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Further International Evidence on the Effect of Private Investment, Economic Freedom and Openness on Economic Growth

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Abstract: Using panel data for a large number of countries and a panel-data procedure, this study seeks to determine the effect of private investment, economic freedom and openness on the rate of economic growth. A model of the neoclassical variety is estimated by regressing growth rate of real GNP per capita on (i) the rate of population growth, (ii) log of real GDP per capita for the " initial" year, (iii) aggregate investment as percent of GDP, (iv) private investment as percent of GDP, (v) trade in goods and services as percent of GDP as a proxy for openness, (vi) average years of schooling of population (age 15+) as a proxy for human capital and (vii) the summary rating for economic freedom reported by Gwartney and Lawson (2000). The sample includes 70 countries, of which 56 are less developed and the panel data cover four 5-year periods from1980 to 1997. In addition to separate cross-section regressions for each period, ' intercept' dummy variables for individual countries as well for different periods in the pooled model are used to capture the country-specific, fixed effects and structural change over time respectively. The estimates indicate that (a) increased share of private investment does not help economic growth and (b) economic freedom and openness have significant positive influence on economic growth. The effects of aggregate investment and human capital appear week.

Key words: Economic freedom, openness, economic growth, human capital and investment

Introduction

Statement of the Problem: Some Asian economies have grown much faster than economies in Africa or Latin America over last three decades. During the period 1980-97, while Asian countries such as Singapore, Hong Kong, China and Korea grew at average rates of 6.03%, 4.75%, 8.33% and 6.58% respectively, African economies such as Nigeria, Sierra Leon and Zambia and Latin American economies such as Colombia and Peru grew at average rates of –0.94%, -3.57%, -1.48%, 1.47% and 0.52% respectively. So it is obviously important to consider why the economic growth rates have differed across countries. In order to answer this question, economists tried to find out the economic variables that affect growth of a country.

According to the simple neo-classical growth model (Solow, 1956), a country's growth depends, besides exogenous technical change, on the saving (investment) rate and the growth in labor force. More recent literature has shown that several other policy-related variables such as government size, share of private investment, economic freedom and openness also, may play an important role in the process of economic growth. Models that relate the rate of growth of output to the rate of capital formation usually make no distinction between the private and public components of investment. The relative significance of private and public investment is a potentially important issue in economic growth, especially in the case of developing countries.

The findings reported in recent studies are somewhat inconclusive about the role of several factors. For example, Khan and Reinhart (1990) observe that " private investment plays a much larger and thus more important role in the growth process than does public investment." Ram (1996), on the other hand, while agreeing with Khan and Reinhart for 1970s, finds that " for the 1980s there is a reversal of the pattern and public investment seems more productive than private investment in most cases". In regard to economic freedom, Spindler(1991) concludes, " there appears to be an important, direct relationship between development and liberty..apparently, this relationship holds for both civil and economic development". Ram (2000), on the other hand, points out "... the lack of any indication of a favorable effect of economic freedom, or of increased share of private investment, on the rate of growth of GDP per capita".

As no clear picture is vivid from the empirical studies, the question remains as to just how worthwhile it is to take policy measures to enhance private investment as opposed to public component of investment, ensure more openness and economic freedom. For this reason, it is clear that further study with more sophisticated and reliable economic analysis is necessary.

Statement of the Purpose: This research is an extension of the work done by Ram(2000), who adapted a growth model based on neo classical aggregate production function, to estimate the effects of private investment, openness and economic freedom on economic growth on a cross country basis. Most of the other studies are also conducted using intercountry cross-sectional data. Since the implications are evidently relevant to individual countries and individual country data are seldom adequate, especially for LDCs, it is useful to use panel data for

a large number of countries. Panel data can allow the country specific " fixed effects" to be captured in the model. Therefore, the purpose of this research is to examine the effects of private investment, openness and economic freedom on economic growth for a large number of countries by using panel data and a simple panel-data estimation procedure.

