 | 4,273 |
| Population (millions Inhabitants) | 9.1 | 15.6 | 16.8 | 10.7 | 37.8 | 23.2 |

Source: CEPR [1990] and Collins and Rodrik [1991] for GDP per Capita and UNCTAD *Handbook of National Trade and Development Statistics*, for population.

## References

Aitken, N.D. [1973], "The Effect of the EEC and EFTA on European Trade: A Temporal Cross-Section Analysis," *American Economic Review*, Vol. 63, pp.881-892.

Anderson, J.E. [1979], "A Theoretical Foundation for the Gravity Equation," *American Economic Review*, Vol. 69, pp.106-116.

Balassa, B. [1988], "Country Size and Trade Patterns: Comment," *American Economic Review*, Vol. 59, pp.201-204.

Balassa, B. [1986], "Japan's Trade Policies," *Weltwirtschaftliches Archiv*, Vol. 122, pp.745-790.

Barker, T.S. [1977], "International Trade and Economic Growth: An Alternative to the Neo-Classical Approach," *Cambridge Journal of Economies*, Vol. 1, pp.153-172.

Bergstrand, J.H. [1989], "The Generalised Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade," *Review of Economics and Statistics*, Vol. 71, pp.143-153.

Bergstrand, J.H. [1985], "The Gravity Equation in International Trade – Some Microeconomic Foundations and Empirical Evidence," *Review of Economics and Statistics*, Vol. 67, pp.474-481.

Bikker, J.A. [1987], "An International Trade Flow Model with Substitution: An Extension of the Gravity Model," *Kyklos*, Vol. 40, pp.315-337.

Brada, J.C. and J.A. Mendez [1985], "Economic Integration Among Developed, Developing and Central Planned Economies: A Comparative Analysis," *Review of Economics and Statistics*, Vol. 67, pp.549-556.

Brenton, P.A. and L.A. Winters [1990], "Non-tariff Barriers and Rationing: UK Footwear Imports," Discussion Paper No. 365, Centre for Economic Policy Research, London.

CEPR [1990], *Monitoring European Integration; The Impact of Eastern Europe*, A CEPR Annual Report, CEPR, London.

Chenery, H.B. and M. Syrquin [1975], *Patterns of Development 1950-1975*, Oxford University Press.

Collins, S.M. and D. Rodrik [1991], *Eastern Europe and Soviet Union in the World Economy*, Institute for International Economics, Washington DC.

Deardoff, A. [1984], "Testing Trade Theories and Predicting Trade Flows," Chapter 8 in Jones, R. and Kenen, P. [ed], *The Handbook of International Economics*, Vol I, Amsterdam: North-Holland.

Greenaway, D. and C. Milner [1990], "South-South Trade: Theory, Evidence and Policy," *World Bank Research Observer*, Vol. 5, pp.47-68.

Helpman, E. [1987], "Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries," *Journal of the Japanese and International Economies*, Vol 1, pp.62-81.

Helpman, E. and P. Krugman [1985], *Market Structure and Foreign Trade*, Cambridge, M.A.: MIT Press, 1985.

Kleiman, E. [1976], "Trade and the Decline of Colonialism" *The Economic Journal*, Vol. 86, pp.459-480.

Krugman, P.R. [1989], "Differences in Income Elasticities and Trends in Real Exchange Rates," *European Economic Review*, Vol. 33, pp.1031-1054.

Kuznets, S. [1973], *Population, Capital and Growth*, New York, Norton.

Leamer, E. and R.M. Stern [1970], *Quantitative International Economics*, Allyn and Bacon, Inc.

Linemann, H. [1966], *An Economic Study of International Trade Flows*, North-Holland Publishing Company, Amsterdam.

Livingstone, I. [1976], "The Impact of Colonialism and Independence on Export Growth," *Oxford Bulletin of Economics and Statistics*, Vol. 38, pp.211-218.

Slama, J. [1983], "Gravity Model and its Estimations for International Flows of Engineering Products, Chemicals and Patent Applications," *Acta Oeconomica*, Vol. 30, pp. 241-253.

Summers, R. and A. Heston [1988], "A New Set of International Comparisons of Real Product and Price Levels: Estimates for 130 Countries 1950-85," *Review of Income and Wealth*, Vol. 34, pp. 1-25.

Wang, Z. and L.A. Winters [1991], "Eastern Europe's Trading Potential," CEPR Discussion Paper No. 610, CEPR, London.

Winters, L.A. [1984], Separability and the Specification of Foreign Trade Functions," *Journal of International Economics*, Vol. 17, pp.239-263.