

ON EXPORTS ECONOMIC GROWTH AND MARGINAL FACTOR PRODUCTIVITY DIFFERENCES

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Özet: Bu makale ihracat performansı ile ekonomik büyüme arasındaki ilişkiyi incelemektedir. İhracat sektöründe kullanılan en son birim faktörün (marjinal faktörün) diğer sektörlerdeki en son birim faktörden daha verimli olup olmaması durumunun büyüme üzerindeki etkisini araştırmaktadır. İki sektörlü bir model kullanılmaktadır. İhracat sektöründen diğer sektörler için bir olumlu dışsallık akışı bulunmuştur. Dışsallıklar ihracat sektöründe yüksek verimliliği garanti etmemektedir. İhracata dayalı büyümeyi gerçekleştiren ülkelerin başarısı ihracat sektörünün kaynakları daha etkin olarak kullanmasından kaynaklanmamaktadır.

Anahtar Kelimeler: İhracat performansı, Ekonomik büyüme, Marjinal faktör verimliliği.

JEL Sınıflaması : O47, F14.

Abstract: This article investigates the relationship between export performance and economic growth in the context of marginal factor productivity differences. It also analyzes the possible externality from export sector. It uses a two sector model to analyze the allocation of marginal factors as to which sector to employ them. It is found that externality does not guarantee higher marginal productivity in export sector than non-export sector. This paper provides evidence supporting the view that the success of economies which adopt export oriented policies *is not* due to the fact such policies bring the economy closer to an optimal allocation of resources.

Keywords: Export Performance, Economic Growth, Marginal Factor Productivity.

JEL Classification: O47, F14.

I. Introduction

The relation between export performance and economic growth has been a subject of a huge literature. Several empirical studies showed that countries with a favorable export growth have benefited from high rates of growth of national income. As a consequence, export promotion strategies are increasingly viewed by policymakers and economists alike preferable to import substitution strategies. Since exports are a component of aggregate output, one would expect a positive correlation between the two. However, most of the studies have found that exports contribute to GDP growth more than just the growth in exports (Balassa, 1978; Feder, 1982).

Marin (1992) investigates the relationship between exports, productivity, the terms of trade, and world output for four OECD countries based on the cointegration and causality concepts. The causality F-tests suggest

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that exports Granger-cause productivity in all countries. Based on his results, Marin (1992) suggests that “outward looking” regime seems to favour productivity performance of developed market economies as well and seems, therefore, not to be restricted to developing countries only as commonly asserted. He finds that positive long-run relation between the terms of trade and productivity and the significant casual link from the terms of trade and productivity in the United States and United Kingdom suggest that the terms of trade has mattered for the productivity performance in two countries. He interprets the results that increases in the real exchange rates have induced the entry of foreign low cost firms into British and Us market leading to the exit of high-cost domestic firms, giving rise to improvements in average productivity. Thus the productivity effects might work via two ways: first, through the exit of low-productivity firms; second through the scale effects of production, since the market share of successful firms will increase, so does the output per firm.

Xu (1996) investigates the casual relationship between exports and GDP. By using Akaike’s final prediction error criterion, he provides a clearer empirical support for the export-led growth hypothesis. The positive causality found for 17 countries provides support for the export-led growth hypothesis, and the two ways causality is found for 9 countries. In this study, export-led growth hypothesis is supported by not only outward-oriented economies like Taiwan, Brazil, but also inward-oriented economies like Mexico, Ecuador, and Nigeria.

Therefore, as can be seen from above, explanations for these observations have emphasized economies of scale, better allocation of resources, easing of foreign exchange constraints, greater incentives for technological improvements and more efficient management techniques due to the competition in abroad (Bhagwati, 1978; Krueger, 1980). These arguments suggest that benefits of export growth are realizing from two different channels; marginal factor productivities are higher in export sector to non-export sector (Feder, 1982). For example, technological and management improvements in the export sector could spill over into the domestic non-export sector. However, there is another body of research looking at the casual relationship between export growth and the growth of national income. Some of these studies have found no unilateral relationship running from export to the growth of national income; there is an implicit endogeneity problem. For example, Fry (1988) fails to find statistically significant marginal productivity and externality effects associated with expansion of the export sector. Some other studies explicitly conducted Granger causality tests for many individual countries to see whether a unilateral relationship between the two variables under consideration exists (Hutchison and Singh, 1992) Kunst and Marin (1989) have investigated the relationship between the productivity and exports based on Austrian data using time serious analysis. The causality analysis indicates no casual link from exports to productivity, while the estimated causality positive causation from

productivity to exports seems to be consistent with the causal hypotheses of the theories of intra-industry trade. However, their empirical result should be taken cautiously since the cointegrated properties of the variable they used were not taken into account.