Review of Subsequent Sections: The remainder of this paper is organized into three sections. Section II dwells on the existing representative literature that is concerned with the effects of private investment, openness and economic freedom on economic growth. First I start with the literature that analyzes the effect of private investment on growth. The work done by Khan and Reinhart (1990) is discussed. Then I analyze the work that examines the effect of outward orientation (or "openness") on growth. The work by Dollar (1992) is discussed. Then, I review the article that examines the effect of economic freedom on growth. The work by Gwartney, Robert and Holcombe(1999) is discussed. Finally, I analyze the study done by Ram(2000), which considers all three variables viz. Private investment, openness, economic freedom along with other important variables that affect the rate of growth of an economy. Section III explains the data and models used and discusses the estimation procedures employed. Section IV reports the estimation results and explains the estimation results. Section V provides a brief overall discussion of the study.

Literature Review: Conventional wisdom suggests that the way to prosperity requires stable and prudent macroeconomic policies, liberalization of the goods and factor markets, greater flexibility in the financial system and an enhanced role for the private sector in economic activity.
Private investment is considered to be more efficient than public investment, to stimulate competitiveness in business and hence promote growth. It is suggested that external openness increases specialization and expands the efficiency-raising benefits of the comparative advantage, offers greater economies of scale due to an enlargement of the effective market size, affords greater capacity utilization and induces more rapid technological change. Similarly, economic theory indicates that economic freedom affects incentives, productive effort and the effectiveness of resource use. The freedom to choose and supply resources, competition in business, trade openness and secure property rights are central ingredients for economic progress.

Role of Private Investment: Although the question of relative productivities of public and private investments is an important issue, few studies have been conducted in this area. One important work was done by Khan and Reinhart (1990). Their cross -section study is based on annual averaged data for 1970-79 for a sample of 24 LDCs. The authors find that the coefficient of total investment is positive and statistically significant in all the cases. The result tells that an increase in the investment-income ratio of 1% will raise the growth rate of output by around 0.1 to 0.2 percentage points, irrespective of whether the increase in the investment-income ratio comes about from an increase in private investment or public investment. Then, to test the equality of marginal productivities of these two components of investment, investment is split up into the ratios of private investment to income and public investment to income. The results show that the coefficient of private investment is positive and statistically significant but the marginal productivity of public sector investment turns out to be negative, though not significant. The results would point to the conclusion that private investment plays a dominant role in growth relative to: (a) total investment; and (b) public sector investment. However, it should be noted that the study only considered the direct effects of private and public investment. So it can be said that the direct effect of private investment on growth outweighs the direct effect of public sector investment.

Role of Outward Orientation or Openness: Dollar (1992) examines the relation between outward-orientation (" openness") and economic growth in developing countries on the basis of inter-country cross sectional data for 95 countries for the period 1976-85. Using a measure of outward orientation based on the deviation of the actual real exchange rate from the "optional" one and the degree of its stabilities, he finds that there is statistically significant positive relation between growth and outward orientation (or openness) and the finding is robust for different specifications of the model.

Role of Economic Freedom: Gwartney *et al.* (1999) examine the influence of economic freedom (both level and change) on economic growth for a long period of time. Economic freedom, measured as Economic Freedom Network (EFN) index which is based on the premise that the central elements of economic freedom are (1) personal choice, (2) freedom of exchange and (3) protection of private property. The EFN index contains 17 components designed to identify the consistency of a nation' s institutions and policies with economic freedom. Using a sample of 100 countries, they estimate the effect of economic freedom (and change of economic freedom) on economic growth. Various specifications of the model which include economic freedom and change in economic freedom with or without other important variables such as investment, human capital, change in human capital, dependency ratio

and change in dependency ratio etc. are estimated. In addition to that, the effectiveness of political freedom and civil liberties as opposed to economic freedom is also considered. The finding is that there is a strong and robust relationship between increases in economic freedom and economic growth. The relationship holds even after measures of physical and human capital are taken into account. Furthermore, the causation runs only in one direction- from increases in economic freedom to a more rapid rate of economic growth. The findings also show that economic freedom has substantially more explanatory power than political freedom and civil liberties as a determinant of economic growth.

