EXPORT PERFORMANCE AND ITS DETERMINANTS: A STUDY FOR JAPAN VIS-A-VIS ITS MAJOR TRADING PARTNERS

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Abstract

The Commission of the European Communities has suggested a conceptually important relationship between export performance and a set of determining factors, including relative cyclical positions (income effects), competitiveness (relative-price effects) and relative growth in productive potential (supply effects and output gap); empirical evidence, however, it still missing. Using panel data for six industrial countries (USA, Japan, Germany, France, the UK, Italy) over the period 1976-1992, this paper investigates the extent to which the above factors can adequately explain export behaviour. Our estimates find fairly strong evidence that demand, supply and competitiveness factors affect export behaviour in Japan, but no such evidence could be found with respect to the U.S. The estimates also underline the influential role of these factors in shaping export behaviour in the selected four EU countries. The results are robust across the many specifications considered, for all countries but the U.S.

I. Introduction

Post-war economic growth has been spurred on mainly by international trade growth, with domestic demand contribution lagging behind. In the OECD area, for example, real GDP grew at 4 percent for the period 1970-76 and 2.6 percent for the period 1977-93. The growth rate for real exports was 7.3% and 5.3% in the corresponding periods, while the growth rate for real domestic demand was 3.3% and 2.5%, respectively.

In observing the external performance of the OECD countries individually, however, Japan appears to be the main beneficiary of growth in international trade, running persistent surpluses over a long period of time. During the period 1976-92, Japan's current account surplus averaged out to 1.8% of GDP, as against 1.7% of Germany, whereas the U.S., the UK, France and Italy had current account deficits of 1.1%, 1.0%, 0.3% and 0.6%, respectively.

A popular subject of debate among economists is which factors can best explain export-performance differences between Japan and its main trading partners. The explanations that have been put forth to justify Japan's export dynamism fall in two groups: those suggesting that Japan's trade surpluses are consistent with conventional trade theories and those adhering to the view that such unprecedented surpluses reflect Japan's unfair trade practices.

At a theoretical level, Japan's export behaviour appears to be consistent with several models describing trade flows across countries:

• The Ricardian model of comparative advantage argues that countries tend to specialize in the production and export of those commodities which can be processed at low relative labour costs (or at high relative labour productivity). Japan's exports of labour intensive products (such as textiles) in the fifties, when labour was abundant, seems to comply with the Ricardian model. The Heckscher-Ohlin model, supporting the view that capital rich countries are inclined to export capital intensive goods, seems to explain Japan's shift to capital intensive commodities in the sixties, when capital became abundant. Finally, the technology-gap model, contending that countries produce and export goods, for which they have a comparative technological advantage, can be used to explain Japan's turn to technology intensive commodities in the seventies and the eighties, as labour and capital shortages came into view [see, for example, Mourdoukoutas (1993)].

• The "twin deficits" hypothesis claims that trade imbalances are likely to be attributed to consumption and savings imbalances across countries. In particular, the U.S./Japan trade deficit can reasonably be expected to reflect differences in consumption and savings patterns between the two countries. The higher level of private consumption and the increasing government deficits in the U.S. induce higher interest rates and strengthen inflationary pressures. Higher interest rates, in turn, attract Japanese savings, the dollar appreciates, the U. S. exports (imports) are discriminated against (encouraged) and the trade balance deteriorates. Therefore, a restrictive fiscal policy in USA could well have an important role to play in bringing its trade accounts toward balance [see Tallman and Resensweig (1991)].

Differences between the two countries in attitudes about savings are, indeed, striking. In the period 1980-92, Japan's gross national savings accounted for 32.5% of GDP, compared to USA's 17.2%. The corresponding figures for gross fixed capital formation were 29.7% and 18.2%. Moreover, Japan's PSBR as a percentage of GDP was 0.5% in the same period, compared to 2.7% for the U.S. One then is tempted to seriously consider the possibility that, as Japan's domestic investment and public deficits are not sufficient to absorb the full amount of savings, a net flow finds its way to other countries with low savings, expecially to the U.S. In addition, Japan's high saving ratios provide low cost capital for investments, which in turn increase productivity, competitiveness and exports.

• It is widely held in theoretical discussions that differences in work-leisure attitudes constitute one of the root causes of the U.S.-Japan trade imbalance. Japan's labour force— being well educated and trained, with high life expectancy—works long hours, takes short vacations, has a strong work ethic and keeps up harmonious employment relationships with management. Thus, Japan, endowed with one of the most productive human resources in the world, shows up in international markets with increased labour productivity, reduced unit labour costs and enhanced competitiveness [see Lincoln (1989), and Ohashi (1983)].

The pure trade-theory orthodoxy, as outlined above, has been challenged by those, who are inclined to view Japan's trade surpluses simply as the outcome of unfair trade practices. Included among these practices are the following:

• Social dumping: In spite of the high growth rates, economic stability and high per capita income (at current dollars), consumers' standards of living in Japan are lower than those prevailing in other western countries. For example, when adjusted for cost of living and currency fluctuations, Japan's per capita GNP falls short of the corresponding U.S. and

German figures [see OECD in Figures, Supplement to OECD Observer (1992)], almost every single consumer item is more expensive in Japan, houses are small and costly, the social infrastructure lags behind that of other industrial countries and the social security system is inadequate. Unsatisfactory living standards and uncertainties, consequent upon social dumping, can partly explain Japanese attitudes towards work-leisure and consumption-savings [see Cole (1992) and Allen (1990)].

　　• Industrial policy: Japan's industrial policy is deemed by many western observers to be an unfair competitive device against foreign trade partners. Included among such devices are the following:

1. Close cooperation between business and government (in transfering resources from declining to expanding industries, in bringing together corporations to develop technological applications, in spreading the cost of adjustment among all factors of production, including the governments, and so on).
2. Export promotion by using a variety of policy tools (e.g., exploring which industries and technologies are to decay or to expand in the future, providing funds and incentives to persuade the parties to work together, coordinating the joint research efforts, applying industrial targeting and implementing a "weak yen" policy).
3. Indicative planning (government directions in the form of signals and guidelines that firms are persuaded to follow).
4. Social consensus building (by designing industrial policy with the active participation of all parties, directly or indirectly affected, that is stockholders, managers, unions, the community, etc.).
5. Protection of domestic industry (by means of strengthening competition and preparing companies for the world markets)[1].

　　• Dumping and import barriers: Continuous trade frictions between Japan and its trading partners are one of the commonplaces of world economic relations. On the export side, Japan is accused of setting the prices on international markets for a variety of manufactured products at below domestic prices. On the import side, Japan is accused of protecting domestic markets with formal and informal barriers (tariffs and quotas, custom procedures, product standards, Keiretsu relations, large number of small retail stores, outdated regulations in the distribution system, regulated financial system, controlled government-procurement procedures, etc.)[2].