Yamada (1998) re-examined the export-led growth hypothesis through testing the Granger causality from export to labor productivity by using the methodology developed in Toda and Yamamoto (1995). He found that, in most cases, the null of noncausality could not be rejected. And they did not find a robust empirical evidence for the hypothesis for developed countries.

In a recent paper, Bernard and Jensen (1999), examines whether exporting has played any role in increasing productivity growth in US manufacturing. Contemporaneous levels of export and productivity are indeed correlated across manufacturing industries. Their analysis, however, indicates that tests on industry data show causality from productivity to exporting but not the reverse. They explained that while exporting plants have substantially higher productivity levels, they find no evidence that exporting increases plant productivity growth rates. However, within the same industry, exporters do grow faster than non-exporters in terms of both shipments and employment. They show that exporting is associated with the reallocation of resources from less efficient to more efficient plants. They also indicate that, in the aggregate, these reallocation effects are quite large, making-up over 40% of total factor productivity growth in the manufacturing sector. Half of this reallocation to more productive plants occurs within industries and the direction of the reallocation is towards exporting plants. They conclude that the positive contribution of exporters even shows up in import-competing industries and non-tradable sectors. The overall contribution of exporters to manufacturing productivity growth far exceeds their shares of employment and output. Compared to the export-led models, the technology theories of trade provide a casual link from productivity to trade rather than vice versa. In those models, market power through innovation contributes the competitive performance in export markets (Vernon, 1966). While the export-led growth models and technology-driven theories of trade stress one direction in the casual relationship, the actual might be in both directions, mainly endogeneity problem might prevail.

The most closely related paper to the present paper here is that by Levin and Raut (1997). They try to combine the effects of human capital and exports on economic growth. They postulate that the export sector can utilize human capital more efficiently than can the rest of the economy. For example, educated workers may be able to adopt more quickly to the sophisticated technology and rapid production changes required for competitiveness in world markets. In this case, they state, the productivity differential associated with the exports sector will rise with the average level of education. Therefore, they incorporate such productivity differential by assuming that total factor productivity in the

production function incorporates the interaction between average level of education and exports. As is known, previous empirical research on the determinants of economic growth has yielded conflicted results. Levin and Raut's (1997) analysis finds the same sensitivity to changes in the sample period, selection of countries, and explanatory variables that have been apparent in earlier studies. However, their analysis yields evidence that is due to an interaction between average education and export orientation, which has been neglected by previous studies. Their results indicate a high degree of complementarity between trade policies and education expenditures and provide new empirical support for the hypothesis that export orientation contributes to economic growth through increasing returns to scale and other sectoral productivity differentials and not merely by relaxing import capacity constraints. In addition, they find that growth in the manufactures exports/GDP ratio has strong influence on economic growth, whereas growth in the ratio of primary commodity exports to GDP has a negligible influence, indicating that increasing returns and other efficiencies are mainly concentrated within the manufactured export sector.

As can be seen from the literature review above, this topic deserves more empirical research with cross-country as well as time series data.

The present paper augments the Feder model, which is developed for a sample of semi-industrialized less developed countries within the decade 1964-1973, by incorporating human capital into the model and it explicitly investigates whether there exists marginal factor productivity differences between export and non-export sector, which is claimed in the original Feder model. It is not unreasonable to include the human capital, which is proxied by secondary school enrollment ratio into the model; if we consider the fact that many developing countries over the last two decades improved their education level and many skilled people are being employed by export sector, then we would expect that the increases in national income growth can come from human capital accumulation in both export and non-export sector. If we think that after a point, shifting resources from non-export to export sector can reduce the marginal productivity of export sector because of decreasing returns to scale eventually set in. In that case externalities running from export to non-export sector might be positive, but marginal productivities of the factors in the export sector, due to decreasing returns, might be in fact negative and reduces the growth rate of the economy as a whole. All these claims will be explicitly tested in the following pages.

II. The Model

The analysis in this paper adopts a supply side description of changes in the aggregate output like in the original Feder model. The economy is viewed as if it consists of two distinct sectors: one producing export goods, and the other producing for the domestic market. Each of the two sectors' output is a function

of the factors allocated to the sector (in the original Feder model, there is no human capital). The output of the non-export sector is dependent on the volume of exports produced; this formulation represents possible beneficial effects of exports on other sectors.

