A Dual-Model Approach to Measuring Income Convergence Sustainability in European and Asian Emerging Economies

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Abstract

The 'tiger' economies of Southeast Asia and the transition economies of Central and Eastern Europe have encountered both rapid growth and considerable upheaval in the last two decades. This study examines the extent to which the two regions have converged to industrialized-country levels of per capita income growth, using the convergence criteria defined in Sala-i-Martin (1996), for the 1992-2007 period. The sustainability of convergence going into the future is estimated using a variant of the balance of payments constrained-growth theory developed in Thirlwall (1979). My findings suggest that both regions exhibit fairly rapid convergence, which is likely to continue in the future due to favorable export demand elasticities, technological diffusion and total factor productivity.

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I. Introduction

Since the early 1990s, development has been occurring apace within the emerging economies of Central and Eastern Europe (CEE) and Southeast and East Asia (SEA). Many of the CEE transition economies have joined the European Union (EU) in recent years, and are thus receiving continued access to structural adjustment funds and various other forms of financial, infrastructural, and technological assistance designed to raise standards of living to those of Western Europe. Southeast Asia has enjoyed similar success in achieving high rates of growth and development, but its overall performance record has been less uniform given the differences in economic structures and institutions present in the region and the lack of a supranational body to harmonize development goals as in Europe. This study attempts to examine the extent to which the two regions are converging towards wealthier countries in terms of per capita income. An eight country sample of Central and Eastern European countries (CEE-8)[2] is compared to a five-country sample of North American and Western European industrialized economies (IND-5)[3]. Similarly, a seven-country sample of East and Southeast Asian countries (SEA-7)[4] is compared to the IND-5.

I estimate convergence in terms of real per capita income growth for the period 1992-2007 by applying the classical convergence techniques of σ-convergence and β-convergence. After determining the extent to which convergence exists, I estimate the sustainability of these results by applying a post-Keynesian framework of balance-of-payments constrained growth (BPC). This approach links productivity growth and export performance in gauging whether economies can finance further growth through innovation and technological advancements (often gained through capital imports), without violating the equilibrium position of the balance of payments. By doing so, I hope to explain how differences in convergence rates may change in the medium and long term and provide insights as to how industrial and trade policy can be adjusted to better position the economy towards a path of manageable growth. This study thus contributes to the existing literature on by directly comparing two of the world's major emerging economy regions in terms of sustainable income convergence, international competitiveness, and technological diffusion (and by extension, longer-term growth prospects).

The economies of Central and Eastern Europe fared relatively poorly in the early 1990s. The structural adjustment programs designed to integrate their

2 The CEE-8 consists of Bulgaria, Czech Republic, Hungary, FYR Macedonia, Poland, Romania, Slovak Republic and Slovenia.

3 The IND-5 consists of Canada, France, Germany, the United Kingdom and the United States.

4 The SEA-7 consists of Indonesia, Republic of Korea, Malaysia, Philippines, Singapore, Thailand and Viet Nam.

centrally planned economies into the global market economy imposed heavy costs on individuals and enterprise through high inflation (a consequence of rapid price liberalization) and unemployment (which occurred through poorly structured privatization initiatives and the shift of resources away from the persistently inefficient heavy industry sectors). In contrast, the driver of growth for the SEA economies in the 1970s and 1980s was the shift away from low value-added agricultural output towards higher-productivity industrial activity. This may raise the question of whether there is a bias towards convergence in SEA and divergence in CEE given the relatively short time frame considered here. I do not believe that this possibility is well-founded, seeing as there seems to be a consensus that reforms, however hastily implemented, were successful in restoring growth in CEE, if considerably less successful in the countries comprising the former Soviet Union (FSU) (Sachs, 1995, Fischer & Sahey, 2000, Falcetti, et. al. 2005). There is also evidence to suggest that initial conditions, such as pre-reform growth rates and degrees of dependence on Soviet-centric economic institutions such as the CMEA (Council for Mutual Economic Assistance), had an important effect on reform-era growth (Heybey & Murrell, 1997). As the CEE-8 were more economically autonomous than the countries of the FSU, it is understandable that their institutions and economic structures would converge with those of the West more rapidly. The process was helped along by the EU's initiatives to fast-track accession for countries that had complied with the acquis communautaire or legislative structure of EU. Aside from FYR Macedonia, all the countries in the CEE-8 joined the EU in 2004 or 2007.

Southeast Asia is home to the third wave of Asian 'tiger economies': Thailand, Indonesia and Malaysia. The SEA-7 sample used in this study also includes two of the original 'tiger' economies that followed Japan towards rapid export-oriented industrialization (EOI) in the 1970s and 1980s: Singapore and the Republic of Korea. While the region has seen dramatic increases in living standards over the past two decades, its economies nonetheless suffered considerable setbacks during the Asian Financial Crisis (AFC) of 1997-98. The event provided a sobering reminder of the double-edged nature of trade and financial liberalization. While the region's manufacturing capacity and export performance was built on the competitiveness engendered through participation in international markets, its domestic institutions were inadequately prepared to deal with the large capital flows crucial to financing the mounting current account deficits being run throughout the region (primarily for the purpose of accumulating capital stock). Even economies with well-developed financial markets like Korea fell victim to speculative attacks on its currency as overseas investors lost confidence in the ability of commercial banks to stem the glut of cheap credit and the avalanche of non-performing loans (NPLs) that

accompanied them.

The outflow of portfolio investment (and to a lesser extent, foreign direct investment (FDI)) resulted in the depletion of foreign exchange reserves, which put pressure on sustainability of the currency pegs presents in many of the region's economies. As bearish markets continued to bet against the region's currencies, a number of economies were forced to devalue, which raised the foreign currency-denominated external debt burden and raised the cost of foreign capital to the point where the International Monetary Fund (IMF) had to provide bailout and bail-in packages. Given that a significant portion of industrial development in the region can be attributed to the agglomeration and technology transfer effects of a liberal FDI regime (Lall, 2003), it is appropriate to analyze the role of FDI flows in assisting convergence. While the bulk of this study focuses on the neoclassical and supply-side determinants of growth, such as physical and human capital accumulation and technological growth, the importance of export-driven capital investment and competitiveness requires a Keynesian explanation of growth as well. The region's struggle with trade imbalances further signifies the role of open-economy growth models in interpreting convergence metrics. Thus, an assessment of the relative success or failure of convergence is incomplete without a BPC approach to gauging its sustainability.

The paper is arranged as follows. The second section examines the leading theoretical literature on and empirical applications of convergence theory and BPC growth. The third section outlines the estimation methodology used in the study, and notes potential caveats in the explanatory power of some of the variables used. The fourth and fifth sections describe the results and attempt to link the findings to the theoretical underpinnings of the existing growth literature. The sixth section discusses the results within the context of structural changes within the economies of the two regions. The seventh section summarizes the findings and concludes the paper.

II. Literature Review

Classical Convergence Theories

The convergence estimation techniques used in this study were first introduced in Sala-i-Martin (1996). They consist of three types: σ-convergence, unconditional β-convergence and conditional β-convergence. σ-convergence occurs when there is an observed decrease in the standard deviation of real per capita incomes over a cross-section of countries over a period of time. Unconditional or absolute β-convergence occurs if poor countries are shown to be growing faster than wealthy countries. The link between σ- and β-convergence

is that the latter must exist if the former is also to exist. The dispersion of real per capita income cannot be reduced if poor countries are not growing faster than their rich counterparts. β-convergence however does not guarantee σ-convergence: consider an example in which poor countries persistently grow faster than wealthy ones over a certain time period $t+T$, to the point where the income differential is in favor of poor countries and the dispersion is higher than it was at time t. Thus, even though the estimated coefficient for β-convergence would be positive, we would note σ-divergence for the sample as a whole. Absolute β-convergence is thus a necessary but insufficient condition for σ-convergence.

