Labor Market and Long-Run Economic Growth of ASEAN Countries

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Abstract. *This article uses a variation of the Solow model that were developed by Alonso, Echevaria and Tran (2004) to explore the interrelations between the labor market and the economic growth. It can be proven that both analytically and empirically, income and capital per worker in the development-state (ASEAN Countries) depend positively on flexibility of the labor market; that the development state unemployment rate depends positively on the rate of population growth and the productivity growth rate and negatively on the savings rate and flexibility of the labor market; and, finally, that labor market flexibility affects convergence toward developing countries. The paper also discusses the economic implications of these results for sigma convergence.*

Keywords: Labor market; growth; unemployment rate; ASEAN.

1. INTRODUCTION

The Solow-Swan neoclassical growth model, despite its age and recent developments in the growth literature, continues to be of great theoretical and empirical interest. There have been a large number of recent papers which test implications of this model, typically using data from the Penn World Tables (PWT) (Summers and Heston, 1991). Prominent examples are Mankiw et al. (1992), who used the data in cross section, and Islam (1998), who used the panel data. The former is dynamic and considered the impact of the growth in inputs on output under the assumption that unemployment is nonexistent. The later is static and considered the determination of the rate of unemployment under the assumption that the growth of capital is nonexistent. Associated with this there has been a considerable discussion of the meaning and interpretation of the central issues in the debate, namely 'convergence'. The debate is discussed; for example, by the contributors to the 'Controversy' section of the July 1996 Economic

Journal introduced by Durlauf (1996). Statistically, convergence has been interpreted as a negative correlation between initial level of income and subsequent growth rate (Islam, 1998). Hence, the popular method for testing convergence hypothesis has been to conduct *growth-initial level regressions*.

The basic assumption of the neoclassical growth model is that, the labor market should have time to return to full employment in the long run, even if we admit sticky wages in the short run; that will be described by the level of employment compatible with frictional unemployment. Therefore, it will be sufficient to use the growth of the labor force when discussing about growth, not the growth of the employed labor force (Alonso et al., 2004). In addition, if the desirable frictional level differs from the equilibrium employment level in the labor market, it is conceivable that this persistent deviation will have an impact on the long-run growth.

However, only a few researchers combined the growth and unemployment phenomena in their research. Furuya (1998) studied the implications of an increase in labor taxes on both unemployment and economic growth. It was followed by Daveri and Tabellini (2000). In fact, both of them did not clearly explain the labor market because of the existence of efficiency wages (in Furuya's) and the existence of a union (in Daveri and Tabellini's). In addition, most of recent studies only observed convergence rates for steady-state, not for development-state. Therefore, in this article we propose the impact of labor market institutional variables on long-run economic growth by using a simple variation of the standard Solow model.

Based on the background, we determine the growth model by including the effects of persistent unemployment on long-run growth of development-state. Section 2 gives the literature review about the interrelationships between the economic growth and the labor market. Section 3 sets out a stochastic version of the Solow growth model that developed by Alonso et al. (2004) and the econometric properties of the model. Section 4 tests the implications regarding convergence toward the developing countries. Long-run effects of labor market variables and testing for convergence effects are shown in Section 5 and Section 6, while the conclusions of the paper is summarized in Section 7.

2. INTERRELATIONSHIPS BETWEEN ECONOMIC GROWTH AND THE LABOR MARKET

Alonso et al. (2004) model is a simple variation of the standard Solow model that is sufficient to investigate the interrelationship between the economic growth and the labor market. By using a variation of Blanchflower and Oswald's (1995) wage curve, it showed an empirical inverse relation between unemployment and wage levels; and it is consistent with models of noncompetitive wage determination. This curve was based on the open-trade-union Layard–Nickell (Layard and Nickell, 1985; 1986) model of wage determination that explained the difference level of unemployment equilibrium from frictional level.

