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Determinants of Economic Growth in South East Asia: An Analysis for the First Decade of the Third Millennium

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Abstract

This paper examines determinants of economic growth in South East Asia during the first decade of the third millennium -- the 2000s. Building on the growth model initially developed by Loayza et al. (2005), and augmented by Araujo et al. (2014), estimates are obtained for the impact that transitional convergence, structural reforms, stabilization policies, and external conditions had on economic growth in the South East Asian region during the 2000s. The most important driver of economic growth was transitional convergence, accounting for about one half of the region's growth. Improvements in structural reforms and favorable external conditions accounted for about one quarter of growth. Stabilization policies had a negligible impact.

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Determinants of Economic Growth in South East Asia:

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Abstract: This paper examines determinants of economic growth in South East Asia during the first decade of the third millennium -- the 2000s. Building on the growth model initially developed by Loayza et al. (2005), and augmented by Araujo et al. (2014), estimates are obtained for the impact that transitional convergence, structural reforms, stabilization policies, and external conditions had on economic growth in the South East Asian region during the 2000s. The most important driver of economic growth was transitional convergence, accounting for about one half of the region's growth. Improvements in structural reforms and favorable external conditions accounted for about one quarter of growth. Stabilization policies had a negligible impact.

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1. Introduction

Economic growth in the South East Asian region has been solid during the first decade of the third millennium. The solid growth performance can be seen in the time-series, i.e. tracing economic growth in South East Asia over the past four decades, and in the cross-section, i.e. comparing economic growth in the region to other developing regions in the world. Figure 1 displays 5-year averaged PPP GDP per capita over the period 1970-2010 for the group of South East Asian countries. Average income for that group was around 7500USD in the five years leading up to 1970; forty years later average income had doubled amounting to about 16000USD. A significant increase in income materialized during the last ten years of the 1970-2010 period: average growth amounted to about five and a half percent per annum during the first decade of the third millennium.

Economic growth in South East Asia during the first decade of the third millennium also exceeded that of other developing regions. Figure 2 displays 5-year averaged PPP GDP per capita over the 1970-2010 period for two developing regions of interest: the Middle East and North Africa, and Latin America and the Caribbean. Despite both of these regions starting out with an initial GDP per capita that was about half that of South East Asia in 1970, both had an average growth rate during the first decade of the third millennium that was about half that of the average growth rate of South East Asia.

In this paper we examine what determined the growth performance of South East Asian countries during the first decade of the third millennium. We build on the growth model developed by Loayza et al. (2005) and Araujo et al. (2014). These authors estimate a panel data model for a world sample of countries. They use their estimated model to examine growth determinants for Latin America and the Caribbean in recent decades. The authors are careful to examine whether the determinants of economic growth are significantly different in LAC countries from the rest of the world. We follow their approach and test whether the coefficients are significantly different for the South East Asian

region. Based on a panel data model that includes interaction terms between the right-hand-side regressors and a dummy variable that is unity for South East Asian countries we find no evidence that suggests a systematic difference in growth determinants for South East Asia.

Distinguishing between economic growth due to transitional convergence, structural reforms, stabilization policies, and external conditions the following findings emerge. First, transitional convergence accounted for about one half of the economic growth in South East Asia during the first decade of the third Millennium. South East Asian countries have no yet reached their steady state growth paths. The net return to capital accumulation in these countries is still high, exceeding effective depreciation. Second, during the first decade of the third millennium structural reforms accounted for about one quarter of South East Asia's economic growth. Improvements in telecommunication infrastructure was the most important change in the structure of the macroeconomy that lifted economic growth in the South East Asian region. Third, external conditions contributed to about one-quarter of South East Asia's growth. The majority of South East Asian countries experienced improvements in their terms of trade throughout the first decade of the third millennium; improvements in the terms of trade, by allowing to buy more goods from overseas for a given number of goods exported, are growth enhancing. Fourth, stabilization policies had a minuscule effect on economic growth.

Figure 3 shows that the growth performance differs considerably among South East Asian countries. The leader was Cambodia with an average growth rate of around 9 percent per annum, followed by Laos where growth averaged around 8 percent per annum. On the other end are East Timor and Brunei where growth rates were negative. The paper discusses the causes of the differential growth performance among the group of South East Asian countries. A key message is that while differences in the deviation of GDP per capita from country-specific steady states explain a significant portion of the difference in economic growth within South East Asia, differences in the change of the structure of the economy and external conditions mattered just as much.