The estimations provided in Sala-i-Martin (1996) suggested that absolute β-divergence and subsequently σ-divergence had occurred in a sample of the world's economies over the 1960-1990 period, which is to say that wealthier countries grew faster than poorer ones. Initially, this finding appeared to cast doubt on the validity of neoclassical models of growth, such as those presented in Solow (1956) and Swan (1956). An example of such a model is shown below in the form of a Cobb-Douglas production function:

$$Y_{i,t} = A_i K_{i,t}^{\alpha} L_{i,t}^{1-\alpha}, \qquad 0 < \alpha < 1, \tag{1}$$

where $Y_{i,t}$ is the output of economy i at time t, K is the stock of capital, L is the stock of labor and A_i is the level of technology. These models predict that the stock of capital in an economy will become static (a situation known as the steady state) when capital investments are just enough to offset depreciation expenses. Given the assumption of diminishing returns to scale on capital $(\alpha<1)$, the model seemingly predicts convergence as it assumes that the rate of return on capital inputs will be higher for poor countries with low initial capital stocks, and lower for richer capital-intensive economies. The model essentially implies that all economies will converge to the same steady state. This outcome rests on the assumed exogeneity of factors such as population growth, the rate of saving and technological change.

The inconsistency of the model with the findings of empirical studies (particularly those performed in the 1980s) was argued to give credence to alternative models of endogenous growth. Romer (1986) presented one such theory that emphasized non-diminishing returns to scale $(\alpha \geq 1)$ as reflective of actual production functions and denoted human capital and technological growth as endogenous factor inputs. The theory does not attempt to discredit the idea of convergence towards an identical steady state, which is what unconditional β-convergence involves. As noted in Mankiw, et al. (1992), it does

however imply that this particular form of convergence is only likely to apply to countries with similar endowments of the exogenous factors mentioned earlier.

This is where the concept of conditional β-convergence enters the literature. Mankiw et al. (1992) and Engelbrecht and Kelsen (1999) suggest that β-convergence theory is consistent with the neoclassical growth literature since the ultimate conclusion of the latter is that the growth rate of an economy is inversely related to its distance from the steady state. This is the case regardless of the initial levels of capital stocks across economies. If we compare a poor country that has reached its steady state against a rich one that has yet to do so (assuming that economies approach different steady states), the neoclassical model predicts that growth will be higher in the rich country relative to the poor one, even if the absolute capital stock of the latter is lower. Empirically, this finding is likely to hold only if individual country effects, such as population growth, economic structure, etc. are controlled for. Conditional β-convergence attempts to do so by isolating country-specific effects through the use of additional structural and institutional control variables.

The available literature on convergence is varied enough to prevent a consensus on a best-practice approach towards its estimation. Given the relatively small sample of economies tested here (13 countries for CEE incl. IND-5, and 12 for SEA incl. IND-5), I use a panel data approach to estimate convergence. Other works in the field have used spatial lag models (Paas, et al., 2006) or information entropy measures such as the Theil index to gauge intra-region inequalities (Faina and Rodriguez, 2008).

Balance of Payments Constrained Growth

The BPC approach to forecasting growth was originally developed in Thirlwall (1979) as a dynamic extension of the Harrod trade multiplier (1933) and provides a demand-side explanation of growth differences between economies: the relative strength of their balance of payments (BOP) positions. While the neoclassical approach explains growth differences as the result of differences in factor supplies and productivity, they do not explain why the differences occur (recall that the Cobb-Douglas production function described earlier attributes output growth to the growth of capital, labor and total factor productivity (TFP), which is estimated as the residual *A*). Thirlwall posited that these differences could be explained by demand constraints within an economy. In the case of an open economy, the BOP position sets an upper limit to the level of demand to which supply can adapt. By assuming that the real exchange rate (RER) and trade balance were constant in the long run, he observed a very close correlation between the income growth rate and the ratio

of the growth rate of exports to the income elasticity of demand (IED) of imports. We consider world income growth in the case of export IED, and home income growth in the case of import IED. Although this presents a Keynesian take on neoclassical theory, Thirlwall noted that the BPC approach was not antithetical to supply-side approaches, as its focus on import and export elasticity indirectly took into account non-price characteristics of output such as quality, and by extension, drew distinctions between the production structures of different economies. He argued that the key to raising growth in a fashion consistent with BOP equilibrium (and thus sustainable over the long term) was structural change that would raise export IED and reduce import IED.

Classical theories of comparative advantage tend to ignore BOP constraints and unemployment of resources by basing the theory on the premise of constant returns to scale, instantaneous wage adjustment and zero transportation costs. Given that the least developed economies tend to feature production patterns that encounter diminishing returns to scale (agriculture, for example), the full employment of resources cannot be guaranteed in this category of production. Nor can rapid wage adjustment be taken as a given, as Keynesian theory subscribes to the 'sticky downwards' phenomenon of wage flexibility. Such products also feature low PED and IED relative to the manufactured products poor countries import from wealthier ones. The same principles can apply to trade between manufacturing-intensive economies, as is the case in SEA-7 and CEE-8. Consider a two-country model in which one country exports only high value-added semiconductors and the other only exports relatively low value-added radios. The table below shows how the BOP constraint on growth occurs due to the differential in the IED of the two product categories. The IED of radios is 0.75 (ε_{EE} = 0.75), while the IED of semiconductors is 1.5 (ε_{DC} = 1.5). Assume that the two economies only export to and import from each other. Assuming that both economies grow at 5 per cent, the table below shows the growth rate of exports and imports in each economy. The resultant tendency to run perpetual deficits in the low value-added economy means that the BOP equilibrium can only be restored by cutting growth.

Table 1 - How IED differentials cause unsustainable trade balances

Emerging Economy	Developed Country
$x = 5 \times \varepsilon_{EE} = 5 \times 0.75 = 3.75$	$x = 5 \times \varepsilon_{DC} = 5 \times 1.5 = 7.5$
$m = 5 \times \pi_{EE}\neg = 5 \times 1.5 = 7.5$	$m = 5 \times \pi_{DC} = 5 \times 0.75 = 3.75$

The original theory was later extended to include open economies with nonzero net capital flows in Thirlwall and Hussein (1982). However, it as-

sumed no limitations on capital inflows aside from the inherent BOP accounting identity, in which debit and credit items must balance each other. This loophole was closed in Moreno-Brid (1998) where limits on capital inflows were applied, leading to the re-definition of the constraint as a stable ratio of trade deficits to income, which is assumed to be a reliable proxy for a stable rate of accumulation of foreign debt. These theoretical extensions strengthened the original link between the BPC and growth rates as they emphasized the vicious cycle that can be triggered if countries running persistent trade deficits (which are equivalent to growing beyond their short-term capacity growth rate) are forced to undertake contractionary policies to restore the trade balance. The subsequent retardation of growth, investment, and technological progress reduces productivity and makes the economy's goods less competitive in international markets, which further exacerbates the BOP position. Thirlwall (1979) argues that the proponents of EOI have recognized this constraint and advocate export growth for its ability to raise output without adversely affecting the BOP position.

