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The Growth Impact of Exports in South Asian Countries

ABID HAMEED, MUHAMMED ALI CHAUDHARY, and KIRAN YOUNAS KHAN

I. INTRODUCTION

How exports affect growth has attracted considerable attention of the researchers in recent years. The failure of the import substitution policy during 1950s and 1960s to engender growth, led the South Asian countries to adopt export promotion strategy in the 70s and 80s to foster their economic growth. Many factors have caused this shift. Firstly, higher export earnings are expected to enhance the ability of a developing country to import additional industrial raw materials and capital goods, which in turn, are likely to expand its productive capacity. Secondly, the competition in the exports market may allow for greater capacity utilisation, higher economies of scale, greater specialisation on the basis of comparative advantage and accelerated technical progress in production for greater contribution to increased employment. Thirdly, strong correlation observed between exports and economic growth prompts export promotion further as part of the development strategy [Khan, *et al.* (1995)].

To analyse the export-led growth, Thirlwall (1999) posits two models. The first model relates to the possibility of export growth to set up a virtuous circle of growth, which means that a country launched once on the path of growth maintains its competitive position in world trade and continuously performs better than other countries. The second model stresses on the idea that growth of exports relieves a country of a balance of payments constraint on demand, so that the faster the growth of exports, the faster the output growth a country can achieve without running into balance-of-payments difficulties.

There is substantial inter-country research evidence on export expansion affecting economic growth positively. A set of studies have analysed the relationship between exports and economic growth in the context of two variables in which output growth is explained in terms of export expansion in isolation of all other important

Abid Hameed is Senior Assistant Professor of Economics at Fatima Jinnah Women's University, Rawalpindi. Muhammad Ali Chaudhary is Professor of Economics at Fatima Jinnah Women's University, Rawalpindi. Kiran Younas Khan is an Economist at the IMF, Washington, D. C.

sources of growth [Emery (1967); Michaely (1977)]. By using aggregate production functions, another set of studies have related aggregate growth to changes in labour, capital and export performance as explanatory variables explaining the growth process [Michalopoulos and Jay (1973); Balassa (1978); Tyler (1981); Feder (1982)].

Although these studies account for a good contribution to the relevant literature, the issue of the effect of export expansion on economic growth is still far from being resolved. As such, there is still need to rigorously investigate the critical effect of expansion in exports on economic growth particularly of South Asian countries. Building on Feder's model (1982), this study examines empirically from an augmented framework the effect of export growth on the economic growth denoted by gross domestic product (GDP) of South Asian countries. It also tests whether the marginal factors productivities in exports differ significantly from those in non-export sectors of the countries under consideration and whether exports generate beneficial inter-sectoral externalities. The required analysis is performed in a production function framework in which the aggregate growth of the included countries for the period 1973 to 2002 is regressed on changes in capital, labour and export performance.

The paper is organised as follows. Section two presents the theoretical framework applied for necessary analysis. Section three describes the data used in the study. Section four presents the results and interprets different estimations undertaken during the course of analysis. The final section concludes the study.

II. THEORETICAL FRAMEWORK

Generalising the original work of Balassa (1978), Feder (1982) measured the effect of positive externality of export sector on non-export sector and the productivity differential favouring the export sector in a typical neoclassical production function. The production functions are assumed to differ across sectors, for reasons of non-optimal allocation of resources between export and non-export sectors due to the presence of externalities and imperfect factor mobility, which remain constant overtime within a given sector.

The framework used by Feder (1982) is mainly a supply-side description of the changes in aggregate output. The supply side of an economy can be expressed as:

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

where, Equation (1) states that gross domestic product *(Y)* is the sum of the outputs of the non-export sector *(N)* and export sector *(X)*. If we let the production in the non-export sector to be affected by the volume of exports produced, the production function of the non-export sector including the externality effect of the export sector becomes as below:

$$N(t) = F\left(K_N(t), L_N(t), X(t)\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where, $K_N(t)$ and $L_N(t)$ denote, respectively the stocks of capital and labour used overtime in the non-export sector. F accounts for respective technologies. Similarly, let the export function be of the following form:

$$X(t) = G\left(K_X(t), L_X(t)\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

where, $K_X(t)$ and $L_X(t)$ are, as before, the stocks of capital and labour used overtime in the production of exports. G like F in Equation (2) above describes the technologies applied in respective sectors.

It is further assumed that the productivity of each input used in the export sector differs from that in the non-export sector by a factor δ, i.e.

$$\frac{\partial G_X / \partial K_X}{\partial F / \partial K_N} = \frac{\partial G_X / \partial L_X}{\partial F / \partial L_N} = 1 + \delta \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Equation (4) can be written in the a somewhat simpler form by dropping the time dependency and by letting subscripts to denote the partial derivatives as shown below:

$$\frac{G_K}{F_K} = \frac{G_L}{F_L} = 1 + \delta \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

where, G_K and G_L represent, respectively the marginal productivities of capital and labour in the export sector and F_K and F_L the marginal productivities of capital and labour in the non-export sector of an economy. However, the marginal factor productivity of the non-export sector is assumed to be lower than that of the export sector due to a number of factors. In the absence of the positive externalities, where δ = 0 and the marginal productivity equates unity, the allocation of resources would be such as maximises the output. The productivity differentials due to externalities are not included in δ, as they are identified specifically later.