Ram (2000) conducts an empirical study of the role of several factors in economic growth, with a major focus on the impact of private investment and economic freedom. He uses a large cross-country sample of 63 countries for the 1990s. Based on the neo classical production function, he uses a reasonably complete econometric model that includes, besides the conventional measures of labor and capital, education, openness, initial-period-income, share of private investment and different measures of economic freedom. Ordinary least squares estimates of several variants of the model are reported which include separate estimates for different measures of economic freedom. To take account of the possible parametric heterogeneity, the estimates are reported for the entire sample as well as for the LDC sub-sample. The major findings are (1) the role of aggregate investment is positive, sizable and highly significant in every case, (2) the coefficient of the private-investment variable has a negative sign in every case, which means there is no indication that an increase in private investment (keeping total investment constant) has a favorable effect on growth, (3) the "openness" variable is also mostly insignificant, (4) the estimates also suggest that economic freedom does not have a positive effect on growth; the overall indication is of an insignificant parameters and the estimates are fragile.

So we see that the findings regarding the effects of private investment, openness and economic freedom on the growth rate of an economy is somewhat mixed. Almost all of these studies used cross sectional analysis. The major drawback of this kind of analysis is that it does not account for country-specific factors that might influence growth. It is either difficult to measure these country-specific factors or unreasonable to assume that they affect the economic growth in the same way across countries. Since the implications are evidently relevant to individual countries and individual country data are seldom adequate, especially for the LDCs, it is useful to base the study on panel data and employ an appropriate panel data estimation procedure.

The Model, Estiamtion Method and Data

The Model: The model used in this research is similar to that of Ram (2000). It begins with the neoclassical aggregate production function:

$$Y = f(L, K) \qquad (1)$$

where Y denotes aggregate real output and L and K indicate inputs of labor and capital respectively.
By taking total differentials on both sides and manipulating the model we get,

$$GY = b_L GL + b_k (GK) \qquad (2)$$

Where GY, GL and GK denote rates of growth of Y, L and K respectively and b_L and b_K are elasticity like parameters.
Adding a constant and also a stochastic disturbance term, (2) may be written as

$$GY = a + b_L GL + b_k (GK) + u \qquad (3)$$

Since, data on capital stock are usually difficult to get, the capital term is replaced by treating the marginal product of capital as the constant parameter and the equation may then be stated as

$$GY = a + b_L GL + a_k (I/Y) + u \qquad (4)$$

Where, a is the rate of neutral technical change, I is gross domestic investment, which is assumed to equal the change in capital stock and a_k is an approximation to the marginal product of capital (or real rate of return on investment).

In line with recent development, economic freedom, openness and human capital (education) are added to this model because these variables may affect aggregate output (and its growth) for given inputs or which may affect productivity and thus impact growth. To represent the share of private investment in GDP, PRV/Y is also included. Due to weaknesses in the data on labor force, GPOP (the rate of population growth) is used as a proxy for labor growth. The basic econometric model then is:

$$GY_{it} = b_0 + b_1 (GPOP)_{it} + b_2 (I/Y)_{it} + b_3(PRV/Y)_{it} + b_4 (FREE)_{it} + b_5 (OPEN)_{it} + b_6 (ED)_{it} + u_{it} \quad (5)$$

Equation (5) can be converted into model of growth of GNP per capita by subtracting GPOP from both sides. Also, in a model of growth of GNP per capita, a (logarithmic) initial-income term is usually added to represent the potential for technological " catch up" or a movement along the transition to steady-state. The model can then be written as

$$GYPC_{it} = a_0 + a_1(GPOP)_{it} + a_2 (I/Y)_{it} + a_3 (PRV/Y)_{it} + a_4(FREE)_{it} + a_5 (OPEN)_{it} + a_6(ED)_{it} + a_7(LY_0)_{it} + v_{it} \quad (6)$$

where GYPC is the rate of growth of real GNP per capita; GPOP is the rate of population growth as a proxy for labor force growth; LY_0 is the log of real GDP per capita for the "initial" year; I/Y is aggregate investment as percent of GDP; PRV/Y is private investment as percent of GDP; OPEN is proxied by trade in goods and services as percent of GDP; ED denotes average years of schooling of population (age 15+); FREE is the summary rating for economic freedom reported by Gwartney and Lawson (2000), which is based on (a) government size, (b) economic structure and use of markets, (c) monetary policy, (d) freedom to use alternative currencies, (e) legal structure and property rights, (f) international exchange and (g) freedom of exchange in capital and financial markets; i denotes the observation for ith country (i = 1,2------70) and t denotes the observation period 1980-85, 1985-89, 1989-93, or 1993-1997.