The total output:

$$Y = N + X \quad (1)$$

The non-export sector:

$$N = F (K_n, L_n, H_n, X) \quad (2)$$

The export sector:

$$X = G (K_x, L_x, H_x) \quad (3)$$

We expect the partial derivative of F function with respect to X to be positive if there are externalities from the export sector to non-export sector.

K_n, K_x =respective sector capital stocks

L_n, L_x = respective sector labor forces

H_n, H_x = respective sector human capital stock

After differentiation of equations (1), (2), and (3), it yields

$$\dot{Y} = \dot{N} + \dot{X} \quad (4)$$

$$\dot{N} = F_K \dot{K}_n + F_L \dot{L}_n + F_H \dot{H}_n + F_X \dot{X} \quad (5)$$

$$\dot{X} = G_K \dot{K}_x + G_L \dot{L}_x + G_H \dot{H}_x \quad (6)$$

Where

$$\dot{K}_n = I_n \quad \text{and} \quad \dot{K}_x = I_x$$

Using eqs. (4), (5), and (6) yields

$$\dot{Y} = F_K I_n + F_L \dot{L}_n + F_H \dot{H}_n + F_X \dot{X} + G_K I_x + G_L \dot{L}_x + G_H \dot{H}_x \quad (7)$$

Now here, the Feder model assumes that there exists marginal factor productivities between the two sectors and formulates it as follows,

$$G_K / F_K = G_L / F_L = G_H / F_H = 1 + \delta \quad (8)$$

Of course in the original model, there is no human capital. Here I am assuming that, following Feder (which will be tested explicitly in shortly), if there is a difference between physical capital and labor in their use in the two different sectors in terms of their respective marginal productivity, then it is not unreasonable that human capital has higher productivity in the export sector.

Using eqs. (7) and (8) yields

$$\dot{Y} = F_K(I_n + I_X) + F_L(\dot{L}_n + \dot{L}_X) + F_H(\dot{H}_n + \dot{H}_X) + \delta[F_X I_X + F_L \dot{L}_X + F_H \dot{H}_X] + F_X \dot{X}$$

Where $I_n + I_X = I$, $\dot{L}_n + \dot{L}_X = \dot{L}$, $\dot{H}_n + \dot{H}_X = \dot{H}$ Using eq.(8) yields

$$F_X I_X + F_L \dot{L}_X + F_H \dot{H}_X = [\delta/(1 + \delta)]X \quad (9)$$

Using eqs. (7) and (9) yields

$$\dot{Y} = F_K I + F_L \dot{L} + F_H \dot{H} + [(\delta/(1 + \delta)) + F_X] \dot{X} \quad (10)$$

Now, following Feder, I will suppose that a linear relationship exists between the real marginal productivities of labor and human capital in a given sector and average output per laborer and per human capital, respectively, in the economy, say

$$F_L = \beta \left(Y/L \right) \quad F_H = \gamma \left(Y/H \right)$$

Then, dividing eq. (10) through by Y and denoting $F_K = \alpha$ yields

$$\dot{Y}/Y = \alpha \left(I/Y \right) + \beta \left(\dot{L}/L \right) + \gamma \left(\dot{H}/H \right) + [(\delta/(1 + \delta)) + F_X] \left(\dot{X}/X \right) \left(X/Y \right) \quad (11)$$

The formulation in eq (11) will be the basis of the empirical work reported in the following section. Under the present formulation, α should be interpreted as the marginal productivity of capital in the non-export sector. If there is no marginal factor differences between the two sectors, $\delta = 0$, and no externality, $F_X = 0$, then eq (11) reduces to familiar neo-classic model augmented by human capital. Our goal here is to test this eq (11) to see whether there is a significant difference between the two sectors in terms of marginal productivities. The variable, $\left(\dot{X}/X \right) \left(X/Y \right)$, is called ‘‘export performance’’ and

is used to show that there is a difference between the two sector in terms of marginal productivities in the original Feder model. $[(\delta/1 + \delta) + F_x]$ is a single parameter in this regression consisting of both marginal factor differentials and externalities. And this parameter is assumed to be constant across countries in the sample, that is, δ and F_x are assumed to be exogenous, and not country specific.

