Chapter 5

An Eleven-Region Test of the Economic and Socio-Political Determinants of Economic Growth: Is Standard Macro Theory Adequate?

5.1. Introduction

Designing and implementing strategies for economic growth in developing countries is an important and difficult challenge. Most developing countries in Asia, Africa, Latin America, the Middle East and Eastern Europe continue to face high levels of income inequality, public debt, corruption, lack of infrastructure, limited personal freedoms, a high crime rate, and inadequate, non-universal systems of education and health care[7]. Indeed, strategy formulation for the low- and middle-income countries constitutes an important economic, political, and social challenge. Added insight into the relationship between growth in gross domestic product and a wide range of macroeconomic, social and political variables could therefore provide powerful information to policy makers as they adjust and align their domestic and foreign policies for growth, stabilization, and equitable development on the factors for which their region is shown to be lagging. As this is done, the traditional models of so-called development economics may either have to be reformulated or discarded.

One of the most basic propositions in all macroeconomics is that output can be influenced on either the demand or the supply side; that is, by fiscal or monetary policies on the one hand, or productivity, labour supply, technical change or structural reforms on the other . From previous chapter has found that the money supply is the most important factors in determining changes in Gross Domestic Product

---

[7] It should be admitted that many so-called "developed" OECD economies face some or all of these problems. This provides further justification for the thesis of this study, which is that one universal macroeconomic model, will now suffice for all economies across the globe.

(GDP) of 95 developing countries. However, these results may not be consistent when broken down by regional groupings of low- and middle-income developing economies. Any significant differences in the level or marginal impact of inflation, interest, exchange rates, money supply, corruption, crime rate, political freedom and other variables should logically lead to differences in the choice of strategy and the weight, timing, and sequencing of the policies to implement those strategies.

The objective of this chapter is to test to what extent standard macroeconomics, once extended to include institutional indicators, is adequate to determine national income in developing countries. We first classify data for 95 countries into 11 distinct regions based on continent, climate, and access to sea lanes. We then seek to isolate the intercept and slope shifters of economic growth in four stages. Stage one tests a standard economic model composed only of the interest rate, exchange rate, money supply, inflation, save, trade openness, export-import ratio, FDI inflow, tourism expenditure, capital formulation and labour supply. Stage two adds 10 regional dummy variables to determine which, if any of the regions are significantly higher or lower than the suppressed base region (Southeast Asia). Stage 3 then adds slope-shifting interaction terms between each region and the economic variables to determine which macro variables in which regions display significantly different marginal impacts on growth. Step 4 extends the model of stage 3 by adding the socio-political variables schooling, political freedom, transparency (i.e. absence of corruption), and criminality. The model of step 4 is inspired by the new institutional economics in general and by the "sufficiency" economy model of the King of Thailand and the gross national happiness paradigm of the King of Bhutan, which posit that true development is inconsistent with an increase in criminality, corruption, and political or educational disenfranchisement. Finally, based on the significant results of each stage of the analysis, we draw practical conclusions for development policy by region and for the developing economies as a whole.

5.2. Data and Model specification

This study uses an unbalanced panel with annual data spanning the period 1996 to 2008 for a sample of 95 developing countries drawn from Central and Eastern Europe, the Middle East, Latin America, the Commonwealth of Independent States, Asia and Sub-Saharan Africa (Table 5.1). To test for non-homogeneity within the sample, Asia is subdivided into South Asia, Southeast Asia and the socialist emerging economies of China and Vietnam; while Africa is divided into four north-south/coastal-interior groupings.

Table 5.1: Number of countries by region

Region	Number
Central and Eastern Europe (CEU)	11
Middle East (ME)	8
Latin America (LA)	19
Commonwealth of Independent States (CIS)	8
South Asia (SA)	5
Southeast Asia (SEA)	10
Socialist emerging Asia (CHVN)	2
Northern coastal Africa (NCA)	9
Southern coastal Africa (SCA)	9
Northern interior Africa (NIA)	4
Southern interior Africa (SIA)	10
Total	95

Source: Adapted from IMF (2009).

This chapter employs the "standard macroeconomic model" and "sufficiency economy-inspired model" which are explained in Chapter 3.

5.3. Results

In this subsection, first the empirical results of the panel unit root test are presented and then if the evidence suggests that the variables do evolve as non-stationary processes, hence, it is necessary to turn to panel cointegration techniques in order to determine whether a long-run equilibrium relationship exists among the non-stationary variables in level form. The last subsection will provide the estimation results of standard macroeconomic model and sufficiency economic model.

5.3.1 The empirical results of the panel unit root test

First, we test the stationary property of our variables which are *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation, ln_save, ln_trade, ln_xi, ln_FDI_inflow, ln_cap, ln_labour, ln_life, ln_school, ln_lack_freedom, ln_transparency* and *ln_crime*.