The remainder of the paper is organized as follows. Section 2 presents the estimation framework. Section 3 discusses the main results. Section 4 concludes.

2. Estimation Framework

This section discusses the baseline econometric model. The baseline model builds on the work of Loayza et al. (2005) and Araujo et al. (2014). After reviewing key features of the baseline model, the section discusses extensions that allow to study determinants of economic growth for South East Asia.

The econometric model relates the change in the natural logarithm of real GDP per capita between two periods to the lagged level of the natural logarithm of GDP per capita and a set of growth determinants:

$$(1.0) \qquad lny_{ct} - lny_{ct-1} = \varphi lny_{ct-1} + \Gamma ln(X)_{ct} + a_c + b_t + e_{ct}$$

where lny_{ct}-lny_{ct-1} is the change in the natural logarithm of real PPP GDP per capita in country *c* between period *t* and *t*-1; lny_{ct-1} is the natural logarithm of real PPP GDP per capita of country *c* in period *t*-1; a_c and b_t are country and year fixed effects; and e_{ct} is an error term. The vector of growth determinants, $X_{ct,}$ includes the natural logarithms of secondary enrolment, the GDP share of domestic credit to the private sector, trade openness, the GDP share of government consumption, telephones lines per capita, inflation, the real exchange rate, an indicator of systemic banking crises, and the growth rate of the terms of trade. Additional variables that we include in X_{ct} are the Polity2 score, which is a measure of the degree of political competition and political constraints, as well as the growth rate of an international commodity export price index that captures windfalls from international commodity price booms.

The baseline econometric model is estimated for a sample of 126 countries spanning the period 1970-2010. Estimating the model based on the largest possible sample of countries ensures that, given the availability of data, the coefficients are estimated as precise as possible (statistical efficiency).

There is trade-off however between statistical efficiency and potential bias that arises from restricting the coefficients to be the same across regions and periods. Hence, the question arises whether the coefficients differ for South East Asian countries? This question can be answered by extending the baseline model to include interaction terms between X and an indicator variable that is unity for South-East Asian countries:

(2) $$lny_{ct} = \theta_3 lny_{ct-1} + \Gamma_3 ln(X)_{ct} + \Gamma_4 ln(X)_{ct} * SEA_c + e_c + f_t + \varepsilon_{ct}$$

In equation (2) the parameter θ_3 captures persistence (or transitional convergence if 1 is subtracted). The vector Γ_3 captures the marginal effects of changes in X on (transitional) GDP per capita growth for countries outside the SEA region. The vector Γ_4 captures the difference in the impact that changes in X have on (transitional) GDP per capita growth for the SEA region. The marginal effects of changes in X on (transitional) GDP per capita growth for countries in the SEA region are given by $\Gamma_3+\Gamma_4$.

Appendix Table 1 provides a detailed description of the variables used in the econometric analysis and their sources.

3. Empirical Results

We begin the section by discussing estimates of equation (1). Table 1 reports the relevant results. The estimates reported there replicate Table 3 in Araujo et al. (2014). Lagged GDP per capita has a significant positive effect on current GDP per capita. The coefficient is around 0.8 and suggests substantial persistence with regard to the impact of past shocks on current GDP per capita. The estimated coefficient implies that there is convergence in transition to countries' steady states; the per annum convergence rate is around 4 percent.

Variables proxying changes in the structure of the macroeconomy have significant effects on economic growth. Education, financial development, trade openness, and infrastucture are growth enhancing while a greater GDP share of government consumption reduces growth. These results are in

line with basic neoclassical growth models (see, for example, Barro and Sala i Martin, 1995). A few words may nevertheless be warranted to motivate, in a concise manner, the plausibility of the empirical results. Education enhances the stock of human capital. That human capital is growth enhancing should not be surprising, e.g. human capital is necessary for the operation and maintenance of machines. The development of financial markets is necessary so that high-ability, but poor, people can obtain finance for investment projects. The Ricardian theory of international trade states that trade openness enhances aggregate productivity; countries specialize in the production of goods and services where they have a comparative advantage, and by doing so factors are put to use where they are most productive.[1] Telecommunication infrastructure is important for the operation of machines and the coordination of workers providing services. Major breakthroughs have been made in that sector over the past decades. From an intertemporal perspective, it is clear that a higher share of government consumption in GDP implies higher taxes. Taxes are a government intervention that distorts the marginal product of labor and capital; this in turn adversely affects firms' demand for labor and capital.

