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DETERMINANTS OF ECONOMIC GROWTH IN DEVELOPING COUNTRIES: AN EXTREME BOUNDS ANALYSIS

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The present study aimed to test the hypothesis of inadequacy of growth theories in developing countries by identifying the robust determinants of economic growth under uncertainty in model selection. The extreme bounds analysis approach was adopted, and nearly 11 million regressions were estimated. Results showed that in developing countries, the behavior of some potential determinants of growth, such as corruption and bureaucracy quality, is against economic growth theories, and some of other variables are weak determinants of growth. The findings also confirmed the power of variables such as investment and trade proxies.

Keywords: Economic Growth, Extreme Bounds Analysis, Developing Countries
JEL Classification: O40, O1

1. INTRODUCTION

After Adam Smith's analysis of economic growth, the first steps in the development of growth theories were taken in the 1930s and the early 1940s. Thereafter, numerous theories were proposed, all seeking to explain two problems, changes in the standards of living over time, and differences in the standards of living across different areas of the world.

Growth theories have evolved over time. The examination of the evolution path of growth theories shows that evolution almost stopped for 15 years (1970 to 1985) because theories had become complex and very technical and also separated from empirical studies. Research on the economic growth flourished again in the mid-1980s with the work of Romer (1986) and Lucas (1988). Parallel to theoretical studies, empirical studies also attempted to identify the determinants of economic growth and

explain differences in standards of living across countries. Although the evolution of economic growth theories is promising for the identification of determinants of economic growth to achieve sustainable growth, since there is no general consensus on the correct growth model, finding the determinants of growth requires extensive empirical studies. One way to identify the determinants of growth is based on theories of economic growth. However, according to economists such as Hicks (1965), Myrdal (1975), Chenery (1983), and Stern (1991), economic theories are not necessarily a good foundation for economic growth in developing countries. These countries should pay attention to their economic and social circumstances to adjust the theories and take advantage of them. In these circumstances, policy-makers in developing countries are faced with difficulties in selecting appropriate theories and modifying them according to their qualifications. Renelt (1991) pointed out that in some cases there are weak relationships between theory and empirical studies, while the relationship between theory and policy-making for development is ultimately an empirical issue. The solution to this problem is conducting more empirical studies to help policymakers develop their insights in accordance to their own countries. Although endogenous theories explain the growth process more successful than classical and neoclassical theories, they are still not sufficient for explaining the growth process in developing countries. Stern (1991) maintains that although growth theories play an important role in our understanding of how economic growth has been set, important factors are definitely missing, and these are the factors related to the nature of economic growth in the developing countries. According to Pritchett (2006), the first-generation models are inconsistent with the needs of developing countries' politicians, and newer growth theories focused on the long run and on the incentives for expanding the technological frontier that did not necessarily benefit most developing countries. In these countries, the interest has been directed towards short- and medium-term growth and accelerating technological catch up for adopting technological innovations that are old in developed countries. Pritchett believes that an explicit expression of Hicks (1965), that the growth theories are inappropriate for developing countries, is not only correct but also predictive. He pointed out that the quest continues. Since growth theories originated in developed countries, and developing countries may have different structures, the growth process in developing countries may not be adequately explained by these theories.

Chenery (1983) reviewed empirical studies conducted over 25 years and reported that it is important to consider differences between the two groups of countries in analyzing their growth process. For adjustments of theories to the terms of developing countries, their characteristics should be taken into consideration. Stern (1991) also believes that developing countries are not directly associated with the growth rate of a long-term steady state, but the main focus of growth theories is on long-term and sustainable growth. Nevertheless, it is possible to model the missing links in developing countries. For this purpose, accurate and detailed empirical studies must be conducted.

Despite these uncertainties in economic theories, the main question is whether each variable introduced by the theory whose effectiveness on economic growth has been

proved in empirical studies can be considered as a determinant of growth. If the answer is positive, the multiplicity of theories as well as numerous empirical studies leads to the introduction of many determinants of growth. For instance, Durlaf et al. (2005) introduced numerous variables (nearly 150) which were significant and consistent with economic theories, at least in the empirical work. Obviously, if these are the growth determinants selection criteria, theoretical and empirical studies do not contribute much to the understanding of the growth process. There are two main reasons for the multiplicity of variables in this relationship. The first reason is that, according to Brock and Durlaf (2001), growth models are open-ended[1], meaning that growth theories are typically compatible. The second reason is measurement considerations. Even if the theory is explicit in the identification of the determinants of growth, i.e. the uncertainty problem of model selection is resolved, the empirical estimates of these factors will not be easy. The uncertainty in the choice of indicators and the measurement of these factors in developing countries are important issue which deem attention.

These issues convinced economists to examine variables between "a set of" variables that have been identified as growth determinants so far, instead of following theories alone. Although many studies have estimated one or a few regressions to examine the factors affecting economic growth, an econometrist knows well that the desired results can be achieved by changing the specification. Thus, reliance on these results may be misleading. This weakness has been pointed out, among others, by Leamer (1983) who emphasized that, under uncertainty of model selection, one must show how much the result depends on which variable included in the regression. Therefore, one should subject regressions to change in specification. This sensitivity analysis provides a convincing justification for the removal or inclusion of individual variables in the probably true regression. Extreme bounds analysis (EBA) proposed by Leamer and Leonard (1983) tries to solve this problem. Levine and Renelt (1992) applied Leamer's extreme bounds test for the first time to identify robust empirical relations discussed in the economic growth literature. Levine and Zervos (1993) pointed out the EBA helps clarify the degree of confidence about correlations between growth and individual variables.

Hence, the purpose of this paper is to identify the determinants of economic growth and its robustness in developing countries. In other words, this study attempts to test the hypothesis proposed by Hicks, Chenery, Stern, and Pritchett, i.e. whether growth theories are adequate for explaining the growth process of developing countries. In this context, this study used the EBA proposed by Levine and Renelt (1992) (L&R, henceforth) and Sala-i-Martin (1997a,b). We implemented these approaches with the unbalanced panel data of 21 years to determine the robustness of the correlation of potential determinants on economic growth in the 72 developing countries. To check the sensitivity of results for changing the specification, we used 103 variables as potential determinants of growth.

[1] For more information, see Brock and Durlaf (2001) and Zara-Nezhad et al. (2014).

This rest of the paper is organized as follows: The following section discusses the methodology and data. Section 3 presents the results of the EBA and discusses them. Finally, Section 4 is allocated to concluding remarks.