Tables 5.2 and 5.3 report in summary fashion the panel unit root tests on the relevant variables. As can be readily seen, most of the tests fail to reject the unit root null hypothesis for *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation, ln_tourism, ln_school, ln_lack_freedom, ln_transparency and ln_crime* in level form in Table 4.2; but the tests do reject the null of a unit root in difference form in Table 4.3. The tables further report the widely used Hadri-Z test statistic, which, as opposed to the aforementioned tests, uses a null hypothesis of no unit root.

However, for *ln_save, ln_trade, ln_xi, ln_FDI_inflow, ln_cap, ln_labour and ln_life* most of the tests do reject the null of a unit root in level form, which implies that these seven variables are stationary at level. Moreover, *ln_HDI* can not be tested for stationary properties because of inefficient observation. Thus, the evidence suggests that the variables which are *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation, ln_tourism, ln_school, ln_lack_freedom, ln_transparency and ln_crime* do evolve as non-stationary processes and the application of OLS will result in biased and inconsistent estimates. It is, therefore, necessary to turn to panel cointegration techniques in order to determine whether a long-run equilibrium relationship exists among the non-stationary variables in level form.

Table 5.2 : Results of Panel Unit root test base on 6 method test for all variables at level

	Null Hypothesis: Unit root (assumes common unit root process)		Null Hypothesis: Unit root (assumes individual unit root process)			Null Hypothesis: Stationary
	Levin,Lim and Chu	Breitung	Im,Pesaran and Shin	Fisher-ADF	Fisher-PP	Hadri
ln_GDP	-1.61	11.48	8.70	92.24	110.75	18.79
	(0.05)	(1.00)	(1.00)	(1.00)	(1.00)	(0.00)
ln_money	-8.59	9.55	2.19	171.91	208.01	18.68
	(0.00)	(1.00)	(0.99)	(0.82)	(0.18)	(0.00)
ln_interest	-38.24	3.046	-4.22	231.49	212.77	15.91
	(0.00)	(0.99)	(0.00)	(0.01)	(0.05)	(0.00)
ln_exchange	-6.17	4.88	1.67	177.83	180.08	21.93
	(0.00)	(1.00)	(0.95)	(0.29)	(0.25)	(0.00)
ln_inflation	6.28	5.13	15.42	118.50	132.80	21.04
	(1.00)	(1.01)	(1.00)	(1.00)	(0.99)	(0.00)
ln_save	-13.53	6.04	-4.57	303.69	277.61	22.26
	(0.00)	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln_trade	-12.58	1.26	-2.61	252.77	237.81	16.09
	(0.00)	(0.90)	(0.01)	(0.00)	(0.01)	(0.00)
ln_xi	-16.72	3.33	-5.05	310.78	341.45	15.90
	(0.00)	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln_FDI_inflow	-14.90	-4.30	-5.69	311.40	379.22	12.52
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln_cap	-17.02	3.69	-2.07	264.74	236.04	15.71
	(0.00)	(1.00)	(0.02)	(0.00)	(0.01)	(0.00)
ln_labour	-38.93	1.51	-3.06	279.72	268.60	18.94
	(0.00)	(0.93)	(0.00)	(0.00)	(0.00)	(0.00)
ln_tourism	-8.45	8.37	-0.27	198.31	236.96	15.12
	(0.00)	(1.00)	(0.39)	(0.17)	(0.00)	(0.00)
ln_school	-59.41	6.24	-0.15	196.90	323.09	19.88
	(0.00)	(1.00)	(0.24)	(0.56)	(0.00)	(0.00)
ln_life	-21.51	2.25	-2.19	191.18	124.00	16.98
	(0.00)	(0.99)	(0.01)	(0.00)	(0.58)	0.00
ln_lack_freedom	-788.69	5.10	-17.74	156.75	247.57	94.00
	(0.00)	(1.00)	(0.00)	(0.68)	(0.00)	(0.00)
ln_transparency	-8.94	1.96	-0.42	131.39	197.06	21.92
	(0.00)	(0.97)	(0.34)	(0.03)	(0.00)	(0.00)
ln_crime	0.20	8.02	2.87	52.42	96.85	14.37
	(0.58)	(1.00)	(1.00)	(0.97)	(0.04)	(0.00)
ln_HDI	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Note: An intercept and trend are included in the test equation. P-values are provided in parentheses.

The lag length was selected by using the Akaike Information Criteria.N/A = inefficient observation.

Table 5.3 : Results of Panel Unit root test based on 6 method test for all variables at 1st difference.