Implicitly, the Layard–Nickell (1985; 1986) model described that both capital intensity and productivity affect the equilibrium unemployment rate. By focusing on capital intensity to determine unemployment and incorporating unemployment into a growth model, the potential and feasible growth can be distinguished. Moreover, the potential growth path for a given savings rate if all resources were utilized can be described. These conditions imply that some labor may not be employed. On the other hand, the feasible growth path implies on some underachievement. Therefore, both income and capital per worker depend positively on labor market flexibility.

The conclusions regarding the effects of the labor market on development-state variables are not different from the ones of a simpler Solow model in which the production function in period t is $Y_t = K_t^{\alpha}((1-u^*)A_tL_t)^{(1-\alpha)}$ in the steady state, where, as usual, Y denotes output, K denotes capital, A is an indicator of labor efficiency, L denotes the labor force, u^* refers to the natural rate of unemployment and α is $0<\alpha<1$ (can have value between 0 and 1). The difference is that this model studies the interrelations between the economic growth and the labor market, that is, the effect of variables affecting the developing countries, such as capital accumulation, on unemployment. This model also predicts that a decrease in the saving rate, an increase in the rate of growth of the labor force, or an increase in the rate of technical progress will tend to increase the rate of unemployment in the developing countries. Finally, there is a third and novel prediction of the model: lack of labor market flexibility slows convergence of the economy toward its steady state. Lack of flexibility implies that the economy produces below its potential every period.

This paper will follow Alonso et al. (2004) model that develops a stochastic Solow growth model for development-state and is customized to the data set that is based on reality when the economy is not using all its productive resources. According to Asian Development Bank (2004), it can be seen that the average Japan unemployment rate during the 1990s was $\pm 4\%$ while countries such as Indonesia and the Philippines maintained double-digit unemployment rates in the 1980s and 1990s. It seems intuitive that double-digit unemployment during two decades should have long-lasting effects on standards of living.

Using a combination of the Asian Development Bank data, the Penn World Tables and data on labor market institutional variables from Lawson and Berhanzl (2004), it shows not only a lower saving rate, a higher growth rate of the labor force or a higher rate of technical progress results in higher unemployment, but also that labor market institutional variables have the predicted effects on development-state output per worker and that labor market flexibility affects convergence toward the development-state.

3. THE MODEL AND APPLICATIONS

The Solow (1994) model represented the household savings behavior to production side of the growth model. However, the assumption of exogenous (and different across-countries) saving rates will be beneficial for empirical results. In addition, the variation of Blanchflower and Oswald (1995) of wage curve is more suitable to integrate into growth model by using aggregate functions that replicate stylized facts, such as the Cobb–Douglas production function. Moreover, Alonso et al. (2004) points out that the unemployment elasticity can be a function of labor market institutional variables.

In most developing countries, the contracts between employers and employees are not negotiated, *it taken for granted*. Therefore, the bargaining power of labor strongly depends inversely on the unemployment ratio. However, to be consistent with a wage curve, the negotiation results as real wage ω can be defines by substituting the rate of employment, ε to the following function,

$$\omega = \varpi \varepsilon^{\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where β denotes the elasticity of agreed wages to employment and ϖ denotes the real wage demanded at full employment. Furthermore, the wage level

represents the infinite of supply labor at certain wage. By maintaining the marginal product over the real wage, firms will maximize profits and employed workers. Thus, they establish the employment level of the agreed wage. This condition can be reflected by using a Cobb–Douglas production function as follows:

$$Y = K^{\alpha}(L\varepsilon)^{1-\alpha} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The marginal product of the employed labor to equal the real wage that firms are willing to pay at the certain level of employment rate requires to calculate the equilibrium of labor market, that is,

$$(1-\alpha)K^{\alpha}(L\varepsilon)^{-\alpha} = \varpi\varepsilon^{\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The firms would be willing to pay wage at full employment need ϖ greater than $(1-\alpha)(K/L)^{\alpha}$ when the equilibrium less than 1. Changes in this parameter will change the level of the curve that depends on the elasticity of agreed wages to employment rate, β. Secondarily, it will be represented by the real wage demanded at full employment, ϖ. The equilibrium level of employment rate can be calculated by:

$$\varepsilon = \min\left(1, \left[\frac{1-\alpha}{\varpi}k^{\alpha}\right]^{\frac{1}{\alpha+\beta}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where k, denotes capital per active worker (as opposed to capital per employed worker). Thus, the equilibrium depends on the level of capital per active worker as well as on the degree of flexibility of the labor market. By substituting ε in the production function, it obtains:

$$Y = K^{\alpha}L^{1-\alpha}\left[\frac{1-\alpha}{\varpi}\left(\frac{K}{L}\right)^{\alpha}\right]^{\frac{1-\alpha}{\alpha+\beta}} = CK^{\frac{\alpha(1+\beta)}{\alpha+\beta}}L^{\frac{(1-\alpha)\beta}{\alpha+\beta}} \quad \ldots\ldots\ldots (5)$$

where $C=((1-\alpha)/\varpi)^{\frac{1-\alpha}{\alpha+\beta}}$ This equation determines the feasibility of production level with certain amount of capital and labor given the institutional characteristics of the labor market. It seems similar with common production function. However, the efficiency parameter (C) positively

depends on β and negatively on ϖ. Thus, it can be stated that product and active workers can determines the feasibility of production function at the equilibrium rate of employment. The following equation represents the feasibility of production function in its intensive form,

$$y = \min\left(k^{\alpha}, Ck^{\frac{\alpha(1+\beta)}{\alpha+\beta}} \right) \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where y is feasible product per active worker. It lies below the potential product per worker, k^{α}, as a consequence of the degree of unused labor.

The increasing production will happen when active population is to be employed. In maximum flexible labor market, $\beta = \infty$, real wages tend to decrease until all active population is employed. However, when β=0, the increasing of active population does not affect the wage sought by workers as well as the absolute level of employment. Therefore, the feasible production function can be improved when capital increases because $Y=CK$.
The change in the capital stock per worker is:

$$k = sCk^{\frac{\alpha(1+\beta)}{\alpha+\beta}} - (n+\delta)k \quad \ldots\ldots\ldots\ldots\ldots (7)$$

where s denotes the saving rate. By assuming that this equation can be applied to developing countries,

$$k^* = \left(\frac{sC}{n+\delta} \right)^{\frac{\alpha+\beta}{\beta(1-\alpha)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

where k^* denotes capital per active worker. Capital per worker is lower in the developing countries than in the steady state, because the feasible production function lies below the potential production function. As result of the difference among each level of capital per worker toward the employment rates, ε, it represents developing countries employment rate, ε^*. By substituting Equation 8 into Equation 4,

$$\varepsilon^* = \min\left(1, \left(\frac{(1-\alpha)}{\varpi} \right)^{\frac{1}{\alpha+\beta}} \left(\frac{sC}{n+\delta} \right)^{\frac{\alpha}{\beta(1-\alpha)}} \right) \quad \ldots\ldots\ldots\ldots\ldots (9)$$

In addition, u^* as unemployment rate in developing countries can be calculated by substituting the value of C into the expression,

$$u^* = 1 - \varepsilon^* = \max\left(0, 1 - \left(\frac{1-\alpha}{\varpi}\right)^{\frac{1}{\beta}} \left(\frac{s}{n-\delta}\right)^{\frac{\alpha}{\beta(1-\alpha)}}\right) \quad \ldots\ldots\ldots\ldots (10)$$

It can be seen that the unemployment rate depends positively on the rate of population growth, n; negatively on the savings rate, s; and positively on the level of workers' expectations, ϖ. In the long run, capital per worker will be less when the saving rate implies less in the long run. As we mentioned before, the saving rate in the long run does not affect employment rates in the flexible market. However, the rate will increase less flexible market.

It can be concluded that the income per worker in those countries will be smaller because of the existing of unemployment. It also affects to level of capital per active worker is lower in the developing countries. Thus, because of the economy is investing less, in the long run income per capita will be lower when unemployment exists. It can be assumed that the labor market institutional constraints are binding toward feasible growth.