III. Empirical Analysis

A. Empirical results of the basic formulation

Eq (11) is used for a cross-country regression relating the rate of growth of GDP (in constant prices) to the share of investment in GDP, growth of labor force, growth of secondary school enrollment (proxy for human capital growth), which is used intensively by many growth regressions, and to the growth of export (in constant prices) multiplied by export share in the GDP.

The study focuses on a group of less developed countries defined by Chenery (1980) as semi-industrialized and the same sample was used by the Feder model too. And, for each country in the sample and for each variable, this study uses averages defined over the period 1972-1992. Now, I run the eq (11) without and with “export performance”.

Table 1: Regression Results for Semi Industrialized LDCs, 1972-1992

| Parameter | Eq (11) without export performance | Eq (11) with export performance |
|-------------------------------|------------------------------------|---------------------------------|
| α | 0.17 (3.68) | 0.28 (2.41) |
| β | 1.07 (3.07) | 1.06 (3.03) |
| γ | 0.89 (1.67) | 1.03 (1.86) |
| $[(\delta/1 + \delta) + F_x]$ | | -0.15 (-0.99) |
| R-square | 0.73 | 0.79 |

Numbers in parentheses are t values

As can be seen from the regression above, there is no significant marginal factor productivity difference between the two sectors. In the first regression (neo-classical model augmented by human capital) almost all the variables are significant and they have expected signs, α is in expected range in both regressions. β and γ are significant and in expected range in the second regression, γ is not significant in the first regression, but it is very close to be significant at 10% level of significance. If we think about the diversity of the countries and if we think that number of observation is only 17, we should not be so critical about the value of γ in the first regression. What is more important about these regressions is that the coefficient of export performance is not significant, and has unexpected sign. Since it is not significant, there is no need to explain why it is negative. From the above regressions can we not say that, even if the coefficient of export performance was significant, there is no a marginal factor differential between the sectors. In order to be able to distinguish between externality effect and marginal productivity differences, we can consider the following specification. Suppose, following Feder (1983), that exports affect the production of non-exports with constant elasticity, i.e.

$$N = F(K_n, L_n, H_n, X) = X^\theta \psi(K_n, L_n, H_n) \quad (12)$$

Where θ is a parameter. Then we can show that

$$N_x \equiv F_x = \theta(N/X)$$

Eq (11) can now be written as

$$\dot{Y}/Y = \alpha \left(I/Y \right) + \beta \left(\dot{L}/L \right) + \gamma \left(\dot{H}/H \right) + \left[(\delta/(1+\delta)) + \theta \left(N/X \right) \right] \left(\dot{X}/X \right) \left(X/Y \right) \quad (13)$$

But it is known that

$$\theta \left(N/X \right) = \theta \left[\left(N/Y \right) / \left(X/Y \right) \right] = \theta \left[1 - \left(X/Y \right) \right] / \left(X/Y \right) = \theta / \left(X/Y \right) - \theta$$

Using this result, eq. (13) is rearranged, obtaining

$$\dot{Y}/Y = \alpha \left(I/Y \right) + \beta \left(\dot{L}/L \right) + \gamma \left(\dot{H}/H \right) + \left[(\delta/(1+\delta)) - \theta \right] \left(\dot{X}/X \right) \left(X/Y \right) + \theta \left(\dot{X}/X \right) \quad (14)$$

This is the regression adopted to distinguish between externality from exports to non-exports and marginal factor productivity differences between the two sectors.

We can see that if it is assumed $\delta/(1+\delta) = \theta$, the model reduces to

$$\dot{Y}/Y = \alpha \left(I/Y \right) + \beta \left(\dot{L}/L \right) + \gamma \left(\dot{H}/H \right) + \theta \left(\dot{X}/X \right)$$

Results of regression adopting the specification of eq.(14) are reported in Table2.

Table 2: Regression Results With Specific Inter-Sectoral Externalities

| Parameter | |
|--------------------------------|---------------|
| α | 0.16 (1.35) |
| β | 0.99 (3.03) |
| γ | 0.26 (0.41) |
| $[(\delta/1+\delta) - \theta]$ | -0.12 (-0.91) |
| θ | 0.24 (1.83) |
| Constant | -0.04 (-1.54) |
| R-square | 0.79 |

As can be seen from the table 2 above, the coefficient of export performance is not significant again. However, the coefficient of export growth is significant at 10 % level of significance. This shows us that there is a significant externality effect running from export sector to non-export sector; if exports are increased by 10 % without withdrawing resources from the non-export sector, the latter grows by 2.4 %. However, even though there is a significant externality effect, we don't know whether marginal factor

productivities in export sector are higher than those in non-export sector by looking at this regression because $[(\delta/1+\delta)-\theta]$ is insignificant. α and γ , in this regression, are not significant. One explanation for this might be multicollinearity between investment in the economy as a whole, human capital growth and export growth.

