"PHILLIPS CURVE" IN SELECTED ASEAN COUNTRIES: NEW EVIDENCE FROM PANEL DATA ANALYSIS

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ABSTRACT

This paper uses panel data analysis to analyse the relationship between the unemployment rate and the inflation rate in five ASEAN countries (i.e. Malaysia, Singapore, Indonesia, Thailand and the Philippines). Since the trade-off relationship between employment and wage-inflation rate in the United Kingdom was pointed out by William Phillips in 1958, this hypothesis of the "Phillips Curve" remains an important foundation for macroeconomics. The main findings from the panel data analysis are that there is no trade-off relationship between the unemployment rate and the inflation rate in these ASEAN countries.

Key Words: unemployment, inflation, ASEAN, panel data analysis

INTRODUCTION

Since 1958 when, a New Zealand-born economist, William Phillips, pointed out a trade-off relationship between unemployment and inflation, many researchers have conducted research on this topic. The inverse relationship between unemployment and inflation is commonly known as the "Phillips curve". Although there are various criticisms of the basic tenets in this hypothesis, the "Phillips curve" has become one of the most important foundations for macroeconomics. As Hart (2003:108) put it, "The Phillips curve still plays a prominent role in macroeconomic theory and associated empirical work".

The basic mechanism behind the "Phillips curve" can be relatively easily understood by the interaction between labour demand and supply. If the labour demand is greater than the labour supply, the excess demand puts upward pressure on the wage rate and may cause high inflation in the country. In this situation, it is easier for workers to find employment. The unemployment rate should be low. By contrast, if the labour supply is greater than labour demand, the excess supply will lower wage rates and lower inflation in the country. In this situation, it is very difficult for workers to find employment. The unemployment rate should be high.

In other words, if there is an economic boom in the country, many companies would have tried to increase their production by employing more workers. In such an economic upturn, there could be co-existence of low unemployment and high inflation. If there is an economic recession, many companies try to decrease their production by laying off workers. In such an economic downturn, there could be co-existence of high unemployment and low inflation.

The "Phillips curve" not only has strong theoretical foundations, but also important political implications. There is little doubt that one of the main policy targets of central banks is price stabilisation by controlling inflation. Many central banks tend to use their monetary policies to keep inflation targets as low as possible. However, if there is an inverse relationship between inflation and unemployment, the central banks could maintain low inflation rates only at the expense of high unemployment. In other words, if there is a trade-off between unemployment and inflation, the central bankers would face a serious dilemma to choose whether they like to have a combination of low-inflation and high-unemployment or *vice versa*. In this context, the "Phillips curve" became an important criterion for decision-makers in the central banks until the 1980s when the hypothesis was strongly criticised by some economists of a different school of thought.

Islam *et al.* (2003:107) argue "In the 1960s and 1970s, the Phillips curve was used as an important macroeconomic policy tool in the developed countries as well as less developed countries. It acted as a reminder for the macroeconomic policy formulators and the governments on how far they were able to push down the inflation rate or unemployment rate without unduly risking the other because of the trade-off relationship between these two key macroeconomic variables".

On the other hand, the problem of a high unemployment rate seems to become one of the important political issues in many countries including ASEAN countries. Political leaders in ASEAN countries may be concerned about high unemployment rates in their countries. They could oppose central bank's initiatives to stabilise price levels, if these monetary policies have a negative impact on the unemployment rate. In other words, central bankers and political leaders could have different opinions about the consequence of price stabilisation policies.

Against such a background, this paper chooses five ASEAN countries (i.e. Malaysia, Indonesia, Thailand, the Philippines and Singapore) as a case study to analyse the relationship between the unemployment rate and inflation rate. It uses panel data analysis to analyse the "Phillips curve" hypothesis in these countries. Although many researchers tested the hypothesis in the individual countries' macroeconomic contexts, there is a lack of panel data analysis to examine the hypothesis. The main research question is, "Is there a trade-off relationship between unemployment and inflation in these ASEAN countries?"

This paper consists of five parts. Following this introduction, the second part briefly reviews previous research on the "Phillips curve". The next part discusses the methodology used to analyse the relationship between unemployment and inflation. The fourth part describes the research findings from the panel data analysis. The final part is the concluding remarks.

LITERATURE REVIEW

The year 1958 became a milestone in the history of economic thought because William Phillips published his seminal and controversial paper entitled "The Relationship between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom 1861-1957" in the London School of Economics' journal, *Economica* (Phillips, 1958). According to him, there is a strong negative relationship between unemployment and inflation in the country during the period. Since then, many researchers have conducted various studies in order to confirm or to refute his findings. Later, this trade-off relationship became known as the "Phillips curve" hypothesis.