3.1 Technical Progress

Consider Y_t, K_t, L_t and ε_t refer to product, capital, active population, and employment respectively in period t and A_t is an indicator of labor efficiency. It is assumed that an increase at an annual rate g through the production function for period t is:

$$Y_t = K_t^{\alpha} (L_t \varepsilon_t A_t)^{1-\alpha} \quad \ldots\ldots\ldots\ldots\ldots (11)$$

In intensive form, output per labor efficiency is:

$$y_t' = k_t'^{\alpha} \varepsilon_t^{1-\alpha} \quad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

where $k_t' = K_t / (L_t A_t)$ denotes capital per labor efficiency.

In period t of developing countries, the real wage ω_t growth at the same rate of A_t a rate g. Thus, the level of employment can be expressed as:

$$\omega_t = \varpi_t \varepsilon_t^{\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

The labor market equilibrium in terms of labor efficiency for period t can be obtained by substituting it:

$$(1-\alpha)k_t'^{\alpha}\varepsilon_t^{-\alpha} = \varpi_t'\varepsilon_t^{\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots (14)$$

where ϖ_t' denotes the wage per labor efficiency sought by workers at full employment. By solving ε in the labor market equilibrium condition,

$$\varepsilon = \left[\frac{1-\alpha}{\varpi'}k'^{\alpha}\right]^{\frac{1}{\alpha+\beta}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

and substituting it into Equation 15 to obtain the feasible product per labor efficiency, then:

$$y' = k'^{\alpha}\left[\frac{1-\alpha}{\varpi'}k'^{\alpha}\right]^{\frac{1-\alpha}{\alpha+\beta}} = Bk'^{\frac{(1+\beta)\alpha}{\alpha+\beta}} \quad \ldots\ldots\ldots (16)$$

where $B=((1-\alpha)/\varpi')^{\frac{1-\alpha}{\alpha+\beta}}$

The unemployment rate can be obtained by emphasizing the level of capital per labor efficiency in the developing countries k'^*, where,

$$k'^* = \left(\frac{sB}{n+g+\delta}\right)^{\frac{\alpha+\beta}{\beta(1-\alpha)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (17)$$

By calling the Equation 10 and substituting the value of k'^* and substituting B we obtain the unemployment rate as follows:

$$u^* = 1-\left(\frac{1-\alpha}{\varpi'}\right)^{\frac{1}{\beta}}\left(\frac{s}{n+g+\delta}\right)^{\frac{\alpha}{\beta(1-\alpha)}} \quad \ldots\ldots\ldots (18)$$

It is now evident that the value of the development-state unemployment rate depends negatively on the marginal propensity to save, s; positively on the population growth rate, n; positively on the productivity growth rate, g; and positively on the level of workers' salary expectations, ϖ. It can be concluded that the less flexible market implies not only a greater unemployment rate and a lower product in the short run, but also a greater unemployment rate and a lower product in the long run.

3.2 Rate of Convergence

The neoclassical model of steady state income converges to:

$$\dot{y} = -(1-\alpha)(n+g+\delta)(y-y^*) \quad \ldots\ldots\ldots\ldots\ldots (19)$$

or the rate of convergence is $(1-\alpha)(n+g+\delta)(y-y^*)$. Therefore, we use Alonso et al. (2004) model to converge income as follows:

$$\dot{y} = -\frac{\beta(1-\alpha)}{\alpha+\beta}(n+g+\delta)(y-y^*) \quad \ldots\ldots\ldots\ldots\ldots (20)$$

The predicted rate of convergence is smaller than the standard growth model because $(\beta(1-\alpha)/(\alpha+\beta)) \leq 1-\alpha$, and less flexible labor market implies that the economy produces below its potential every period. Therefore, the convergence rates in developing countries higher than the convergence rates in steady state.