2. METHODOLOGY AND DATA

Leamer (1978; 1983) and Leamer and Leonard (1983) suggested a solution for the problem of uncertainty in model selection and named it "extreme bound analysis", that is an approach for reporting the sensitivity of results to variation in model specification. In this study, we first employed the L&R (1992) version that has the following framework:

$$Y = c + \beta_I I + \beta_M M + \beta_Z Z + u, \quad (1)$$

where Y stands for the growth rate of GDP per capita, I for a set of base variables always included in the regression, M for a variable of interest whose fragility or robustness is going to be examined, and Z for a set of up to three variables chosen from a set of variables identified as a potential determinant of economic growth. Then, we followed the approach by Sala-i-Martin.

The judgement procedure in L&R is such that if β_M is consistently significant and of the same sign in all regressions, then the M-variable is robust; otherwise, it is fragile. Sala-i-Martin (1997) criticized the L&R approach and argued that their criteria are very rigid and very difficult for any variable to pass. He introduced the confidence level in order to avoid assigning the label of one or zero to the variables, and considered the entire distribution of the coefficients of the M-variable (β_M). He computed the fraction of cumulative distribution function lying on each side of zero and named the greatest area CDF(0). He also used the weighted approach to give more importance to the regression that is more likely to be true. He calculated the value of CDF(0) in the weighted and unweighted form under the assumption that the distribution of the coefficients is normal or not. For more details, specifically on computing CDF (0), see Zarra-Nezhad and Hosseinpour (2014) and Zarra-Nezhad et al. (2014).

In this study, we applied EBA on 103 variables using the random-effects model to estimate the following equation:

$$Y_{it} = \alpha_0 + v_i + \beta_I I_{it} + \beta_M M_{it} + \beta_z Z_{it} + u_{it}, \quad (2)$$

where the v_i term is the random effect of country i. The random-effect model was used because when some variables are constant for each individual, a fixed-effect regression is not an effective tool because such variables cannot be included (Dougherty, 2007: 416). The panel data of the study were composed of 72 developing countries over the period 1990-2010. The countries were the same as those reported by Zarra-Nezhad et al. (2014).

In this study the dependent variable was the growth rate of per capita GDP from the *Penn World* Tables 7.1. The I-variables were chosen following the L&R (1992). The I-variables were composed of the investment share of GDP (IRATIO), the initial level of real GDP per capita in 1990 (IN), the secondary school enrollment rate (ENSE), and the annual rate of population growth (POPG). For more information about the reasons for choosing these I variables see Zarra-Nezhad and Hosseinpour (2014). All variables and their sources are the same as those in Zarra-Nezhad et al. (2014). Like L&R (1992) and Levine and Zervos (1993), when evaluating the robustness of each M variable, we restricted this pool of Z-variables by excluding any variable which might measure the same phenomenon.

3. RESULTS

This section presents the results of the EBA versions of L&R (1992) and Sala-i-Martin (1997). We estimated 11,137,748 regressions[2] and summarized the results of both approaches in the following tables (Tables 1 up to 14). Results of L&R approach are reported in tables with odd numbers (1-3-5-7-9-11-13) that their columns (i) present the lowest and highest as well as the coefficient of base regression for each variable. Columns (ii) and (iii) report the t statistics and p-values, respectively. Columns (iv) and (v) respectively report the fractions of positive and negative coefficients from all estimated coefficients. Columns (vi) gives the percentage of significant coefficients. Finally, Column (vii) reports the final result of the robustness or fragility of variables. Results of Sala-i-Martin's approach are reported in the tables with even numbers (2-4-6-8-10-14), where two columns (i) and (ii) report the weighted mean of the estimated coefficients of M-variables and weighted standard errors, in that order. Columns (iii), (iv) and (v) respectively give the significance level or CDF(0) in weighted normal and weighted and unweighted non-normal cases. Results of normality test are not reported in the tables, but it must be noted that the coefficient distribution of

[2] For more details suppose that one attempts to examine the robustness of potential determinants of growth within a set of 101 variables. Four variables leaved as *I*-variables, one variable is the variable of interest, and it is examined whether it significantly and robustly affects economic growth, and the rest of them (98 variables) are counted as *Z*-variables that are allowed to combine in a subset of up to three. Based on combination formula $C(98,i) = 98!/(98 - i)!i!$ that $i = 1,2,3$, one has 98 single, 4753 binary, 152096 ternary combinations. Thus, 156947 regressions, in addition to a base regression, are estimated. In Levin and Renelt's procedure, if all 156947 coefficients of the variable of interest were statistically significant and of the same sign, it is called a *robust* determinant of growth; otherwise, it is fragile. This process is repeated for each of other 99 variables as the variable of interest (M). As mentioned before, when evaluating the robustness of each *M*-variable, we restrict this pool of *Z*-variables by excluding any variable that may measure the same phenomenon. Therefore, the total number of estimated regressions, after these considerations, is 11137748.

all M-variables was non-normal. Still, contrary to the results reported by Sala-i-Martin, we report the weighted CDF(0) with normality assumption of coefficient distribution. Column (vi) reports the number of estimated specification, and column (vii) shows the final results of the mentioned approach.

Although the justification of each finding of this study would be the subject of new study, we attempt to justify some results in brief. As observed in Tables 1 and 2, we used two proxies for corruption, the corruption measure (CORR) of the International Country Risk Guide that rates countries on a 0-6 scale, where the higher values indicate lower corruption, and another proxy (FFCORR) from the Heritage Foundation that rates countries on a 0-100 scale where higher values indicate lower corruption. CORR is robust according to the L&R criteria. It was significant and also of the same sign in all specifications (about 100000 specifications). However, their sign was negative; given the definition of the proxy, it means that in developing countries corruption leads to economic growth. This result is against the views of Mauro (1995) and Shelifer and Vishney (1993) in the framework of endogenous growth theories, but compatible with old theories about corruption and economic growth attributed to Leff (1964), Bayley (1966), and Huntington (1968). The result of another corruption proxy did not pass the L&R criteria, and was called fragile. The difference in the results of these proxies could be due to measurement errors. The results of Sala-i-Martin criteria also confirmed that only the corruption measure of the International Country Risk Guide (CORR) is robust (Table 2).

Findings contrary to what the theory of growth suggests were repeated again in the following two variables, democratic accountability (VOICE) and democratic dummy (DEMOC), but the results were fragile in these cases by both criteria (the L&R's and the Sala-i-Martin's). Another group of variables that were analyzed included demographic characteristics. According to the L&R criteria, all of them were fragile. The share of the population of 14 years old or below (POP14), share of the population of 65 years old or over (POP65), fertility (FERT), and median age of people in countries (MAGE) were significant, respectively at 98.2, 99.71, 73.1 and 87.85% of estimated regressions. Nevertheless, the growth of population share between 15 to 65 years old (PG1465) and urbanization share (URB), population (POP), and population growth (POPG) were significant in very low percentages of specifications. The interesting point in these variables is the positive sign of the coefficient of POP65 (Table 1). According to the Sala-i-Martin criteria, the CDF(0) value for POP14, POP65, FERT, and MAGE is >0.95, and so they are called robust (Table 2).