　　Pure trade theory and alleged tariff or non-tariff barriers still leave many things to be explained. Indeed, Japan runs persistent trade surpluses with the U.S. and the European Union (EU), even in products that USA and EU have a strong presence in world markets. Moreover, trade friction has been alleviated through intensive trade negotiations between the parties concerned. As a result, many tariff and non-tariff barriers have been lifted, Japan's market is open to foreign products and competition, the yen has appreciated substantially since 1985, the power of the Keiretsu system is declining, restrictions to large-scale retailing are gradually removed, the financial system is in the process of deregulation, the government procurement system is simplified, and so on. Yet, Japan's trade surplus continues to grow. Such an

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[1] See Johnson, 1982, and Komiya et al., 1988.
[2] See Burbone (1988), Butler (1991), Cushman et al. (1989), Doi (1991), Lincoln (1990), Saxonhouse and Stern (1989), and Corker (1991).

extraordinary trade performance calls for a deeper search into the roots of the Japanese surplus in world transactions.

The Commission of the European Communities (CEC) has recently surveyed develop-ments in the U.S., Japanese and Community competitiveness, and outlined the determinants of a country's ability to increase its market shares (European Economy, 1993). The main interest of the study centers on identifying the factors which generate the differences in the export performance among the three trade partners, but it provides no empirical clue to explain these differences. A more complete picture can be obtained, therefore, if one turns to an eco-nometric investigation of the factors, which presumably account for observed discrepancies in competitiveness.

The purpose of this paper is to empirically test and measure the extent to which the competitiveness indicators, that are suggested by theory and the CEC, can adequately explain variations in export performance across six industrial countries: The U.S., Japan, Germany, France, the UK and Italy, the last four accounting for the bulk of the external trade of the EU. Roughly speaking then, the countries of our sample can be partitioned into three groups (USA, Japan, EU), representing the three main antagonists in world markets. Panel data are used throughout the present study for the six countries, in each year between 1976 and 1992. A backward extension of the data set was not possible, due to the lack of data on a number of crucial variables.

II. The Conceptual Framework for Empirical Analysis

The determining factors of cross-country variation in shares of export markets fall, according to the CEC, in three groups: competitiveness (relative price effects), relative cyclical position (income or demand effects) and relative productive potential (supply effects).

The impact of the business cycle on the external position is thought to be captured by the relative demand growth: the higher the rate of domestic demand growth, the lower is the export market share and the larger is the trade deficit, other things being equal.

In the 17-year period considered, Japan shows up with both the highest average domestic demand growth (3.8%) and the smallest coefficient of variation (0.5). The corresponding figures for the remaining countries are the following: USA (2.7%, 1.0), Germany (2.4%, 0.9), France (2.5%, 0.8), the UK (2.1%, 1.5), Italy (3.1%, 0.8). Such demand-growth differentials would normally imply a deterioration of Japan's current balance vis-a-vis the other sample countries. This is not, however, the case as Japan was shown to have the largest current account surplus, slightly exceeding that of Germany, whereas the other countries have current account deficits. Since Japan registered an improved current account performance, despite its rapid domestic-demand growth, one is tempted to conjecture that the cyclical factor can explain but a small part of the trade performance, while the two other factors must be playing more important roles.

To allow for the possibility that the relative cyclical position is not adequately represented by movements in domestic demand, the unemployment rate is also utilized as an alternative measure to proxy for the upswings and downswings of the business cycle. It is widely recognized, however, that the unemployment rate is an unreliable cyclical indicator, due to the plethora of measurement errors that enter into the process of estimating the relative official

figures[3].

The most appropriate indicator of competitiveness is claimed by the CEC to be the relative (real) unit labour cost in the manufacturing sector, ULCM. This indicator corresponds to the ratio of the manufacturing unit labour cost index in the home country to the manufacturing unit labour cost indices in its trading partners (with all data expressed in a common currency), and captures the combined impact of changes in both relative unit labour cost (in national currency) and nominal effective exchange rate[4].

An increase in ULCM, i.e., a deterioration in competitiveness, is normally expected to be associated with a reduction in export market shares. On the other hand, the rapid growth of domestic demand is likely to elicit some deterioration in competitiveness, so that a multi-collinearity problem may arise in the estimation of the export performance function. Moreover, demand disturbances may be attributed to inappropriate budgetary policies; in this case, public deficit should be used as instrument or it should be included in the set of explanatory variables and be tested along with the other determinants of export performance.

The CEC recognizes the definitional problems inherent in treating ULCM as a measure of relative profitability, given that the latter may be influenced by other factors, too. Thus, an increase in ULCM need not necessarily lead to a fall in profitability, if the resultant rise in output prices can be passed on to foreign consumers. This may be the case when product differentiation, shifts in external demand preferences, the quality of exported items, the sales-promotion techniques, the degree of industrial specialization in high-tech products, differences in domestic input prices, and so on, allow the home country to pass domestic cost increases on to its trading partners, without any squeeze in profit margins. Consider now the opposite case of a country, which faces decreasing relative export prices, under conditions of unchanged ULCM. Despite the conventional wisdom of regarding this country as having improved its competitiveness, the reduction in its relative value-added deflator—as a consequence of the profit squeeze—points fairly directly to the opposite direction.

Therefore, interpreting ULCM as the closest unique proxy of competitiveness may divert the empirical analysis into misleading inferences. To overcome this problem, the CEC suggests that the ULCM is supplemented with the deflator of manufacturing value added (PVA), which takes into account both output price variations and input price movements. ULCM and PVA may enter the right-hand side of the export performance function either separately or as a ratio (UP = ULCM/PVA); this ratio gives the evolution of labour's share in value added for the home manufacturing sector relative to the trading partners' manufacturing sectors, while its inverse gives the evolution of the relative profit margins. An explicit measure of profitability may be provided by the ratio (VW) of the value added per worker in manufacturing (VAW),

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[3] For example, labour hoarding, in periods of adverse economic conditions, is a widespread practice for many Japanese firms, which prefer keeping their workers on payroll with reduced hours of work to laying them off. Another form of maintaining redundant labour within the firm is the reassignment of workers from declining to expanding industries within the same conglomerate. Many of these transfers to company subsidiaries downgrade employment conditions and constitute a form of disguised unemployment. A similar problem arises in Japan with respect to "discouraged workers"; they are mainly women who enter the labour market when demand for labour increases and return home when demand falls. A form of hidden unemployment is also the increasing number of involuntary part-time workers. Last but not least, the Japanese Labour Survey requires just one hour of weekly work for including one in the employed labour force, as compared to 15 hours in the U.S. (see McCallum, 1986, Mairesse, 1987, Tachibanaki, 1987).

[4] The underlying reason for recommending ULCM is that its changes signal changes in relative profitability in the opposite direction, thus affecting the incentive to produce traded (manufactured) goods.

expressed in a common currency, to the average wage bill in manufacturing (RW), also expressed in a common currency[5].