	Null Hypothesis: Unit root (assumes common unit root process)		Null Hypothesis: Unit root (assumes individual unit root process)			Null Hypothesis: Stationary
	Levin,Lim and Chu	Breitung	Im,Pesaran and Shin	Fisher-ADF	Fisher-PP	Hadri
ln_GDP	-27.37 (0.00)	-4.80 (0.00)	-12.80 (0.00)	467.03 (0.00)	550.09 (0.00)	21.75 (0.00)
ln_money	-19.85 (0.00)	-0.51 (0.30)	-9.79 (0.00)	415.09 (0.00)	600.17 (0.00)	16.85 (0.00)
ln_interest	-30.03 (0.00)	-4.73 (0.00)	-15.58 (0.00)	517.52 (0.00)	756.72 (0.00)	26.86 (0.00)
ln_exchange	-20.21 (0.00)	-2.27 (0.01)	-7.24 (0.00)	323.49 (0.00)	380.97 (0.00)	16.82 (0.00)
ln_inflation	-17.91 (0.00)	12.37 (1.00)	-2.15 (0.02)	286.35 (0.00)	297.60 (0.00)	25.88 (0.00)
ln_tourism	-13.32 (0.00)	-4.28 (0.00)	-5.46 (0.00)	300.02 (0.00)	715.25 (0.00)	31.61 (0.00)
ln_school	-20.03 (0.00)	1.24 (0.89)	-2.37 (0.01)	190.41 (0.00)	391.93 (0.00)	26.88 (0.00)
ln_lack_freedom	-73.30 (0.00)	7.39 (1.00)	-15.60 (0.00)	298.44 (0.00)	455.17 (0.00)	90.99 (0.00)
ln_transparency	-12.29 (0.00)	-4.43 (0.00)	-2.84 (0.00)	161.62 (0.00)	447.34 (0.00)	37.59 (0.00)
ln_crime	14.64 (0.00)	9.08 (1.00)	11.48 (0.00)	147.83 (0.00)	117.86 (0.00)	15.25 (0.00)

Note: An intercept and trend are included in the test equation. P-values are provided in parentheses.

The lag length was selected by using the Akaike Information Criteria.

5.3.2 The empirical results of panel cointegration test

Having established that *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation, ln_tourism, ln_school, ln_lack_freedom, ln_transparency* and *ln_crime* are I(1), the Pedroni (2004) and Kao (1999) test was used to examine the cointegrating relationship among the variables. The results for the eight different panel test statistics suggested by Pedroni and Kao are reported in Table 5.4 and 5.5.

For the standard macroeconomic model (Table 5.4), four of the seven Pedroni test statistics suggest that *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation* and *ln_tourism* are cointegrated at the 10 percent level or better. The Kao (1999) test also suggest that *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation* and *ln_tourism* are cointegrated at the 5 percent level.

For model of sufficiency economy inspiral model (Table 5.5), only Kao(1999) test is available and this test suggests that *ln_GDP, ln_money, ln_interest, ln_exchange, ln_inflation, ln_tourism, ln_school, ln_lack_freedom, ln_transparency* and *ln_crime* are cointegrated at the 1 percent level.

Table 5.4: Pedroni's (2004) and Kao (1999) for panel cointegration test for standard macroeconomic model

Test Statistic	T-Ratio	P-Value
Pedroni's (2004)		
Panel υ-statistic	1.36*	0.09
Panel Phillip-Perron ρ-statistic	10.79	1.00
Panel Phillip-Perron t-statistic	-13.19***	0.00
Panel ADF t-statistic	2.13	0.98
Group Phillip-Perron ρ-statistic	14.47	1.00
Group Phillip-Perron t-statistic	-33.15***	0.00
Group ADF t-statistic	-2.98***	0.00
Kao (1999) Test	1.73**	0.04

Note:*, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent levels, respectively.

Table 5.5: Kao(1999) for panel cointegration test for sufficiency economy inspiral model

Test Statistic	T-Ratio	P-Value
Kao (1999) Test	-3.08***	0.00

Note: *** denote statistical significance at the 1 percent level.

       The results from the cointegration test suggest that all variables are cointegrated. Therefore equation (3.3) and (3.4) can be estimated by ordinary least squares(OLS) and generalized method of moments (GMM), and the estimated parameters are not subject to spurious regression phenomena.

5.3.3 Estimation Results

When we estimate panel data regression models, we consider the assumptions about the intercept, the slope coefficients, and the error term. In practice, the estimation procedure is either the fixed effects model or the random effects model (Greene 2003). Firstly, we employed the Hausman (1978) test to choose between the Fixed Effect Model (FEM) and the Random Effect Model (REM). The null hypothesis is the individual effects are uncorrelated with other regressors in the mode, If correlated (null hypothesis is rejected) a random effect model procedures biased estimators so the fixed effected model is preferred. In this case the null hypothesis was rejected. Therefore, the FEM and the pooled model were tested by the poolability test, under which the null hypothesis that slope are the same across countries or over time and the result rejected null hypothesis. Hence, we used FEM for both models.

1) Standard Macroeconomic Model

The standard macroeconomic model shows the relationship among gross domestic product, the money supply, interest rate, exchange rate and inflation rate[8] (see Table 5.6).

Comparing a purely linear model with a model which uses the square of the interest rate and the square of the inflation rate, the adjust R-squared in the squared model is higher than the non squared model; and the AIC, SIC and SE regression are lower. These findings confirm that the relationship between the interest rate and output, and inflation rate and output, are non-linear.