4. THE IMPACT OF GROWTH VARIABLES ON PERSISTENT UNEMPLOYMENT

This research follows Furuya (1998) and Alonso et al (2004) to determine the impact of savings rate, growth rate of the labor force, and technological progress (as independent variables) toward long-run unemployment rate (as dependent variables). To test the model predictions, we used the Asian Development Bank, combined with CIA fact book data and used moving averages to estimate some unavailable data. Data on unemployment rates, growth rate of the labor force and saving rate were taken directly from the database. The rate of technological progress was calculated by combining feasible data from those sources and each country's website.

We obtained the Productivity Index of the steady states, that assumes output per worker and capital per worker grow at the same rate in the developing countries. We used a pooled-ordinary least-squares (OLS) regression.

Table 1 provides descriptive statistics for each dependent and independent variables that used in the research model. It can be seen that Thailand has the lowest unemployment rate and the highest is Philippine. This condition could be affected by their labor force growth which only half of their ASEAN partners. Moreover, their labor production level higher than Malaysia, even their Capital per Worker less slightly compare to Malaysia. Surprisingly, Malaysia has the highest Convergence Rates and the lowest is Cambodia. It is indicated that even their labor's initial income relative high compare to other ASEAN countries, but the living expense in Malaysia and Singapore also relatively high.

In addition, Singaporean saving rate is the highest one in ASEAN area and nearly 19 times compare to Cambodia. Singapore also achieve the highest level for their Technological Progress compare to others, it is consistently related with their national mission as technological hub in Asia. Moreover, Singapore government governs their workers better than other countries by delivering more active policies to protect them. Furthermore, the high level of labor income in Singapore and Malaysia motivate to save their wages more compare to other ASEAN countries. Finally, Myanmar has the lowest position on the workers benefit duration and also active policies from their government. Nevertheless, the difference level of economic development and size populations among ASEAN members caused standard deviation relative high compare to OECD countries.

Table 1
DESCRIPTIVE STATISTICS OF DEPENDENT AND INDEPENDENT VARIABLES OF NINE COUNTRIES OF ASEAN

No	Country	UER	PL	CpW	CR	Sav	LFG	TP	Dur	AP	TW	EP	Asav
1	Cambodia	2.30	9.43	16.98	18.14	2.5	3.64	25.47	2.81	1.87	3.83	6.32	4.23
2	Indonesia	4.84	17.88	23.73	28.29	29.5	2.30	35.60	3.43	3.23	8.07	11.34	11.54
3	Laos	5.70	18.07	14.30	25.48	8.90	3.34	21.45	2.37	1.67	9.50	4.92	4.67
4	Malaysia	3.90	26.56	27.20	84.63	40.67	3.11	40.80	6.63	5.58	6.50	18.78	17.91
5	Myanmar	4.10	14.25	14.87	27.43	12	3.80	22.30	1.02	1.32	6.83	3.86	4.35
6	Philippine	8.80	14.84	19.56	42.92	16.34	2.75	29.34	3.56	3.34	8.67	12.04	12.32
7	Singapore	2.80	41.69	34.58	62.93	47	3.25	51.87	6.67	6.53	4.67	22.43	16.16
8	Thailand	2.00	34.25	25.24	37.94	35.3	1.15	37.86	4.21	4.27	3.33	15.32	12.45
9	Vietnam	4.44	13.43	19.71	47.34	18.18	1.2	29.56	2.38	3.21	7.40	10.98	9.76
Mean		4.32	21.16	21.80	41.68	23.39	2.72	32.69	3.68	3.45	6.53	23.39	10.38
SD		2.07	10.76	6.19	21.04	15.36	0.98	9.85	1.92	1.77	2.16	6.27	5.08

Notes:

Dependent variables

UER = unemployment rate
PL = production level
CpW = capital active per worker
CR = convergence rates

Independent variables

Sav = savings
LFG = labor force growth
TP = technological progress
Dur = duration
AP = active policies
TW = tax wedge
EP = employment protection
Asav = adjusted saving

By using the data from 1988 to 2002 from nine countries[1] (all ASEAN countries except Brunei Darussalam) and uses pooled-OLS regression, the results confirm Furuya's and Alfonso's conclusions although the slope of saving and technical progress was too small, but the growth of labor force implied higher rate of unemployment in the long run. However, although previous researcher has shown that there are positive relationship between the equilibrium rate of employment and the level of capital per labor efficiency predicted by the model, but our results are different. It happened because the unemployment rate in developing countries is higher; therefore it is not affected significantly by saving rate or technical progress or even labor force growth as much as in steady states. Moreover, the feasible data in our research is also the concern that affects the results (Table 1).