As observed in Table 3, education measurements such as primary school enrollment rate in the general level and according to sex (ENP, ENPFE, and ENPM), secondary school enrollment rate in the general level and according to sex (ENS, ENSFE and ENSM), tertiary school enrollment rate (ENT), literacy rate (LIT), and mean years of schooling of adults (MYSCH) were fragile according to the L&R criteria. Based on the judgment procedure of Sala-i-Martin (Table 4), from among these indicators of education, only the tertiary school enrollment rate was robust. Easterly and Levine

(1997a) introduced the ethno-linguistic variable as the determinant of economic growth. Our results on the robustness of these variables showed that ethno-linguistic fractionalization (ELF) and language diversity (LDI) are fragile in both judgment procedures.

Table 1. Results of L&R Approach for Corruption, Democracy and Demographic Proxies

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
CORR	low	-1.650	-5.700	0.000	0.000	100.00	100.00	robust
	base	-1.420	-5.000	0.000				
	high	-0.430	-2.300	0.020				
FFCORR	low	-0.034	-1.570	0.120	81.450	18.540	8.130	fragile
	base	0.002	0.110	0.910				
	high	0.115	4.700	0.000				
DEMOC	low	-2.500	-3.000	0.003	12.850	87.150	1.200	fragile
	base	-0.390	-0.540	0.590				
	high	1.170	1.400	0.160				
VOICE	low	-0.061	-3.200	0.001	0.025	99.975	20.100	fragile
	base	-0.298	-1.620	0.110				
	high	0.080	0.430	0.670				
POP	low	-1.790	-3.600	0.001	92.100	7.900	1.930	fragile
	base	0.210	0.960	0.336				
	high	0.750	2.930	0.004				
POPG	low	-0.305	-3.170	0.002	28.550	71.450	0.094	fragile
	base	-0.024	-0.160	0.876				
	high	0.247	1.500	0.130				
DENS	low	-0.006	-2.960	0.003	1.500	98.500	1.130	fragile
	base	-0.002	-0.940	0.350				
	high	0.001	0.600	0.550				
POP14	low	-3.220	-2.950	0.003	0.000	100.00	98.200	fragile
	base	-2.030	-2.760	0.006				
	high	-0.380	-0.590	0.550				
POP65	low	1.580	0.870	0.380	100.000	0.000	99.710	fragile
	base	7.810	3.020	0.003				
	high	11.740	4.400	0.000				
PG1465	low	-0.184	-0.460	0.640	99.990	0.010	3.200	fragile
	base	0.708	1.440	0.150				
	high	1.240	2.500	0.012				
URB	low	-0.048	-1.900	0.063	62.790	37.210	0.015	fragile
	base	0.002	0.060	0.950				
	high	0.050	1.700	0.090				
FERT	low	-1.500	-3.600	0.001	0.001	99.999	73.100	fragile
	base	-0.790	-2.240	0.025				
	high	0.070	0.180	0.860				
MAGE	low	-0.250	-1.310	0.190	96.520	3.480	87.850	fragile
	base	0.240	3.350	0.001				
	high	0.399	5.330	0.000				

Table 2. Results of S-i-M Approach for Corruption, Democracy and Demographic Proxies

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vii) Number of specification	Robust / Fragile
CORR	-1.270	0.280	1.000	1.000	1.000	106082	robust
FFCORR	0.018	0.020	0.810	0.770	0.710	161800	fragile
DEMOC	-0.450	0.680	0.748	0.754	0.736	106082	fragile
VOICE	-0.300	0.180	0.955	0.939	0.931	106082	fragile
POP	0.157	0.210	0.771	0.815	0.818	85401	fragile
POPG	-0.042	0.140	0.614	0.677	0.633	88642	fragile
DENC	-0.002	0.002	0.818	0.795	0.817	85401	fragile
POP14	-1.880	0.717	0.996	0.993	0.995	97076	robust
POP65	7.240	2.490	0.998	0.996	0.998	98855	robust
PG1465	0.646	0.470	0.917	0.898	0.917	88642	fragile
URB	0.001	0.025	0.512	0.638	0.619	88642	fragile
FERT	-0.760	0.340	0.987	0.979	0.978	82240	robust
MAGE	0.210	0.077	0.997	0.981	0.981	106082	robust

Aghion and Banerjee (2005) believed the correlation of financial development fluctuations with economic growth is weak when credit ratio is high and vice versa. Financial development indicators such as the growth of domestic credit to the private sector as a percentage of GDP (CREDG), volatility of domestic credit to the private sector as a percentage of GDP (extracted by Hodrick-Prescott filter) (CREDVOL), variability of domestic credit to the private sector as a percentage of GDP (CREDVAR), and dollarization (DOLLAR) were analyzed in this study.

The results of both procedures demonstrated that dollarization is a weak determinant, and the volatility of domestic credit to the private sector is a robust determinant and has a negative effect on economic growth. The other indicators of financial development were identified as fragile (Tables 3 and 4).

Based on traditional views, natural resources make considerable rents for states (Viner, 1952; Lewis, 1955; Rostow, 1960) and have positive effects on economic growth. However, this idea is criticized by resource curse. The results of our study showed that the coefficient of primary product (MINING) was significant in about 87% of the regression and almost all of them were positive. Although these results do not pass the L&R criteria, according to Sala-i-Martin's procedure, MINING is robust and confirms traditional views (Tables 4 and 6). Another group of variables introduced as the determinant of growth are geographical and physiogeographical variables (Bloom and Sachs, 1998; Gallup, Sachs, and Mellinger, 1999; Master and Sachs, 2001) that include the absolute latitude (LATIT), land locked dummy (LOCKED), length of coastline (COAST), arable land (ARABLE), and rainfall (RAIN). According to our results, all of them were fragile (Tables 5 and 6).

