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REGIONAL ECONOMIC INTEGRATION, MOBILITY OF PRODUCTION FACTORS AND THE ROLE OF CENTRAL BANK

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Abstract

We show that in a fully integrated economy, in which there is free mobility of goods and factors, each member's share of total output will equal its shares of total stocks of productive factors (i.e., physical and human capital). We label this result the equal-share relationship. This relationship also holds in the presence of technological differences or costs of factor mobility among members if outputs or inputs are properly measured to reflect such differences or costs. The equal-share relationship is the limiting distribution of output and factors among members of a fully integrated economy, and it constraints the set of policies that can affect each member's relative growth within an integrated economy. A key result is that investment plays a central role in determining production distribution across economies. Using panel macroeconomic database of ASEAN countries, empirical tests are conducted to seek the effects of monetary policy performance on investments. The results confirm that a central bank through its monetary policy can have a significant influence on investment performance. Low inflation and macroeconomic stability significantly increase investments. Therefore, in light of the upcoming establishment of ASEAN Economic Community, the role of central bank for ASEAN members in increasing investments is more essential.

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1. Introduction

At the January 2007 ASEAN Summit in Cebu, Philippines, ASEAN leaders agreed to bring forward to 2015 an ambitious initiative to integrate their economies and establish an ASEAN Economic Community (AEC). The community was previously planned to be instituted by 2020 as per earlier ASEAN leaders' decision at the 2003 ASEAN Summit in Bali. The main motivation in the beginning was the need for a significantly higher level of regional economic integration if the ASEAN economies were to compete in a world in which the weight of China and India would continue to rise. The AEC is now aspired to be a single market and production base, a highly competitive economic region, a region of equitable economic development and a region that is fully integrated into the global economy. To achieve such objectives an AEC blueprint was launched at a more recent ASEAN Summit in Singapore in November 2007. This blueprint is intended to be the roadmap required to implement the AEC by 2015. The manuscript contains action plans, targets and timelines for the implementation of the various economic initiatives to advance the AEC.

Developing an ASEAN single market and production base necessitates achieving free flow of goods, services, investment, capital and skilled labor. To this end, 12 priority sectors have been selected as the catalyst and these sectors will pursue a fast track integration path.[1] In this context, the ASEAN Free Trade Area (AFTA) has been one of the most important building blocks of the AEC as it has facilitated the agenda towards free movement of goods in the region. AFTA was formed in January 1992 at the ASEAN Summit meeting in Singapore. By now, tariff rates reduction to 0 to 5 percent under AFTA have been adopted by most member countries with full implementation by all members from 2010. Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand (referred to as the ASEAN-6) agreed to complete the comprehensive tariff reduction program in 2008 which was moved

[1] These 12 priority sectors are: electronics, information and communications technology (ICT), healthcare, wood-based products, automotives, rubber-based products, textiles and apparels, agro-based products, fisheries, air travel, tourism and logistics.

forward to 2002. Cambodia, Laos, Myanmar and Viet Nam (CLMV countries) were given longer time frames to complete the program: Viet Nam in 2006, Laos and Myanmar in 2008 and Cambodia in 2010.

Conceptually, the AEC is intended to mimic a European Union (EU)-style single market. Within the ASEAN context, it will require all measures to remove discrimination against ASEAN suppliers of goods, services and factors. ASEAN still has indeed a long way to go to achieve a single market. To do so will require a fundamental change in thinking by ASEAN economic policy-makers especially in the way they approach regional economic integration. The relatively successful AFTA implementation (trade-related liberalizations) more or less has left issues concerning factor mobility at the top of the AEC implementation programs.