Table 2
UNEMPLOYMENT AS DEPENDENT VARIABLE

Variable	Coefficient	*t*-Statistic
Saving	-3.04E-05	-2.694672
Labor Force Growth	0.25586	0.253117
Technical Progress	-2.59E-05	-3.183382
Adjusted R^2		0.477
Included Observations		13

5. LONG-RUN EFFECTS OF LABOR MARKET VARIABLES

As we mentioned before, the labor market institutions affect the employment and convergence rate. Whereas ϖ on income and employment in the long run explained labor market institutions. Moreover, β represents sought wage elasticity with respect to employment rate and higher β reflects more flexible labor market. The effects of a change in β on income and employment in the long run are similar to those of a change in ϖ. An increase in β shifts the non accelerating rate of employment curve upward and also increases the efficiency in production. Therefore, the savings per worker curve shifts upward in this case as well.

Additional effect of the increasing β will increase the convergence rates and the curvature of the savings rate per worker. Therefore, the developing countries are declined sooner if there were a decrease in workers' salary expectations. By substituting Equation 9 and the value of B into Equation 5, we obtain the following equation:

$$y' = B^{\frac{\beta+\alpha}{\beta(1-\alpha)}}\left(\frac{s}{n+g+\delta}\right)^{\frac{(1+\beta)\alpha}{\beta(1-\alpha)}} = \left[\frac{1-\alpha}{\varpi}\right]^{\frac{1}{\beta}} \hat{s}^{\frac{(1+\beta)\alpha}{\beta(1-\alpha)}} \quad \ldots\ldots\ldots (21)$$

where $\hat{s} = s/(n+g+\delta)$.

For the first of this models, it tests the logarithmic form of Equation 10, assuming b to be the same across countries.

$$\ln y' = \frac{1}{\beta}\ln(1-\alpha) - \frac{1}{\beta}\ln\varpi + \frac{(1+\beta)\alpha}{\beta(1-\alpha)}\ln\hat{s} \quad \ldots\ldots\ldots\ldots (22)$$

This equation uses constant in the first term, the second depends on wage aspirations, and the third depends on the redefined saving rate. Institutional variables may affect the parameter β, and therefore it may not necessarily be the same across countries. However, because the relation between the parameter β and ϖ is highly nonlinear, estimating this equation without further information or assumptions is an almost impossible task. The problems have been described in the debate between Lee et al. (1998) and Islam (1998) concerning the econometrics of growth and convergence and the need to impose slope homogeneity in certain cases.

It assumes that ϖ depends on the institutional variables in an exponential form; that is,

$$\varpi = \prod_j \Gamma x_j^{\gamma_j} \quad \ldots\ldots\ldots\ldots\ldots\ldots (23)$$

where x_j refer to it. This research used 5 of 9 labor market institutional variables from Blanchard and Wolfers (2001) as independent variables to describe long run effects of labor market variables toward feasible production level, capital per worker and also convergence rates in ASEAN countries. In addition, this research excludes replacement rate (*rrate*), union coverage

(*union*), union density (*uden*) and coordination (*coord*) variables, because the data was not available either too difficult to collect from existing sources.