Table 3. Results of L&R Approach for Education, Language and Financial Development Proxies

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
	low	-0.028	-1.510	0.130				
ENP	base	0.009	0.520	0.600	79.890	20.110	0.00	fragile
	high	0.023	1.340	0.180				
	low	-0.034	-1.910	0.057				
ENPFE	base	0.005	0.280	0.780	64.060	35.940	0.000	fragile
	high	0.019	1.150	0.249				
	low	-0.023	-1.230	0.220				
ENPM	base	0.011	0.60	0.550	89.570	10.430	0.000	fragile
	high	0.024	1.350	0.180				
	low	-0.025	-1.230	0.220				
ENS	base	0.041	2.590	0.010	93.070	6.930	67.100	fragile
	high	0.075	3.860	0.000				
	low	-0.026	-1.380	0.170				
ENSFE	base	0.037	2.480	0.013	92.610	7.390	62.720	fragile
	high	0.072	3.900	0.000				
	low	-0.018	-0.930	0.350				
ENSM	base	0.046	2.760	0.006	97.050	2.950	72.100	fragile
	high	0.076	4.400	0.000				
	low	-0.006	-0.308	0.760				
ENT	base	0.072	3.840	0.000	99.990	0.010	86.800	fragile
	high	0.113	5.640	0.000				
	low	-0.049	-1.650	0.098				
LIT	base	0.012	0.460	0.650	71.890	28.110	0.004	fragile
	high	0.062	2.190	0.029				
	low	-0.328	-1.410	0.158				
MYSCH	base	0.309	1.520	0.129	92.640	7.360	10.290	fragile
	high	0.656	3.110	0.002				
	low	-2.080	-1.150	0.250				
ELF	base	1.580	1.180	0.240	99.790	0.210	1.360	fragile
	high	4.030	2.600	0.010				
	low	-1.350	-0.910	0.366				
LDI	base	1.480	1.150	0.252	98.940	1.060	0.760	fragile
	high	3.910	2.800	0.005				
	low	-0.068	-5.200	0.000				
CREDG	base	-0.001	-0.050	0.960	18.730	81.270	9.490	fragile
	high	0.043	2.990	0.003				
	low	-0.390	-9.100	0.000				
CREDVOL	base	-0.370	-8.390	0.000	0.000	100.00	100.000	robust
	high	-0.130	-3.840	0.000				
	low	-0.380	-1.160	0.250				
CREDVAR	base	0.048	1.690	0.092	99.140	0.860	16.410	fragile
	high	0.106	3.700	0.000				
	low	-0.390	-0.260	0.796				
DOLLAR	base	0.513	0.330	0.741	99.150	0.850	0.000	fragile
	high	3.120	1.950	0.051				

Table 4. Results of S-i-M Approach for Education, Language and Financial Development Proxies

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vii) Number of specification	Robust/ Fragile
ENP	0.004	0.016	0.606	0.654	0.665	82240	fragile
ENPFE	-0.001	0.015	0.510	0.624	0.628	82240	fragile
ENPM	0.008	0.017	0.673	0.686	0.691	82240	fragile
ENS	0.030	0.016	0.972	0.924	0.929	82240	fragile
ENSFE	0.027	0.015	0.964	0.919	0.926	82240	fragile
ENSM	0.035	0.016	0.983	0.933	0.938	82240	fragile
ENT	0.059	0.019	0.999	0.983	0.987	85401	robust
LIT	0.005	0.024	0.581	0.687	0.683	82240	fragile
MYSCH	0.230	0.200	0.880	0.851	0.860	102426	fragile
ELF	1.430	1.240	0.874	0.863	0.865	106082	fragile
LDI	1.310	1.210	0.861	0.845	0.840	102426	fragile
CREDG	-0.005	0.009	0.650	0.777	0.680	98855	fragile
CREDVOL	-0.340	0.040	1.000	1.000	1.000	98855	robust
CREDVAR	0.040	0.030	0.933	0.911	0.919	98855	fragile
DOLLAR	0.588	1.460	0.656	0.654	0.657	106082	fragile

The government is one of the major agents in economy, and economists attempt to incorporate it into models. To what extent the government intervenes in the economy has always been controversial in the economic literature. Hence, the issue of government size has raised. Besides government size and expenditure, the effect of government expenditure composition on economic growth is also discussed. Our results of the sensitivity analysis of government consumption (GC), growth of GC (GCG), deficits (DEF), military expenditures (MILIT), public health expenditure (HE) and government size (G) showed that in the L&R inflexible procedure, only deficit was correlated with economic growth negatively and robustly.

However, public health expenditure was significant in a high percentage of specification (97.54%) but could not pass the L&R criteria (Table 5). Deficits (DEF), military expenditures (MILIT), and public health expenditure (HE) were introduced as robust in the Sala-i-Martin approach (Table 6). The negative correlation of public health expenditure and economic growth may be surprising. In the economic literature, public expenditures could be divided into productive and unproductive expenditures, but there is disagreement over what expenditures constitute productive expenditure. Most researchers classified health expenditure into investment in human capital and, therefore, productive. Devarajan et al. (1996) suggest that expenditures which are normally considered productive could become unproductive if there is an excessive amount of them.

Table 5. Results of L&R Approach for Primary Product, Geographic, Government and Health Proxies

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
	low	-2.220	-0.820	0.400				
MINING	base	5.300	2.390	0.017	99.930	0.070	86.590	fragile
	high	14.780	5.800	0.000				
	low	-0.060	-1.30	0.190				
LATIT	base	0.044	1.710	0.090	93.780	6.220	17.140	fragile
	high	0.104	3.040	0.002				
	low	-2.740	-2.650	0.008				
LOCKED	base	0.080	0.08	0.933	56.920	43.080	0.050	fragile
	high	1.240	1.180	0.240				
	low	-0.000	-1.900	0.058				
COAST	base	-2.80e-06	-0.080	0.940	23.570	76.430	0.000	fragile
	high	0.000	0.667	0.510				
	low	-0.021	-0.890	0.370				
ARABLE	base	0.037	1.560	0.118	96.260	3.740	9.590	fragile
	high	0.090	3.450	0.001				
	low	-0.001	-2.600	0.001				
RAIN	base	-0.000	-1.040	0.300	2.910	97.090	1.690	fragile
	high	0.001	1.700	0.090				
	low	-0.250	-3.200	0.001				
GC	base	-0.130	-1.900	0.058	0.003	99.997	29.320	fragile
	high	0.009	0.240	0.800				
	low	-0.025	-2.160	0.030				
GCG	base	-0.019	-1.620	0.106	0.000	100.00	0.370	fragile
	high	-0.010	-0.870	0.390				
	low	-0.510	-11.700	0.000				
DEF	base	-0.475	-11.600	0.000	0.000	100.00	100	robust
	high	-0.165	-5.800	0.000				
	low	-0.750	-4.630	0.000				
MILIT	base	-0.398	-2.720	0.006	0.250	99.750	83.210	fragile
	high	0.102	1.240	0.220				
	low	-1.470	-5.600	0.000				
HE	base	-0.917	3.63	0.000	0.001	99.999	97.540	fragile
	high	0.008	0.029	0.980				
	low	-0.070	3.450	0.006				
G	base	-0.025	-1.240	0.216	0.870	99.130	7.000	fragile
	high	0.026	1.320	0.190				
	low	-0.390	-2.700	0.008				
LIFE	base	-0.002	-0.370	0.700	17.930	82.070	1.010	fragile
	high	0.160	2.240	0.030				
	low	-0.003	-0.830	0.400				
ASR	base	0.003	0.770	0.440	97.760	2.240	2.670	fragile
	high	0.020	3.200	0.001				
	low	-0.077	-2.230	0.030				
MORT	base	-0.004	-0.170	0.870	39.230	60.770	0.012	fragile
	high	0.051	1.980	0.047				