The cost competitiveness indicators (ULCM, PVA, VW) alone are insufficient to fully account for the actual developments in a country's competitive position, because there may exist other factors weighting more heavily in interpreting the level and growth rate of export activity. Included among these factors are structural differences among countries with regard to the specialization features of each, as well as differences in the composition of trade baskets. Suppose, for example, that export prices of individual items in a particular country are perfectly aligned with those of its foreign competitors, but that this country is specialized in the production and export of those commodities, for which international prices are high and increasing. Alternately, suppose that world demand for the products, that have a significant weight in the basket of the country under consideration, are price inelastic, due to their high quality standards. In both cases, competitive positions may remain unchanged, despite possible differences in relative export prices.

If the structure of the trade basket plays a decisive role in explaining the particular country's export behaviour, the favourable effects on its export receipts will be recorded as improvements of its terms of trade relative to its competitors, and will continue to be registered as increases in the relative PVA. However, the value-added deflator of the manufacturing sector can no longer be treated as an exogenous variable and an instrumental-variables technique should be adopted. In the context of the present study, the most suitable instrument to be considered is the ratio of the value of exported machinery and transport equipment to the total value of exports (MAC). The underlying reason is that the goods allotted to machinery and transport equipment are mainly high-tech products with a large and expanding world market share.

The list of competitiveness indicators could be further extended by including the relative export price (PX), which embodies both the relative unit labour cost and the relative profitability of each country's manufacturing sector. A rise in relative export prices should be negatively related to the export performance, unless relative price increases reflect diverse export-basket composition and the products, that are sold at high prices in international markets, weigh heavily in the basket.

Let us now turn to the third category of factors, that determine the export performance, i.e., the relative growth in productive potential (supply effects). The argument advanced by the CEC is that the degree of competitiveness, and hence the growth rate of exports, tends to be inversely related to the starting level of real wage rate (RW76). In particular, if countries are similar with respect to structural parameters for labour productivity and technology, then countries with low initial wage rates tend to have both lower competitiveness scores and poorer export performance than countries with high initial wage rates. This is so because gaps between wage levels in the past could set off catching-up evolutions in the coming periods, resulting in deteriorations in competitiveness, which are only the path of real convergence for some countries. Thus, there is a force that promotes convergence in levels of wage costs across countries.

The hypothesis that countries with low initial wage costs per worker tend to have a poorer

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[5] An alternative measure of profitability [(VAW-RW)/VAW], used in the estimation of the export performance function, did not produce qualitatively different results.

export performance than countries with high initial wage costs may not hold, when value added per worker is taken into consideration. If, for example, convergence in absolute levels of average wage cost is accompanied by adequate improvements in average productivity levels, then the catching-up process may even strengthen competitive positions. This is clearly shown in figures 1 and 2, which plot the paths of wage rates and average productivity (value added per worker) in manufacturing, respectively, for Japan, the U.S. and Germany, during the period 1976-92 (data expressed in dollars).

As depicted in figure 1, the U.S. is the country with the highest level of wage rates over

FIGURE 1.   AVERAGE REAL WAGE COST IN MANUFACTURING
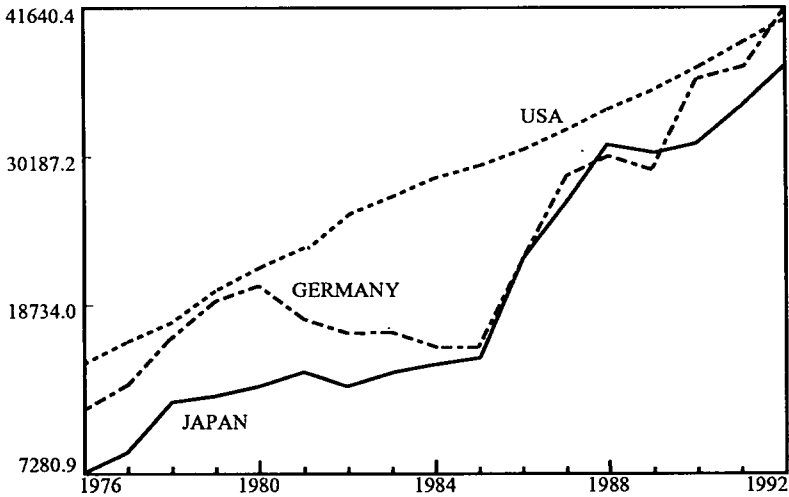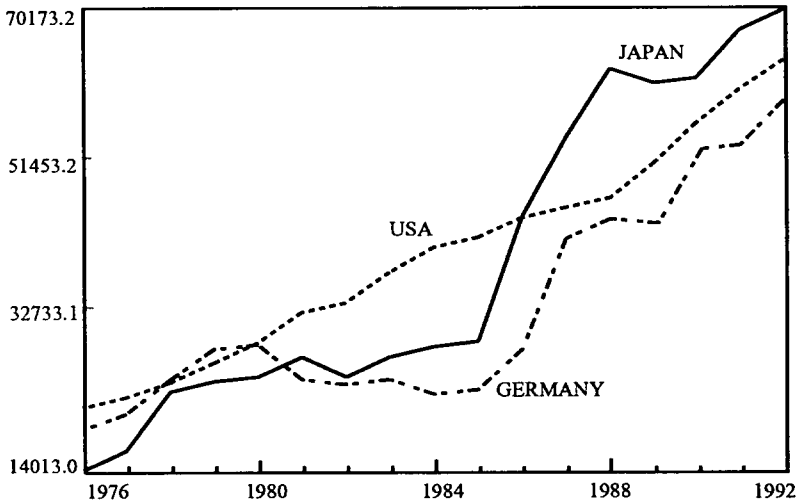

FIGURE 2.   REAL VALUE ADDED PER WORKER

almost the entire period considered. It is only in 1992 that Germany has taken over. Japan maintains its rank of third place (the only exception being the period 1988-89), after the U.S. and Germany. Even though Japan still has some catching up to do before it joins the top level, a rather strong convergence tendency is under way which might, at first blush, undermine Japan's international competitiveness advantage. Turning, however, to figure 2, it is easily seen that Japan's average productivity has been in excess of the U.S. productivity since 1986 (and in excess of Germany's productivity since 1981). Thus, the evidence suggests that Japan's average productivity (in manufacturing) is the highest, while its average wage cost is the lowest, indicating a higher gross profitability compared to the U.S. and Germany. As a corollary, there was plenty of room for a profit squeeze in the Japanese manufacturing sector —through probably a real appreciation of the yen—up to the end of 1992. It remains to be seen whether the econometric evidence will lend credit to the above argumentation.