Fixed-Effects Model: The main purpose of this study is to test the effects of private investment, openness and economic freedom on economic growth in a typical individual country. Since the implications are evidently relevant to individual countries and individual country data are seldom adequate, introduction of fixed-effects dummies, which capture country-specific differences that are not reflected in the explanatory variables in model (6), is useful. In a fixed-effects model, dummy variables are used to allow the intercept term to vary over cross-section units (and over time) to measure the impact arising from unknown variables. There is always a chance for some country- or time-specific factors that affect economic growth but cannot be included in the growth equation. It is either difficult to measure these country-specific factors or unreasonable to assume that they affect economic growth in the same way across countries. Fixed-effects model allows for the possibility that for given values of the regressors, growth rate may differ across the countries.

Thus, use of the fixed-effects model is suitable for several reasons. First, the data cover a large number of diverse countries and cross-country heterogeneity is to be expected. Second, the important issue is the effect of private investment, openness or freedom on growth in a typical individual country and not in some global context. Third, as already stated, there are several country-specific fixed factors that affect economic growth and are not captured by the model. Fourth, in that case, the coefficient of an included variable in pure cross-section format includes the effect of these country-specific factors as well as the effect of that variable.

In line with above discussion, 69 country specific "intercept" dummies are added to model (6). In addition, three time dummies are also included to allow the intercept to change over time. The augmented model then is:

$$GYPC_{it} = c_0 + c_1(GPOP)_{it} + c_2 (I/Y)_{it} + c_3 (PRV/Y)_{it} + c_4(FREE)_{it} + c_5 (OPEN)_{it} + c_6(ED)_{it} + c_7(LY_0)_{it} + ? d_i D_i + ? e_t PD_t + å_{it} \quad (7)$$

where D_i' s are country specific dummies (D_i = 1 for ith country and 0 otherwise); PD_t' s are period dummies (PD_t = 1 for t th period and 0 otherwise) and $å_{it}$ is a well-behaved random term.

Estimation Method: OLS procedure is used to estimate the following variants of the model:

1. Model (6) is estimated for 4 time-periods (1980-85, 1985-89, 1989-93 and 1993-97) separately to compare the effects of the variables of interest on economic growth across the four periods.
2. Model (6) with 3 time dummies (pooled model) is estimated to see the overall influence of private investment, openness and economic freedom on economic growth of the countries.
3. Model (7) is estimated to study the effect of the variables of interest after time-specific and country-specific fixed effects have been accounted for. Although a more general parametric variability over time and across country is also possible, this set of estimates should provide a fairly clear intuition of the role of various factors in economic growth. As already stated, there seems no study that has used such a format to consider the effect of private investment, openness and economic freedom.

Data Definition and Sources: Averaged data for the period 1980-85, 1985-89, 1989-1993 and 1993-97 for 70 countries are used. Data are mainly drawn from World Development Indicators 1999 (World Bank CD-ROM). Data definitions and sources are shown in Table1.