Table 6. Results of S-i-M Approach for Primary Product, Geographical, Government and Health Proxies

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vi) Number of specification	(vii) Robust/ Fragile
MINING	5.830	2.110	0.997	0.988	0.986	106082	robust
LATIT	0.034	0.030	0.909	0.882	0.886	106082	fragile
LOCKED	-0.004	0.880	0.502	0.607	0.601	102426	fragile
COAST	-7.957e-07	0.000	0.594	0.610	0.610	102426	fragile
ARABLE	0.028	0.022	0.895	0.869	0.876	106082	fragile
RAIN	-0.000	0.000	0.808	0.796	0.804	106082	fragile
GC	-0.113	0.065	0.958	0.935	0.955	102426	fragile
GCG	-0.018	0.011	0.941	0.937	0.944	106082	fragile
DEF	-0.437	0.040	1.000	1.000	1.000	156948	robust
MILIT	-0.320	0.140	0.995	0.960	0.983	106082	robust
HE	-0.757	0.240	0.999	0.995	0.997	161800	robust
G	-0.020	0.020	0.860	0.831	0.853	161800	fragile
LIFE	-0.026	0.056	0.678	0.683	0.674	106082	fragile
ASR	0.003	0.003	0.797	0.760	0.782	106082	fragile
MORT	-0.001	0.020	0.515	0.671	0.656	106082	fragile

In particular, capital expenditures that are thought to be the mainstay of development may have been excessive in developing countries and so transform into unproductive at the margin. These issues and our results indicate that the governments of developing countries might have misallocated resources. This line of inquiry is open for further research. At the end of Tables 5 and 6, we can observe the results of health indicators, including life expectancy (LIFE), infant mortality rates (MORT), and adult survival rates (ASR), which were fragile based on both decision procedures.

Inflation (INF), the mean of inflation growth as an anticipated component of inflation (INFG), and inflation variability (INFVAR) as an uncertainty index in the economic environment were deemed fragile in both approaches. The other variable was price levels. Consumption price (PC) and investment price (PI) indicate the severity of barriers that hinder the realization of the theory of purchasing power parity (PPP) on consuming and investing goods, and a higher value of this index means there are more barriers. The results of judging the procedures are different. In the L&R approach, both variables are fragile, whereas in Sala-i-Martin procedure, only investment price is fragile, and given the CDF(0) amounts, consumption price has a robust correlation with economic growth. Following Easterly and Levine (1997a), we used telephone lines (per 100 people) as an economic infrastructure proxy that could not pass the L&R criteria; however, it was significant in about 85% of regressions and retained its sign (positive). On the other hand, this variable passed pass Sala-i-Martin criteria and was a robust determinant. Initial income (IN) and investment ratio (IRATIO) that were among the I-variables were also tested.

Table 7. Results of L&R Approach for Price and Infrastructure, Initial Income, Investment and etc.

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
INF	low	-0.031	-4.800	0.000	8.030	91.970	3.530	fragile
	base	-0.001	-0.180	0.856				
	high	0.002	0.690	0.490				
INFG	low	-0.002	-2.810	0.005	0.000	100.00	10.730	fragile
	base	-0.001	-1.670	0.095				
	high	-0.000	-0.240	0.810				
INFVAR	low	-0.001	-0.550	0.590	99.930	0.070	11.050	fragile
	base	0.002	1.920	0.055				
	high	0.003	2.170	0.030				
PC	low	-0.064	-3.490	0.001	0.000	100.00	40.640	fragile
	base	-0.020	-1.960	0.050				
	high	-0.003	-0.300	0.765				
PI	low	-0.007	-2.530	0.010	5.500	94.500	0.350	fragile
	base	-0.002	-0.700	0.483				
	high	0.010	2.380	0.020				
TEL	low	0.017	0.320	0.750	100.0	0.000	85.440	fragile
	base	0.135	2.930	0.003				
	high	0.187	4.100	0.000				
IN	low	-2.040	-3.980	0.000	0.070	99.930	22.840	fragile
	base	-0.674	-1.470	0.141				
	high	0.214	0.457	0.648				
IRATIO	low	0.040	2.230	0.026	100.00	0.000	100.00	robust
	base	0.169	5.560	0.000				
	high	0.249	8.000	0.000				
LPR	low	-0.042	-1.270	0.200	0.990	99.010	0.200	fragile
	base	0.037	1.160	0.200				
	high	0.074	2.170	0.030				
EXDEBT	low	-0.042	-6.12	0.000	0.000	100.00	99.990	fragile
	base	-0.033	-5.13	0.000				
	high	-0.006	-1.510	0.130				
MG	low	-0.005	-1.230	0.220	99.920	0.080	3.490	fragile
	base	0.005	1.000	0.320				
	high	0.059	4.950	0.000				
M	low	-0.072	-6.400	0.000	0.000	100.00	99.990	fragile
	base	-0.048	-4.660	0.000				
	high	-0.010	-1.710	0.088				
EXCONS	low	-0.517	-3.300	0.001	0.010	99.990	32.020	fragile
	base	-0.259	-1.730	0.080				
	high	0.036	0.230	0.818				

Table 8. Results of Sala-i-Martin Approach for Price and Infrastructure, Initial Income, Investment and etc.