Stabilization policies are proxied for by an indicator for systematic banking crises, inflation, and the real exchange rate. These variables are found to have an insignificant effect on economic growth. With regard to inflation and the real exchange rate, this is not unexpected as over the medium run (i.e. five years) prices should have adjusted to ensure that value marginal products across firms equalize in sectors where there is perfect mobility of factors.

Improvements in external conditions as captured by growth in the terms of trade and windfalls arising from growth in the international commodity prices of exported goods are growth enhancing. An increase in the international price of exported commodities enables to purchase more goods from overseas. There is more finance available for the purchase of (intermediate) goods. Vice versa, a

1 For a discussion of New Trade Theory, see Ventura (2005).

decline in the international price of imported goods is also growth enhancing as for a given export value more goods can be imported (that in turn may be used in the production of final products, as is the case with regard to intermediate goods).

In order to examine whether the impact of these variables differs systematically for South East Asia we estimate equation (2). The relevant results are reported in Table 2. We see that the coefficients on the interaction terms are all statistically insignificant. This suggests that the impact of structural reforms and stabilization policies is not systematically different between South East Asia and the rest of the world.

The estimated model fares reasonably well in terms of predicting the change in GDP per capita over the first decade of the third millennium. Between 1996-2000 and 2006-2010 the average change in the natural logarithm of GDP per capita for South East Asia was around 0.28. Based on the changes in the right-hand-side variables in equation (2) the model generates a predicted change of 0.33. Hence, the model correctly predicts the sign of the change in log GDP per capita for the time period and region analysed. Quantitatively the difference between the actual and the predicted change in log GDP per capita is less than 20 percent.

Figure 4 provides a bar plot of the contribution to growth arising from transitional convergence, structural reforms, stabilization policies, and external conditions. The values are computed using the coefficients in column (1) of Table 1 and the change in the right-hand side variables between 1996-2000 and 2006-2010. The largest contribution to growth comes from transitional convergence. About half of the change in GDP per capita between 1996-2000 and 2006-2010 is due to South East Asian countries converging towards their (country-specific) steady states. Whereas structural reforms contributed to about one quarter of the change in GDP per capita between 1996-2000 and 2006-2010, the contribution to growth from stabilization policies was minuscule amounting to less than 4 percent. External conditions mattered significantly, contributing slightly less than one-quarter of the change in

GDP per capita.

Improvements in infrastructure was the most important component of structural reforms. Figure 5 provides a bar plot of the growth contribution arising from each component in the structural reform category. During the first decade of the third millennium there was a significant expansion of telecommunication infrastructure in South East Asian countries. The estimates suggest that due to this favorable change in the structure of the economy economic growth was lifted by around one and a half percentage points per annum. A negative development in the structure of South East Asian economies was the increase in the GDP share of government consumption. The increase in the government burden that materialized during the first decade of the third millennium shaved off about half a percentage point of economic growth. South East Asian countries experienced on average favorable developments in education, trade openness and financial development. These developments boosted economic growth by about half a percentage point per annum.

The countries in South East Asia that experienced the highest growth rates during the first decade of the third millennium are Cambodia, Laos and Vietnam. Figure 6 provides a bar plot of the change in the natural logarithm of GDP per capita between 1996-2000 and 2006-2010 for each of the South East Asian countries. Figure 7 plots the contribution to economic growth from structural reforms. The three countries with the highest growth rates are also the ones with the most significant improvement in the structure of their macroeconomies. This underscores the previous finding that structural reforms had a significant effect on the growth of South East Asia during the first decade of the third millenium.

4. Conclusion

This paper analysed economic growth in South East Asia for the first decade of the third millennium. South East Asia's growth performance throughout that decade was solid. The majority of countries

experienced growth in average income at a rate that exceeded the growth rate of previous decades. Further, in the cross-section of countries South East Asia's economic growth rate exceeded that of other developing regions in the world for the time period analysed. Based on the growth model developed by Loayza et al. (2005) and Araujo et al. (2014), this paper found that about half of the growth in South East Asia throughout the past decade was due to transitional convergence. Other significant contributors to economic growth were structural reforms – in particular, with regard to the development of telecommunication infrastructure – and favorable external conditions.