Assume that F and G are homogeneous functions of degree 1, differentiating Equations (2) and (3) with respect to time yield Equations (6) and (7) as below:

$$\frac{dN}{dt} = \frac{\partial F}{\partial K_N}\frac{dK_N}{dt} + \frac{\partial F}{\partial L_N}\frac{dL_N}{dt} + \frac{\partial F}{\partial X}\frac{dX}{dt} \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$\frac{dX}{dt} = \frac{\partial G}{\partial K_X}\frac{dK_X}{dt} + \frac{\partial G}{\partial L_X}\frac{dL_X}{dt} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Now, we can write Equations (6) and (7) under linear approximation as Equation (8) and (9) as under:

$$\dot{N} = F_K . I_N + F_L . \dot{L}_N + F_X . \dot{X} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

$$\dot{X} = G_K . I_X + G_L . \dot{L}_X \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

where, I_N and I_X are gross investments in respective sectors, $\dot{L}_X$ and $\dot{L}_N$ are the sectoral changes in labour force and F_X is the externality effect of exports on the output of non-exports sector. Now, by differentiating totally the identity, $Y = N + X$, with respect to time, we obtain the following:

$$\frac{dY}{dt} = \frac{dN}{dt} + \frac{dX}{dt} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

Under the linear approximation, Equation (10) can be written as:

$$\dot{Y} = \dot{N} + \dot{X} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

Substituting Equations (5) and (9) in Equation (11) above, we get the following:

$$\dot{Y} = F_K . I_N + F_L . \dot{L}_N + F_X . \dot{X} + G_K . I_X + G_L . \dot{L}_X \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

From Equation (5), we get the following results:

$$G_L = (1+\delta) F_L \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

$$G_K = (1+\delta) F_K \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (14)$$

Substituting Equations (13) and (14) in Equation (12), we obtain the following equations:

$$\dot{Y} = F_K . I_N + F_L . \dot{L}_N + F_X . \dot{X} + (1+\delta) F_K . I_X + (1+\delta) F_L . \dot{L}_X \quad \ldots \quad \ldots \quad (15)$$

$$\dot{Y} = F_K (I_N + I_X) + F_L (\dot{L}_N + \dot{L}_X) + F_X . \dot{X} + \delta (F_K . I_X + F_L . \dot{L}_X) \quad \ldots \quad (15A)$$

Now, since the total investment can be defined as $I = I_N + I_X$ and total growth of labour as $\dot{L} = \dot{L}_N + \dot{L}_X$, Equation (5) and (9) then imply that

$$F_K . I_X + F_L . \dot{L}_X = \frac{1}{1+\delta} (G_K . I_X + G_L . \dot{L}_X) = \frac{\dot{X}}{1+\delta} \quad \ldots \quad \ldots \quad (16)$$

Thus, using this result in Equation (15A) finally yields the following:

$$\dot{Y} = F_K . I + F_L . \dot{L} + (\delta / (1+\delta) + F_X) . \dot{X} . \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (17)$$

In his model (1982), Feder made use of the assumption that the marginal productivity is linearly related to the average output per worker, i.e.,

$$F_L = \beta . (Y / L) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (18)$$

Denoting marginal productivity of capital F_K by α $(F_K \equiv \alpha)$ and dividing Equation (17) through by Y, we get the following results:

$$\frac{\dot{Y}}{Y} = \alpha.\left(\frac{I}{Y}\right) + \beta.\left(\frac{\dot{L}}{L}\right) + \left[\frac{\delta}{1+\delta} + F_X\right].\left(\frac{\dot{X}}{X}\right).\left(\frac{X}{Y}\right) \quad \ldots \quad \ldots \quad \ldots \quad (19)$$

where, α is the marginal productivity of capital in non-export sector, which is assumed as constant, and $((\delta/1+\delta)+F_X)$ is the sum of the productivity differential and the production externality effects.

The specification given in Equation (19) is used to empirically test the hypothesis of a positive effect of exports on growth. However, the externality effect denoted by F_X and the productivity differential effect given by $(\delta/1+\delta)$ cannot be empirically tested in this equation.