While this study uses a markedly different variant of the BPC approach to assist the analysis of convergence, it may nonetheless be instructive to elaborate on the roots of its theoretical foundations. The original model of BPC growth derives demand functions for home-country import and export demand and a BOP equilibrium condition, as presented below:

$$X = \left(\frac{P}{P^{*}E}\right)^{\phi} Z^{\varepsilon} \tag{2}$$

where X is export quantity, P is home-country price level, P^{*} is foreign-country price level, E is the nominal exchange rate for the foreign currency in terms of the home currency, Z is the real output of the rest of the world, φ is the price elasticity of demand (PED) for exports, and ε is the IED of exports.

$$M = \left(\frac{P^{*}E}{P}\right)^{\psi} Y^{\pi} \tag{3}$$

where M is export quantity, Y is home-country output, ψ is the PED of imports, and π is the IED of imports.

$$PX + PF = PM \tag{4}$$

This is the BOP equilibrium condition. F represents net inflows of foreign

capital. By log-linearizing the above three equations and differentiating with respect to time, the following dynamic system is obtained:

$$a(p + x) + (1 - a)(p + f) = p + m \tag{5}$$

$$m = \psi(p^* + e - p) + \pi y \tag{6}$$

$$x = \phi(p - p^* - e) + \varepsilon z \tag{7}$$

$$y^* = \frac{(1 + a\phi + \psi)(p - p^* - e) + a\varepsilon z + (1 - a)f}{\pi} \tag{8}$$

$$y^* = \frac{\varepsilon z}{\pi} = \frac{x}{\pi} \tag{9}$$

For ease of notation, the lower-case letters in Equations (4) through (8) represent proportional rates of growth (i.e. $x = \frac{\Delta X}{X}$). Here, a represents the share of export revenue in total foreign currency receipts. In Equation (7) note that *y** represents the theoretical BOP-constrained rate of growth for the home country. It is represented as a function of the PED and IED of exports and imports, the growth of rest-of-world income, net capital flows and the real exchange rate. Equation (8) represents the simplified form of the theoretical rate of growth: the ratio of the growth rate of exports to the IED of imports. Note that the two important assumptions are applied to give this simplified form, which is thought to be valid for the long run: no external debt *(a=1)* and purchasing power parity *(p – p* – e = 0)*.

We can now discuss how BPC growth theory is germane to this study. The brief time frame used here is unlikely to be able to match actual growth rates with those predicted by (8). That said, the question of export performance and import/export elasticities in general is crucial to an understanding of the intrinsic factors behind output and productivity convergence in both SEA-7 and CEE-8. The industrialization of the former group has been built on EOI strategies that have provided incentives to raise competitiveness through investments in human and physical capital stocks, as well as technology and innovation. While economic reforms in the CEE-8 were originally intended to restore macroeconomic stability during the transition period, the structural reforms these economies undertook to join the EU (excl. FYR Macedonia) were intended to prepare their economies for a trade and customs union with 15

highly developed economies, so the same incentives to export and pressure to compete apply. The theoretical literature emphasizes the necessity for economies to satisfy both domestic and foreign demand in order to ensure long-term economic growth.

The estimation model used in this study looks at the evolution of import/export IED over a sixteen-year period split into four four-year intervals, and attempts to link changes in these metrics with structural changes within the economies in order to draw conclusions on competitiveness and productivity. This becomes especially necessary as an analysis of total factor productivity (TFP) convergence is outside the scope of this paper: as yet, there is no statistical database with cross-country TFP data, given the widely varying approaches to its estimation and the lack of uniform data availability (at the industry-level, rather than at the macro-level) in several countries[5].

III. Estimation Methodology and Data

σ-Convergence and β-Convergence

As mentioned previously, σ-convergence occurs if the cross-sectional dispersion of real per capita income declines over a period of time. If σ_t is the standard deviation of the log of per capita income for a sample of countries at time *t*, then σ-convergence exists if $\sigma_t > \sigma_{t+T.}$

We can estimate unconditional β-convergence with the following equation, which appears in Engelbrecht and Kelsen (1999):

$$Y_{i,t,t+T} = a - b\log(y_{i,t}) + e_{i,t,t+T} \quad (10)$$

where $Y_{i,t,t+T} = log(y_{i,t+T}/y_{i,t})/T$, or the annualized rate of growth of real per capita GDP for economy *i* over a time interval beginning at *t* and ending at *t+T*. $Log(Y_{i,t})$ is the initial level of real per capita GDP for economy *i* and $b = (1 - e^{-\beta T})/T$, where β indicates the rate of convergence. A positive sign for the coefficient estimate of $log(Y_{i,t})$ indicates divergence. As noted previously, the regressions are run with a combined sample of CEE-8 and IND-5 economies and a second sample of SEA-7 and IND-5 economies. It should be noted that the statistical significance/insignificance of *b* as estimated via linear regression is not directly applicable to the value for β[6]. The regressions are run for four-

5 Reviews and criticisms of various TFP estimation methods can be found in Bosworth & Collins (2003).

6 While Sala-i-Martin (1996) uses a non-linear least squares estimation method to derive the appropriate statistical significance value for b, I argue that OLS results are sufficient for relatively small country samples. Engelbrecht and Kelsen(1999) make use of this estimation method, as do Onwuka et al. (2006).

year intervals (T=4) over the period 1992-2007, in order to provide a smoothing effect for business cycle fluctuations. Thus, the panel data set will consist of four time periods for each country in the sample. Per capita income data is provided by the United Nations Statistics Division, and is measured in 1990 US dollar-denominated prices.

To estimate conditional β-convergence, we control for country-specific factors that explain differences in steady-state levels. Thus, the estimation equation used to accomplish this is a slightly modified version of (9), with an added vector of control variables, *X*:

$$Y_{i,t,t+T} = a - b\log(y_{i,t}) + c\,FDI_{i,t,t+T} + d\,X_{i,t-1} + e_{i,t,t+T} \quad (11)$$

Here, $FDI_{i,t-1}$ represents the average annualized growth of foreign direct investment stock (calculated through log difference, as with the dependent variable) lagged one year to avoid simultaneity bias. We expect this variable to have a positive effect on growth. The control variables are also lagged one year for the same reason. The ones we shall be including are:

(a) Human Capital: we use data for the gross enrollment ratio in secondary school programs (men and women, as a proportion of school-age children) as a proxy measure for human capital. For a given level of initial per capita income, we expect a higher education level to increase the steady-state level of income, as workers are become better suited to adopting new production methods, technology, and ideas. The data for this measure was gathered from the statistical databases of the OECD, the World Bank's World Development Indicators (WDI), UNESCO, and the Asian Development Bank (ADB).

(b) Savings rate: We use the proportion of net investment to GDP as a proxy for this measure, given the link between savings and investment in the neoclassical model of growth for a closed economy. The use of selective industrial policy in SEA-7 and the use of EU structural funds for the development of infrastructure and institutions in CEE-8 justify its consideration as an important determinant of growth. We thus expect the sign on the coefficient to be positive. The data used is a measure of Gross Fixed Capital Formation, which accounts for depreciation expenses, as defined by the World Bank and International Monetary Fund; the data is provided by the WDI database.

(c) Agricultural output-to-GDP ratio: The established link between EOI policies and the rapid industrialization of the Tiger economies were part of a rapid decline in the contribution of output towards agriculture, with labor and capital shifting towards higher value-added manufacturing. While the bulk of

the SEA economies, barring Viet Nam, have matured in this respect and reflect only small changes in the ratio, it may still be of importance for CEE-8 economies, which now have a much larger market for agricultural produce, thanks to access to EU-15 markets and participation in the Common Agricultural Policy (CAP). Nonetheless, due to the low value-added nature of agricultural production (price-distorting effects of farming subsidies and quotas notwithstanding), we expect the coefficient on this variable to be negative. Data is provided through the WDI database on a value-added basis.

(d) Industrial output-to-GDP ratio: This is a catch-all proxy for industrialization, as it includes all forms of manufacturing, including low value-added, labor-intensive products such as textiles, and high-technology, capital intensive goods such as electronics and heavy industry goods such as automotives. We expect the sign on this coefficient to the positive, as the higher productivity implied in manufacturing operations should have a positive effect on the steady-state level of income. Data is provided by the WDI on a value-added basis.

(e) Services output-to-GDP ratio: This is a measure of the extent to which the economic structure within an economy has been moving towards the tertiary stages of production (distribution, marketing, business services, etc.). In some ways, a higher contribution of the service sector to output reflects higher skills levels within the economy. Singapore is one such example: its solid manufacturing base has created clustered externalities in the form of polytechnic institutes, research, and development laboratories and market intelligence consultancies. Higher living standards and a stronger institutional structure have also led to the development of a vibrant financial sector and legal service firms. Relative to agriculture and manufacturing, services are often assumed to be the highest-value added activity within an economy. While the validity of this is debatable with regards to tourism-based economies, there are few if any economies in the sample that match that description. Data is provided by the WDI on a value-added basis.