The FEM estimation result shows that the money supply, interest rate, square of inflation rate, and exchange rate exert positive impacts upon gross domestic product; while the squared interest rate and the inflation rate have negative effects at the 10 percent level of statistical significance or better. The results indicate that the elasticity of money supply is greater than the elasticity of either the interest rate, the

---

[8] Tourism is also considered in the conceptual model of Figure 2.1. However, a high degree of empirical multicollinearity with the money supply will prevent it from being explicitly treated in the econometric estimations reported in this study.

inflation rate or the exchange rate; and that and a 1percent increase in money supply leads to a gain in gross domestic product of 0.598percent.

Table 5.6: Model 1 FEM estimation results

Variable	No square		Square	
	Coefficient	Prob	Coefficient	Prob
C	-2.273	0.000	-2.043	0.000
LN_MONEY	0.586***	0.000	0.598***	0.000
LN_INTEREST	0.021*	0.074	0.103***	0.002
(LN_INTEREST)^2			-0.014**	0.025
LN_EXCHANGE	0.161***	0.000	0.142***	0.000
LN_INFLATION	0.225***	0.000	-0.379***	0.001
(LN_INFLATION)^2			0.028*	0.057
Adjust R-squared	0.931		0.932	
SE regression	0.178		0.176	
AIC	-0.537		-0.558	
SIC	-0.127		-0.139	

Note: ***, **,* denote statistical significance at the 1, 5 and 10 percent level, respectively.

After the Hausman and poolability tests determined that the FEM is efficient and consistent, we introduced ten dummy intercept variables against a comparison group (South East Asia) as well as slope-shifting interaction terms between these regional dummies and the macro variables. The result of a macroeconomic model with only the ten dummy intercept shifters but no slope-shifters or socio-political variables is shown in Table 5.7. Except for the Middle East and Northern Coastal Africa, the eight other dummy variables are statistically significant at the 10 percent level or better.

Comparing the coefficients of the dummy for each region with the base region (Southeast Asia) shows that only South Asia and Latin America have a higher coefficient than Southeast Asia; implying that, without considering any monetary, fiscal or trade policy differences, these countries have higher output than Southeast Asia.

Table 5.7: Model 2 (standard macroeconomic model with 10 dummy intercept shifters)

Variable	Coefficient	t-Statistic	Prob.
C	-3.89	-14.90	0.00
Regional groupings			
CEU	-0.23	-2.83	0.00
ME	-0.14	-1.57	0.12
LA	0.42	5.67	0.00
CIS	-0.41	-4.61	0.00
SA	0.22	2.20	0.03
CHVN	-0.28	-1.88	0.06
NCA	-0.09	-1.04	0.30
SCA	-0.15	-1.78	0.07
NIA	-0.29	-2.71	0.01
SIA	-0.11	-1.25	0.21
Macro Variables			
LN_MONEY	0.45	40.93	0.00
LN_INTEREST	0.54	7.07	0.00
(LN_INTEREST)^2	-0.09	-6.21	0.00
LN_INFLATION	-0.20	-1.85	0.06
(LN_INFLATION)^2	0.01	0.38	0.70
LN_EXCHANGE	0.03	4.32	0.00
F-Stat (Prob) = 585.216 (0.000), R-Square(Adj) = 0.983			

To analyze whether the policy implications should be different in each region, slope shifters but no socio-political variables were added to create the full standard model (Table 5.8). That model specification also included a lagged dependent variable[9] because dependence variable has its own memory, and as expected it improves R-squared and also it help correct autocorrelation. To control the endogeneity, we perform the GMM estimation technique and using the lagged of dependence variable at time t-2 or ln_GDP(-2) which is predetermined and it is expected to be independence with disturbance.

---

[9] Using a lagged dependent variable can improve R^2 and correct for autocorrelation (see G.R. Pasha *et al* 2007).

Table 5.8: Model 3 (standard macroeconomic model with regional slope shifters)