If the marginal productivities in export and non-export are equal, i.e. $(\delta = 0)$ and there are no externalities involved, i.e. $(F_X = 0)$, then Equation (19) will take a form of neo-classical formulation of sources of growth model. However, Equation (19) can be estimated in the following form

$$\left(\frac{\dot{Y}}{Y}\right) = \alpha.\left(\frac{I}{Y}\right) + \beta.\left(\frac{\dot{L}}{L}\right) + \gamma.\left[\left(\frac{\dot{X}}{X}\right).\left(\frac{X}{Y}\right)\right] \quad \ldots \quad \ldots \quad \ldots \quad (20)$$

Here, the term (I/Y) is the share of investment in GDP and $(\dot{L}/L)$ is the growth rate of labour force. Further, the term $[(\dot{X}/X)(X/Y)]$ can be interpreted as the weighted export growth, that is, the export growth rate weighted by the share of exports in GDP. Thus, the model states that the annual growth rate of GDP is linearly dependent on the annual growth rate of the labour force, annual investment-GDP ratio and the weighted growth rate of exports. Furthermore, the parameters of α and β represent the marginal productivity of capital and labour, respectively, in the non-export sector of an economy. The coefficient of the weighted export growth (γ) represents the differential factor productivities.

The above set of equations is still not competent to empirically show the externality and the productivity differential effects of export growth of an economy. To analyse the productivity effect, Feder (1982) adopted a clear specification for term F_X. Assuming that the exports affect the production of non-export sector with a constant exponential rate, θ. On the basis of this assumption, the production function of non-export sector can be parameterised as depicted below:

$$N = F(K_N, L_N, X) = X^{\theta}.\psi(K_N, L_N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (21)$$

where, θ is parameter. So we can say that:

$$\frac{\partial N}{\partial X} \equiv F_X = \theta . X^{\theta-1} \psi(K_N, L_N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (22)$$

$$\frac{\partial N}{\partial X} \equiv F_X = \theta X^{\theta} . X^{-1} \psi(K_N, L_N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (22A)$$

$$F_X = \theta . \left(\frac{N}{X} \right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (22B)$$

Now, in light of the above, Equation (19) can be rewritten as

$$\frac{\dot{Y}}{Y} = \alpha . \frac{I}{Y} + \beta . \frac{\dot{L}}{L} + \frac{\delta}{1+\delta} + \theta . \left(\frac{N}{X} . \frac{\dot{X}}{X} . \frac{X}{Y} \right) \quad \ldots \quad \ldots \quad \ldots \quad (23)$$

But knowing that:

$$\theta . \frac{N}{X} = \theta . \frac{N/Y}{X/Y} = \frac{\theta . [1 - (X/Y)]}{(X/Y)} = \frac{\theta}{(X/Y)} - \theta \quad \ldots \quad \ldots \quad \ldots \quad (24)$$

Equation (23) can be rewritten as

$$\frac{\dot{Y}}{Y} = \alpha . \frac{I}{Y} + \beta . \frac{\dot{L}}{L} + \frac{\delta}{1+\delta} + \left(\frac{\theta}{X/Y} - \theta \right) . \theta \frac{\dot{X}}{X} . \theta \frac{X}{Y} \quad \ldots \quad \ldots \quad \ldots \quad (25)$$

$$\frac{\dot{Y}}{Y} = \alpha . \frac{I}{Y} + \beta . \frac{\dot{L}}{L} + \left(\frac{\delta}{1+\delta} - \theta \right) . \frac{\dot{X}}{X} . \frac{X}{Y} + \theta \frac{\dot{X}}{X} \quad \ldots \quad \ldots \quad \ldots \quad (25A)$$

On assuming $(\delta / 1+\delta) = \theta$, Equation (25A) reduces to

$$\frac{\dot{Y}}{Y} = \alpha . \frac{I}{Y} + \beta . \frac{\dot{L}}{L} + \theta \frac{\dot{X}}{X} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (26)$$

Equation (26) is essentially the same equation which Balassa (1978) and Tyler (1981) adopted in their studies. If Equation (25A) is written with separate δ's and θ's, it can then be written as:

$$\frac{\dot{Y}}{Y} = \alpha . \frac{I}{Y} + \beta . \frac{\dot{L}}{L} + \frac{\delta}{1+\delta} . \frac{\dot{X}}{X} . \frac{X}{Y} + \theta \frac{\dot{X}}{X} - \frac{\dot{X}}{X} . \frac{X}{Y} \quad \ldots \quad \ldots \quad \ldots \quad (27)$$

where, the estimated coefficient θ yields the externality effect of exports on non-export sector.

III. DATA DESCRIPTION

We analysed the effect of exports on economic growth of six South Asian countries: Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka. The period of analysis extends form 1973 to 2003. However, we were constrained by non-availability of needed data to drop Bhutan from the study. The aggregate data on constant GDP and implicit price deflator are in dollars for all the six countries and are obtained from the National Accounts Statistics database maintained by the Statistical Division of the United Nations [UN (2005)]. However, the data on exports and fixed capital formation (proxy for investment in national currency), population (proxy for labour) and exchange rate are obtained from various issues of International Financial Statistics Yearbook (IMF). The proxy for capital is defined as share of investment in GDP, (I/Y).