References

Araujo, J., M. Brueckner, M. Clavijo, E. Vostroknutova, and K. Wacker (2014). Benchmarking the Determinants of Economic Growth in Latin America and the Caribbean. World Bank Publications, The World Bank, number 91015, December.

Arezki, R. and M. Brueckner (2012). "Commodity Windfalls, Democracy, and External Debt." Economic Journal 122: 848-866.

Barro, R. and X. Sala-i-Martin (2003). Economic Growth. 2nd Edition MIT Press; Cambridge, MA.

Brueckner, M. (2014). "Background Paper to Beyond Commodities: The Growth Challenges of Latin America and the Caribbean." World Bank.

Blundell, R., and S. Bond (1998). "Initial conditions and moment restrictions in dynamic panel data models." Journal of Econometrics 87: 115-43.

Durlauf, S., P. Johnson, and J. Temple (2005). "Growth Econometrics." Handbook of Economic Growth (Aghion and Durlauf, eds.), North-Holland, 2005.

Heston, A., R. Summers and B. Aten (2012). "Penn World Table Version 7.1." Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Loayza, N., P. Fajnzylber and C. Calderón (2005). "Economic Growth in Latin American and the Caribbean: Stylized Facts, Explanations, and Forecasts." World Bank Publications, The World Bank, number 7315, April.

Polity IV (2012). "Political Regime Characteristics and Transitions." Online Database. http://www.systemicpeace.org/polity/polity4.htm

Reinhart, C. and K. Rogoff (2011). "From Financial Crash to Debt Crisis." American Economic Review 101: 1676-1706.

Ventura, J. (2005). "A Global View of Economic Growth." in Handbook of Economic Growth vol 1B, P. Aghion and S. Durlauf (eds), 2005, Elsevier.

World Bank (2013). World Development Indicators. Online Database. http://data.worldbank.org/indicator

Wooldridge, J. (2002). Econometric Analysis of Cross Section and Panel Data. Cambridge, MIT Press.

Appendix Table 1. Description of Variables

Variable	Description	Source
Growth Rate of GDP per capita	The change in the natural logarithm of real PPP GDP per capita between period t and t-1.	PWT 7.1
Lagged GDP per capita	The natural logarithm of real PPP GDP per capita in period t-1.	PWT 7.1
Schooling	The natural logarithm of the secondary school enrolment rate.	WDI (2013)
Financial Development	The natural logarithm of the ratio of domestic credit to the private sector divided by GDP. Domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	WDI (2013)
Trade Openness	The natural logarithm of the ratio of exports plus imports over PPP GDP adjusted for countries' population size.	PWT 7.1
Infrastructure	The natural logarithm of main telephone lines per capita. Telephone lines are fixed telephone lines that connect a subscriber's terminal equipment to the public switched telephone network and that have a port on a telephone exchange. Integrated services digital network channels and fixed wireless subscribers are included.	WDI (2013)
Government Burden	The logarithm of the ratio of government consumption expenditures over GDP.	PWT 7.1
Polity2	The polity2 score measures the degree of political constraints, political competition, and executive recruitment. It ranges between -10 to 10 with higher values denoting more democratic institutions.	Polity IV
Inflation	The natural logarithm of 100+consumer price inflation rate. CPI inflation reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	WDI (2013)
Real Exchange Rate	The natural logarithm of the GDP price level divided by the nominal exchange rate.	PWT 7.1
Banking Crisis	Indicator Variable that is unity in period t if the country experienced a banking crisis.	Reinhart and Rogoff (2011)
Terms of Trade Growth	The change in the natural logarithm of the net barter terms of trade index. The net barter terms of trade index is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000.	WDI (2013)
ComPI Growth	The change in an international commodity export price index. The index is constructed as $$\text{ComPI}_{ct} = \prod_{i \in I} \text{ComPrice}_{it}^{\theta_{ic}}$$ where $ComPrice_{it}$ is the international price of commodity i in year t, and θ_{ic} is the average (time-invariant) value of exports of commodity i in the GDP of country c. Data on international commodity prices are from UNCTAD Commodity Statistics and data on the value of commodity exports are from the NBER-United Nations Trade Database (Feenstra et al., 2004). The commodities included in the index are aluminum, beef, coffee, cocoa, copper, cotton, gold, iron, maize, oil, rice, rubber, sugar, tea, tobacco, wheat, and wood.	Arezki and Brueckner (2012)