This paper tries to shed some lights regarding what will happen after fully free factor mobility are achieved following the establishment of AEC in 2015 and as a way to strengthen analytical tools to anticipate ASEAN Economic Community 2015. Such objectives were clearly stated by Governor of Bank Indonesia at the Annual Bankers' Dinner January 18, 2008. In this annual strategy presentation, the Governor noted as follows (see Abdullah, 2008, page 154):

> *"The third initiative in the monetary sector is strengthening policy analysis related to AEC 2015. The ASEAN Charter in Singapore on 20th November 2007 witnessed the introduction of the ASEAN economic integration program that is no longer up for negotiation. The AEC 2015 intra ASEAN free-trade agenda is nearly complete and will usher in a significant change in the movement of the production factor. The effect of free movement in the production factor is the establishment of a new configuration of intra ASEAN economic production distribution. It is therefore imperative for a central bank to understand the determinants of this new configuration. We need to project new characteristics and determinants of economic production distribution. As we are discussing something that will take place in the future, we do not have any data that can be interpreted through empirical study. Therefore, Bank Indonesia will initiate several theoretical and analytical research programs."*

2. Regional Integration and Factor Mobility

Fundamentally, a surge of regional integration agreements over the past two decades, including the formation of the ASEAN Economic Community, have sought to reduce barriers to the exchange of goods, services and, in the extreme, factors of production among subsets of countries.[2] Other examples include the NAFTA (United States, Canada and Mexico), the European Union's "Europe 1992" internal market program, the recent accession of additional countries into the European Union (EU), and ongoing efforts to initiate or renew agreements among a variety of nations (e.g., the Free Trade for the Americas and MERCOSUR). The literature dealing with the economic implications of regional integration has mostly dealt with the effects of reducing barriers to the movement of goods. Less attention has been given to the implications of also allowing greater mobility of productive factors within an integrated economy. This omission from the literature is important not only because cross-border factor flows are becoming increasingly important,[3] but also the international trade literature has long recognized that goods trade and cross-border factor flows can evidence a substitute or complement relationship. Hence, reducing barriers to the movement of productive factors within an integrated area would be expected to affect the final distribution of production across members of an integrated economy.

In this paper we take a general form (not an ASEAN specific) to investigate the implications of allowing factor mobility within an integrated economy for the distribution of production across members. Employing factor price equalization as a driving force, we show that factor mobility among members of an integrated economy (IE) implies that each member's share of total IE output will equal its shares of the total IE stock of each productive factor (i.e., its shares of total physical

[2] Sachs and Warner (1995) chronicle these liberalization efforts.

[3] The importance of factor mobility in many parts of the world is evidenced by the growing importance in many nations' balance of payments of remittances from abroad (e.g., International Monetary Fund, 2004). Capital flows in the form of foreign direct investment continue to be important among industrialized countries and they are increasingly also being directed toward developing countries.

and human capital). We term this theoretical prediction the "equal-share" relationship. This theoretical analysis is in line with the

An important implication of the equal-share relationship is that it sets a constraint on the long-run relative growth performance of IE members. In particular, since the sum of output shares across IE members equals unity, the long-run expected growth rate of output shares must be zero. Therefore, it is not possible for every member of an IE to sustain a positive rate of growth of its output share in the long-run. Moreover, the constraint imposed by the equal-share relationship implies that in any given time period, the relative growth performance of IE members can be taken to be a random outcome contingent on alternative states of nature. The random behavior of member's relative growth is more true the greater the extent of economic integration among members. For example, it is truer if members do not run independent monetary or exchange rate policies, when fiscal policies are constrained by institutions, when education systems are harmonized, and when successful local industrial policies are rapidly imitated.

The implications of our analysis for growth relates to the existing growth literature in several respects. First, our analysis has a direct implication for the question of convergence in national outputs that has been extensively investigated in the growth literature (see e.g. Durlauf and Quah, 1999). Empirically, Evans and Karras (1996) and Evans (1997) find higher speeds of income convergence among US states than for countries. These findings are consistent with the theoretical predictions of Barro *et al*. (1995) who show that an open economy with partial capital mobility has a higher rate of convergence than does a closed economy. Similarly, Rappaport (2005) introduces labor mobility in the neoclassical growth model to show that emigration creates a disincentive for gross capital investment. This disincentive partly offsets the positive contribution of labor mobility to faster income convergence. In our framework, the equal-share relationship implies that IE members will have the same output per efficiency unit of labor. This implication is the essence of the convergence hypothesis investigated by the growth literature, here interpreted in terms of efficiency units of labor and not per capita.