(f) Openness: We use the ratio of total import and export value to nominal GDP to gauge trade openness. While this is hardly a perfect metric, data for more precise measures (such as the average tariff rate, calculated as the proportion of tariff revenue to import value) are difficult to come by, and when available, are not uniformly calculated across all economies or exclude other measures of protection (non-tariff barriers such as import quotas, voluntary export restraints, etc.). The trade to GDP ratio is thus a popular measure for openness, despite its obvious limitations. Emerging economies that feature relative openness to trade are thought to become more competitive and productive over time, due to the greater feasibility of specializing in their comparative advan-

tages and ability to import technologies and practices from more developed economies. Since this leads to greater productive and allocative efficiency, we can expect greater openness to have a positive effect on the steady-state level of income. It should be noted however that there is some evidence to suggest that greater openness is linked more directly to greater investment (through FDI, for example) and physical capital accumulation, rather than GDP growth, so using it as an independent variable carries some risk of misspecification[7]. To mitigate the problem, I will later attempt to link the variable with BPC theory. Data is provided by the statistical database of the World Trade Organization (WTO).

(g) Participation in Regional Trading Arrangements: This is a dummy variable that represents whether or not the economy in question is part of a regional free trade agreement (FTA). This does not apply to bilateral FTAs as it would be difficult to isolate the effects of such agreements (of which there can be many within a single country) on growth. For the purpose of this study, we are more interested in examining the effects of multi-country FTAs in creating patterns of specialization within emerging economies and thus assisting the development and implementation of higher-productivity manufacturing or service-oriented practices. We therefore expect a positive sign on the coefficient for this variable. The main FTAs to consider here are NAFTA, which applies to the United States and Canada, and the European Common Market. The Association of Southeast Asian Nations (ASEAN), which includes all SEA-7 nations (excl. Korea, which is included in ASEAN+3), has been working towards harmonizing tariff and non-tariff barriers and customs procedures for intra-region trade flows, but has not established a formal region-wide FTA yet.

The BPC Approach: Estimation of π and ε

As mentioned previously, BPC theory will be applied to estimate shifts in the IED of exports and imports for the two regions for the 1992-2007 period. By doing this, I hope to provide empirical backing for the insights provided by evolutionary economic theory, which emphasizes the role of political institutions, structural rigidities, and trade relationships in determining growth in developing economies[8]. The estimation equations used are adapted from Cimoli, et al. (2009):

$$m = c + \psi(rer_t) + \pi(y_t) + e_t \qquad (12)$$

where m is the growth rate of imports, rer_t is the growth rate of the real ex-

7 See Levine and Renelt (1992) for a more detailed analysis of this issue.
8 See Taylor (2004) for an in-depth discussion of these theories.

change rate, y_t is the growth rate of real GDP. The intercept is represented by c, with e_t representing a normally distributed error term. As with (2), the coefficient ψ is the PED of imports and π is the IED of imports. Trade data has been collected from the statistical database of the World Trade Organization (WTO), while RER calculations were performed on exchange rate and price level data from the UN Statistics Division and the IMF World Economic Outlook Database (WEO). RER was calculated with the following formula:

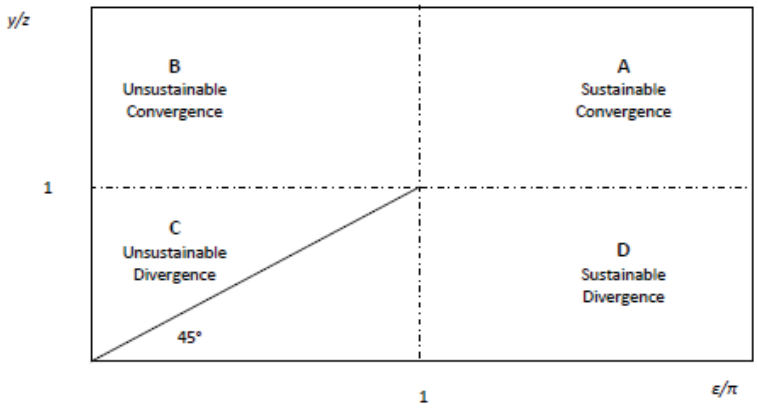
$$RER = e * \frac{P}{P^*} \tag{13}$$

where e is the nominal exchange rate of the foreign currency in terms of units of the home currency, P is the home-country price level and P^* is the foreign country price level, which is denoted as the United States. We assume that financial markets are complete and no cross-currency arbitrage opportunities exist. In this formula, an increase in e represents depreciation of the home currency. The estimation equation for PED and IED of exports is shown below:

$$x = c + \phi\left(\frac{1}{rer_t}\right) + \varepsilon(z_t) + e_t \tag{14}$$

where x is the export growth rate, z_t is the growth rate of rest-of-world real income, and as in (1), the coefficient φ represents the price elasticity of demand (PED) for exports while ε represents the IED of exports. Regressions are run over four-year intervals for the 1992-2007 period, providing an estimate for the PED and IED of imports and exports for each region and for each time period. The CEE-8 and SEA-7 samples are regressed separately and the IND-5 sample is excluded from the dataset in order to capture region-specific shifts in the IED of trade flows. It should be noted that an ideal calculation of zt would be a weighted average of the major trading partners for each region, but given the lack of precise data on these figures (which vary from country to country), we have used a simple average of the log of world GDP growth. This data was provided by the UN Statistics Division. After completing the regressions, the coefficient estimates are plotted on the graph/matrix below.

Figure 1: Convergence Quadrants Diagram



The ratio of IED of exports (ε) to IED of imports (π) is plotted on the horizontal axis, while the ratio of the region's output growth rate (y) to the world output growth rate (z) is plotted on the vertical axis. Four convergence scenarios can now be identified. The northeast quadrant A represents the preferred position for each region, as it represents a range of economic outcomes in which the convergence rate is deemed sustainable. This is because the ratio of regional to world growth rates is higher than unity and greater than or equal to the regional export IED to import IED ratio (or more simply, $y/z \geq \varepsilon/\pi > 1$). This implies that the current account (CA) position is either in equilibrium or showing a surplus. Thus, the region's economy is not BOP-constrained and for the time period in consideration, is not at risk of a costly re-adjustment down the line.

Similarly, unsustainable convergence occurs at (B), where the growth of the region relative to the rest of the world occurs along with an elasticity ratio less than unity. It suggests that growth is being fueled by import consumption rather than export performance. This can be expressed as: $\varepsilon/\pi < y/z > 1$. Some large economies can finance this disequilibrium by undertaking debt denominated in their own currency. For the most part, developing countries with thin capital markets are unable to do so and must take on debt denominated in foreign currencies. The subsequent need to hedge against exchange rate fluctuation risk is normally met through the use of financial instruments such as forward contracts. For developing economies, the transaction costs of doing so can be very high, as it may be difficult to find counterparties willing to accept a nominal sum of the domestic currency if there is little prospect of

investing the money in an interest-bearing asset denominated in that currency[9]. Thus convergence can be unsustainable if economies are susceptible to a credit crunch where overseas lenders refuse to make new loans. The speculative attacks on Asian currencies that triggered the AFC can be seen as a failure to appropriately hedge against such risks, especially in the face of mounting current account deficits across the region.

Unsustainable divergence occurs at (C) where $\varepsilon/\pi < y/z < 1$. Here, the elasticity ratio is lower than the relative rates of growth, both of which are lower than unity. This is the least preferable of all the four outcomes, as even import consumption cannot fuel growth and convergence, as it can at (B). At (D), we have a scenario in which the elasticity ratio outstrips the relative growth ratio, or more simply, the economy does not grow as fast as the rest of the world, but manages to keep the CA balanced or in surplus. This is denoted by $y/z \leq \varepsilon/\pi > 1$.

IV. Estimation Results

Table 2 shows the results for σ-convergence tests for the CEE-8 + IND-5, the SEA-7 + IND-5 and a combined sample of all three regions.