Table 1. Economic Growth Regressions

Dependent Variable: ln(GDP p.c.)		
	(1)	(2)
	SYS GMM	FE OLS
Persistence		
Lagged ln(GDP p.c.)	0.78***	0.75***
	(0.06)	(0.03)
Structural Policies and Institutions		
Schooling	0.02	-0.03
	(0.05)	(0.03)
Financial Development	0.07***	0.02
	(0.03)	(0.02)
Trade Openness	0.08*	0.10***
	(0.05)	(0.03)
Government Burden	-0.26***	-0.13***
	(0.04)	(0.03)
Infrastructure	0.14***	0.08***
	(0.03)	(0.02)
Political Institutions	-0.00	-0.01
	(0.03)	(0.02)
Stabilisation Policies		
Inflation	-0.01	-0.01*
	(0.01)	(0.01)
Real Exchange Rate	-0.06	-0.02
	(0.04)	(0.03)
Banking Crisis	-0.04	-0.05*
	(0.03)	(0.03)
External Conditions		
ComPI Growth	10.48***	6.96***
	(2.69)	(2.59)
Terms of Trade Growth	0.12***	0.11***
	(0.03)	(0.03)
Country Fe	Yes	Yes
Year Fe	Yes	Yes
Observations	464	464
Countries	126	126

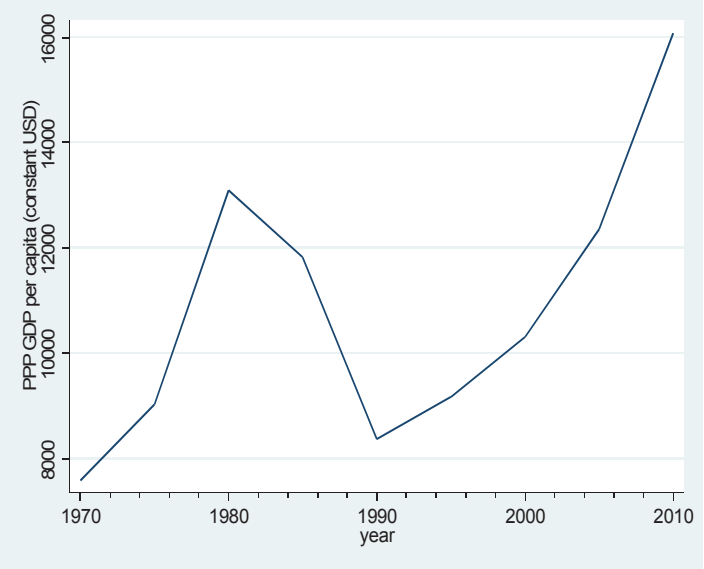
Note: The dependent variable is real GDP per capita. The method of estimation in column (1) is system-GMM; column (2) least squares. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

Table 2. Economic Growth Regressions
(Are the Growth Effects of Structural and Stabilization Policies Significantly Different in SEA Countries?)

Dependent Variable: ln(GDP p.c.)		
	(1)	(2)
	SYS GMM	SYS GMM
	Coefficient (SE) for Linear Term	Coefficient (SE) for Interaction with SEA Dummy
Schooling	0.00 (0.05)	-0.37 (0.23)
Financial Development	0.05 (0.03)	0.09 (0.13)
Trade Openness	0.08 (0.05)	-0.01 (0.35)
Government Burden	-0.23*** (0.04)	0.15 (0.26)
Infrastructure	0.15*** (0.03)	-0.01 (0.15)
Political Institutions	0.01 (0.03)	-0.08 (0.08)
Inflation	-0.01 (0.01)	-0.03 (0.07)
Real Exchange Rate	-0.07* (0.03)	0.10 (0.23)
Banking Crisis	-0.05 (0.03)	-0.10 (0.09)
AR (1) Test, p-value	0.01	0.01
AR (2) Test, p-value	0.14	0.14
Sargan Test, p-value	0.53	0.53
Country Fe	Yes	Yes
Year Fe	Yes	Yes
Observations	464	464
Countries	126	126