III. *Empirical Results for the Total of the Sample Countries*

Our data set incorporates time series as well as cross-sectional variation in export performance for six industrial countries (USA, Japan, Germany, France, the UK, and Italy) over the period 1976-92. The centerpiece of the analysis is an aggregate export performance function of the form:

$$X_{ct} = a_0 + a_1 Y_{ict} + a_2 P_{jct} + a_3 S_{zct} + u_{ct} \tag{1}$$

where c and t index countries and years, respectively, X is the export performance for total goods (annual percentage change), the Y's are the income effects (relative cyclical positions), the P's are the relative-price effects (competitiveness), the S's are the supply and output-gap effects (growth in productive potential), the a's are parameters and u is an error term.

The cyclical effects on export performance are captured by using alternatively the growth rate of real total domestic demand and the unemployment rate. To allow for the possibility of deficit-induced demand disturbances, the fiscal deficit/GDP ratio (B) is included in the set of instrumental variables[6]. The competitiveness indicators used throughout the econometric analysis are: (i) the ratio of the unit labour cost to the deflator of manufacturing value added (UP = ULCM/PVA), as a measure of the wage share, and (ii) the ratio of the value added per worker to the average wage bill in manufacturing (VW), as a measure of profitability; alternately, the relative export price is employed as a composite competitiveness index. Finally, the output-gap indicators are represented by the starting level of the wage rate (RW76) and average productivity (VAW).

Comparable data on all the variables used are drawn from OECD, IMF and EU. Sources and definitions for these variables are reported in the appendix. In order to estimate the export performance function, we have pooled the intercountry time-series data. In the case of a single country, the data often move closely together, generating severe multicollinearity, which

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[6] In addition to MAC and B, other instruments included are the employment growth rate in manufacturing, inflation and changes in effective exchange rate.

makes it difficult to estimate the parameters of the export performance function, without imposing restrictive assumptions. The intercountry data, however, are generally more flexible, thus allowing a better chance to identify parameter estimates[7]. In order to capture these intercountry differences in our estimation, we have assumed that:

$$a_0 = a_0 + a_{0c}DV_c, \; a_1 = (a_1 + a_{1ic}DV_c)Y_{ict}, \; a_2 = (a_2 + a_{2jc}DV_c)P_{jct}, \text{ and}$$
$$a_3 = (a_3 + a_{3zc}DV_c)S_{zct} \tag{2}$$

where DV_c refers to country dummies taking values 1 and 0, and c, as noted earlier, is the country identification index.

The availability of panel data permits greater flexibility in the specification of the econometric error. As in other applications[8], a typical specification would be:

$$u_{ct} = \varepsilon_c + \mu_t + n_{ct} \tag{3}$$

where ε_c is a country-specific component, μ_t is a time-specific component and n_{ct} is an i.i. d. error. The ε_c capture those characteristics of the export performance function in each country that are omitted from the equation, but do not vary over time; the μ_t control for shocks to the export performance function that are common to all countries in each time period[9]; the n_{ct} is the purely random effect.

Inferences that there are large effects on export performance from income, supply or competitiveness factors can only be drawn from econometric specifications that exclude country-specific effects. Such effects, however, cannot be seriously left out of the analysis. Indeed, the aggregate export performance function (equation 1) ignores the effects of many factors that could diversify export behaviour across countries: differences in attitude toward consumption/savings and work/leisure, in the quality and educational level of the work force, in geography, land area and climate, in endowments of raw materials, in pursuing economic policy, and so on. It would thus be advisable, as a first step, to check for the existence and importance of the country-specific effects.

Let us start by treating the country-specific effects as fixed, controlling for their presence by entering all variables as deviations from country-specific means; the time effects are also treated as fixed. In doing so, inferences will be conditional upon the particular set of ε_c, present in the sample, and information from cross-country variation in the variables will be ignored, in favour of information from time-variation within each country.

At a second stage, the country-specific effects will be treated as random, i.e., as a component of the error term that contributes to their overall variance. The time effects will continue to be treated as fixed. The unconditional inference permitted by a random-effects specification may be preferable, if certain correlation problems, can be resolved, since retaining

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[7] Indeed, numerical values of the coefficients of correlation among the explanatory variables were found to range from a maximum of 0.66 (for UP and UN) to a minimum of 0.02 (for VAW). Moreover, the multicollinearity problem, mentioned in Section II, with respect to possible co-movements in demand growth and unit labour cost does not seem to exist: the coefficient of correlation between D and UP is as low as 0.30.

[8] See, for example, Holts-Eakin (1994) and Evans and Karras (1994).

[9] In practice, the μ_t control primarily for business-cycle effects on export performance. We could, therefore, include the unemployment rate as a measure of cyclical conditions, instead of using time effects.

the cross-country information is always desirable: The problem of correlation between error terms common to each country, due to the presence of ε_c, can be easily solved by utilizing a generalized least squares (GLS) estimator. However, if the right-hand variables are correlated with the country effects, the GLS estimator will be biased and inconsistent. The null hypothesis that country-specific effects are uncorrelated with the regressors is normally tested by comparing the fixed-effects estimator with the GLS estimator.

To obtain a more complete picture, a third set of results will be presented, where both the country-specific effects and the time effects will be treated as random. Because heteroskedasticity could be important across countries, the standard errors for the coefficients are based on White's heteroskedasticity-consistent covariance matrix.

The estimated results are reported in table 1: column 1 displays the results for the basic fixed (country and time) effects model; column 2, for the random (country-specific) and fixed (time) effects model; and column 3, for the random (country and time) effects model. The three models explain a fairly large portion of the sample variation in export performance. The demand, supply and competitiveness effects, taken together, account for between 46 and 59 percent of the sample variance of export performance during the period 1976-92, and the Durbin-Watson statistic for each of the three regressions indicates the absence of first-order autocorrelation.

TABLE 1.   ESTIMATES OF EXPORT PERFORMANCE FUNCTION:
TOTAL OF SAMPLE COUNTRIES

	Fixed (country and time) effects (1)		Random country and fixed time effects (2)		Random (country and time) effects (3)	
Constant	—		-14.90	(1.71)	-28.50	(1.85)
D	-0.70	(3.42)	-0.41	(2.45)	-0.23	(1.70)
UP	-0.031	(1.38)	-0.012	(1.14)	-0.006	(0.64)
VW	6.34	(3.08)	9.8	(2.12)	9.26	(2.12)
RW76	0.0002	(0.75)	0.0007	(2.19)	0.0007	(2.33)
VAW	-0.0003	(2.27)	-0.0005	(2.44)	-0.0005	(2.56)
R^2	0.573		0.461		0.587	
DW	1.68		1.63		1.74	
$\chi^2(5)$	—		1869.6		1928.6	

Note: Numbers in parentheses are the heteroskedasticity consistent t-statistics; χ^2 is the chi-square statistic for the hypothesis that country-specific effects are uncorrelated with the regressors.