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vi) Number of specification	(vii) Robust/ Fragile
INF	-0.001	0.003	0.683	0.632	0.611	98855	fragile
INFG	-0.001	0.001	0.933	0.917	0.937	98855	fragile
INFVAR	0.002	0.001	0.930	0.910	0.923	98855	fragile
PC	-0.019	0.010	0.972	0.961	0.962	102426	robust
PI	-0.002	0.002	0.749	0.753	0.770	106082	fragile
TEL	0.116	0.045	0.995	0.983	0.983	106082	robust
IN	-0.682	0.439	0.940	0.911	0.922	109824	fragile
IRATIO	0.148	0.029	1.000	1.000	1.000	109824	robust
LPR	0.031	0.030	0.850	0.833	0.842	106082	fragile
EXDEBT	-0.031	0.006	1.000	1.000	1.000	106082	robust
MG	0.005	0.005	0.855	0.813	0.829	95369	fragile
M	-0.043	0.010	1.000	1.000	1.000	102426	robust
EXCONS	-0.265	0.144	0.967	0.954	0.956	106082	fragile

Results showed that the prediction of neoclassical growth models (conditional-convergence hypothesis introduced by Barro and Sala-i-Martin (1992)) is not satisfied, but investment ratio had a robust positive correlation with growth rate. Investment ratio passed the rigid criteria of L&R and its CDF(0) values were equal to 1. This result was also confirmed in the L&R study. In general, according to the results, as growth theories claim, investments are vital for economic growth (Tables 7 and 8). According to the results of our study, in both procedures, labor participation rate (LPR) as a potential determinant of growth is also fragile.

As for external debt as a potential determinant of growth, we know that if the government can properly use borrowed funds in productive investment and provide the principal and interest of debt from investments, then debt leads to long-term economic growth. According to the debt overhang hypothesis, if the debt is more than the amount which can be repaid in future, country will experience a reduction of growth in the long run. The debt Laffer curve shows that if debt has to be managed properly to an optimal level, growth will increase over time and if, the level of debt increases over time, growth will be reduced (Sachs, 1989a; Claessens et al., 1996; Pattillo et al., 2001). Given these results, external debt in developing countries has a negative and robust effect on economic growth. In other words, in these countries, the amount of external debt is too high to be repaid in future, so it has a negative correlation with economic growth (Tables 7 and 8).

Table 9. Results of L&R Approach for ICRG, Exchange Rate and Regional Proxies

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
PRR	low	-0.104	-5.480	0.000	0.010	99.990	88.730	fragile
	base	-0.059	-3.490	0.000				
	high	0.009	0.788	0.431				
RULE	low	-0.495	-2.050	0.040	12.460	87.540	0.020	fragile
	base	-0.142	-0.620	0.537				
	high	0.458	2.010	0.045				
BQ	low	-1.600	-4.400	0.000	0.000	100.00	97.180	fragile
	base	-1.200	-3.330	0.001				
	high	-0.110	-0.470	0.640				
ETT	low	-0.650	-2.950	0.010	99.990	0.010	28.800	fragile
	base	-0.420	-1.940	0.052				
	high	0.030	0.270	0.790				
GS	low	-0.050	-0.430	0.670	99.860	0.140	5.140	fragile
	base	0.116	1.010	0.314				
	high	0.310	3.040	0.003				
BMP	low	-0.19	-1.500	0.140	96.410	3.590	20.590	fragile
	base	0.250	1.620	0.105				
	high	0.670	4.700	0.000				
EAST	low	-6.050	-1.900	0.053	14.950	85.050	0.003	fragile
	base	-0.370	-0.180	0.850				
	high	2.70	0.840	0.400				
LATIN	low	-3.60	-3.300	0.001	1.260	98.740	14.990	fragile
	base	-1.250	-1.660	0.097				
	high	1.600	1.800	0.080				
AFRICA	low	-2.500	-1.960	0.050	86.510	13.490	0.0640	fragile
	base	0.530	0.510	0.600				
	high	3.300	2.200	0.030				
OPEC	low	-0.550	-0.450	0.650	99.990	0.010	73.100	fragile
	base	2.230	2.250	0.025				
	high	3.420	3.410	0.001				
SPAIN	low	-2.600	-2.500	0.010	4.870	95.130	0.790	fragile
	base	-0.930	-1.170	0.240				
	high	1.200	0.960	0.340				
BRIT	low	-1.170	-1.70	0.090	70.260	29.740	0.350	fragile
	base	0.098	0.140	0.890				
	high	1.900	2.600	0.009				

As Tobin (1965) suggests, a rise in money extension leads to economic growth by changing individuals' portfolio. Our results showed that the growth of M2 (GM) is fragile in both approaches. In other words, monitory policies do not have a robust correlation with economic growth in developing countries. Broad money as a percentage

of GDP is regarded as the financial development index in the economic literature; in our study, this variable was significant in 99.99% of regressions, but was introduced fragile in the L&R approach, although was called robust in the Sala-i-Martin procedure.

Barro (1996) introduced black market exchange premium as an index of the departure of official prices that affects economic growth. Our results showed that the black market exchange premium index is really fragile in both procedures. Barro (1996) argues that the legacy left by developed countries in their former colonies can improve institutions and affect economic growth. Also, belonging to a particular group or area can affect growth rate. In this study, results demonstrated that among the variables of this group [East-Asia dummy (EAST), Latin-America dummy (LATIN), Sub-Saharan Africa dummy (AFRICA), OPEC members dummy (OPEC), Spanish colony dummy (SPAN), and British colony dummy (BRIT)], OPEC members dummy was a robust determinant of growth, but just in the Sala-i-Martin approach (Tables 9 and 10).

Table 10. Results of Sala-i-Martin Approach for ICRG, Exchange Rate and Regional Proxies

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) CDF(0) Non-normal unweighted	(vi) Number of specification	(vii) Robust/ Fragile
PRR	0.044	0.016	0.997	0.980	0.990	161800	robust
RULE	-0.101	0.220	0.678	0.725	0.753	106082	fragile
BQ	-1.03	0.347	0.998	0.993	0.997	106082	robust
ETT	-0.340	0.200	0.954	0.940	0.956	106082	fragile
GS	0.136	0.110	0.890	0.863	0.831	106082	fragile
BMP	0.194	0.143	0.912	0.854	0.914	161800	fragile
EAST	-0.475	1.870	0.600	0.626	0.628	106082	fragile
LATIN	-1.100	0.750	0.930	0.903	0.895	106082	fragile
AFRICA	0.416	1.001	0.661	0.676	0.686	106082	fragile
OPEC	1.990	0.930	0.983	0.972	0.973	106082	robust
SPAN	-0.739	0.765	0.833	0.821	0.808	106082	fragile
BRIT	0.297	0.640	0.679	0.716	0.671	102426	fragile

The importance of constraints on the government was introduced first by Montesquieu (1748) and Smith (1776) and then in the institutional economic literature by Buchanan and Tullock (1962), North and Thomas (1973), and North (1981; 1990). Hall and Jones (1999), Acemoglu et al. (2001 and 2002), Easterly and Levine (2003), Dollar and Kraay (2003), and Rodrik et al. (2004) indicated the positive effects of constraints on executive on economic growth. In this study, constraints on executive (EXCONS) were fragile determinants, but the important point is its negative effect in almost all regressions (Tables 7 and 8).