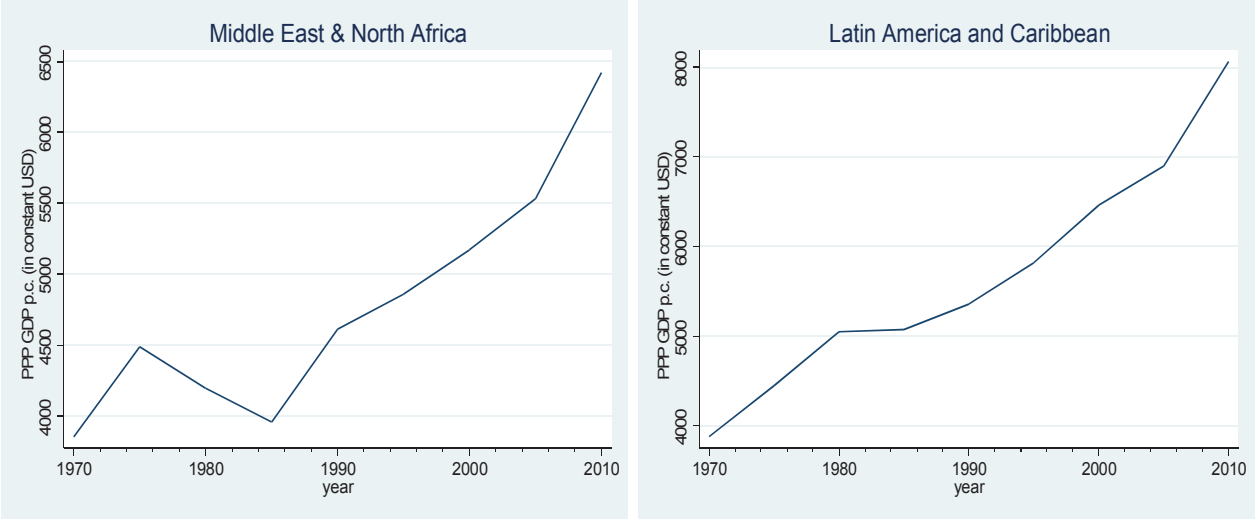
Note: The dependent variable is real GDP per capita. The method of estimation is system-GMM. Columns (1) and (2) report estimates from an interaction model where the variables in the vector X are interacted with a dummy variable that is unity for SEA countries, see equation (2). Columns (1) reports coefficients in the vector Γ_3, column (2) reports coefficients in the vector Γ_4. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

Figure 1. GDP per capita in South East Asia
(5-Year Averages, 1970-2010)



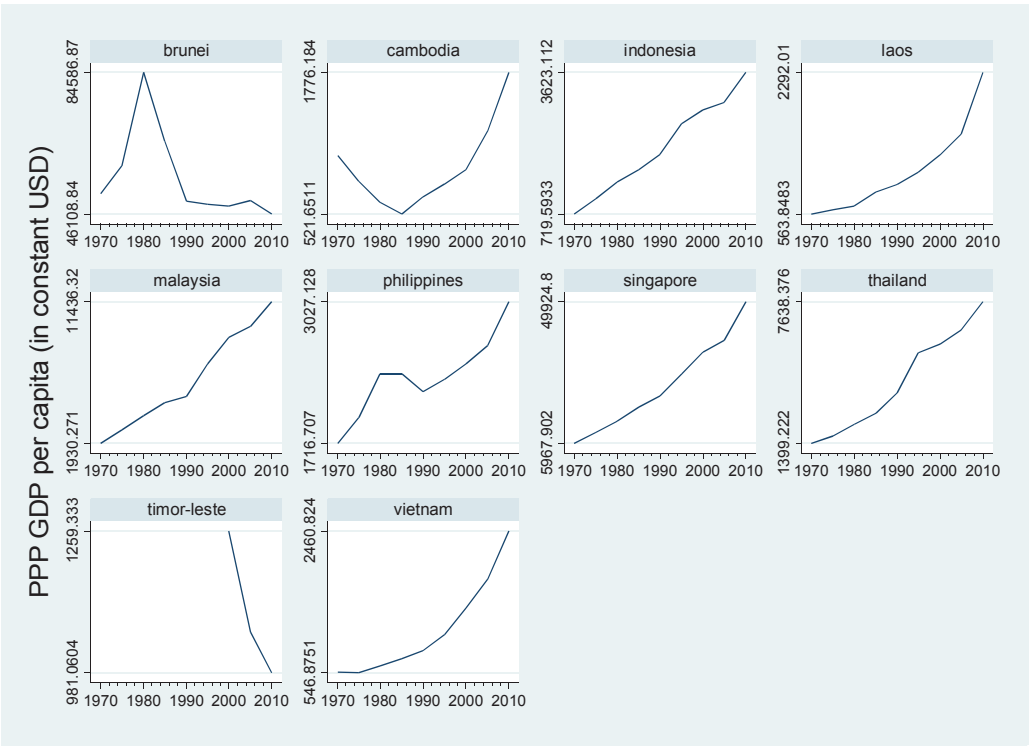
Source: Penn World Table (Heston et al, 2012), unweighted average