Table 1: Data Definitions and Sources

Data	Definition	Source
Growth of per capita GNP GYPC	Rate of growth of real GNP per capita averaged over 1980-85, 1985-89, 1989-1993 and 1993-97	World Development Indicators 1999 (World Bank CD-ROM)
Growth of Population GPOP	GPOP is the rate of population growth averaged over 1980-85, 1985-89, 1989-1993 and 1993-97	World Development Indicators 1999 (World Bank CD-ROM)
Gross Investment I/Y	Gross domestic investment as percent of GDP averaged over 1980-85, 1985-89, 1989-1993,and 1993-97	World Development Indicators 1999 (World Bank CD-ROM)
Private Investment PRV/Y	Private investment as percent of GDP (calculated by multiplying private investment as percent of GDFI and GDFI as percent of GDP and dividing by 100) and averaged over 1980-85, 1985-89, 1989-1993 and 1993-97	World Development Indicators 1999 (World Bank CD-ROM)
Log of Initial Income LY_0	Log of real GDP per capita for 1980, 1985, 1990 and 1995	World Development Indicators 1999 (World Bank CD-ROM)
Data	Definition	Source
Openness OPEN	Proxied by the sum of import and export of goods and services as percent of GDP averaged over 1980-85, 1985-89, 1989-1993 and 1993-97	World Development Indicators 1999 (World Bank CD-ROM)
Education* ED	Average years of schooling of population (age 15+) for the years 1980, 1985 and 1990	Barro and Lee (1996)
Economic Freedom FREE	Summary rating for economic freedom for the years 1980, 1985, 1990 and 1995	Gwartney and Lawson (2000)
Time Dummy PD_t	Time dummy for t-th period (PD_t = 1 for t^{th} period and 0 otherwise, where t = 1,2,3)	
Country Dummy D_i	Country dummy for ith country (D_i = 1 for ith country and 0 otherwise, where i = 1,2, ---, 69)	

*As data beyond 1990 for education are not available, 1990 data are used for last two periods

Results and Discussion

Before regression estimates of equations (6) and (7), I would like to provide some descriptive statistics for the sample(s) on which the regressions are based. Although the total number of countries covered is 70, missing data limit the sample size a little.

Table 2: Descriptive Statistics

	Mean (Unweighted)	Std. Deviation	Minimum	Maximum	N
GYPC (1980-1997) (%)	1.245	3.232	-6.89	16.93	279
I/Y(1980-1997) (%)	21.145	7.200	3.00	46.58	280
OPEN(1980-1997) (%) and	66.863	53.297	14.77	384.99	280
PRV/Y(1980-1997) (%)	13.113	548.150	238.65	31.645	250
ED(1980, 85, 90)	5.149	2.638	0.55	11.94	278
FREE(1980, 85, 90,95)	5.630	1.668	2.00	9.80	274
LY_0(1980, 85, 90,95)	7.967	1.031	5.97	10.22	277
GPOP(1980-1997) (%)	2.003	0.980	-1.17	5.63	280

Table 3: Partial Correlation Coefficients between Growth rate of Per capita GNP and other variables

	I/Y(1980-1997) (%)	OPEN(1980-1997) (%)	PRV/Y(1980-1997) (%)	ED(1980, 85, 90)	FREE(1980,85, 90,95)	LY_0(1980,85, 90,95)	GPOP(1980-1997) (%)
GYPC (1980-1997)	0.458	0.224	0.354	0.157	0.305	0.195	-0.154

Table 2 shows the mean, standard deviation, maximum and minimum values of the variables for the period 1980-1997. Table 3 shows the simple correlation coefficient between growth rate of per capita GNP and other variables. It turns out that correlation coefficient of growth rate and private investment (0.354), openness (0.224) and freedom (0.305) are positive. Though the values are not very large, still they are not ignorable. So we see that there is positive association between growth rate and these variables. However, we cannot say anything about the direction of the causation as correlation cannot determine the direction of causation. Other variables viz. gross investment, education, log initial income are also showing positive association with growth rate while population growth shows negative association.

Table 4:Regression Estimates of Equations (6) and (7) of the text (t- statistics are in parentheses)