All the variables used in the study are expressed in 1990 constant prices. Some observations were missing in certain series, which were completed by interpolation. The values of gross fixed capital formation for Nepal for the Year 1973 and for Maldives for Years from 1973 to 1979 were interpolated on the basis of the means of growth rates of previous values. However, the values of gross capital formation for Maldives for the years from 1991 to 1994 are interpolated by using a cubic spline routine. Each country's data are expressed in national currency and current prices are first converted into dollars by dividing them by the average exchange rate. To ensure consistency, data are expressed in terms of million of dollars. Data on exports for all countries are deflated or put into constant-price terms by means of each country's implicit price deflator with 1990 as the base year and expressed in terms of dollars, because they serve as the least objectionable price indices for this sector. The growth rates of exports $\left(\dot{X}/X\right)$, population $\left(\dot{L}/L\right)$ and GDP $\left(\dot{Y}/Y\right)$ (*GDPG*) are obtained by using the standard formula commonly applied for calculation of growth rates. The investment/GDP (*I/Y*) and exports/GDP (*X/Y*) are calculated by taking simple ratios for the given years. The weighted export growth $\left[\left(\dot{X}/X\right)\left(X/Y\right)\right]$, that is, the export growth rate weighted by the share of exports in GDP is calculated by multiplying the series of exports growth by the exports/GDP series. The combination of relevant data from six South Asian countries resulted in a sample size of 180 observations.

IV. ECONOMETRIC ESTIMATION

Based on the analytical framework explained in the previous section, three equations are estimated. The first equation represents the conventional neo-classical model in which GDP growth is expressed as a function of capital and labour growths, and it is estimated with OLS technique. The second equation estimated concerns the factor productivity effect. The final equation estimated is about the individual externality effect.

IV.1. Results Obtained with Basic Neo-classical Model

These results are based on Equation (20) depicted in the previous section. In its estimation, we assume that $\gamma = 0$. This procedure gives us the conventional neo-classical model in which GDP growth is formulated to depend on capital and labour growth. Results obtained on estimation of this equation are represented in Table 1, which show that both investment and labour growth have a highly positive and significant impact on the GDP growth of the countries included in the sample.

Table 1

Results Obtained from Estimation of Conventional Neo-classical Model

Variable	Coefficients	*t*-values
Constant	0.011	1.421
I/Y	0.121***	3.954
$\dot{L}/L$	0.855***	4.968
R^2: 0.17		Adjusted R^2: 0.16
DW: 1.56		*F*-statistic: 18.35

*** Coefficient significant at 1 percent level of significance.

Further, both variables have expected signs. However, the magnitude of labour coefficient is more and that of capital coefficient is less than the ones reported in earlier studies [Balassa (1978); Tyler (1981) and Michalopoulos and Jay (1973)]. The results reported in Table 1 show that a one percent increase in labour growth, $\dot{L}/L$, increases the growth of GDP by 0.85 percent. Similarly, a one percent increase in capital, I/Y, increased GDP growth by 0.12 percent. The large highly significant coefficient on labour does not make any sense as the countries in our sample have large pools of surplus labour, which would imply a lower figure for the marginal productivity of labour. This nonsensical result could be due to adoption of a simple specification and the ensuing effect of omitted variables which could inadvertently cause upward bias in our estimates.

Finally, the size of *R*-square for the estimated model is 0.17, which shows that the explanatory power of this model is somewhat low. This weak explanatory power of the model and the large magnitude observed on the labour coefficient can be attributed to the omitted variable bias introduced into the model due to the non-inclusion of export and its accompanying productivity and externality effects. We have attempted to improve upon these results by specifying a richer specification that takes into account these omitted variables by estimating panel data models.

IV.2. Results Based on the Basic Feder Model

The results derived with the simple Feder's model, using fixed effects approach,[1] are reported in Table 2. In the estimation of Equation (20), it is assumed that intercept term differs across countries but it remains constant for each country. Therefore, the countries included are represented by dummies to allow their intercept term to vary across them. These fixed effects also include the average effects of the omitted variables, in particular, the effects of these factors, which are peculiar to each country. The results show that both labour and capital approximated, as mentioned before, by population and investment, have the expected positive impact on the GDP growth. However, the marginal productivity of capital in non-export sector is not statistically significant, while all other coefficients are positive and statistically significant. The results obtained from the estimation of Equation (20) show that a one percent increase in labour growth causes GDP to grow by 0.37 percent, which is significant at 5 percent level. Although, the effect of labour growth on GDP growth is positive, it is relatively small in magnitude because the sample countries are underdeveloped with large labour force compared to the size of their economies. This is why the marginal productivity of labour is not very high

Table 2

Results Based on Feder Model Estimated Using Fixed Effects Model

Variable	Coefficients (FE)	Coefficients (FE-2SLS)^
Constant	0.0396***	.0411 ***
I/Y	0.0033	–.0238
$\dot{L}/L$	0.3751**	.3131*
$(\dot{X}/X).(X/Y)$	0.4528***	.8393***
R^2:	0.42	.21
Bhargava D.W :	1.95	
Baltagi and Wu:	2.02	
F-statistic #:	7.58	5.98

* Coefficient significant at 10 percent level of significance. ** Coefficient significant at 5 percent level of significance. ***Coefficient significant at 1 percent level of significance.