Table 2: σ-Convergence

Year	1992	1997	2002	2007
σ-SEA-7	1.73	1.55	1.59	1.53
σ-CEE-8	1.30	1.15	1.07	0.87
Combined sample	1.45	1.31	1.31	1.23

The data suggests that while σ-convergence has consistently occurred for all regions (barring one instance for SEA-7 in 2002), CEE-8 has been converging considerably faster to the levels of the IND-5. The increase in divergence shown for SEA in 2002 can be explained by the lingering effects of the Asian Financial Crisis, which had its most deleterious impact on Indonesia, a country with over 200m people, which is nearly as much as the entire CEE-8 population[10]. It should be clear that the above table only shows a snapshot of economic performance for a single period. The divergence of 2002 was also linked to the downturn in regional exports following the September 11 attacks and the Bali bombings in the following year (ADB, 2003).

To see how the data matches up with overall growth convergence results,

9 This is known as the 'original sin' problem and is discussed in greater detail in Eichengreen and Hausman (1999).

10 For purposes of comparison, the σ-value for SEA-7 for 1998 was 1.69

let us first look at the results for unconditional β-convergence. The data is presented below.

Table 3: Unconditional β-convergence, SEA-7

	OLS (1)	GLS (2)	GLS (DV) (3)	GLS (DV)(TD) (4)
Initial per capita GDP	-.003 (.002)	-.003 (.002)	-.073 (.024)*	-.165 (.035)*
Country Dummy Joint F-Statistic			23.27**	
Time Dummy Joint F-Statistic				39.52*
Observations	48	48	48	48
R^2	0.044	-	-	-
B	0.003	0.003	0.064	0.127

* - Statistically significant at 1%
** - Statistically significant at 5%
*** - Statistically significant at 10%
Note: The dependent variable is the average growth rate of per capita GDP over a four-year period, calculated by log difference. Figures in parentheses denote standard errors. R2 values as calculated by STATA following GLS estimations are not bounded between 0 and 1 and thus do not provide a measure of the variation of the dependent variable accounted for by the model.

Given the continuing debate over the precision of estimation approaches and techniques, four different types of estimation are recorded here. Column (1) shows the results obtained using Ordinary Least Squares (OLS) estimation. Column (2) shows the results of Generalized Least Squares (GLS) estimation, which helps account for cross-sectional heteroskedasticity and time-wise autocorrelation. Column (3) repeats the GLS estimation but includes the effect of country dummy variables in order to control for country-specific fixed effects, such as differences in production functions. Column (4) performs GLS estimation using both country dummies and time dummies. The latter is applied to isolate the impact of time-specific events such as regional economic downturns. While this was the original intention of regressing the data on four-year cycles, the relatively short time frame used in the study might risk overestimating the effect of unique events such as the Asian Financial Crisis, thus creating a need for the time dummy.

While OLS and GLS estimations do not provided statistically significant results for the independent variable (the initial level of per capita GDP), adding the country and time dummies dummy to the GLS (DV) and GLS (DV) (TD) estimations respectively shows that unconditional β-convergence does in fact exist. The negative sign of the independent variable reflects what we would expect of the neo-classical model: growth is higher when the economy is further away from its steady state, i.e. when output is lower. The 'Joint F-Statistic' rows show that the dummy variables in (3) and (4) are jointly sig-

nificant, thereby justifying their inclusion. The result is somewhat surprising, since we would expect unconditional β-convergence to occur only among economies with similar steady states. For the time being however, we will postpone discussion of the implications of these results until after the conditional convergence and trade elasticity estimations have been carried out. Below are the results for CEE-8.

Table 4: Unconditional β-convergence, CEE-8

	OLS (1)	GLS (2)	GLS (DV) (3)	GLS (DV)(TD) (4)
Initial per capita GDP	-.007 (.003)**	-.007 (.002)*	.008 (.020)	-.108 (.038)*
Country Dummy Joint F-Statistic			22.47**	
Time Dummy Joint F-Statistic				15.26*
Observations	52	52	52	52
R^2	.1039	-	-	-
B	.007	.007	-0.008	0.090

* - Statistically significant at 1%
** - Statistically significant at 5%
*** - Statistically significant at 10%
Note: The dependent variable is the average growth rate of per capita GDP over a four-year period, calculated by log difference. Figures in parentheses denote standard errors. R2 values as calculated by STATA following GLS estimations are not bounded between 0 and 1 and thus do not provide a measure of the variation of the dependent variable accounted for by the model.

We find evidence for very slight β-convergence using OLS estimation. The independent variable has the expected sign in all instances barring the GLS(DV) estimation, which is statistically insignificant. As with SEA-7, the inclusion of country and time dummies results in a marked increase in the speed of convergence (9 per cent as opposed to 0.7 per cent).

Table 5: Conditional β-convergence, SEA-7

	OLS (1)	GLS (2)	GLS (DV) (3)	GLS (DV)(TD) (4)
Initial per capita GDP	-.007 (.010)	-.007 (.009)	-.165 (.034) *	-.199 (.037) *
FDI Stock growth rate	.0631 (.035) ***	.0631 (.031) **	.074 (.026) *	.035 (.022)
Human Capital	-.039 (.032)	-.039 (.028)	-.057 (.035)	-.044 (.030)
Savings Rate	-.040 (.070)	-.040 (.064)	.002 (.068)	.053 (.058)
Agriculture v.a/GD	-	-	-	-.035 (.139)
Manufacturing v.a./GDP	.109 (.163)	.109 (.147)	.027 (.158)	.011 (.136)
Services v.a./GDP	.148 (.192)	.148 (.173)	.117 (.156)	-
Trade Openness	.002 (.006)	.002 (.006)	.110 (.029) *	.085 (.025)*
Regional Trading Arrangement	-.010 (.015)	-.010 (.013)	.015 (.013)	.017 (.014)
Dummy Variable Joint F-Statistic			51.39*	24.62*
Observations	48	48	48	48
R^2	0.20	-	-	-
B	.007	.007	0.127	0.146

* Statistically significant at 1%
** Statistically significant at 5%
*** Statistically significant at 10%
Note: The dependent variable is the average growth rate of per capita GDP over a four-year period, calculated by log difference. Figures in parentheses denote standard errors. R2 values as calculated by STATA following GLS estimations are not bounded between 0 and 1 and thus do not provide a measure of the variation of the dependent variable accounted for by the model.

Note that the Agriculture/GDP variable is dropped in (1) and (2) and Services/GDP is dropped in (4) due to collinearity. The convergence rates in (3) and (4) are drastically different from those in (1) and (2), though it should be noted that the independent variable coefficients in the latter two cases are not statistically significant. Below are the estimation results for CEE-8.

Table 6: Conditional β-convergence, CEE-8

	OLS (1)	GLS (2)	GLS (DV) (3)	GLS (DV)(TD) (4)
Initial per capita GDP	-.029 (.006) *	-.029 (.006)*	-.116 (.025)*	-.109 (.027)*
FDI Stock growth rate	-.008 (.025)	-.008 (.023)	.003 (.014)	.011 (.013)
Human Capital	-.027 (.053)	-.027 (.047)	-.037 (.059)	.006 (.054)
Savings Rate	-.081 (.070)	-.081 (.064)	-.092 (.049)*	-.071 (.045)
Agriculture v.a/GD	-.375 (.113) *	-.375 (.103)*	-.652 (.166)*	-.746 (.159)*
Manufacturing v.a./GDP	-.088 (.069)	-.088 (.063)	-	-
Services v.a./GDP	-	-	.275 (.067)*	.281 (.072)*
Trade Openness	.003 (.013)	.003 (.011)	.020 (.016)	.036 (.015)*
Regional Trading Arrangement	.013 (.009)	.013 (.008)	.022 (.005)*	.013 (.006)**
Dummy Variable Joint F-Statistic			149.34*	14.52*
Observations	52	52	52	52
R^2	0.39	-	-	-
B	.027	.027	.095	.090

* Statistically significant at 1%
** Statistically significant at 5%
*** Statistically significant at 10%
Note: The dependent variable is the average growth rate of per capita GDP over a four-year period, calculated by log difference. Figures in parentheses denote standard errors. R2 values as calculated by STATA following GLS estimations are not bounded between 0 and 1 and thus do not provide a measure of the variation of the dependent variable accounted for by the model.