Refer to equation 23, we use pooled regression to determine the effect of institutional variables toward feasible production level:

$$\ln y_{it} = c + \sum_{j=1}^{9} a_j \ln x_{jt} + a_0 \ln \hat{s}_{it} \quad \ldots\ldots\ldots\ldots (24)$$

The data are from the World Development Indicator (World Bank, 2001). It uses data for 14 years, that is, $t=1$ to 14 and nine countries, that is, $i=1$ to 9. Investment rates refer to the Gross Capital Formation (as percentage of GDP) in the data. The labor growth rate is calculated from the Total Labor Force. We set up the depreciation rate as much as 5% and the rate of technological progress 2.5%. In addition, we assumed g equal to 3.5% to reflects higher labor growth in developing countries by dividing GDP in 2001 by the Total Labor Force.

The results show that the employment protection tends to have a negative impact. However, the employment duration, saving rate and active policies from government positively affect it. All the other variables are significant effects and have the expected sign, except for the unemployment benefit duration, which is expected to have a negative effect. It may be explained by the fact that a longer duration allows for a better job–worker match, increasing productivity in the long run, and thus, overcoming the short-run negative effects.

The coefficient for $\hat{s}$ (adjusted saving in the tables) is consistent with our expectations as well: the coefficient 0.3628, equals to $(1+\beta)\alpha/(\beta(1-\alpha))$, according to the model. As stated in Section 3, the coefficient of the log-linear regression of employment on capital per efficient unit of labor 0.014, equals to $\alpha/(\alpha+\beta)$, according to the model. These two coefficients jointly imply an $\alpha = 0.23$ and a $\beta = 16.46$ (Table 3).

Table 3
LN (*Y*) AS DEPENDENT VARIABLE

Variable	Coefficient	t-Statistic
ln (duration)	0.26*	3.47
ln (active policies)	0.26*	4.68
ln (tax wedge)	-0.00012	-0.23
ln (employment protection)	-0.21*	-2.45
ln (adjusted saving)	0.3628*	3.02
Constant	7.34	6.53
Adjusted R^2		0.545
Included observations		54

Note: * Significant at p = 0.01.

Finally, we test the implication of labor market institutional variables on capital per worker. It tests the logarithmic form of Equation 11, assuming β to be the same across countries,

$$\ln k' = \frac{1}{\beta}\ln(1-\alpha) - \frac{1}{\beta}\ln\varpi + \frac{\alpha+\beta}{\beta(1-\alpha)}\ln\hat{s} \quad \ldots\ldots\ldots (25)$$

where the first term is a constant, the second depends on wage aspirations, and the third depends on the redefined saving rate. By assuming that ϖ depends on the institutional variables in an exponential form, the regression is,

$$\ln k_{it} = c + \sum_{j=1}^{8} \alpha_j \ln x_{jt} + \alpha_0 \ln \hat{s}_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (26)$$

We employed the data from the Penn World Tables (2004), and we use the same rate of labor force growth similar to institutional variables, depreciation rate, and rate of technological progress. We focused on their effects through the chain unemployment–income–savings (as our main concerned in this research). It would be expected that the duration and employment protection to have a negative impact; active labor market policies to have a positive impact; and the tax wedge to have no impact. Table 4 presents the empirical results of the regression.

Table 4
ln (k) AS DEPENDENT VARIABLE

Variable	Coefficient	t-Statistic
ln (duration)	0.13***	1.41
ln (active policies)	0.16**	2.12
ln (tax wedge)	0.34*	2.87
ln (employment protection)	-0.21*	-3.97
ln (adjusted saving)	0.36**	2.38
Constant	4.34	3.12
Adjusted R^2		0.412
Included observations		54

Note: * Significant at p = 0.01; ** significant at p = 0.05; *** significant at p = 0.1.

As it turns out, active labor market policies have the expected positive effects; and employment protection shows the expected negative effect. However, both the tax wedge and unemployment benefit duration show positive effects toward unemployment, contrary to expectations. In the case of the tax wedge, a higher tax wedge may encourage substitution toward capital and away from labor. The effect of benefit duration is consistent with that on productivity in Table 2.

6. TESTING FOR CONVERGENCE EFFECTS

Our model predicts that the less flexible of labor market flexibility will slower the convergence rates. We use $\beta(1-\alpha)(n+g+\delta)/(\alpha+\beta)$ to gain the income per capita rate. By returning to the idea of institutional variables, we can test the implication of the model and also the convergence.