Period	Constant	I/Y	OPEN	PRV/Y	ED	FREE	LY0	GPOP	R^2	Adj R^2	D.F.	F
1980-85 Cross-section data without pooling	5.666	0.259**	-0.009	0.182*	-0.016	0.23	1.579**	-0.929**	0.567	0.505	55	9.01
(Model 6)	(1.53)	(3.8)	(-1.25)	(1.82)	(-0.08)	(0.76)	(-2.83)	(-2.25)				
1985-89	7.76	0.067	-0.01	0.234*	-0.196	0.939**	-1.545**	-1.008**	0.364	0.283	62	4.5
	(1.58)	(0.87)	(-1.78)	(1.78)	(-0.8)	(3.15)	(-2.1)	(-2.3)				
1989-93	-3.24	0.409**	0.002	-0.281**	-0.098	0.993**	-0.617	-0.414	0.461	0.395	64	6.97
	(-0.62	(4.8)	(0.22)	(-2.21)	(-0.4)	(3.43)	(-0.78)	(-1.00)				
1993-97	8.933**	0.284**	0.004	-0.141	-0.074	0.569**	-1.279**	-1.885**	0.568	0.508	58	9.56
	(-2.16)	(-4.48)	(-0.60)	(-1.48)	(-0.36)	(1.98)	(-2.12)	(-4.24)				
1980-97 Pooled data with period	5.584**	0.235**	-0.004	0.009	-0.039	0.705**	-1.298**	-0.903**	0.426	0.401	242	17.24
dummies	(2.41)	(6.34)	(-1.12)	(0.16)	(-0.34)	(4.71)	(-3.81)	(-4.18)				
1980-97	6.689	0.05	0.037**	0.145	-0.187	0.864**	-1.545*	-0.832	0.683	0.533	242	4.53
Pooled data with period and country dummies	(1.05)	(0.63)	(2.52)	(1.35)	(-0.38)	(3.67)	(-1.65)	(-1.52)				

* Statistically significant at 10% level, ** Statistically significant at 5% level

Table (4) reports ordinary least-squares (OLS) estimates of several variants of equations(6) and (7). First four rows show the estimates of model (6) for four cross section periods, fifth row shows estimates of the pooled model (6) with three period dummies (not shown here) and sixth row shows the pooled model (model 7) with three time dummies and 69 country specific dummy variables. The main results are:

1. The fit of the models is quite good. Both R^2 and adjusted R^2 are quite high. The regressions explain more than half of the variation of the growth rate. The regressions are always significant (significant F values). Both R^2 and adjusted R^2 increase when pooled model (with country dummies) are introduced.
2. Investment variable has always expected sign. For full sample, for cross section analysis, mostly significant at 5% level (except for the period 1985-89, when the estimate value is also very small),. For other three periods, the size is quite large, which show an indication of significant positive influence of investment on growth rate. For pooled model, without country specific dummies, estimate is still sizable and significant at 5% level. However, for model with specific country dummies, the magnitude decreases drastically and also loses its significance. This might be due to the values of investment for four different periods that do not vary much. As a consequence, the effect of investment may not be captured properly by fixed effects model.
3. Private investment (as percent of GDP) has shown mixed trend. In the case of cross section analysis, for the periods 1980-85 and 1985-89, it is positive and significant at 10% level. However, for the most recent two periods, when privatization was being boosted, the estimates are negative - for period 1989-93, it is significant at 5% level and for 1993-97, it is not significant. However, the coefficient turns out to be positive when pooled model (with and without country specific dummy variables) is considered, though none is statistically significant.
4. Openness, another parameter of major interest, for cross section models, shows negative effects, but the estimates are not significant at any reasonable level. Even when pooled model with period dummies (but without country dummies) is considered, it retains its negative sign, though not statistically significant. However, when pooled model with country specific dummies is considered, the coefficient gains its positive sign, which is statistically significant at 5% level. However, if we consider the magnitudes, it turns out that the effects are not very large. The effect is about one- twenty fifth of a percentage point due to a percentage point increase of openness.
5. Relative to another parameter of major interest, the estimates suggest a strong indication of a statistically significant favorable effect of economic freedom on growth. In all cases, the coefficient has positive sign and statistically highly significant (except for period 1980-85). When pooled model (with period dummies as well as country specific dummies) is considered, a 1 percentage point increase in freedom may raise growth rate

by 0.864 percentage point; which is to say that, a 1 unit increase in economic freedom raises growth rate by nine-tenth of a unit, which is not trivial at any consideration. So it might be concluded that economic freedom plays a significant role in economic growth.