A different view of the processes generating economic converge is contained in the literature that relates financial services and growth. Financial intermediation pools funds and allocates these to those activities expected to produce the highest reward. A more efficient allocation of savings tends to increase rates of growth (Bencivenga and Smith, 1991). Internationally, greater integration of financial markets is expected to both lower the cost of financial capital and to foster a reallocation of capital from capital abundant to capital scarce countries. One effect of such a reallocation of capital resources may be to promote technological progress (e.g., venture capital) that can offset decreasing returns to physical capital and may generate endogenous growth (Greenwood and Jovanovic, 1990). Empirically, Levine (1997) found evidence of a cross-country pattern linking growth and domestic finance. However, Edison *et al*. (2002) and Eschenbach (2004), who also review the more recent literature, find weak evidence of a link between capital mobility and per capita income growth. A key contribution of our analysis is to show that capital market integration, and factor mobility in general, will lead to the emergence of the equal-share relationship that then introduces a constraint on the relative growth performance of members of an integrated area.

Finally, the equal-share relationship also addresses Lucas' (1990) question as to why more capital does not flow from rich to poor countries. Namely, an economy with a low level (and hence a low share) of human capital will also have a low share of physical capital, and also a low share of output.

Given the potential theoretical importance of the equal-share relationship, we examine empirically for its presence for different groupings of economic units (i.e., US states, EU countries, Developing Countries, and the World). Our empirical results, based on panel data spanning the period from 1965 to 2000, indicate that the data fit the theoretical equal-share prediction the higher the degree of factor mobility among a defined set of IE members.

3. The Model

We consider an economy (or economic unit) that produces a single good by means of a constant return to scale production function:

(1) $Y_t = F(K_t, H_t)$.

where Y_t is the level of output, K_t is the level of physical capital stock and H_t is the level of human capital stock, all at time *t*. To facilitate interpretation we assume the production function takes the Constant Elasticity of Substitution (CES) form:

(2) $$Y_t = \gamma \left\{ \delta K_t^{-\rho} + (1-\delta) H_t^{-\rho} \right\}^{-1/\rho}$$

where γ is an efficiency parameter, δ the degree of physical capital usage, and ρ is a substitution parameter such that the elasticity of substitution between the two inputs is $\sigma = 1/(1+\rho)$. Given (2), the marginal product of physical capital is:

(3) $$(F_K)_t = \gamma\delta \left\{ \delta + (1-\delta)\left(\frac{K_t}{H_t} \right)^{\rho} \right\}^{-(1+\rho)/\rho}$$

Combining (2) and (3) one can write:

(4) $$(F_K)_t = \gamma^{-\rho}\delta \left(\frac{Y_t}{K_t} \right)^{1+\rho}.$$

Similarly, the expression for the marginal product of effective labor (human capital) is:

(5) $$(F_H)_t = \gamma(1-\delta) \left\{ (1-\delta) + \delta \left(\frac{K_t}{H_t} \right)^{\rho} \right\}^{-(1+\rho)/\rho}$$

or

(6) $$(F_H)_t = \gamma^{-\rho}(1-\delta) \left(\frac{Y_t}{H_t} \right)^{1+\rho}.$$

We now introduce a second economy and consider the implications of allowing factor mobility between the two economies. If physical capital and human capital are perfectly mobile between the two economies then we would expect each factor to flow from the low to high rate of return country until each factor's rate of return (marginal product) is equalized between the two economies.