Figure 2. GDP per capita in Other Developing Regions
(5-Year Averages, 1970-2010)



Source: Penn World Table (Heston et al, 2012), unweighted average

Figure 3. GDP per capita in South East Asia, by Country



Source: Penn World Table (Heston et al, 2012)

Figure 4. Actual vs. Predicted Growth
(South-East Asian Region, 2006-2010 vs. 1996-2000)

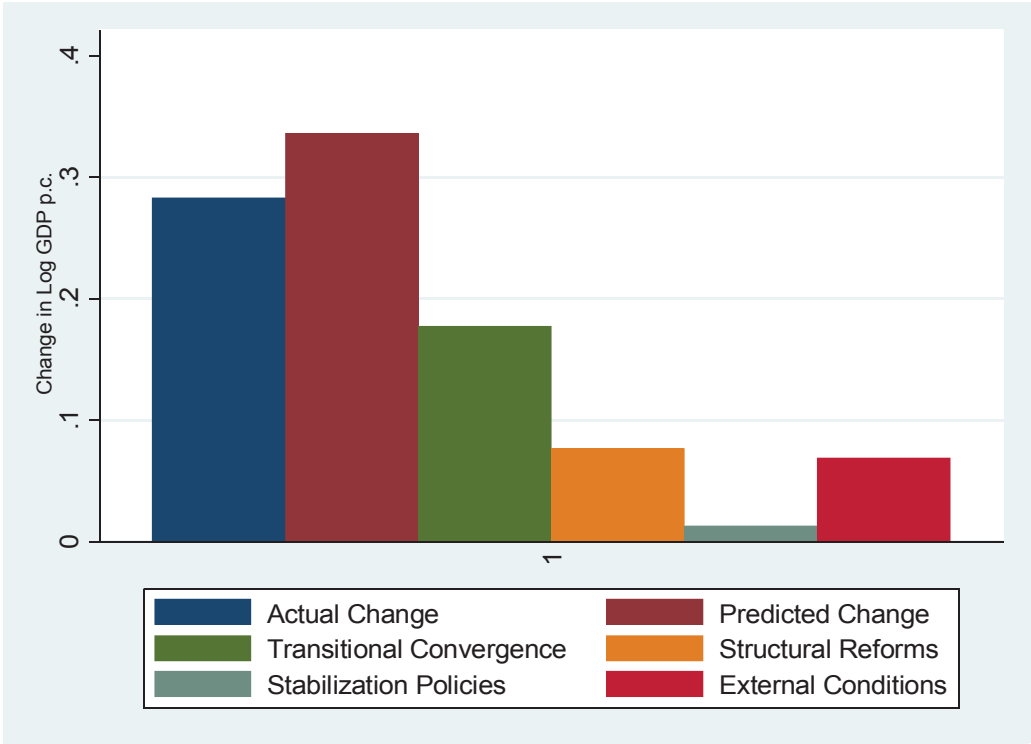


Figure 5. Growth Contribution of Specific Structural Reforms
(South-East Asian Region, 2006-2010 vs. 1996-2000)