6. Education variable mostly shows negative influence, though, not significant. The result might be due to the proxy (average years of schooling) used for education which might be a poor proxy variable.
7. The role of initial income is always negative and mostly significant as was expected. The coefficient retains its negative signs even after pooled model with country specific dummies is considered.
8. Population growth has negative effect in most of the cases. It is negative and highly significant for all cross section models. For pooled model (without country dummies) also it is negative and significant. However, when country dummies are introduced it loses its significance. The reason for the insignificant influence might be due to the use of population growth as a proxy for labor force growth, which, as we know, may be a poor representative due to the time lag between the growth of population and labor force growth.

Conclusion

The importance of private investment, openness and economic freedom for economic growth has been stressed by many economists. Consequently, a large quantity of research has been conducted on this relationship, both at the theoretical and the empirical levels. All the same, large gaps still remain in our knowledge of this topic.

As economic growth is one of the most important development issues and variables like private investment, openness and economic freedom have significant policy implications in this context, the influence of these policy variables on economic growth is of great importance. Although there are quite a few studies, most of the studies are based on intercountry cross section analysis, which cannot take country specific fixed effects into account. Since the implications are evidently relevant to individual countries and individual country data are seldom adequate, it is useful to base the study on panel data and employ an appropriate panel data estimation procedure which can consider the country specific fixed effects.

Two models (model (6) and model (7)) are used in this study and both are based on the neo classical aggregate production function. With some mathematical manipulation and adding some variables of importance, in line with recent literature, the models are obtained. The second model is obtained by adding 69 country specific intercept dummies and three period dummies with the set of regressors in model (6).

The models are estimated 70 countries. First model (model 6) is estimated for four different time periods to compare the effects of the variables of interest on economic growth across the four periods. The pooled model with three period dummies is then estimated to see the overall influence of private investment, openness and economic freedom on economic growth of the countries.

Finally, the second model (model 7) (with 69 country specific dummy variables and three period dummies) is estimated to study the effect of the variables of interest after time-specific and country-specific fixed effects have been accounted for.

The sample consists of 18 years of data for 70 countries averaged over 1980-85, 1985-89,19 89-93 and 1993-97. Growth rate is considered as the growth rate of per capita GNP, investment is the Gross Domestic Investment as percent of GDP, Private investment is the also expressed as percent of GDP, labor force growth is proxied by the rate of growth of population, the proxy for log of initial income is log of real GDP in initial periods, " openness" is measured as the summation of export and import as percent of GDP, education is proxied by average years of schooling of population (age 15+) and freedom is the summary rating for economic freedom calculated by Gwartney and Lawson (2000).

The results obtained from both the models can be summarized as follows: (a) private investment does not seem to be more productive than public investment, (b) Openness plays a positive role to raise the growth rate of a country. However, the magnitude of the estimate is not very large in the sense that the change in growth rate due to change in openness is not a sizable amount. (c) Economic freedom exhibits significant positive role in economic growth. It seems that the effect of economic freedom is much stronger than that of openness. Relative to other variables, gross investment, though shows significant positive effect in cross section analysis, losses its significance in pooled model, population growth and education do not seem to enhance growth directly and initial income effects growth inversely.

Appendix

List of countries in the sample

Algeria	Colombia	Hong Kong	Nicaragua	Sri Lanka
Australia	Congo	India	Niger	Sweden
Bangladesh	Costa Rica	Indonesia	Norway	Syria
Barbados	Dominican Rep	Japan	Pakistan	Thailand
Benin	Ecuador	Jordan	Panama	Togo
Bolivia	Egypt	Kenya	Paraguay	Trinidad
Botswana	El Salvador	Malawi	Peru	Tunisia
Brazil	Fiji	Malaysia	Philippines	Turkey
Bulgaria	Ghana	Mali	Poland	Uganda
Cameroon	Greece	Mauritius	Rwanda	UK
Canada	Guatemala	Mexico	Senegal	US
Cent Af Rep	Guyana	Nepal	Sierra Leone	Uruguay
Chile	Haiti	Netherlands	Singapore	Venezuela
China	Honduras	New Zealand	South Africa	Zambia

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