Two prominent American economists, Paul Samuelson and Robert Solow openly supported the hypothesis. Samuelson and Solow (1960) examine the relationship between these two macroeconomic variables in the case of the United States. They conclude that there is an inverse relationship between unemployment and inflation in the country. Solow (1970) and Gordon (1971) further confirmed the existence of a negative trade-off relationship between unemployment and inflation in U.S. macroeconomic data of both pre-1970s and post-1970s. These findings are known as the "Solow-Gordon affirmation" of the "Phillips curve" hypothesis.

Although the "Phillips curve" has strong theoretical foundation and some empirical support, some economists have strongly criticized the hypothesis since the 1960s. In other, there was serious debate over the existence of the "Phillips curve". Islam *et al.* (2003: 107) argue that "Since its inception, the Phillips curve hypothesis has been open to debate".
Two economists who criticise the hypothesis and point out that there is no trade-off relationship between unemployment and inflation are Friedman (1968) and Phelps (1967). They argue that there could be a negative relationship between unemployment and inflation in the short-run. However, there would be no trade-off relationship between them in the long-run.

According to them, policy makers may be concerned about a short-run consequence of price stabilisation policy because the policy could have negative impacts on the unemployment rate. On the other hand, the unemployment rate would stabilise around the equilibrium level of unemployment in the long-run. In this case, policy makers could conduct their monetary policy without taking into consideration negative impacts on unemployment rates. Cashell (2004) agues that in the long run unemployment rates would move towards equilibrium level which is dubbed as the natural rate of unemployment or "non-accelerating inflation rate of unemployment (NAIRU).

Furthermore, Lucas (1976) strongly criticised the existence of the "Phillips curve". He argues that there could be a trade-off relationship between unemployment and inflation if workers do not expect that policy makers will try to create an artificial situation of high-inflation with low-unemployment. Otherwise, workers would foresee the high inflation in the future and would ask their employers to increase their wages. In this case, there could be co-existence of unemployment and a high inflation rate. This criticism is known as the "Lucas critique".

After the Lucas's harsh criticism in the 1970s, many economists lost interest in conducting research on the topic. As Debelle and Vickery (1998:384) put it, "The Phillips curve fell into a period of neglect in academic circles during the 1980s, while remaining an important tool for policy makers". However, there has been a revival of interest in the

"Phillips curve" in the 1990s. Debelle and Vickery (1998:384) point out "More recently, the Phillips curve has again been the subject of intensive debate (for example, the symposium in the *Journal of Economic Perspectives)"*

Against such a backdrop, King and Watson (1994) test the "Phillips curve" hypothesis using U.S. post-war macroeconomic data. Their findings provide empirical support of the existence of a trade-off relation between unemployment and inflation in the country. They argue that there could be an inverse relationship between unemployment and inflation if long-run and short-run noises were removed from the data.

Hogan (1998) examines the "Phillips curve" using the U.S. macroeconomic data from 1960 to 1993. Hogan also shows that there is a significant and negative relationship between unemployment and inflation although the traditional "Phillips curve" seems to over-predict the rate of inflation.

Moreover, a recent methodological innovation to examine the "Phillips curve" hypothesis is that some researchers make use of panel data analysis to analyse the "common" Phillips curve over different countries. For example, John DiNardo and Mark Moore (1999) use panel data analysis to examine 9 OECD (Organisation for Economic Co-operation and Development) countries. They use the method of Ordinary Least Squares (OLS) and Generalised Least Squares (GLS) and point out an existence of a "common" Phillips curve in these OECD countries. DiNardo and Moore conclude, "In sum, we believe that our results show a remarkable robust relationship between relative inflation and relative unemployment". Turner and Seghezza (1999) also employ the panel data method to examine the "Phillips curve" in 21 OECD countries over the period from the early 1970s to 1997. They use the method of Seemingly Unrelated Estimation (SURE) rather than OLS in order to analyze the pooled data. They conclude that the overall result provides "strong support" for the "common" Phillips curve among 21 member countries of the OECD.

The framework for analysis for the Phillips curve is mainly estimated under the assumption of closed economy. However, Batini *et al.* (2005) derived an open economy Phillips curve from theoretical principles. They show that the consistent estimation of parameters requires that the model is augmented by variables in the open economy.

More recently, Tang and Lean (2007) used time series data for the period of 1971-2004 to test the stability of the Phillips curve in Malaysia. They found that there is a stable trade-off relationship between inflation rates and unemployment rates in the country in the short-run and long-run. Linked to this is the work of Furuoka (2007)who estimated a trade-off relationship between inflation and unemployment in Malaysia for the period 1973-2004. The empirical findings indicate, as Tang and Lean (2007) show, there is a long-run relationship between the two variables, as well as causal relationship between them.