Inspection of the three columns in table 1 indicates that most parameters carry the correct sign but they are of quite a diverse order of magnitude and possess different significance levels. A comparison of the fixed-effects estimator of column 1 with the estimates in columns 2 and 3 reveals that the chi-square statistic[10] for testing the null hypothesis that country-specific effects are uncorrelated with the regressors is equal to 1870 and 1929 repectively, substantially

[10] The orthogonality of the right-hand-side variables and export performance is examined by testing the equivalence of the fixed and random-effects estimates with a Hausman test. The test statistic is distributed a χ^2 with five degrees of freedom.

above the 1% critical value of 15.1 for 5 degrees of freedom. Thus, the null hypothesis is easily rejected at the 1% level of significance. One must, therefore, either rely on the fixed-effects estimates alone and ignore the cross-sectional information in the data or employ another set of instrumental variables to circumvent the source of inconsistency.

We do not intend to instrument further for the explanatory variables of equation 1, in order to obtain more consistent country-specific estimates. The reason is that arriving at other lists of instrumental variables, that are a priori more valid than the independent variables themselves, is a formidable, if not impossible, task. As a consequence, we shall report only the estimates obtained by treating both the country-specific and time effects as fixed. In doing so, we assume throughout that: (i) the ε's cannot be regarded as a sample of realizations from a distribution because we include the bulk of industrial countries in our sample, and (ii) the μ's cannot be regarded as independent realizations from a stationary distribution if technology does indeed improve over time.

Before embarking on a discussion of the results for the individual countries, it may be advisable to make some comments on the parameter estimates of table 1. Though considerable caution needs to be taken in interpreting the aggregated results, they nevertheless may be useful in making broad judgements on the overall patterns of the interrelationships between export performance and its determining factors.

Our estimates of the coefficients on demand growth are reported in the second row of table 1. On their face, these estimates seem to provide considerable evidence that cyclical factors adversely affect trade market shares and current balances. Indeed, even though the demand coefficients vary widely across the three models, they are negative and statistically significant at the 5% level in models 1 and 2 (at the 10% level in model 3): a 10 percentage-point upward movement in a country's domestic demand differential with respect to its trading partners would tend to elicit a 7 percentage-point deterioration in its export performance, according to the fixed-effects model 1 (a 4.1 pecentage-point deterioration in model 2 and a limited 2.3 percentage-point deterioration in the random-effects model 3).

The unemployment rate was found to be a poor substitute for demand growth as an alternative index of relative cyclical positions; it had the correct negative coefficient but it could not pass the t-statistic test at either the 5 or the 10 percent level of significance. It should be noted, however, that the substitution of the unemployment rate for demand growth had no effects on the order of magnitude or the sign of the remaining variables in the export performance function.

The coefficients on the two competitiveness indicators, though correctly signed, give mixed results. While there is a clear-cut evidence of a positive relationship between relative profitability and export performance, the coefficient on relative wage share turns out to be negative but insignificantly different from zero in all the models. To obtain a more complete picture of the competitiveness-export performance relationship, we replaced the two measures (relative wage share and profitability) with the composite index of relative export prices and reestimated equation 1. The export-price coefficient is statistically significant at 1% level and negative, indicating a strong negative relation between relative export prices and export performance.

A plausible explanation that can be put forth to justify the behaviour of the above relative-price indicators is the following. Foreign demand for the traded goods of the sample countries as a whole is price elastic, due to the prevailing strong competitive conditions in

international markets. Accordingly, a higher level of labour share in manufacturing value added, if allowed to be shifted forward, would ultimately undermine trade market shares. Such a development, however, is not confirmed by the data, as export performance has been shown to respond negatively, but insignificantly, to changes in relative wage share. The underlying reason may be that increases in relative wage shares are likely to be partly absorbed by a lower level of profitability and/or by putting more emphasis on the specialization features of the sample countries. This argument seems to be corroborated by available statistical evidence:

     • the correlation coefficient between relative wage share and relative profitability is negative and adequately high (-0.52);
     • omitting the profitability variable from the export performance function and reestimating equation 1 gives an impressively higher and significantly negative coefficient on the wage share [-0.05 (-2.30)]. This result remains approximately unaltered when the relative export price is added to the explanatory-variables list;
     • the relationship between export performance and wage share shows up more clearly and strongly when the ratio of high-tech to total exports is omitted from the instrumental-variables set; in this case, the coefficient value of wage share further rises both in magnitude and in statistical significance [-0.06 (-2.9), in the fixed-effects model].

The second competitiveness indicator (profitability) exerts a strong positive influence in all the models, thus providing firm empirical backing to the assertion that wide profit margins may prove to be more important than low labour costs—the two concepts need not move in opposite directions—as a means of promoting export activity.

Turning now to the productivity-potential and output-gap effects, we observe that the wage gap, as represented by the initial (1976) wage rate, appears to play no substantial role in the fixed-effects model, though it results in a positive, non-negligible impact on export performance in the remaining two models; by contrast, the response of export performance to changes in labour productivity is significantly different from zero in all the models with an unexpected negative sign.

Focusing our attention on the most reliable fixed-effects model, a tentative inference to be drawn is that there does not seem to exist a wage catching-up process, adversely affecting competitiveness and export performance in the total of the six industrial countries; what is more important, increases in labour productivity appear to discourage export activity. The absence of a wage-convergence process can be readily accepted. More difficult is, however, the justification of the negative response of export performance to productivity improvements, so that a closer examination of the true nature of this relationship is required.

As will be evident in subsequent analysis, the response of export share to productivity changes is not uniform across the sample countries, because this relation appears to be dominated by economic conditions, prevailing in some of them (especially in the U.S. and Germany). In addition, the correlation coefficient between initial wage rate and labour productivity is positive and fairly high (0.56) for the six industrial countries as a whole, suggesting that some of the benefits of productivity improvements are reaped by wage earners. This, in turn, encourages domestic demand at the expense of exports. Indeed, the omission of the productivity variable from the estimation of the export performance function causes both the sign and magnitude of the wage-gap index to change dramatically from positively insignificant [0.0002 (0.75)] to negatively significant [-0.0003 (-3.20)], implying a quite

strong wage convergence path. The reverse process of omitting the initial wage rate ends up with a weak positive relation between export performance and productivity.

IV. *Empirical Results for the Individual Countries*

The foregoing discussion is based on pooled information from six industrial countries of different sizes and economic structures, so that the resulting estimates may be interpreted as average responses of the total of these countries. Consequently, our postulate that the supply, demand and competitiveness forces work in the way described in the pooled sample does not absolutely contradict the notion that differing results cannot be obtained in any individual country of the sample. To deal with the problem of the necessarily high level of aggregation, involved in cross-country comparisons with panel data, equation 1 is reestimated by utilizing the dummy-variables system (2). Table 2 displays the individual-country responses to export performance determinants, in the context of the fixed-effects model.