Romer (2001) stated that we cannot find an aspect of institutions and policies that would not affect the nation's income. These institutions and policies create

environments in which private decisions are made. If crime is not controlled or there is civil and foreign war, investment returns for private-sector activities would be reduced. If the contracts are not respected or interpretations of the courts are not unpredictable, long-term investment plans will become less attractive. If the political regime of a country is unstable, rates of saving and investment demand will decrease. We examined property right (PRR), rule of law (RULE), bureaucracy quality (BQ), ethnic tension (ETT), and government stability (GS). The results revealed that none of these passed the L&R criteria, but property right (PRR) and bureaucracy quality (BQ) were significant in

Table 11. Results of L&R Approach for Religion, Scale Effects and Social Development Proxies

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
CHIRST	low	-3.090	-3.000	0.003	68.040	31.960	0.630	fragile
	base	0.140	0.170	0.870				
	high	3.730	3.100	0.002				
MUSLIM	low	-2.470	-2.400	0.020	40.050	59.950	0.100	fragile
	base	-0.120	-0.14	0.887				
	high	3.300	3.100	0.002				
HIND	low	-3.02	-0.830	0.410	6.490	93.510	0.490	fragile
	base	1.480	0.490	0.627				
	high	1.820	0.900	0.370				
BUDD	low	-5.370	-2.800	0.006	6.490	93.510	0.490	fragile
	base	-0.960	-0.500	0.615				
	high	1.820	0.900	0.370				
OTHER	low	-5.690	-1.430	0.150	32.100	67.900	0.000	fragile
	base	0.090	0.020	0.981				
	high	4.200	1.170	0.240				
NONRE	low	-7.500	-1.600	0.110	67.050	32.950	0.000	fragile
	base	1.025	0.280	0.777				
	high	9.150	1.660	0.098				
REF	low	-1.140	-0.674	0.501	99.940	0.060	22.600	fragile
	base	2.100	1.630	0.104				
	high	5.390	3.240	0.001				
AREA	low	-2.30e-07	-1.330	0.184	89.900	10.100	0.000*	fragile
	base	1.00e -07	0.760	0.448				
	high	3.20e -07	2.000	0.045				
L	low	-4.40e-09	-1.350	0.180	93.200	6.800	3.500	fragile
	base	3.30e-03	1.030	0.301				
	high	1.40e-08	3.220	0.001				
GEQ	low	-2.600	-1.040	0.297	99.170	0.830	14.370	fragile
	base	4.490	1.700	0.096				
	high	9.800	3.400	0.001				
CIVIC	low	-6.820	-1.050	0.296	85.540	14.460	0.000	fragile
	base	1.130	0.170	0.870				
	high	12.120	1.830	0.067				

Table 12. Results of Sala-i-Martin Approach for Religion, Scale Effects and Social Development Proxies

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) *CDF*(0) Normal weighted	(iv) *CDF*(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vi) Number of specification	(vii) Robust/ Fragile
CHIRST	0.152	0.856	0.570	0.703	0.691	106082	fragile
MUSLIM	-0.057	0.847	0.527	0.687	0.676	106082	fragile
HIND	1.630	2.870	0.722	0.723	0.701	106082	fragile
BUDD	-0.930	1.760	0.702	0.692	0.711	106082	fragile
OTHER	-0.549	3.380	0.565	0.597	0.588	106082	fragile
NONRE	0.347	3.410	0.541	0.633	0.625	106082	fragile
REF	2.040	1.180	0.959	0.944	0.932	106082	fragile
AREA	6.182e-08	1.269e-07	0.687	0.698	0.709	106082	fragile
L	2.888e-09	3.046e-09	0.829	0.815	0.806	106082	fragile
GEQ	3.510	2.640	0.909	0.870	0.900	106082	fragile
CIVIC	1.620	6.310	0.602	0.617	0.619	106082	fragile

very high percentages of regressions (Table 9). These two variables were robust determinants of the economic growth of developing countries in the Sala-i-Martin approach. It is important to mention that their coefficients signs were negative in almost all regressions, which does not confirm the relevant theories (Table 10).

Weber (1930), Huntington (1996), Landes (1999), and Inglehart and Baker (2000) believe that culture, religious practices, and beliefs have important effects on the development and growth rate of countries. Barro and McCleary (2003) entered different indexes of religious fractionalization in growth regressions and concluded that they have significant effects on the economic growth rate. Moreover, Sala-i-Martin (1997) in his study reported that religious indexes are robust determinants of growth. In our study, however, all the selected religious indexes [fraction of Christian (CHIRST), fraction of Muslim (MUSLIM), fraction of Buddhist (BUDD), fraction of Hindu (HIND), fraction of other religion (OTHER), fraction of population that have no religion believe (NONRE), and religion fractionalization index (REF)] were fragile in both judging procedures.

Based on our findings, various proxies of scale effects such as total area (AREA) and total labour force (L) do not matter for the economic growth rate of developing countries. These results on proxies of scale effects are the same as those reported by Sala-i-Martin (1997). Our proxies for social development were civic activism and gender equality, both of which were fragile (Tables 11 and 12).

In the last two Tables (13 and 14), the remaining variables were taken into account. First, we discuss shock proxies. Under Black's hypothesis, growth innovation should positively correlate with economic growth (Black, 1979). We chose technology shock proxy (GIN) just like Kormendi and Meguire (1985). This variable did not pass the very strict test of L&R, but admitted the Sala-i-Martin criteria. In other words, our results

support the Black hypothesis. Barro (1977; 1978) argues that monetary shocks make noises in the process of extracting proper signals from relative prices for the efficient allocation of resources, so monetary shocks have a negative correlation with economic growth. In this study, we extracted monetary flactuations from M1 by the Hodrick-Prescott filter and used this component (MSHOCK) and its standard deviation

Table 13. Results of L&R Approach for Shocks, Security Proxies, FDI and Economic Freedoms