^ The instrumented variables are capital and weighted export growth and instruments are labour, export shares, lagged values of capital, lagged values of weighted export growth and lagged values of GDPG.

F-statistic for the two models rejects the null hypothesis that all the fixed effects are jointly zero (p-values are zero for both the models).

[1]The study uses panel data so both random effects and fixed effects models are estimated. The Hausman test yields the value of χ^2 (3) = 10.80, resulting in a clear rejection of the null hypothesis of random effects against the fixed effects model.

in these countries. The coefficient of capital variable carries a positive sign implying that increase of one percent in capital leads to 0.003 percent increase in GDP growth. Since the estimated coefficient is insignificant, its effect may be taken with caution.

It may be realised that the results strongly support the hypothesis that marginal productivities in exports sector are higher than in the non-export sector, as the coefficient of $(\dot{X}/X).(X/Y)$ is positive and statistically significant, showing that a one percent increase in the weighted export growth increases the growth of GDP by 0.45 percent. This means that if the weighted export growth rate increases by ten percent in the South Asian countries, the GDP growth rate of countries will on average, increase by 4 percent. As such, we can argue that exports exercise a significant positive impact on the output growth of the South Asian countries: this result is in concurrence with prior expectations because the international trade contributes significantly to the GDP of these countries. The computed differential marginal productivity parameter (δ) is 0.81 $((\delta/1+\delta)=0.45)$ which indicates the existence of a substantial productivity differential between exports and non-exports sector.

It may also be realised that the coefficient of capital estimated with the conventional neo-classical model was positive and statistically significant but it on the introduction of the variable of exports, $(\dot{X}/X).(X/Y)$, declined sharply in size and turned insignificant. This result agrees with that reported earlier by Sun and Parikh (1999). Nevertheless, the growth in labour force is found to be statistically significant in countries being analysed. But this is supported by an earlier study [Crespo and Worz (2003)], which used a sample of 45 countries including many developing countries along with all the industrialised countries. However, many earlier studies, such as Feder (1982) and Sun and Parikh (1999) have found labour growth to exercise statistically insignificant effect on GDP growth. This may be due to the fact that there was no labour surplus in sample countries during the period under investigation.

Further, it may also be noted that when the productivity differential (γ) is introduced in the conventional neo-classical model, R^2 is almost doubled to the size 0.42. This shows the superiority of Equation (20) over the conventional neo-classical model. A similar situation has been reported earlier by Balassa (1978) and Feder (1982).

Results from Bhargava, *et al.* (1982) modified Durbin Watson statistic and Baltagi and Wu (1999) locally best invariant statistic fail to reject the null hypothesis of no serial correlation. Bhargava *et al.* is generalisation of Durbin-Watson statistic for fixed effect model. The realisation of this statistic is 1.96. As in the usual Durbin Watson case, the null hypothesis of no serial correlation is rejected if the realisation of the statistic is below the lower bound critical value and is not rejected if the

statistic is larger than the upper bound critical value. The critical values are reported in Bhargava, *et al.* (1982). As the statistic is close to 2, we fail to reject the null of no serial correlation. Baltagi and Wu statistic is distributed as $N(0,1)$. To test null hypothesis that $\rho=0$ against the alternative that $\rho > 0$, one refers to the lower tail of normal distribution. As the realisation of the statistic is 2.02, we fail to reject the null hypothesis of no serial correlation.

The estimation carried above can be criticised on the grounds that it suffers from simultaneous causality, which can lead to correlation between the regressor and error term. The ensuing simultaneity bias, is mitigated by employing a two stage least squares fixed effects estimator (FE-2SLS). We instrument for capital and export variables by using labour, export shares and lagged values of capital, weighted exports growth, and GDPG as instruments. The results of the Hausman's test for overidentifying restrictions yields χ^2 (2) = 2.682 with a *p*-value of .2616 which points to non-rejection of the overidentifying restrictions. This implies that test results supports our choice of instruments.

The results given in Table 2 for FE-2SLS estimation are almost similar to the fixed effects (FE) estimation with three exceptions. Firstly, the magnitude and sign on the capital coefficient changes but is insignificant as before. Since the estimated coefficient is insignificant, its effect may be taken with caution. Secondly, the magnitude on marginal productivity rises indicating a stronger effect of marginal productivities on GDP growth. Thirdly, the computed differential marginal productivity parameter (δ) is 5.22 which indicates a much higher productivity differential between exports and non-exports sector as compared to our earlier estimate of 0.45.

IV.3. Results Based on Feder's Model Incorporating Parameterised Externality Effect

The equations estimated in the previous section cannot empirically test the externality and the productivity differential effects. Keeping in line with traditional conventions the specific inter-sectoral externality effect is determined by estimating Equation (27) using the fixed effect approach. The results given in the Table 3 clearly show that capital and labour growth both exhibit the expected positive influence on the output growth. But the productivity of domestic capital in non-export sector continues to be insignificant even in this case. Since the estimated coefficient is insignificant, its effect may be taken with caution. It has been found that although a one percent increase in labour growth increases GDP growth by 0.36 percent, it is significant at 5 percent level of significance.