Variable	Coefficient	t-Statistic	Prob.
C	-0.29	-4.11	0.00
Regional Groupings			
CEU	0.12	6.10	0.00
ME	0.17	1.79	0.07
LA	0.25	4.74	0.00
CIS	0.32	4.94	0.00
SA	0.04	1.84	0.07
CHVN	0.02	0.59	0.56
NCA	-4.86	-2.50	0.01
SCA	0.03	1.70	0.09
NIA	-1.89	-3.27	0.00
SIA	-0.05	-0.72	0.47
Macro Variables			
LN_MONEY	0.04	6.81	0.00
LN_INTEREST	-0.01	-0.57	0.57
(LN_INTEREST)^2	-0.01	-1.96	0.05
LN_INFLATION	-0.06	-2.58	0.01
(LN_INFLATION)^2	0.02	6.84	0.00
LN_EXCHANGE	0.02	4.72	0.00
LN_GDP(-1)	0.97	171.56	0.00
Cross-effects by country group			
CEU_EXCHANGE	-0.03	-2.96	0.00
CIS*(LN_INTEREST)^2	-0.01	-3.04	0.00
CIS_EXCHANGE	-0.01	-2.32	0.02
CIS_MONEY	-0.01	-1.90	0.06
LA*(LN_INFLATION)^2	-0.01	-2.93	0.00
LA_EXCHANGE	-0.01	-3.60	0.00
ME_INTEREST	-0.19	-1.71	0.09
ME*(LN_INTEREST)^2	0.07	1.92	0.05
ME_EXCHANGE	-0.01	-1.97	0.05
NCA_INFLATION	0.19	2.47	0.01
NCA*(LN_INFLATION)^2	-0.18	-2.33	0.02
NCA*(LN_INTEREST)^2	0.01	2.04	0.04
NCA_MONEY	-0.02	-2.94	0.00
NIA_INFLATION	0.41	3.32	0.00
SIA_MONEY	0.02	15.58	0.00
F-Stat (Prob) = 9356.125 (0.000), R-Square(Adj) = 0.996 DW static = 1.684 AIC = -1.436 ,SIC = -1.290			

Except for two regions (Socialist emerging Asia and Southern Interior Africa), all other dummy variables are statistically significant at the 10 percent level or better. The adjusted R-squared of 0.996 shows a very high and improved explanatory power of the model. The F statistic of 9356.125 indicates that the overall estimated relationship among gross domestic product and macroeconomic variables is significant. The coefficient of lagged GDP is statistically significant, implying that the gross domestic product depends not only on the pure exogenous variables, but also on its own lagged values.

The results of Table 5.8 reveal significant differences in both intercepts and interaction terms, implying that corrective policies should be different for each region. They also suggest that past policy mixes may have diverged significantly as well. The coefficient of all macroeconomic variables (except the interest rate) is statistically significant at the 10 percent level or better. The results indicate that, in the benchmark region (Southeast Asia), the elasticity of the inflation rate is greater than the elasticity of either the interest rate, the money supply or the exchange rate; and that a 1percent increase in inflation rate leads to a loss in gross domestic product of 0.06percent. Moreover, the coefficients of the square of the interest rate and inflation rate are significantly negative and positive, respectively; implying that the relationship between GDP and the interest rate switches from being positive to being negative at the turning point. Meanwhile, the relationship between GDP and inflation switches from being negative to being positive at the turning point.

Cross-effects by macro indicator and region

It is interesting to evaluate for which regions the key macroeconomic indicators of the standard model display significant differences in slope. Some variables have significantly different impacts for many regions as compared to the base region Southeast Asia. For example, the money supply has a greater marginal impact upon GDP in Northern coastal Africa, the Commonwealth of Independent States and Northern interior Africa. Other variables show bidirectional differences as compared to the base region. For example, depreciation in the national currency can improve the GDP for Latin America, the Commonwealth of Independent States and

the Middle East, but it depresses GDP in Central and Eastern Europe. Similarly, inflation seems to reduce GDP growth in South East Asia, the Commonwealth of Independent States, the Middle East, South Asia, Latin America and Southern interior Africa. However, in Northern coastal Africa and Northern interior Africa, inflation has a positive effect on GDP.

Finally, some variables show few significant interactions by region, suggesting that policies have been, or could continue to be, similar across all developing nations. For example, the interest rate is significant only in Middle East.

2) Sufficiency Economy Inspired Model

The sufficiency economy inspired model (Table 5.9) depicts the relationship among GDP, the money supply, interest rate, exchange rate, inflation rate, school enrollment, the lag of political freedom, transparency (i.e., the absence of corruption), and the crime rate.

Table 5.9: FEM estimation results for macroeconomic, social and political variables

	No square		Square	
Variable	**Coefficient**	**Prob**	**Coefficient**	**Prob**
C	-3.891	0.000	0.001	0.999
LN_MONEY	0.412***	0.000	0.335***	0.000
LN_INTEREST	-0.016	0.326	-0.075	0.124
(LN_INTEREST)^2			0.025**	0.046
LN_EXCHANGE	-0.424***	0.000	-0.603***	0.000
LN_INFLATION	0.865***	0.000	-0.226	0.177
(LN_INFLATION)^2			0.130***	0.000
LN_SCHOOL	0.306***	0.002	0.208**	0.021
LN_LACK_FREEDOM	-0.054	0.133	-0.055*	0.091
LN_TRANSPARENCY	0.031	0.589	0.069	0.189
LN_CRIME	-0.015	0.131	-0.004	0.673
Adjusted R-squared	0.997		0.998	
SE regression	0.093		0.084	
AIC	-1.695		-1.888	
SIC	-0.673		-0.842	

Note; *, **, *** denote rejection of the null hypothesis at the 10 percent ,5 percent and 1 percent levels, respectively.