Note that the Services/GDP variable is dropped in (1) and (2) due to collinearity, while the Manufacturing/GDP variable is dropped in (3) and (4) for the same reason. In both the SEA-7 and CEE-8 regressions, there is only a very slight difference between the estimates for standard errors reported by OLS and GLS estimation.

The results of the BPC regressions are outlined below in term of import and export IED.

Table 7-1: Evolution of Import IED, π

Period	1992-1995	1996-1999	2000-2003	2004-2007
SEA-7	2.42*	0.89**	1.59*	2.45*
CEE-8	2.42*	1.36*	4.03*	3.75*

Table 7-2: Evolution of Export IED, ε

Period	1992-1995	1996-1999	2000-2003	2004-2007
SEA-7	7.07*	2.66*	1.60***	3.86*
CEE-8	4.70*	1.29**	6.85*	5.59*

Note: Asterisks denote levels of statistical significance as outlined in previous tables. See Appendix A for the full set of regression results.

V. Explanation of Results

σ-Convergence and β-Convergence

The generally positive results for σ-convergence and unconditional β-convergence suggest that both regions may have become a 'convergence club' of sorts, somewhat like the OECD in the sense that the gulf in per capita income growth is narrowing rapidly and that the economies are shifting towards the same steady state. It should be said, however, that the explanatory power of this metric in terms of gauging parity in regional standards of living is limited by the fact that the dispersion of per capita income is calculated directly, without accounting for the population differences between them. This is consistent with the methods used in other studies (Onwuka, et al., 2006 and Engelbrecht and Kelsen, 1999). Using the population-weighted measure might be biased downwards with regards to SEA-7 given the high population and low development level of Indonesia relative to Korea and Singapore, and upwards in CEE-8, since the relatively low population of poorer countries like FYR Macedonia would provide disproportionate weight to more heavily populated and developed countries like Poland and Hungary.

The conditional β-convergence measures provide a set of results more amenable to deeper analysis. For SEA-7, we find surprisingly high rates of convergence: 12.7 per cent per year after accounting for country-specific fixed effects, 14.6 per cent per year after accounting for country and time-specific fixed effects). For CEE-8, we find convergence occurring at 2.7 percent per year before country and time-specific fixed effects are taken into account, and at 9.5 percent and 9 percent after they are. The fact that the second measure is nearly four times greater than the first can be explained by the possible correlation between country-specific effects and initial levels of income, which create a downward bias on convergence estimates in instances where such effects are excluded from the regression (Caselli et al., 1996). An additional explanation is provided in Dowrick and Quiggin (1997), who find that constant-price comparisons of per capita GDP tend to distort cross-country differences due to substitution bias in the price levels of the economies considered. Whether

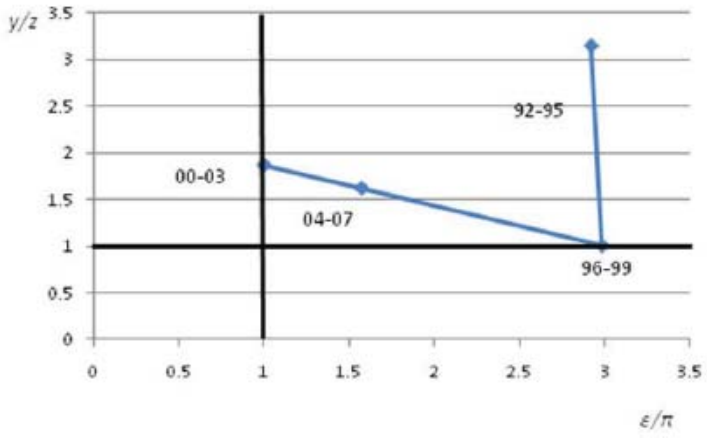
or not convergence estimates overshoot or undershoot their actual values depend on whether reported prices correspond to relatively rich or relatively poor countries. It should also be noted that the risk of simultaneity bias is higher in this estimation than in comparable studies because the dependent variables are lagged one year, compared to four or more years in other studies. Due to the relatively brief time frame considered here, the implementation of longer lags was not feasible.

The use of country and time dummies makes the meaning of the obtained results somewhat ambiguous. For example, the SEA-7 GLS (DV) estimated convergence rate of 12.7 per cent suggests that the dispersion of per capita income will be eliminated in approximately five and a half years, which in spite of the rapid growth of the Singaporean and Korean economies, seems unlikely for the entire sample. The use of country dummy variables makes this direct interpretation even less convincing as it proxies for the differences of production functions across economies and thus may in fact be suggesting the rate at which the economies are converging towards their individual steady states, rather than the income levels of their more developed counterparts.

Estimations of ε and π

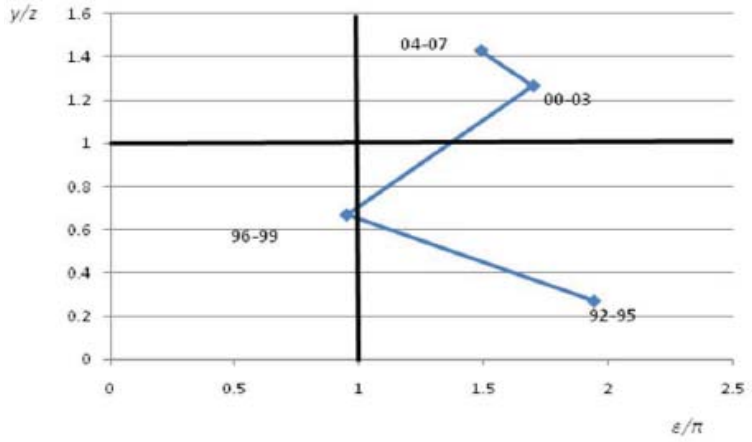
Do the IED estimations provide further insight into this particular issue? Tables F.1 and F.2 show how export and import IED have been changing for each region over the time period in question. It is economically intuitive that if the IED for imports is greater than unity (which tends to be the case for most countries) and there are no matching increases in price competitiveness, equal rates of growth for imports and exports for the home country will create BOP difficulties, which will eventually have to be dealt with through painful contractionary policies. This was the case with the structural adjustment programs put into place throughout the region after the AFC. In fact, if the IED of imports exceeds unity, then the rate of growth of exports must be higher than that of home income if the BOP constraint is to be avoided. Figure X.3 plots the relative trade elasticities (ε/π) against the relative rate of growth (y/z) in the form shown in the schematic convergence matrix in Fig. 1.

Figure 2: Convergence Quadrants for SEA-7



This shows that SEA-7 has been gradually moving into the 'sustainable convergence' range since 1999. This is not surprising, given the persistent current account surpluses and resultant accumulation of foreign exchange that occurred after the crisis waned (See Appendices 2 and 3 for data tables on trade surpluses and exchange reserves). What we can infer about the direction of future growth is that it is unlikely to be BOP-constrained in the classical sense, where output growth is limited by access to overseas credit and the ability of countries to service these external debts. The β-convergence regressions suggest that FDI and trade openness had a significant impact on macroeconomic performance. We discuss the implications of these results in the following section.

Figure 3: Convergence Quadrants, CEE-8



Turning now to the CEE-8, we see the region very well placed to avoid BOP-constraints in the future. The latest data ("04-07") show that the regional growth rate relative to the global growth rate is roughly similar to SEA-7 as is the export/import elasticity ratio. In terms of overall improvement over the 1992-2007 period however, CEE-8 has performed tremendously well since the beginning of the 'shock therapy' reforms of the early 1990s, when it appeared to be on the path to sustainable divergence. Looking at the β-convergence regressions allows us to link the strong performance of its economies to a structural shift away from agricultural production towards the higher-productivity tertiary sector. It can also be seen that being part of the European common market has had a positive impact on per capita income growth. As with SEA-7, we discuss the implications of these findings in the following section.