Table 3

Results Based on Feder's Model Incorporating Parameterised Externality Effect [#]

Variables	Coefficients (FE)	Coefficients (FE-2SLS)
Constant	0.039***	.041***
I/Y	0.003	–.025
$\dot{L}/L$	0.369**	.324*
$(\dot{X}/X).(X/Y)$	0.411***	.898*
$(\dot{X}/X)-(\dot{X}/X).(X/Y)$	0.009	–.017
R^2:	0.42	.20
Bhargava D.W :	1.95	
Baltagi and Wu:	2.02	
F-statistic [Ψ]:	7.62	5.91

*Coefficient significant at 10 percent level of significance. **Coefficient significant at 5 percent level of significance. ***Coefficient significant at 1 percent level of significance.

The Random effects model is rejected in favour of the fixed effects model by the Hausman test χ^2 (4) = 8.145.

^ The instrumented variables are capital, weighted exports growth and instruments are labour, export shares, lagged values of capital, lagged values of weighted export growth and lagged values of GDPG.

ψ F-statistic for the two models rejects the null hypothesis that all the fixed effects are jointly zero (p-values are zero for both the models).

It has been found that the export sector has higher productivity than the domestic sector as shown by the coefficient of $(\dot{X}/X).(X/Y)$, which is positive and significant at 1 percent significance level. The computed differential marginal productivity parameter (δ) is 0.70 $((\delta/1+\delta)=0.411)$ which indicates the existence of a substantial productivity differential between exports and non-exports sector. However, it has also been found that the parameter θ (Equation 27), which shows that the externality effect of exports on non-exports sector, is close to zero and statistically insignificant in the sample countries. Thus, we can say that no growth enhancing externalities arise from the exports sector in the case of South Asian countries. These results agree with those of the study by Crespo and Worz (2003), where the externality terms for low technology intensive exports and high technology-intensive exports were found to be statistically insignificant. However, estimates of Feder (1982) indicated the inter-sectoral externality parameter as statistically significant.

Results from Bhargava, *et al.* modified Durbin Watson statistic and Baltagi and Wu statistic indicate no serial correlation. Further, the results of the Hausman's test for overidentifying restrictions yields χ^2 (1) = 2.650 with a p-value of .1036 which points to non-rejection of the overidentifying restrictions. This implies that test results supports our choice of instruments.

The results given in Table 3 for FE-2SLS estimation are almost similar to the fixed effects estimation with four exceptions. Firstly, the magnitude and sign on the capital coefficient changes but is still insignificant as before. Secondly, the magnitude of the coefficient on weighted exports rises indicating that export sector has higher productivity than the domestic sector. Thirdly, the sign on externality coefficient is of the opposite sign but is insignificant as before. Fourthly, the computed differential marginal productivity parameter (δ) is 8.80 which indicates a much higher productivity differential between exports and non-exports sector as compared to our earlier estimate of 0.70.

Thus, the overall results indicate that, in the South Asian countries, exports contribute to growth mainly through increased productivity and not through the external effects, such as knowledge or technology spillovers. However, these results agree with the view of Grossman and Helpman (1991), who point out that the highly competitive environment in the international markets contributes to the technological improvements and also to improvements in the efficiency of production and management dealings. Although, the transfer of technology, skills and knowledge is believed to be more important in case of imports rather than exports, this effect could not be captured in this paper due to the supply side description of the model which could not separate the difference between exports and imports.

The results need to be interpreted in the context of South Asian export structure, which is significantly reliant on the low-tech labour-intensive products. The South Asian countries have not been able to upgrade skill and technology profile of their exports. Furthermore, the performance of the South Asian exports in terms of product and market diversification has also been relatively poor.

Thus, we conclude that the productivity of the export sector is greater than the non-export sector due to the competitive environment of international market, improved techniques for production, efficient management, skilled labour, etc. But there is no effect of externalities arising from export sector on the domestic sector of economy.

V. CONCLUSION

The relationship between exports and economic growth has long been a subject of great interest in the development literature. The theoretical consensus on export-led growth emerged in 1970s and 1980s after the successful performance of the East-Asian economies. Many studies have found exports affecting economic growth favourably in different countries and regions. This paper provides updated estimates of the relationship between GDP growth and exports in the South Asian countries for the period of 1973 to 2002. Using the production function framework, the impact of exports on economic growth are separated into two parts: productivity differentials due to differences in the exports and non-exports sector and the beneficial positive externalities generated by the export sector.

The paper tends to support the view that the economies adopting the export promotion strategy succeed partially due to the fact that such policies lead the economies on a path towards the optimal allocation of resources. The findings of the present study show that the exports growth has a positive effect on economic growth in the South Asian countries. Our results agree with the earlier findings of the marginal productivity of exports sector being higher than the non-export sector due to the development of efficient and internationally competitive management, improved production techniques, technological progress and higher quality labour, etc. The learning effects and other positive externalities of the exports sector are found to be insignificant and are not found influential for the better performance of the domestic sector. This may be due to the low-tech and labour-intensive nature of the exports of these countries.