Table 5.9 shows the significant impact of political and social indicators on output which implied the important of political and social indicators and consider only effect of macroeconomic can lead to incomplete results. The FEM estimation results indicate that the money supply, the square of the inflation rate, the square of the interest rate, and school enrollment stimulate GDP; while the exchange rate and the lack of freedom bear negative impacts at the 10 percent level of statistical significance or better.

The elasticity of the exchange rate (0.603percent) is the greatest in this group of variables. Since once again the Hausman and poolability tests showed that FEM is efficient and consistent, we re-introduced the ten dummy variables and interaction terms (Table 5.10).

Table 5.10: Model 4 (sufficiency economy inspired model)

Variable	Coefficient	t-Statistic	Prob.
C	-3.00	-3.28	0.00
Regional grouping			
CEU	0.13	1.41	0.16
ME	-0.10	-3.31	0.00
LA	2.27	2.40	0.02
CIS	0.25	2.53	0.01
SA	-0.52	-2.16	0.03
CHVN	-0.08	-1.41	0.16
NCA	-0.01	-0.25	0.80
SCA	-1.64	-3.99	0.00
NIA	-0.06	-1.43	0.15
SIA	-0.86	-3.40	0.00
Macro and social –political variables			
LN_GDP(-1)	0.91	71.72	0.00
LN_MONEY	0.08	6.82	0.00
LN_INTEREST	0.02	0.76	0.45
(LN_INTEREST)^2	-0.01	-0.94	0.35
LN_EXCHANGE	0.01	2.19	0.07
LN_INFLATION	0.99	3.03	0.00
(LN_INFLATION)^2	-0.10	-2.91	0.00
LN_SCHOOL	-0.01	-0.49	0.62
LN_LACK_FREEDOM	-0.02	-1.77	0.08
LN_TRANSPARENCY	-0.02	-0.90	0.37
LN_CRIME	-0.01	-0.48	0.63
Cross-effects by country group			
CEU_EXCHANGE	-0.02	-2.72	0.01
CEU_INTEREST	0.06	3.38	0.00
CEU_MONEY	-0.02	-2.06	0.04
CIS_TRANSPARENCY	0.12	1.85	0.07
CIS_EXCHANGE	-0.02	-2.67	0.01
CIS_LACK_FREEDOM	-0.09	-2.46	0.01
LA_INFLATION	-1.33	-3.42	0.00
LA*((LN_INFLATION)^2)	0.12	3.53	0.00
LA_MONEY	0.02	3.04	0.00
LA_SCHOOL	0.14	2.67	0.01
ME_CRIME	-0.03	-2.07	0.04

Table 5.10(Cont)

Variable	Coefficient	t-Statistic	Prob.
SA_SCHOOL	0.12	1.94	0.05
SCA_TRANSPARENCY	0.45	3.66	0.00
SCA_EXCHANGE	-0.08	-2.58	0.01
SCA_LACK_FREEDOM	-0.70	-4.59	0.00
SIA_EXCHANGE	0.03	3.34	0.00
SIA_SCHOOL	0.19	3.18	0.00
F-Stat (Prob) = 5014.995 (0.000), R-squared(Adj) =0.998 D.W Stat = 2.091 AIC= -2.307 SIC = -1.843			

Table 5.11: Comparative summary between the regionally-extended standard macroeconomic and sufficiency economy inspired models

Computation	LSDV Standard Macroeconomic Model (Table 5.8)	LSDV Sufficiency Economy Inspired Model (Table 5.10)
SE of Estimate (S)	0.116	0.072
R-Squared[10] (adj)	99.6%	99.8%
AIC	-1.436	-2.307
SIC	-1.380	-1.843
Durbin-Watson statistic	1.684	2.091

Table 5.11 compares the standard macroeconomic model with the sufficiency economy inspired model on the basis of the standard error of regression, adjusted R-Squared, Akaike information criteria (AIC) value, Schwarz information criteria (SIC) value, and the Durbin-Watson (DW) statistic for autocorrelation. The standard error of regression in the Sufficiency Economy Inspired Model is smaller, signaling less spread of estimated values around the true values. An increase in the adjusted R-Squared can be noted despite the inclusion of more variables in the model. The lower AIC and SIC values for the Sufficiency Economy Inspired Model confirm the superior specification of this model.

[10] Empirically, the highest R-squareds reported by Chenery and Syrquin in their early development work at the World Bank were 0.84 and 0.81; but their dataset was not as extensive in number of countries or years. So it is possible that our data would yield higher R-squareds. Chenery and Syrquin also used base year GDP and base year GDP squared to explain GDP. So there is a precedent for inclusion of lagged dependent variables.