VI. Linking the Data to Structural Change and Evolutionary Theories of Growth

As we have seen, the Asian economic recovery and the enduring success of the European transitional reforms can be attributed in part to strong export performance. We have also noted the role of future competitiveness in sustaining high rates of growth. This raises the question of whether emerging economies must continuously run trade surpluses (and hence reduce their potential living standards by consuming less than they produce) in order to converge to the income levels of wealthier countries. While there is evidence of this occurring in now-industrialized economies such as Japan or Hong Kong SAR, it is a far less realistic proposition for other economies which need to import capital

and technologies from rich nations in order to grow. It is especially unlikely that the next economy to converge to rich-country income levels will be able to avail the protectionist measures used by the Asian tiger economies between the 1970s and 1990s. Globalization and free trade (or some approximation thereof) are facts of life for developing economies today and can impact growth prospects positively, as we are observing in China with respect to manufactured goods, or negatively, as with developing countries with large agricultural sectors (where local produce may struggle to compete with imports from countries that subsidize farm output). While BPC theories do not explicitly support protectionist measures, there is evidence to suggest that growth policies that account for the BOP constraint could benefit from import controls (McCombie and Thirlwall, 1994)[11].

The problem of sustainability is even more pronounced when considering the source of growth for many newly industrialized economies (NIEs)[12]: factor inputs, and little else. Solow (1957) calculated that over 80 percent of US growth between 1909 and 1949 resulted from technological change, with the remainder from changes in factor inputs. This stands in stark contrast with the evidence provided in Young (1994, 1995) that suggests that the Asian NIEs grew primarily through large, non-reproducible increases in factors such as labor force participation, attainment of secondary-level education and investment as a proportion of GDP. He argues that, all things considered, total factor productivity growth (the A in the production function in equation (1), which, as mentioned, is also referred to as the Solow residual or the technology parameter or efficiency gains; the terms are interchangeably used in the literature) in the NIEs was almost nil after accounting for population growth, and the shift of labor from agriculture to manufacturing.

Therefore, the formulation of a framework of sustainable growth policies suitable for open, liberalized economies cannot rely solely on the theoretical foundations of demand- and supply-side approaches. An overall development policy must also include the contributions of evolutionary economic theory that considers the importance of structural factors such as domestic institutions and trade relationships in order to explain why and how economies adapt to changing circumstances in order to become more productive and increase

11 The authors note that such policies are likely to result in a spiral of retaliatory measures, reducing the net gain for the protectionist economy. They maintain however that some method of lowering the import IED may be necessary in the short run in order to relax the constraint sufficiently to allow the accumulation of factor supplies necessary to increase the capacity growth rate. The policy is argued to be the least-worst alternative for an economy positioned at the Unsustainable Divergence quadrant in the convergence matrix, where growth is fueled by import consumption (McCombie and Thirlwall, p. 452).

12 In this context, NIEs refer to the four Asian tiger economies. The term is also frequently used to describe countries with fairly significant industrial sectors such as Brazil or Saudi Arabia.

growth. This approach is especially applicable to CEE-8: the conditional convergence regressions suggest that diminishing returns to capital investment may already have set in. Additionally, while the shift of labor towards services has assisted income convergence, TFP may decrease in this sector as it did in East Asia if the shift is not matched by similar increases in competiveness and innovation. Peneder (2002) discusses the concept of 'Schumpeterian efficiency' in explaining positive structural changes in manufacturing and service industries.

This sort of efficiency is defined as the simultaneous occurrence of growth and a shift in the qualitative structure of the economic system towards a production frontier conducive to future innovation-driven expansion. Peneder finds that this sort of shift occurs more frequently in economies that feature technology-driven secondary and tertiary sectors where the propensity to generate positive sector-wide externalities is higher. Thus, while this analysis suggests that the CEE-8 has benefited from shifts away from agriculture and (to a lesser extent) manufacturing, the long-term gains may not hold if, for instance, the sector composition is weighted more towards fairly low-productivity business process outsourcing activities such as accounting rather than innovation-driven areas such as medical or industrial research and development.

The same argument is applicable towards SEA-7, where FDI flows have been shown to have had a positive (and highly significant) impact on income convergence. While manufactured exports remain the driver of growth in emerging East Asia, rising cost competition from economies such as China (which itself has been a beneficiary of FDI-driven technological learning) and the nascent industrial sector of India means that the region's economies must increasingly focus on more value-added activities. In his analysis of developing country manufactured exports, Lall (2000) shows that technology-intensive products create externalities such as attracting higher quality and better-targeted FDI and incentivizing the development of specialized polytechnic institutes (which may represent greater allocative efficiency compared to simply building more universities). Manufactured exports with higher technology content levels grow faster than other product categories, and over time allow economies to gain a higher share of global exports, a crucial point for economies looking to avoid the BOP constraint without resorting to trade barriers. The table below provides some evidence for this point by noting the high correlation between each region's high-technology exports and their share of the world's exports over the 1992-2007 period.

Table 8: Correlation of High-Technology Mfg. Exports to Market Share of Global exports

	Market Share of World Exports
SEA-7 High-Technology Exports	0.8705*
CEE-8 High-Technology Exports	0.8745*

Note: Asterisks denote statistical significance levels as described in previous tables. Regional high-tech export shares and global export shares are calculated as simple averages of country-level data within the sample. The data is provided by the World Bank WDI and the WTO.

Have the two regions shown convergence with high-income countries with regards to productivity growth and rates of technological diffusion? There is evidence to suggest that increased absorptive capacity in both regions was related to increasing trade openness in the last 15 years (World Bank, 2008, p. 13), which encourages greater competitiveness among domestic producers. Seeing as how trade openness had a positive and statistically significant effect on income growth, let us discuss this point further. The neoliberal school of economics promotes trade openness as the driver of competitiveness and innovation, but this theory encounters problems when applied to economies with commodity-intensive export portfolios that tend to experience declining terms of trade over time. While the bulk of exports in our country sample consists of manufactured goods, it should be remembered that smaller economies like Vietnam (Can be spelled either way, preferred one word in western culture) and even fairly large ones like Thailand are major exporters of agricultural staples. While rising trade volumes appear to have benefited both SEA and CEE, we should define 'openness' carefully with regards to the unique circumstances of economies within our sample. The continuing deadlock over agricultural subsidies at the Doha round of WTO talks could have a proportionately larger impact on openness and export performance in these economies than any breakthroughs in lowering industrial tariffs. While agriculture is normally dismissed as a low-productivity activity, investment in productivity-raising technologies such as high-yield crop varieties and fertilizer manufacturing cannot occur without a trade system that does not incentivize producers. However, with regards to non-resource intensive economies, we can say with some certainty that open economies tend to feature lower price levels that reflect moderate protection and incentives geared towards the external market (Dollar, 1992).

Openness has also been beneficial for the CEE-8, where tariff-free access to the Eurozone has helped reduce the income gap (excl. FYR Macedonia). McCombie and Thirlwall (1994) note that membership in a customs union creates productivity gains through shifts in production patterns that reflect an economy's comparative advantage. They warn that there are likely to be con-

siderable factor reallocation adjustment costs for economies with historically high levels of protection; given that EU membership gives the majority of the CEE-8 entry into a club of highly competitive economies, the elimination of tariff barriers could create problematic trade imbalances before productivity levels in the accession economies catch up. Damijan et al. (2008) provide evidence that the region has held up remarkably well in terms of export performance: by distinguishing between market access and supply capacity, the authors find that export competitiveness enjoyed considerable growth due to the technological diffusion effect of FDI and the exploitation of low labor costs relative to the EU-15.