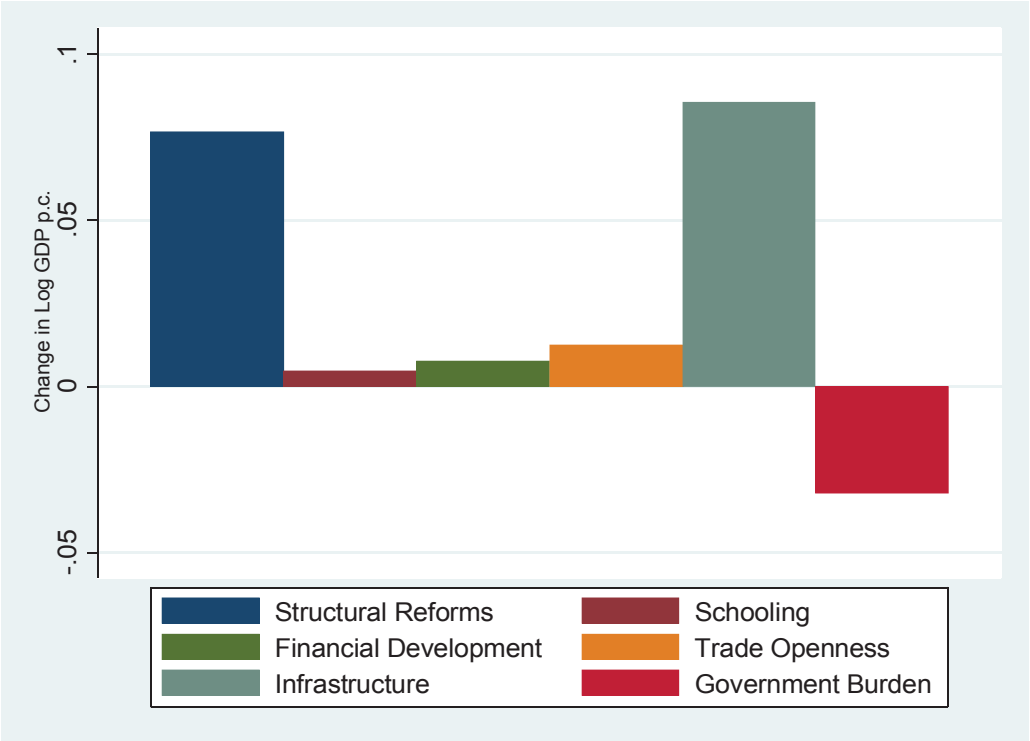


Figure 6. Growth in South-East Asian Countries
(2006-2010 vs. 1996-2000)

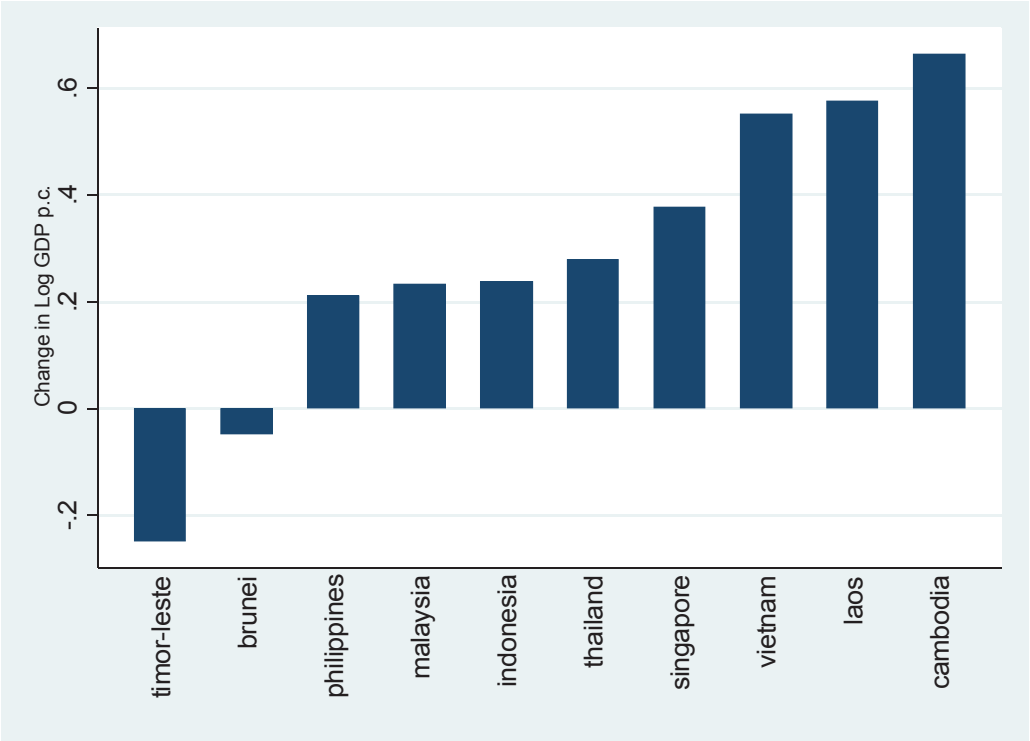


Figure 7. Contribution to Growth from Structural Reforms by Country