TABLE 2. FIXED EFFECTS ESTIMATES OF EXPORT PERFORMANCE FUNCTION: INDIVIDUAL COUNTRIES

	Japan	USA	Germany	France	UK	Italy
Constant	-2.28	3.08	-24.0	15.6	178.9	-46.0
	(0.25)	(0.32)	(0.44)	(0.84)	(4.4)	(0.81)
D	-2.42	-0.36	-0.98	-0.77	-0.22	-1.13
	(3.25)	(0.62)	(3.18)	(3.39)	(0.93)	(3.37)
UP	-0.33	-0.04	-0.28	0.007	0.04	-0.04
	(3.76)	(0.15)	(1.46)	(0.13)	(0.62)	(1.98)
VW	15.40	12.9	12.6	7.63	103.6	15.9
	(0.52)	(0.45)	(0.23)	(0.43)	(5.42)	(0.70)
RW76	-0.0035	0.002	0.0016	-0.0003	0.0009	0.0007
	(3.26)	(1.55)	(1.65)	(0.16)	(0.95)	(0.39)
VAW	0.0024	-0.002	-0.0015	0.0003	-0.0003	-0.0009
	(4.19)	(1.45)	(21.7)	(0.31)	(2.62)	(1.33)
$\chi^2(6)^{(a)}$	31.2	5.3	43.9	22.1	75.0	78.8
R^2	0.489					
DW	1.97					

(a) Chi-square statistic for the hypothesis that regression coefficients sum to zero; the critical value of $\chi^2(0.05, 6)$ is 12.6.

The following points emerge from the estimates reported in table 2:

The coefficients of the dummy variables are jointly statistically significant. The chi-square statistic for testing the null hypothesis that the coefficients on the dummies are all zero is equal to 20.4, exceeding the 5% critical value of 12.6 for six degrees of freedom. Thus, the chi-square test decisively rejects the joint hypothesis of insignificant country dummies, suggesting that strong intercountry differences are present in export behaviour. Note, however, that the bulk of intercountry differences is concentrated on the UK, which exhibits a significantly positive constant.

The demand, supply and competitiveness indicators are shown to explain a large portion

of the export-performance variation in all the sample countries, except the U.S. Indeed, it is only with the U.S. that chi-square is below its critical value, indicating that we cannot reject the null hypothesis that regression coefficients are jointly zero. Accordingly, other factors than those contained in equation 1 should be called upon to explain the behaviour of USA's export sector, in sharp contrast to what happens in the remaining sample countries.

An inspection of table 2 reveals that Japan's export behaviour fits almost perfectly into the prescriptions of export performance laid down by the CEC, given that all the explanatory variables (except VW) pass the t-statistic test at the 1% or 5% level of significance. At the other extreme is the U.S., whose export behaviour complies with none of the export-promoting criteria set out by the CEC. At an intermediate stage, a number of independent variables are found to result in non-negligible effects on export performance in the remaining countries (two in Germany, the UK, and Italy and one out of five in France).

From the cyclical factors, demand growth is correctly signed and weighs heavily in four countries (Japan, Germany, France and Italy). The impact of the two competitiveness indices is not uniformly felt across countries; export performance is negatively sensitive to changes in relative wage share in two countries, Japan and Italy, and positively sensitive to profitability in just one country, the UK. A mixed pattern of results emerges with respect to the supply indicators: export performance responds to real wage gaps in a significantly negative way in Japan but in a positive—though marginally significant—way in Germany; on the other hand, labour-productivity improvements tend to encourage export activity in Japan but to discourage it in Germany and the UK.

Turning now to the influence of the export performance determinants in each country, a few comments are in order:

Japan: As is evident from table 2, relative demand growth has played a major role in shaping Japan's external position. The mean annual percentage change in Japan's real domestic demand, over the period 1976-92, was the highest among the sample countries (e.g., Japan: 3.8%, USA: 2.7%, Germany: 2.4%, UK: 2.1%) and is shown to have caused substantial deterioration of its trade market share. Even though it is widely recognized that domestic demand growth has contributed a lot to accommodate economies of scale and spark growth (especially in the fifties and sixties), by leading industry developments in Japan[11], the distortionary effects on export performance cannot be overlooked. Thus, we cannot rule out on a priori grounds the possibility that the export-constraining features of expanding domestic demand will eventually encroach upon Japan's leadership in world markets, as more and more Japanese come to find value in consumption and leisure, the percentage of elderly persons keeps on rising, import barriers are removed and the level of the economy's maturity approaches that of the other industrial countries.

The wage share coefficient is negative, quite large and more than twice its standard error. Interestingly, this coefficient attains the highest values for Japan, the lowest for USA, France and the UK, and intermediate ones for Italy and Germany. The strong negative link between export performance and relative wage share in Japan should be attributed to the fact that this country shows up with the highest relative manufacturing unit labour cost, over the entire period 1976-92. Remember that: (i) the relative wage share has been defined as the ratio of relative unit labour cost to relative deflator of value added in manufacturing, and (ii) the

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[11] See, for example, Porter (1990).

concept of relative unit labour cost coincides with the nominal effective exchange rate deflated by unit labour cost in manufacturing.

The descriptive statistics of the initial data set reveal that Japan has, on the average, the lowest relative deflator of manufacturing value added (Japan: 1.01, USA: 1.10, Germany: 1.15, France: 1.38, UK: 1.29, Itary: 1.50), which is indicative of a long-run profit-squeeze policy. At the same time, Japan has the highest relative unit labour cost in manufacturing (using 1980 as the base year, Japan: 115.7, USA: 99.1, Germany: 101.8, France: 95.2, UK: 84.2, Italy: 104.3). This unfavourable development in Japan's relative unit labour cost mirrors the dramatic changes in effective exchange rate positions: in 1976, for instance, the Japanese currency stood at 296.6 yen to a dollar; since then, however, the yen has appreciated substantially, trading at 126.6 yen to a dollar in 1992.

The parameter value for profitability remains quite small and insignificantly different from zero, in Japan. The reduced responsiveness of export performance to changes in profitability accords with the widespread feeling that Japanese corporations take a long-term approach to setting goals. In business long-term planning, short-term profits are often sacrificed to long-term sales and market share growth[12]. As the share of market is more important to Japanese corporations than immediate profitability, the profit incentive ceases to be the principal prompting force of export activity.

The most unique characteristic of Japan's data is that they are supportive of the catching-up hypothesis. Contrary to the evidence presented in table 2 for the other sample countries, the wage-gap proxy seems to exert a strong negative influence on Japan's export performance, while the productivity indicator bears a significantly positive coefficient, in accordance with the two basic implications of the wage-convergence hypothesis. Thereby, gaps between wage levels in the past appear to justify catching-up evolutions in the current period, resulting in deteriorations of export performance, which are only the path of real convergence for Japan. These wage gaps, however, reflect average-productivity level gaps, which tend to offset the adverse effects on exports of the wage-convergence process.