However, if there are barriers to factor mobility then rates of return will only be partially equalized.[4] For simplicity, we can represent such barriers by a time-varying proportional wedge in rates of return to physical capital ($\bullet_t(k) > 0$) and rates of return to human capital ($\bullet_t(h) > 0$). Given this, the relation between the rates of return between the two economies can be written:

$$(7) \qquad \gamma^{-\rho}\delta\left(\frac{Y_t}{K_t}\right)^{1+\rho} = \lambda_t(k)(\gamma^*)^{-\rho^*}\delta^*\left(\frac{Y_t^*}{K_t^*}\right)^{1+\rho^*}$$

$$(8) \qquad \gamma^{-\rho}(1-\delta)\left(\frac{Y_t}{H_t}\right)^{1+\rho} = \lambda_t(h)(\gamma^*)^{-\rho^*}(1-\delta^*)\left(\frac{Y_t^*}{H_t^*}\right)^{1+\rho^*}$$

where '*' indicates second economy variables. The ratio of (7) to (8) gives the ratio of human to physical capital:

$$(9) \qquad \frac{H_t}{K_t} = \eta(\lambda_t)^{1/(1+\rho)}\left(\frac{H_t^*}{K_t^*}\right)^{\theta}$$

where:

$\eta = \left[\delta^*(1-\delta)/(1-\delta^*)\delta\right]^{1/(1+\rho)}$, implying $\eta = 1$ when $\delta = \delta^*$;

$\theta = (1+\rho^*)/(1+\rho)$, implying $\theta = 1$ when $\rho = \rho^*$;

$\lambda_t = \lambda_t(k)/\lambda_t(h)$, implying $\lambda_t = 1$ when $\lambda_t(k) = \lambda_t(h)$.

Using these definitions we can write (7) as:

$$(10) \qquad \frac{Y_t}{K_t} = \nu\omega(\lambda_t(k))^{1/(1+\rho)}\left(\frac{Y_t^*}{K_t^*}\right)^{\theta}$$

where:

$$\nu = (\delta^*/\delta)^{1/(1+\rho)}$$

$$\omega = \left[(\gamma^*)^{-\rho^*}\gamma^{\rho}\right]^{1/(1+\rho)}$$

We are now fully equipped to illustrate the implications of the model for the distribution of output and factors between the two economies. To show the role of human capital, rewrite (8) as:

[4] Barriers to capital mobility can include sovereign and political risk, capital controls, and tax differences that can hinder cross-border investments. Barriers to human capital mobility include government regulations on immigration and work permits, differences in pension systems and languages between countries.

(11) $$\frac{Y_t}{H_t} = \frac{\omega\eta}{\nu}(\lambda_t(h))^{1/(1+\rho)}\left(\frac{Y_t^*}{H_t^*}\right)^{\theta}$$

Traditionally, (11) serves as a basis for productivity calculations and comparisons across countries. However, unlike the existing literature (e.g., Hall and Jones, 1999) where productivity is measured by output per worker, equation (11) expresses (like the endogenous growth literature) productivity in terms of output per effective unit of labor. For the sake of comparison, consider Hall and Jones' (1999) example of the United States and Niger. In 2000, US output per worker was 38 times higher than output per worker in Niger. Using as a measure of human capital the number of persons with at least a secondary education, output per unit of human capital in Niger is instead measured to be 1.3 times higher than in the United States for the same period. This indicates the sensitivity of productivity comparisons to the measurement of human capital.

To obtain a first expression of the equal-share relationship, note that (9) and (10) can be written as follows:

$$\frac{H_t}{K_t} = \eta(\lambda_t)^{1/(1+\rho)}\left(\frac{H_t^*}{K_t^*}\right)^{\theta} = \frac{H_t + \left(H_t^*\right)^{\theta}\eta(\lambda_t)^{1/(1+\rho)}}{K_t + \left(K_t^*\right)^{\theta}}$$

$$\frac{Y_t}{K_t} = \nu\omega(\lambda_t(k))^{1/(1+\rho)}\left(\frac{Y_t^*}{K_t^*}\right)^{\theta} = \frac{Y_t + \left(Y_t^*\right)^{\theta}\nu\omega(\lambda_t(k))^{1/(1+\rho)}}{K_t + \left(K_t^*\right)^{\theta}}$$