All dummy variables in Table 5.10 are statistically significant at the 10 percent level or better except for Central and Eastern Europe, Socialist emerging Asia, Northern Coastal Africa and Northern Interior Africa. The strong goodness-of-fit statistics show that GDP is significantly related to both macroeconomic and socio-political indicators. The adjusted R-squared is 0.998. The significance of the F statistic indicates that the relationship among GDP and macroeconomic variables and social indicators is significant overall. Moreover, social indicators play an important role in determining GDP in only 7 regions: South East Asia, the Commonwealth of Independent States, Latin America, South Asia, Southern Interior Africa, Southern Coastal Africa and the Middle East. The coefficient of the money supply, the exchange rate, the inflation rate and the lack of freedom are statistically significant at the 10 percent level or better. The results indicate that, in the benchmark countries of Southeast Asia, the elasticity of the inflation rate is greater than the elasticity of either the money supply, the exchange rate or the lack of freedom; and that a 1percent increase in inflation leads to a gain in GDP of 0.99percent. This result is consistent with the argument, reported in Perkins *et al.* 2006, that there may be an optimal non-zero level of inflation.

Cross-effects by country group

Some regions have strong intercept- or slope-shifters with the macroeconomic indicators, while others do not. In the latter group, Northern Coastal Africa, Northern Interior Africa and Socialist emerging Asia show no statistically significant in either the intercept or interaction terms. This is surprising that in the standard model, inflation was significant in the model for Northern Interior Africa; and the money supply, interest rate, and exchange rate for Northern Coast Africa. However, Socialist emerging Asia is not significant in either the intercept or interaction terms in either the standard model or the sufficiency economic model. The new equation suggests that Vietnam and China actually behave close to the suppressed dummy region, Southeast Asia, once the marginal impacts of all macroeconomic and socio-political indicators are fully specified. The more complete specification of macroeconomic, political and social variables has removed these apparently misleading interactions from the improved equation.

For the remaining regions Table 5.12 summarizes the intercept- and slope-shifters of Table 5.10 for policy purposes. Policy-operable economic and sociopolitical factors are listed down the side of the table, while the seven significant regions are listed across the top. Only significant elasticities are shown in the matrix. If a region*variable elasticity is shown in green it means that that country enjoys a steeper, more productive upward growth trend than that of the other regions. It should be build upon that in the future and may even be used as a case-study model for other regions. Meanwhile, any figure shown in red points to a region with inefficient or wrong policies in a given dimension. Finally, all elasticities shown in **bold** are sufficiently large to offset the overall effect of the variable in the equation. (As it turns out, the only exceptions are Money in LA and CEU.)

Table 5.12 : Policy matrix of significant elasticities by region in the sufficiency-inspired model.

Variable		Overall	LA	CIS	SCA	CEU	SIA	ME	SA
Economic	*Intercept*		**2.27**	**0.25**	**-1.64**		**-0.86**	**-0.1**	**-0.52**
	Exchange	**0.01**		-0.02	-0.08	-0.02	0.03		
	Money	**0.08**	**0.02**			-0.02			
	Interest	0.02				**0.06**			
	Interest^2	-0.01							
	Inflation	**0.99**	**-1.33**						
	Inflation^2	**-0.10**	**0.12**						
Socio-political	*School*	-0.01	**0.14**				**0.19**		**0.12**
	Transparency	-0.02		**0.12**	**0.45**				
	Lack_freedom	**-0.02**		**-0.09**	**-0.7**				
	Crime	-0.01						**-0.03**	
	Policy divergences		5	4	4	3	3	2	2

The Table 5.12 reveals several important patterns. For example, Central and Eastern Europe, for example, constitute a second group where the factors affecting GDP are strictly macroeconomic: the money supply, the exchange rate, and the interest rate. Interest rate and money supply are significantly and positively related to GDP, while the exchange rate can reduce GDP. The absolute elasticity of the interest rate (0.08 %) is the greatest.

A third group shows the strong presence of human capital within the economic model. In South Asia for example, there is a significant, positive impact of school enrollment on GDP. A 1percent increase in school enrollment leads to a gain in GDP of 0.12percent. In Latin America, school enrollment replaces the exchange rate to join the money supply and inflation in playing a positive role in improving the country's GDP, while the inflation rate now reduces GDP in this region. The elasticity of inflation rate (0.34%) is greater than that of either the money supply or the school enrollment. Similarly, in Southern interior Africa, there is a positive (and significant) relationship between school enrolment and GDP which similarly a positive impact of the exchange rate. The relative elasticity of school enrollment (0.18%) is greater than that of the exchange rate.

Meanwhile, a fourth group of countries displays significant interactions with socio-political variables. In the Commonwealth of Independent States, lack of freedom joins exchange rate revaluation as an important negative determinant of variations in GDP, while the absence of corruption has a positive impact. The elasticity of the absence of corruption (0.12%) is greater in absolute value than those of the other variables. Similarly in Southern Coastal Africa, the lack of freedom also joins exchange rate revaluation to exert a strong negative effect on GDP, while lowering corruption (enhancing transparency) improves GDP. These variables collectively replace the money supply in the narrower standard macro model. In relative terms, the elasticity of freedom (0.70%) is far greater than those of the exchange rate or even transparency. In the Middle East, the crime rate has a significant negative effect on GDP at the 1 percent level (Table 5.12). This shows that a 1percent increase in crime rate decreases GDP by around 0.03 percent.