However, with the introduction of exports, together with capital and labour, into the production function-type framework, the coefficient on the capital declined in size and was found to be insignificant. Similarly, labour growth was found to have a theoretically expected positive impact on economic growth, which points to the prevalence of surplus labour in the South Asian economies because almost all of the South Asian countries are underdeveloped with a large labour force compared to the size of their economies. Therefore, the marginal productivity of labour is also very low in South Asian countries.

Overall, the study shows that the productivity of exports sector is more than the non-exports sector and there are no inter-sectoral externalities generating from the exports sector in the countries under observation. The structure of exports, percentage of primary and manufactured exports, and type of products for the export are also associated with the externality effects and the exports of the South Asian region comprise mostly of labour-intensive and low-tech primary products. Therefore, the externalities arising from the export sector do not play a vital role in the enhancement of growth. Thus, we can say that the countries with a certain development level and well diversified export structure and highly processed products generally yield positive externalities for the non-export sector. The other justification for the insignificant impact of externalities from export sector can be that the transfer of embodied knowledge and technology, which is another channel of indirect, dynamic gains from trade, is of more importance with respect to imports rather than exports. The skill, technology and new production techniques enter into the boundaries of the countries through the imported products and that has much influence on the demand of domestic products. Thus, the domestic sector of economy is affected by the imports rather than the exports. Our empirical results also support this argument that there is no big role of spillovers arising from exports on the domestic sector.

Finally, it is suggested that other social and political characteristics could be added to the list of omitted variables. Further, the efforts should be made to generate

the relevant data and identify the effects of composition of exports on GDP in the South Asian economies. The calculation of these effects will certainly help in the diversification of the South Asian export structure. The region needs to pay attention to the innovative activities in order to upgrade the technology profile of the countries. This will stimulate exports and bring about drastic changes in their existing export policies.

REFERENCES

Balassa, B. (1978) Exports and Economic Growth: Further Evidence. *Journal of Development Economics* 5:2, 181–89.

Balassa, B. (1985) Exports, Policy Choices and Economic Growth in Developing Countries after the 1973 Oil Shock. *Journal of Development Economics* 18:2, 23–35.

Baltagi, B. H., and P. X. Wu (1999) Unequally Spaced Panel Data Regression with AR(1) Disturbances. *Econometric Theory* 15, 401–406.

Begum, S., and Abul Shamsuddin (1998) Exports and Economic Growth in Bangladesh. *The Journal of Development Studies* 35:1, 89–114.

Bhargava., A., L. Franzini, and W. Narendranathan (1982) Serial Correlation and the Fixed Effects Model. *Review of Economic Studies* 49, 533–554.

Crespo-Cuaresma, J., and Julia Worz (2003) On Export Composition and Growth. Vienna Institute for International Economic Studies (WIIW), University of Vienna, Austria. (Working Paper.)

Emery, R. (1967) The Relation of Exports and Economic Growth. *Kyklos* 20, 470–486.

Feder, G. (1982) On Exports and Economic Growth. *Journal of Development Economics* 12:1, 59–73.

Grossman, G. M., and E. Helpman (1991) *Trade, Innovation, and Growth in the Global Economy*. Cambridge, Massachusetts: MIT Press.

Heller, P. S., and Richard C. Porter (1978) Exports and Growth: An Empirical Re-investigation. *Journal of Development Economics* 5:1, 191–93.

IMF (Various Issues) *International Financial Statistics, (Yearbook)*. Washington, D. C.: International Monetary Fund.

Khan, A. H., Afia Malik, and Lubna Hasan (1995) Exports, Growth and Causality: An Application of Co-integration and Error-correction Modeling. *The Pakistan Development Review* 34:4, 1001–1012.

Michaely, M. (1977) Exports and Growth. *Journal of Development Economics* 4:1, 49–53.

Michalopoulos, C., and Keith Jay (1973) Growth of Exports and Income in the Developing World: A Neo-Classical View. Washington, D. C. (A.I.D. Discussion Paper No. 28.)

Moschos, D. (1989) Export Expansion, Growth and the Level of Economic Development. *Journal of Development Economics* 36, 93–102.

Sun, H., and Ashok Parikh (1999) Exports and Economic Growth in China. Deakin University, Australia and University of East Anglia, UK. (Working Paper No. 9905.)

Thirlwall, A. P. (1999) *Growth and Development.* (6th edition). London: Macmillan Press Ltd. 82–123.

Tyler, W. G. (1981) Growth and Export Expansion in Developing Countries. *Journal of Development Economics* 9:1, 121–130.

United Nations (2005) *National Accounts Statistics Database (CD Rom Version).* United Nations Statistical Division.