Combining these two expressions gives:

(12) $$\frac{H_t}{H_t + (H_t^*)^{\theta}\eta\lambda_t^{1/(1+\rho)}} = \frac{Y_t}{Y_t + (Y_t^*)^{\theta}\nu\omega\lambda_t(k)^{1/(1+\rho)}} = \frac{K_t}{K_t + (K_t^*)^{\theta}}$$

Equation (12) establishes a link between the first economy's shares of the total output, physical capital, and human capital across the two economies. Differences in technology between the two economies imply only a rescaling of the original variables. A difference between •• and • indicates a neutral difference in technologies that has no effect on the optimal selection of physical capital and human capital, but it does have an effect on the distribution of output through • in (12). A difference between the substitution elasticities introduces the power •

whereas differences between the other parameters lead to a multiple rescaling of variables.

Equation (12) nests several share relationships that relate to different assumptions about technology and factor mobility. If technology is identical between the two economies then (12) simplifies to:

$$(13) \qquad \frac{H_t}{H_t + H_t * \lambda_t^{1/(1+\rho)}} = \frac{Y_t}{Y_t + Y_t * \lambda_t(k)^{1/(1+\rho)}} = \frac{K_t}{K_t + K_t *} .$$

In this new form of the equal-share relationship, some variables for the second economy are rescaled by the proportional differences in rates of return. For example, from (13), an absence of barriers to physical capital mobility ($\lambda_t(k) = 1$) implies equal output and physical capital shares that, however, differ from the human capital share. If we assume that both $\lambda_t(k) = 1$ and $\lambda_t(h) = 1$ then the equal-share relationship takes the simple form:

$$(14) \qquad \frac{H_t}{H_t + H_t *} = \frac{Y_t}{Y_t + Y_t *} = \frac{K_t}{K_t + K_t *}$$

This states that when there are no barriers to factor mobility and technologies are identical, each economy's shares of total output, total physical capital and total human capital will be identical.

The equal-share relationship (14) has three main implications. First, a reallocation of physical capital between IE economies, that is, $dK_t = -dK_t$, must be accompanied by an increase in output and either an inflow of foreign human capital or an accumulation of domestic human capital to rebalance the equality of world shares. Similarly, a policy that increases a country's share of total IE human capital will raise both the country's share of total IE output and its share of total IE physical capital (via either an inflow of foreign physical capital or accumulation of domestic capital).

Second, our framework can be related to the broad topic of output convergence by noting that if (14) holds then the following two equalities will also hold:

(15) $$\frac{Y_t}{H_t} = \frac{Y_t + Y_t^*}{H_t + H_t^*}$$

(16) $$\frac{Y_t}{H_t} = \frac{Y_t^*}{H_t^*}$$

From (16) it is clear that, if the equal-share relationship holds, the two economies will have the same output per efficiency unit of labor. This implication is the essence of the productivity convergence hypothesis (Baumol, 1986), here interpreted in terms of efficiency units of labor and not per capita.

Third, the equal-share relationship (14) can be extended to the case of an integrated economy that comprises $j = 1,...,N$ members. If all members have the same technology, and there is perfect mobility of either physical or human capital among members, then the equalization of factor rates of return implies:

(17) $$\frac{H_{it}}{\sum_{j=1}^{N} H_{jt}} = \frac{Y_{it}}{\sum_{j=1}^{N} Y_{jt}} = \frac{K_{it}}{\sum_{j=1}^{N} K_{it}} \qquad \text{for } i = 1, \ldots, N$$

This set of equalities express the distribution of output and factors among N members of a fully integrated economy. Like (12), expression (17) can be extended to allow for differences in technology and factor market imperfections among members.