Changes in the traditional channels of technology diffusion have reduced the constraints on their availability and use. Half a century ago, the main drivers of productivity growth were complex, wide-scale infrastructure projects such as transportation and communication networks, healthcare and education. Due to the high cost and risks associated with such initiatives, the onus to implement them was on the national government, whose actions might have been constrained by the financial feasibility of each project. Now that a comparable base of infrastructure has been developed in both regions, the determinants of marginal productivity gains come through products such as the Internet, cellular phone networks, computers, and migration flows (which tend to involve overseas training and subsequent technology transfers to the home country). This structural shift has created a greater role for private capital and private economic agents who can operate within a less rigid and more allocatively efficient regulatory structure as the state is able to reduce its involvement in initiatives to raise TFP.

Further CEE-specific evidence is provided in Bijsterbosch and Kosala (2009), where TFP in both manufacturing and services has seen impressive gains in the past 15 years and are converging towards levels seen in the Eurozone. They note however that tertiary sector productivity growth has been less impressive than that of manufactures which confirms the potential risk mentioned earlier of conflating sector output growth with productivity growth and ignoring the increase of factor inputs in the sector. The growth of FDI in the region that occurred through the deepening of common market integration appears to have benefited manufacturing, while human capital growth, measured through regional educational achievement rates has the greatest impact on tertiary sector productivity.

VII. Conclusion

This study attempts to combine supply-side and demand-side theories of growth of in order to explain the source of income convergence in the emerging economies of Europe and East Asia. Classical convergence methods are supplemented by a secondary model that estimates changes in trade elasticities and thereby provides insight into the long-term competitiveness of the economy and by extension, the sustainability of convergence. I find that the existence of convergence has been matched by sustained improvements in trade performance, technological diffusion, and total factor productivity. Additionally, I note that FDI flows and trade openness have been an important source of convergence in emerging East Asia, while openness, EU membership, and a shift towards tertiary production have provided similar benefits for emerging Europe. I concede, however, that the analysis is not comprehensive in the least; the estimation models may be likely to suffer from simultaneity bias, while the BPC models cover too few periods to exhibit a full picture of structural shifts in trade flows and regional competitiveness. A more thorough examination of export-oriented growth would benefit from a discussion of comparative shifts in total factor productivity; as that is beyond the scope of this paper, I have relied on outside evidence to argue my points. Nonetheless, while the numerical magnitude of some of my findings may be compromised by methodological misspecification, I am fairly confident in the validity of the positive trend suggested in my results. Not only have the two regions performed remarkably well in the wake of difficult circumstances, they appear to have bolstered their future prospects by making optimal choices in productivity investments and liberalized trade regimes, both of which have been found to be conducive to the further reduction of the income gap.

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Appendix A

Note: Robust Standard Errors are denoted in Parentheses. Asterisks (*) denote significance levels as stated in previous tables.

Estimation of π- SEA-7

Dep. Variable: Import Growth	1992-1995	1996-1999	2000-2003	2004-2007
Growth of RER	.75 (.47)	-.214 (.070)*	-.47 (.22)***	.32 (.22)
Growth of Real GDP	2.42 (.18)*	.892 (.375)**	1.59 (.34)*	2.45 (.177)*
n	28	28	28	28
R^2	.99	.98	.99	.99

Estimation of ε- SEA-7

Dep. Variable: Export Growth	1992-1995	1996-1999	2000-2003	2004-2007
1/RER Growth	.111 (.076)	.484 (.119)*	.912(.248)	-.016 (.032)
Growth of World GDP	7.07 (.556)*	2.66 (.887)*	1.60 (.829)***	3.86 (.346)*
n	28	28	28	28
R^2	.99	.99	.99	.99

Estimation of π- CEE-8

Dep. Variable: Import Growth	1992-1995	1996-1999	2000-2003	2004-2007
Growth of RER	.076 (.023)*	.017 (.010)	-.173 (.080)**	.026 (.167)
Growth of Real GDP	2.418 (.490)*	1.370 (0.34)*	4.03 (.31) *	3.75 (.186)*
n	32	32	32	32
R^2	.99	.99	.99	.99

Estimation of ε- CEE-8

Dep. Variable: Export Growth	1992-1995	1996-1999	2000-2003	2004-2007
1/RER Growth	-.001 (.009)	-.004 (.004)	.000 (.0002)	.000 (.004)
Growth of World GDP	4.70 (.74)*	1.29 (.59)**	6.85 (.84)*	5.58 (.237)*
n	32	32	32	32
R^2	0.98	.99	.99	.99

Appendix B

Current Account Balance (% of GDP) : SEA-7

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Indonesia	3.72	4.83	4.30	4.00	3.45	0.61	0.10	2.98	2.43
Korea	5.28	2.30	1.59	0.94	1.86	3.90	1.77	0.57	0.56
Malaysia	15.69	9.05	7.85	7.96	11.98	12.09	15.00	16.69	15.37
Philippines	(3.77)	(2.93)	(2.45)	(0.36)	0.36	1.87	2.01	4.55	4.94
Singapore	17.38	11.56	13.09	13.07	23.67	18.14	22.71	25.42	23.49
Thailand	10.17	7.60	4.43	3.69	3.35	1.72	(4.33)	1.05	5.71
Vietnam	4.10	3.55	2.10	(1.72)	(4.88)	(3.50)	(1.06)	(0.27)	(9.83)

Appendix B (cont.)

Current Account Balance (% of GDP): CEE-8

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	(5.03)	(5.57)	(5.63)	(2.43)	(5.50)	(6.58)	(12.37)	(18.44)	(25.15)
Czech Republic	(2.43)	(4.74)	(5.29)	(5.66)	(6.33)	(5.25)	(1.34)	(2.56)	(3.15)
Hungary	(7.83)	(8.36)	(6.01)	(6.98)	(7.95)	(8.42)	(7.52)	(7.55)	(6.45)
Macedonia, FYR	(2.65)	(1.88)	(7.22)	(9.43)	(4.10)	(8.39)	(2.60)	(0.88)	(7.16)
Poland	(6.94)	(5.83)	(2.82)	(2.53)	(2.12)	(4.00)	(1.22)	(2.69)	(4.73)
Romania	(4.10)	(3.70)	(5.49)	(3.33)	(5.82)	(8.36)	(8.88)	(10.39)	(13.85)
Slovak Republic	(4.80)	(3.30)	(8.27)	(8.01)	(5.92)	(7.81)	(8.54)	(7.05)	(5.43)
Slovenia	(3.95)	(3.16)	0.18	1.07	(0.78)	(2.66)	(1.73)	(2.49)	(4.22)

Appendix C

Foreign Exchange Reserves (USD Billions): SEA-7

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Indonesia	26.25	28.28	27.05	30.75	34.74	34.72	32.93	40.87	54.74
Korea	73.70	95.86	102.49	120.81	154.51	198.18	209.97	238.39	261.77
Malaysia	29.67	27.43	28.63	32.42	42.77	64.91	69.38	81.72	100.64
Philippines	13.14	12.97	13.35	13.20	13.52	12.98	15.80	19.89	30.07
Singapore	76.51	79.72	75.15	81.57	95.47	111.85	115.71	135.81	162.52
Thailand	33.80	31.93	32.35	38.04	40.97	48.50	50.50	65.15	85.11
Vietnam	3.32	3.42	3.66	4.12	6.22	7.04	9.05	13.38	23.47

Source: IMF International Financial Statistics

Foreign Exchange Reserves (USD Billions): CEE-8

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	2.77	3.03	3.25	4.36	6.17	8.71	7.99	10.89	16.42
Czech Republic	12.81	13.02	14.19	23.32	26.29	27.84	29.14	31.05	34.45
Hungary	10.71	10.92	10.30	9.72	12.03	15.33	18.30	21.32	23.77
Macedonia, FYR	0.43	0.43	0.74	0.72	0.90	0.90	1.23	1.75	2.08
Poland	26.11	26.32	25.16	27.96	31.72	34.55	40.49	46.11	62.72
Romania	1.52	2.47	3.92	6.12	8.04	14.62	19.87	28.07	37.19
Slovak Republic	3.37	4.02	4.14	8.81	11.68	14.42	14.90	12.65	18.03
Slovenia	3.06	3.11	4.24	6.85	8.34	8.66	8.01	6.99	0.94

Source: IMF International Financial Statistics