Cross-effects by macro indicator

The money supply continues to exert a positive and significant effect in South East Asia, Latin America, and Central and Eastern Europe. Only in Central and Eastern Europe does the interest rate have a positive impact on GDP.

Meanwhile, the coefficient of inflation is negative, but the coefficient of the squared interest rate is positive, indicating that inflation can reduce the economic

growth in the inflation rate below 4.12 percent and can encourage growth at above 4.12 percent. However, the threshold is very low compared to that reported by Christoffersen and Doyle (1998), who suggest that the threshold level of inflation for developing countries is 13 percent. Hasanov (2011) also found that below 13 percent of inflation rate, there exists a positive relationship between inflation and GDP. Further research can find the optimal threshold for inflation in each region. Depreciation in the national currency can improve the GDP for Southern Interior Africa; while appreciation in the national currency of Central and Eastern Europe, the Commonwealth of Independent States and Southern coastal Africa encourages GDP growth. Further research will be required to more fully explain the latter outcome.

Cross-effects by social indicator

School enrollment (as a proxy for human capital accumulation) has a statistically significant positive impact on GDP in Latin America, South Asia and Southern Interior Africa, where it replaces many of the other variables in the more limited macro model. The elasticity of school enrollment with respect to GDP varies between 0.12 and 0.19, which implies that an increase of 1 percent in school enrollment can raise GDP by 0.12 to 0.19 percent. The insignificance of school enrollment in other developing regions may be the result of constant returns to human capital.

Transparency is positively associated with GDP, indicating that corruption reduces productivity in the Commonwealth of Independent States and Southern coastal Africa. An increase in corruption by 1 percent lowers productivity by 0.12-0.45 percent of GDP. Similarly, the lack of political freedom undermines GDP in South East Asia and the Commonwealth of Independent States. Finally, only the Middle East demonstrates a negative effect of the crime rate upon GDP. An increase in the crime rate by 1 percent lowers productivity by 0.03 percent of GDP.

5.4. Concluding remarks

According to Todaro (2000), an underdeveloped country is one which has low levels of living (absolute poverty, poor health, poor education and other social services), low self esteem (low respect, honor, dignity) and limited freedom of choice. Therefore, designing and implementing strategies for economic growth in developing countries must be based upon the integration of a comprehensive set of causal variables. The present study examines the long run relationship among growth in gross domestic product and key macroeconomic, social and political variables in 95 developing countries for the period 1996-2008. Since the results may not have been consistent when broken down by regional grouping of low- and middle-income economies, we also classified the data for 95 countries into 11 distinct regions based on continent, climate and sea-lane access and attempted to account for heterogeneity by including country-specific effects such as dummies.

In the extended standard macroeconomic model (our model 3), there were significant differences in both the growth intercept and causal interaction terms by region compared with the benchmark region (Southeast Asia). This implies the need for different policy weightings by developing region. The results also indicated that some variables (e.g. money) manifested the same direction of impact on gross domestic product across all regions; while the results varied across regions for such other variables as the exchange rate and inflation rate. Moreover, the inflation rate was significant only in South East Asia and Northern Coastal Africa; suggesting the need for specific policies in these two regions.

Adding the socio-political variables schooling, political freedom, transparency (i.e. absence of corruption), and criminality to create the sufficiency economy-inspired model (our model 4) revealed the somewhat surprising result that social indicators play no important role in determining GDP in less than half of the regions (5 of 11). Overall, school enrollment has a greater impact on GDP than other social indicators. Only Socialist emerging Asia, Northern Coastal and Northern Interior Africa showed no statistical significance in either the intercept or interaction term which suggests that, without macroeconomic and social policy, Socialist emerging

Asia, Northern Coastal and Northern Interior Africa have experienced the same growth in output as South East Asia. Central East Europe displays no socio-political interaction effects; implying that to develop the economy in this region requires only "standard" macroeconomic policy.

The other six regions do show statistically significant interaction terms for the social and political variables. In the Commonwealth of Independent States and Southern coastal Africa, transparency is positively associated with GDP, which implies that corruption is bad for this region. The lack of political freedom has statistically significant negative impacts on GDP in South East Asia, Southern Coastal Africa and the Commonwealth of Independent States, which implies that increasing political freedom can enhance output growth. Moreover, only in the Middle East does the crime rate reduce growth.

More generally, our results indicate that macroeconomic, social and political variables can all significantly determine output and that their impacts can be used to differentiate 11 regions presumed all to belong to the "developing" world. Therefore, to truly understand output growth in developing economies and to elaborate macro policies that spur, sustain and stabilize growth, the results of this study should be taken carefully into account by both planners and donors. The major limitation of the current study is that, for reasons of space, we have had to focus on output growth, leaving aside income distribution and poverty issues which also pose formidable challenges to sustainable development. These issues should become the object of further research.