Now, we can think that there is a simultaneous determination of export growth and the growth of aggregate output; output growth is a function of growth, but export growth might be a function of output growth too. To solve this endogeneity problem, I will instrument export growth. There is a host of instrumental variables (IV) that can be used. I could have used the growth rate of income in OECD including USA and Japan's growth rates of aggregate output since growth rates of these countries are "given"(exogenous) to the less developed semi-industrialized countries. But a couple of countries in the sample used in this study are members of OECD. Another problem with this IV is that which countries to pick. I have used 17 countries in this study, so I need average growth rates of 17 OECD (total members are more than 17) countries over the period 1972-1992. Therefore, to avoid the selection bias, I have not used this IV. Instead, I used the average annual export for each country in the sample in the period 1960-1970. The results of this two stage least squares are shown in Table 3.

Table 3: *Two Stage Least Squares*

| Parameter | |
|------------------------------|---------------|
| α | 0.12 (1.00) |
| β | 0.94 (3.49) |
| γ | -0.05 (-0.07) |
| $[(\delta/1+\delta)-\theta]$ | -0.11 (-1.01) |
| θ | 0.35 (2.04) |
| Constant | -0.03 (-1.40) |
| R-square | 0.78 |

As can be seen from the table 3 above, there is a significant externality effect from export sector to non-export sector. However, we don't know whether marginal factor productivities are higher in export sector than those in non-export sector since the coefficient of "export performance", $[(\delta/1+\delta)-\theta]$, is not significant. β is significant and in the expected range, showing that surplus labor was not the general case for the sample in the period under consideration. α and γ are not significant in this regression either. This might be a result of the collinearity between export

growth in the period (1960-1970) and investment in capital and human capital in the period 1972-1992 since the export sector uses skilled labor too.

IV. Conclusion

We tested, in this paper, whether marginal factor productivities in export sector are higher than those in non-export sector. Contrary to many studies, we found non significant marginal factor productivity differentials between the two sectors. We confirm the Fry's results that there are no significant marginal factor productivity differences between the two sectors in the sample for the period 1972-1992. This paper provides evidence supporting the view that the success of economies which adopt export oriented policies *is not* due to the fact such policies bring the economy closer to an optimal allocation of resources. Even though there is a positive externality from export sector to non-export sector it does not guarantee that marginal factor productivities are higher in export sector.

In the analysis above, we have used a single observation for each country, taking the averages for every variable under consideration. As a future extension of this paper, we can extend this analysis for a panel of countries. The number of countries is under our control, meaning developed countries can be included as a separate category. The time span for the analysis depends upon the availability of the data. Under the panel data investigation, we can look for the possible fixed effects across countries.

The time span also can be extended to the recent years even though for developing countries in the sample the time span under study is more important to test the possible differences between export and non-exports sectors.

Appendix 1: Sources of data and definitions

A.1. calculation of variables

All data were obtained from World tables of World Bank, 1980 and 1994. Variables were calculated from time series for the period 1972-1992 in constant prices. Average rates of growth were obtained by regressing $\ln Z_t = a + b \cdot t$ where Z_t is the economic variable under consideration and t is time. The rate of growth, say, n is then calculated as $n = \exp(b) - 1$. Average ratios (investment/GDP, export/GDP) were calculated as simple averages for the period 1972-1992. Table A.1. presents means and standard deviations of the variables used in this study.

Table A.1 *Descriptive Statistics*

| Variable | Mean | Stdev |
|--------------------|-------|-------|
| GDP growth | 0.046 | 0.021 |
| I/Y | 0.254 | 0.06 |
| Population growth | 0.020 | 0.009 |
| Human cap growth | 0.015 | 0.005 |
| Export growth | 0.102 | 0.37 |
| Export performance | 0.032 | 0.49 |

A.2. *Composition of sample*

Following Chenery (1980) like the Feder model, the definition of semi-industrialized LDCs applies to the following economies which are included in the sample: Argentina, Brazil, Chile, Colombia, Costa Rica, Greece, Hong Kong, Israel, Korea, Malaysia, Mexico, Portugal, Singapore, Spain, Thailand, Turkey and Uruguay.

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