We perform a convergence (transitional dynamics) analysis to the ASEAN countries as developing countries, with changes due to significant changes in savings or population growth rates. Subsequently, take the stand those small deviations around the developing countries are enough to test for convergence.

Convergence rate is calculated using the following formula (Equation 14 in Mankiw et al., 1992) to obtain λ_i:

$$\ln(y_t^i / y_0^i) = (1 - e^{-\lambda_i t}) \ln(y^{*i} / y_0^i) \quad \ldots\ldots\ldots\ldots\ldots (27)$$

in which output per worker refers to the real GDP per worker (1995 International Prices) in the Penn World Tables (2004). The initial year is 1988 and the final year is 2000. The steady state value, y^{*i}, is calculated using the Investment Share of GDP percentage (1995 International Prices), and the same depreciation rate, rate of technological progress, and labor force growth rate as above. Capital intensity, α, is set equal to *1/3*. The steady-state value is calculated as follows:

$$y^{*i} = \left(\frac{\hat{s}_i}{\hat{s}_{JP}} \right)^{\alpha/(1-\alpha)} y_t^{JP} \quad \ldots\ldots\ldots\ldots\ldots (28)$$

where, again, $\hat{s}_i = s_i/(n+g+\delta)$. Investment shares and labor force growth rates refer to averages for the period. In this research we assumed that Japan is as the steady state, and therefore, we cannot calculate a convergence rate for this country. Equivalently, we calculate convergence rates using Japan's as a base .

Table 5 indicates that the convergence rates in ASEAN countries are higher than in OECD's countries. As explained in the introduction, negative correlation between initial level of income and subsequent growth rate in ASEAN countries 6-40 times higher than OECD countries.

Table 5
CONVERGENCE RATES (AS PERCENTAGE)

Indonesia	28.29	Myanmar	27.43
Malaysia	84.63	Lao	25.48
Singapore	62.93	Vietnam	47.34
Thailand	37.94	Cambodia	18.14
The Philippines	42.92		

According to Alonso et al. (2004), it is also expected that all institutional variables do not affect the curvature and the tax wedge have a small but positive impact, consistent with the effect of the tax wedge on

capital accumulation in Table 4. Table 6 depicts the results of the regression with the significant variables.

Table 6
CONVERGENCE RATE AS DEPENDENT VARIABLE

Variable	Coefficient	t-Statistic
Duration	-0.001135	-2.67809
Tax wedge	-0.020436	-2.043187
Employment protection	-0.058	-1.71014
Constant	0.0295	3.555744
Adjusted R^2		0.393
Observations		13

7. CONCLUSIONS

It can be concluded that previous models show that the labor market flexibility influenced positively income and capital per worker. In addition, the rate of population growth and technological progress are positively related with the unemployment rate in developing countries. On the contrary, saving rate and the labor market flexibility have negative influence on it. Finally, the higher flexible market in the developing countries tends to make convergence rates higher compare to convergence rates in steady states.

In fact, lower saving rate, higher growth of the labor force, or faster technological progress result in higher unemployment as shown by the results of a pooled-OLS regression. The prediction output per worker in development states is affected most by the labor market institutional variables. Finally, we construct convergence rates and regress them against the same labor market institutional variables.

We consistently found that the level of equilibrium employment in the labor market differs from the desirable frictional level. Moreover, it will have an impact on long-run growth and above variables affect convergence toward the ASEAN countries.

At present, data limitations preclude including such factors, particularly in developing countries that the availability of the data is critical when we analyzed. Hopefully, our work and results can be used as a starting point for an examination of these other factors. Debate over which measures

to include, how to quantify them will no doubt result in a more complete understanding of the complex interactions between labor market institutions and economic performance.

NOTE

1. ASEAN comprises Cambodia, Indonesia, Lao, Malaysia, Myanmar, Singapore, the Philippines, Thailand and Vietnam.

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