Comments

I want to commend the authors for taking up an issue that is of utmost importance to the world in general, and to the South Asian region in particular—the issue of opening up of economies to international trade, in particular assessing the importance of export sector in the growth process of a country. Indeed, the authors ask very pertinent questions; do exports have a positive impact on the GDP growth rate? Are marginal productivities of factors of production higher in the sector producing exportable goods? Does export sector exert a positive externality on other sectors of the economy?

I have comments about four aspects of this paper; the model, econometric methodology, data and results. These comments are positive suggestions, should you wish to improve your paper in future, and should be taken in that manner.

Coming to my first comment about the model used in the paper, the authors base their analysis on the neoclassical production function. They use Feder model of 1982 which he developed specifically to answer research questions posed above. My concern is that this model is a bit dated. Neoclassical production function has undergone many transformations since then. The most important being the inclusion of human capital, which has now become a standard variable in growth regressions. We owe this to seminal work by Mankiw, Romer and Weil (1992) *Quarterly Journal of Economics*. I can not over emphasise the importance of this variable, it is not labour force *per se* but skilled labour force that has proved to be the driver of growth.

Second important advancement in this area is the inclusion of institutional variables in growth regressions. There is voluminous literature on that as well, and this variable has been instrumental in explaining cross country differences in economic performance.

I want to draw your attention to a paper by Knight, Loayza and Villanueva (1993, IMF Staff Papers) who further extend Mankiw, *et al.* model to capture the impact of international trade and government fixed investment. They also use a panel data approach to determine the importance of country specific effects on growth. May be that study can be of help to you to upgrade your model in future.

It is not necessary to follow in their footsteps but their work has helped us broaden our horizon and has helped us in putting things in a perspective in answering questions like, is our model rightly specified? For example, it is argued that exclusion of human capital variable causes upward bias in the estimated effects of investment and population (proxy for labour). I would also encourage you to read Barro's work.

My second comment is about the econometrics of the paper, especially on the issue of reverse causation that plagues any research work on economic growth. In your case, if income growth causes export expansion then your parameter estimates will be biased. There are ways to deal with this problem. We can estimate a system, or we can use techniques relying on instruments. There is a whole menu to choose from. Use of instrumental variable technique has the advantage as it takes care of other econometric problems, e.g., measurement errors, omitted variables.

One problem with Feder's study is that he did not check the robustness of his results [see Sebastian Edwards (1993), *Journal of Economic Literature*], and your study suffers from same problem. By using data from Penn World Table as an alternative, you can check robustness of results.

I would like to mention two studies here. One by Durlauf and Quah ["The New Empirics of Economic Growth", CEP Discussion Paper 384, Jan. 1998], and other by Temple ["The New Growth Evidence", *Journal of Economic Literature*, March 1999]. Both are excellent review articles on issues mentioned above.

Coming to data, it seems that your panel has observation on six variables over thirty years for each country. This is long enough period and I wonder if you checked the stationary properties of the series. In a study on Asian economies by Dipendra Sinha most of the variables are not stationary in their level forms.

Coming to the results, your results are very peculiar. In Table 1 the MP of labour is 0.86, and you justify this result by saying that these countries are labour abundant which explains a large share of labour in the GDP. All previous studies report a negative coefficient for population variable, with higher absolute value for developing countries. In your next table (Table 2) which shows result of Feder's model using fixed effect, the MP of labour comes down to 0.37, you write and I quote (page 11). Although the effect of labour growth on GDP is positive, it is relatively small in magnitude because the sample countries are underdeveloped with large labour force compared to the size of their economies. This is why the MP of labour is not very high, whereas on page 10 (for Table 1) you gave similar reasoning for high MP of labour. It is a bit confusing for the reader as to which is true.

Again on page 12, second last paragraph, you write that "exports exercise a significant positive impact on the output growth of the SA countries. This result is in concurrence with prior expectations because international trade contributes significantly to the GDP of these countries. I do not think that's the case. In Pakistan, it is a mere 13 percent (2003-2004), India 11 percent, Bangladesh 14 percent, whereas Malaysia has 124 percent, Hong Kong 131 percent, Singapore 170 percent (for the year 1999).

Your estimates for marginal productivity of capital are very low; again it is against received wisdom. You quote a study by Sun and Parikh and write that they get similar results, but Sun and Parikh divide total capital into domestic and foreign capital and MP of foreign capital is 0.7 in their study.

You also do not mention estimates of country dummies in your fixed effect model.

Decomposition of exports into primary and manufacturing, and between high tech and low tech exports gives better understanding of which sector has higher MP and externality effect. Without it, it is quite difficult to prescribe which sector should be given preference. Should we export more of raw cotton and rice or move to high tech labour intensive goods. Your policy prescription about moving to high tech manufactured exports comes out of nowhere.

Finally, it would be helpful to have a brief discussion of the export sector of the countries under study, which are very different, e.g., India and Bangladesh are included in the category of manufactured exporters by Easterly in his GDN data set.

Lubna Hasan

Pakistan Institute of Development Economics,
Islamabad.