USA: The U.S. is the only sample country, for which the conceptual framework for export behaviour, constructed by the CEC, completely fails to hold. All the coefficient estimates are insignificantly different from zero, both individually and jointly. Interest, therefore, should center on identifying new factors, which could generate reasonable estimates, as the results in table 2 for the U.S. may be biased due to the omission of relevant variables. There are numerous plausible hypotheses, all deriving from established theoretical models, that might go some way towards explaining differential findings across countries. For instance, alternative approaches that have been provided in quantifying the determinants of the U.S. export performance can be found in Hatsopoulos et al. (1990), Butler (1991) and Tallman and Rosenbersweig (1991), to name a few.

Main EU countries: The export function framework outlined in this study and adopted from the reasoning developed by the CEC seems to provide an appealing model for investigating differences in export behaviour between the four EU countries considered. Though equation 1 is capable of explaning a portion only of the export performance variations in these countries, several features are shown to characterize individual reactions to export determinants.

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[12] See, for example, Kono (1990), and Shimizu (1990).

In particular, neigher of the two competitiveness variables has a significant impact on export performance in Germany. In contrast, distortionary effects attendant on domestic demand growth are overwhelmingly present in the process of shaping its relative export position. The two supply factors point to the absence of a wage catching-up procedure but the omission of productivity from the estimation of equation 1 leads to a negative wage-gap coefficient (significant at the 10% level). This in turn implies the operation of a hidden wage catching-up mechanism, which is obscured by productivity improvements embodied in wage rate increases.

Export performance in France appears to be dominated by domestic demand develop-ments solely. The catching-up process produces negligible effects and competitiveness indices play no substantial role in promoting export activity.

The UK is the only country with a statistically significant constant, indicating the particular conditions under which its export sector operates: in sharp contrast to what happens in the other EU countries and in Japan, domestic demand growth in the UK does not seem to distort its exports, while adjustments in its relative wage share are inadequate to inflict any serious damage to its total export effort. Similarly, the UK is the only country, where profitability emerges as a mostly important factor in formulating export performance. The estimates for the two supply indices, if taken at face value, denote the absence of a wage catch up, but the analysis of this issue copies after that of Germany.

Lastly, Italy's export performance is shown to be influenced by domestic demand evolutions and, to a lesser extent, by movements in relative wage share. Wage convergence plays no essential role and profit maximization does not rank as a high priority target in export planning.

V. Testing the Robustness of the Results

A well established method of assessing the validity of the above findings involves testing their sensitivity to alternative model specifications. In carrying out these tests, we examined variants of the export performance function that included additional control variables, after replacing the instrumental-variables technique with ordinary least squares. The augmented export performance function contained the value of machinery exports to total value of exports (MAC), the fiscal deficit/GDP ratio (B), the growth rate of employment in manufac-turing (DEMP) and the public debt/GDP ratio as additional regressors. This approach allows us to see whether omitted variables bias affects estimated demand, supply and competitiveness effects on export behaviour. To save space, table 3 contains the results for the three principal competitors in international markets (Japan, USA and Germany).

The extended equation model yields for Japan results qualitatively similar to those given in table 2. The estimated new demand, supply and competitiveness coefficients are of similar magnitude and the inclusion of the additional variables (while not themselves statistically significant) marginally influences their significance. The fact that the deficit, export structure and employment growth controls (B, MAC, DEMP) are not statistically significant at conventional levels suggests that the most important determinants of Japan's export behaviour are well-captured by the economic variables included in table 2. Note that the least squares estimator in table 3 excludes the public debt/GDP ratio, since the value of Pearson's coefficient

of correlation $(r=0.76)$ indicates strong collinearity between this variable and the fiscal deficit/GDP ratio.

TABLE 3.   FIXED-EFFECTS ESTIMATES OF EXPORT PERFORMANCE FUNCTION:
SENSITIVITY ANALYSIS

	Japan				USA				Germany			
Constant	24.50	-7.20	-25.70	-0.82	-50.30	-22.20	-15.80	-62.7	4.60	7.30	-30.1	50.1
	(0.49)	(0.14)	(0.57)	(0.02)	(1.40)	(0.20)	(0.34)	(1.75)	(0.06)	(0.06)	(0.28)	(0 62)
D	-2.26	-2.43	-3.03	-2.95	-0.28	-0.32	-0.17	-0.12	-1.02	-1.11	-0.93	-0.99
	(3.06)	(3.15)	(3 42)	(3.55)	(1.42)	(0.60)	(0.27)	(0.48)	(3.5)	(2.10)	(2.92)	(3.73)
UP	-0.35	-0.33	-0.48	-0.52	-0.30	-0.04	-0.06	-0.32	-0.24	-0.20	-0.20	-0.02
	(4.57)	(3.89)	(2.95)	(3.67)	(1.87)	(0.13)	(0.28)	(2.22)	(1.46)	(0.88)	(0.87)	(0.12)
VW	24.0	12.4	0.09	6.30	-67.10	-1.73	3.95	73.1	25.5	29.7	2.90	34.0
	(0.78)	(0.41)	(0.003)	(0.22)	(2.20)	(0.02)	(0.13)	(2.58)	(0.60)	(0.46)	(0.05)	(0.78)
RW76	-0.0034	-0.0036	-0 0039	-0.004	-0.001	0.001	0.0015	-0.0015	0.002	0.002	0.002	0.002
	(3.36)	(2.30)	(3.30)	(3.43)	(1.02)	(0.37)	(1.38)	(1.33)	(2.49)	(1.61)	(0.94)	(2.34)
VAW	0.0022	0.0025	0.003	0.003	0.0007	-0.001	-0.0015	0.0008.	-0.02	-0.002	-0.001	-0.002
	(4.46)	(3.10)	(4.20)	(4.46)	(0.66)	(0.6)	(1.40)	(0.92)	(3.18)	(2.0)	(1.44)	(3.44)
MAC	0.46	—	—	0.49	2.04	—	—	2.0	0.23	—	—	0.67
	(1.52)			(1.60)	(4.40)			(4.23)	(0.64)			(1.98)
B	—	-0.11	—	—	—	-0.36	—	—	—	-0.40	—	—
		(0.17)				(0.20)				(0.47)		
DEMP	—	—	-12.60	-9.74	—	—	-11.80	-9.93	—	—	-5.05	-8.79
			(1.04)	(0 79)			(2.31)	(3.20)			(2.02)	(3.93)
R²	0.607	0.446	0.447	0.584	0 607	0.446	0.447	0.584	0.607	0.446	0.447	0.584
DW	2.38	1.98	2.0	2.36	2.38	1.98	2.0	2.36	2.38	1.98	2.0	2.36

Table 3 portrays a quite different picture for the U.S. In particular, two of the additional variables, namely the export structure and the growth rate of employment in manufacturing, are significantly different from zero, both individually and jointly; moreover, when jointly estimated with the five initial regressors, they enhance the magnitude and significance of the two competitiveness measures: the relative wage share is shown to adversely affect export performance, while profitability tends to improve it substantially. Such a lack of robustness corroborates the argument advanced in the present study that the CEC's theoretical framework of export behaviour raises serious questions about the efficiency of the outcomes, in so far as the U.S. is concerned, in the sense that the results obtained rest on a misspecification of the export performance equation for this country.