Variable		(i) Beta	(ii) t	(iii) p-value	(iv) Pos coef.	(v) Neg coef	(vi) Percent of Significance	(vii) Robust/ Fragile
GIN	low	-0.017	-0.110	0.910	99.999	0.001	76.170	fragile
	base	0.340	2.590	0.010				
	high	0.560	4.280	0.000				
MSHOCK	low	-0.000	-0.027	0.980	99.997	0.003	0.000	fragile
	base	0.002	0.870	0.390				
	high	0.004	1.930	0.054				
STDMSHOCK	low	-0.004	-1.970	0.050	5.000	95.000	0.004	fragile
	base	-0.001	-0.650	0.520				
	high	0.003	1.410	0.158				
WAR	low	-1.100	-1.500	0.140	11.370	88.630	0.000	fragile
	base	-0.280	-0.400	0.690				
	high	0.670	1.010	0.300				
REVOCOUP	low	-0.314	-1.120	0.260	27.990	72.010	0.000	fragile
	base	-0.029	-0.090	0.260				
	high	0.210	0.639	0.523				
ASSASSIN	low	-0.070	-0.450	0.560	94.620	5.380	0.000	fragile
	base	0.041	0.270	0.790				
	high	0.135	0.900	0.370				
FDI	low	0.009	0.180	0.860	100.00	0.000	57.850	fragile
	base	0.140	2.060	0.039				
	high	0.239	3.400	0.001				
ECOFREE	low	-0.345	-6.330	0.000	1.180	98.820	75.330	fragile
	base	-0.120	-2.980	0.003				
	high	0.150	2.360	0.018				
FINFREE	low	-0.085	-4.70	0.000	0.030	99.970	74.360	fragile
	base	-0.045	-2.810	0.005				
	high	0.010	0.410	0.680				
FISCALFREE	low	-0.020	-0.780	0.430	99.540	0.460	36.800	fragile
	base	0.040	1.790	0.074				
	high	0.109	4.030	0.000				
MFREE	low	-0.004	-0.160	0.880	99.999	0.001	91.100	fragile
	base	0.056	2.430	0.015				
	high	0.190	7.370	0.000				
IFREE	low	-0.089	-5.800	0.000	0.001	99.999	96.150	fragile
	base	-0.059	-3.630	0.000				
	high	0.004	0.200	0.850				
BUSINESSFREE	low	-0.140	-5.800	0.000	0.001	99.999	98.780	fragile
	base	-0.110	-4.430	0.000				
	high	0.000	0.003	0.997				

Table 14. Results of Sala-i-Martin Approach for Shocks, Security Proxies and Economic Freedoms

Variable	(i) Weighted Beta	(ii) Weighted standard error	(iii) CDF(0) Normal weighted	(iv) CDF(0) Non-normal weighted	(v) *CDF*(0) Non-normal unweighted	(vi) Number of specification	(vii) Robust/ Fragile
GIN	0.290	0.130	0.988	0.970	0.973	106082	robust
MSHOCK	0.002	0.002	0.812	0.799	0.802	95368	fragile
STDMSHOCK	-0.001	0.002	0.721	0.719	0.713	102426	fragile
WAR	-0.15	0.640	0.593	0.638	0.624	106082	fragile
REVOCOUP	-0.035	0.320	0.543	0.565	0.554	106082	fragile
ASSASSIN	0.030	0.150	0.589	0.606	0.620	106082	fragile
FDI	0.122	0.065	0.969	0.953	0.969	106082	robust
ECOFREE	-0.084	0.038	0.986	0.942	0.957	161800	fragile
FINFREE	-0.030	0.016	0.987	0.965	0.972	161800	robust
FISCALFREE	0.040	0.023	0.959	0.922	0.944	161800	fragile
MFREE	0.062	0.022	0.998	0.983	0.988	161800	robust
IFREE	-0.049	0.016	0.999	0.993	0.996	161800	robust
BUSINESSFREE	-0.086	0.024	0.999	0.996	0.997	161800	robust

(STDMSHOCK) as monetary shock proxies. The results revealed that these have weak and very fragile correlations with economic growth. Three indexes of security, including war dummy, number of revolutions and coup detat incidents, and number of political assassination were very weak determinants of economic growth in developing countries, and their estimated coefficients were insignificant in all regressions (Tables 13 and 14).

The results of sensitivity analysis pertaining to the effect of forign direct investment (FDI) on economic growth showed that about 60% of estimated coefficients are statistically significant, and all coefficients are positive, so this variable is robust only according to Sala-i-Martin procedure.

Finally, we examined economic freedom indexes. Friedman (1962) argued that, for economy, economic freedom is better than every approach of control of activities. New growth theories also pointed out that economic freedom can explain differences in the economic performance of countries (Vanssay and Spindler, 1994; Alesina, 1998; Haan and Siermann, 1998; Nelson and Singh, 1998).

Based on our findings, although economic freedom and its components did not pass L&R criteria, they were statistically significant in a high percentage of regressions; moreover, financial freedom, monetary freedom, investment freedom, and business freedom were robust determinants of economic growth according to the judging procedure of Sala-i-Martin. The sign of coefficients of all of these, except for monetary freedom and fiscal freedom, was negative. These results seem strange. Two institutes of Heritage Foundation/Wall Street Journal and Fraser publish economic freedom indexes. We used the Heritage Foundation data because their time series data cover more of our period. As Haan and Sterm (1999) indicate, the index of both institutes have a high

correlation of about 0.8. Haan and Sterm (1999) utilized Fraser institute data and concluded that economic freedoms have positive and significant effects on the economic growth. Nevertheless, their study and other studies (that use economic freedom index) are cross-sectional. Hence, the question whether economic freedoms and economic growth have a negative correlation or not is open for further research (Tables 13 and 14).

4. CONCLUDING REMARKS

The hypothesis that economic theories are not adequate for developing countries was introduced by Hicks (1965), Chenery (1983), Stern (1991), and Pritchett (2006). The question remains unanswered which theory is better or which determinant introduced by theories must be entered in the empirical growth regression of developing countries. This hypothesis was not comprehensively subjected to empirical testing. In this study, we attempted to collect the potential determinants of economic growth introduced by theories which were statistically significant in empirical studies (e.g. L&R and Sala-i-Martin, but with a larger set of potential determinants) and, given the uncertainty issue in model selection, subject them to test. Some of the results of our study are again exposed to other types of uncertainty, such as duration of the period under investigation, the approaches of estimating coefficients, and so on. In this study, we only tried to control uncertainty in the selection of specifications; therefore, more than 11 million regressions were estimated.

Despite these considerations, our results for a large number of variables showed that some of them have an opposite sign to that reported by economic theories, for example corruption, property rights, bureaucracy quality, share of the population of 65 years old or over. As for some other variables such as primary school enrollment rate in the general level and according to sex, security index, growth of government expenditures, and so on, given the very small number of specifications in which they were statistically significant, we can claim that they play no role in the growth process of these countries. On the other hand, our results robustly confirmed the power of some potential determinants such as trade and investment introduced by growth theories.

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