Germany appears to lie in the middle place: the estimated coefficients of the initial variables show a pattern that seems remarkably similar to the one reported in table 2 (just as in Japan) but, at the same time, export structure and employment growth, when jointly considered, exert a sizeable impact on export performance (just as in the U.S). It is worth mentioning that, in both Germany and the U.S., the higher the ratio of machinery to total exports—which is postulated to account for technological advances—the larger is the improvement in export performance; by contrast, export activity proves to be adversely affected by an acceleration of the employment growth rate, due to the concomitant reanimation of domestic demand elements.

The additional variables leave the pattern of coefficients of the initial variables almost unaltered in the remaining three EU countries (except for France's profitability, the statistical

significance of which is enhanced)[13]. Notwithstanding this similarity, the export-structure control variable was found to be significantly positive in France, but significantly negative in the UK, indicating possibly a low degree of specialization of UK's exports in advanced products over the period considered.

Additional models may be used to explore the sensitivity of export performance to new formulations. The demand, supply and competitiveness effects are further examined by adding the square of the wage-gap variable to the explanatory-variables set of the basic equation for export performance; that is, instead of a linear form, the relation between export behaviour and RW76 is now quadratic. The estimated coefficient of the square term is insignificantly different from zero in all countries, except Japan. In the latter, the coefficient of the square term is positive but only marginally significant (t-value = 1.6), while the coefficient on the linear term remains significantly negative (t-value = 3.1). A positive coefficient on the square term means that the force toward convergence (negative relation between export performance growth and initial wage rate) attenuates as export performance is improved, though this force proves to be not particularly strong in Japan. The remainder of the results suggest that other conclusions are fundamentally similar to those derived from the estimates of table 2.

A final way to evaluate the credibility of the results appearing in table 2 requires checking for the stability of the model. To this end, we conducted an F-test on the model, by breaking up the sample into two parts at the period 1985. In the first subperiod, 1976-85, Japan had maintained an undervalued currency and world economy had gone through the tensions of oil-crises and fiscal imbalances; the second subperiod, 1986-92, is characterized by substantial yen appreciation, escalating trade frictions between Japan and its major partners and ongoing efforts to compromise conflicting interests in world markets, including the Structural Imped-iments Initiative. The calculated F-statistic is 2.24, which is smaller than the critical value (2.78 at 5% significance level) required to reject the hypothesis of stability. Therefore, there is no evidence of a structural shift and the hypothesis that the two sets of coefficients come from the same population cannot be rejected.

VI. *Conclusions*

The hypothesis that changes in relative cyclical positions (income or demand effects), relative growth in productive potential (supply effects and output gap) and competitiveness (relative price effects) are the three main categories of factors determining export performance —and, in general, developments in trade balances—has become the focus of recent discussions in a wide variety of academic, popular and policy settings, including the Commission of the European Communities. However, no previous efforts to empirically test this hypothesis have been made, due probably to the difficulty of obtaining comparable relative data.

Given that the issue is fundamentally empirical, this paper has explored the determinants of export performance in six industrial countries over the period 1976-92, by utilizing the theoretical framework, advanced by the CEC. Our analysis of the pooled time-series cross-sectional variability of export performance gives results for Japan that are considerably

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[13] The results for France, Italy and the UK are not reported here; they are, however, available from the author upon request.

supportive of the CEC's conceptual setup. The demand, supply and competitiveness effects tend to appear weaker in the selected EU countries (Germany, France, the UK, Italy), in varying degrees, but the general applicability of the model cannot be seriously disputed; in contrast, the evidence suggests that such effects can hardly explain the pattern of the U.S. export behaviour, which is likely to be dominated by factors, not accounted for in the present study. Finally, empirical estimates were found to be insensitive to alternative specifications in all countries but the U.S.

These tentative conclusions need to be qualified, however, as there are several other issues that require further research. There is, for example, a need to broaden the list of determining factors and/or of countries, to specify alternative analytical models, to introduce dynamic effects, with a view towards examining the complex interconnections through time between export performance and underlying economic forces, and to adopt more advanced econometric techniques. Nevertheless, the results do provide a clue to explain export performance and go somewhat toward accounting for the differences in export behaviour among the countries considered.

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APPENDIX

Descriptions of the data used and their sources follow. The data are annual covering the period 1976 to 1992.

XP = export performance for total goods (percentage changes); it is the ratio between export volumes and export markets for total goods. The export volume is the sum of the exports of food, raw materials, energy and manufactures. The export market is calculated by OECD as the weighted sum of the individual export markets for the above commodities, where the weights correspond to the commodity export structure of the exporting country in the previous year. Source: OECD Economic Outlook, June 1994, No 55 (Annex table 43).

ULCM = relative unit labour cost in manufacturing, expressed in a common currency. Source: OECD Economic Outlook, June 1994, No 55 (Annex table 41).

PX = relative export price for manufactured goods, expressed in a common currency. Source: OECD Economic Outlook, June 1994, No 55 (Annex table 42).

B = general government net borrowing (percentage of GDP). Source: European Economy, No 58, 1994 (Table 62).

DEBT = gross public debt (percentage of GDP). Source: OECD Economic Outlook, various issues.

D = real total domestic demand (percentage changes). Source: European Economy, No 58, 1994 (Table 25).

UN = unemployment rate. Source: European Economy, No 58, 1994 (Table 3).

ER = exchange rate (period average). Source: International Financial Statistics, IMF.

EMP = number of employees in manufacturing. Source: OECD National Accounts.

W = total wage bill of employees in manufacturing (current prices). Source: OECD National Accounts.

RW = real wage bill per employee in manufacturing: (W/EMP)/ER.

VAC=value added in manufacturing (constant prices). Source: OECD National Accounts.

VAN=value added in manufacturing (current prices). Source: OECD National Accounts.

PVA=deflator of manufacturing value added (VAN/VAC).

UP=relative wage share in manufacturing (ULCM/PVA).

VAW=value added per worker in manufacturing (average productivity):(VAN/EMP)/ER.

VW=profitability indicator in manufacturing (VAW/RW).

RW76=initial wage rate (RW in 1976).

MAC=value of exported machinery (SITC 8) as a percentage of the total value of exports. Source: OECD, Foreign Trade Statistics, Series C.

In order to construct relative values for D, PVA and VW, the corresponding data from a list of countries—excluding the particular country, for which the relative value is to be calculated—are aggregated by using the 1980 U.S. dollar GDP weights. The list of countries selected coincides with the one used by OECD to estimate XP, ULCM and PX. 1980 is used as the base year for all indices throughout the text.

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