Despite the fact that the previous research used time-series data analysis to examine the existence of the Phillips curve in the region. This paper hopes to contribute to the existing literature by using panel data regression in ASEAN countries. In other words, this paper aims to contribute methodologically to the literature.

RESEARCH METHODOLOGY

There is a lack of systematic panel econometric analysis to explain the relationship between unemployment and inflation rates in the Asian context, so this paper uses panel data analysis

to test a "common" Phillips curve in. Malaysia, Singapore, Indonesia, Thailand, and the Philippines during 1982-2004. The annual data for unemployment rate and inflation rates for these countries are obtained from the Asian Development Bank (2005). In this paper, inflation rate is benchmarked to the annual rate of increases in the consumer price index in Malaysia.

In this paper, the following three separate methods are used: 1) pooled Ordinary Least Squares (OLS), 2) one-way fixed effects, and 3) two-way fixed effects. The fixed-effects approach is better suited for the case where there exist unobservable country-effects and unobservable time-effects.

First of all, in order to test the trade-off relationship between unemployment rate and inflation rate without taking into account country- and time-effects, a pooled OLS regression model which also incorporates the lagged values of inflation rate could be expressed as:

$$IFR_{it} = \alpha + \beta_1 UER_{it} + \beta_2 IFR_{it-1} + \varepsilon_{it}, \qquad (1)$$

where IFR_{it} is inflation rate in the country i in the year t, UER_{it} is unemployment rate in the country i in the year t, IFR_{it-1} is one-year lagged values of inflation rate in the country i, α is the intercept, β_1, β_2 are slope parameters and ε_{it} is the error term. To incorporate country-effects, a one-way fixed effects model could take a form:

$$IFR_{it} = \alpha_i + \beta_1 UER_{it} + \beta_2 IFR_{it-1} + \varepsilon_{it}, \qquad (2)$$

where α_i is country-effects. Finally, to incorporate both country- and time-effects, two-way fixed effects model could take the form:

$$IFR_{it} = \alpha_0 + \alpha_i + \theta_t + \beta_1 UER_{it} + \beta_2 IFR_{it-1} + \varepsilon_{it}, \qquad (3)$$

where α_0 is the intercept, θ_t is time-effects.

If country-effects there would exist in the regression model, the pooled OLS, or equation (1), does not effectively estimate the linkage between the independent variables and dependent variable. Similarly, if there exist time-effects, the one-way fixed-effects model, or equation (2), does not effectively estimate the regression model. Thus, there is a need to analyse the significance of country-effects and time-effects. The F-test could be used for this purpose (Greene, 2003, p.289).

Secondly, the Hausman specification test is employed to determine whether the needs reference fixed-effects approach is better suited for the analysis than random-effects approach. The random effect-model could be written as

$$IFR_{it} = \alpha + u_i + \beta_1 UER_{it} + \beta_2 IFR_{it-1} + \varepsilon_{it}, \qquad (4)$$

where u_i is group specific random element.

Next, this paper uses a panel cointegration method to examine the long-run relationship between unemployment rate and inflation rate in the selected ASEAN

countries. According to Bahmani-Oskooee and Miteza (2004), "Panel cointegation tests are no more than an application of the Engle and Granger (1987) cointegation test to panel data. They suggest that "the first step is to investigate the integrating property or stationarity of each variable". Thus, this paper uses three different panel unit roots tests (i.e. Levin-Lin-Chu (LLC) test, Im-Pesaran-Shin (IPS) test and Maddala-Wu (MW) test).

Panel unit root tests could be considered as an extension of the univariate unit root test. The LLC test is based on the pooled panel data as follows (Levin and Lin, 1992);

$$\Delta y_{it} = \rho y_{i,t-1} + \alpha_0 + \sigma t + \alpha_i + \theta_t + \varepsilon_{it} \qquad (5)$$

where ρ, α_0 ,σ are coefficients, α_i is individual-specific effect, θ_t is time-specific effect. According to Levin and Lin (1993), the LLC test could be conducted by the following steps. In step1, subtract the cross-section average from data;

$$\bar{y} = 1/N \sum_{i=1}^{N} y_{it} \qquad (6)$$

In step 2, apply an ADF test to each individual series and normalise the disturbance. The ADF model could be expressed as;

$$\Delta y_{it} = \rho_i y_{i\,t-1} + \sum_{j=1}^{p_i} \delta_{ij} \Delta y_{i,t-j} + \alpha_i + \varepsilon_{it} \qquad (7)$$

Maddala and Wu (1999) argue that this is equivalent to performing two auxiliary regressions of Δy_{it} and $y_{i,t-1}$ on the remaining variable in equation (7). Let the residuals from these two regression be $\hat{e}_{i,t}$ and $\hat{V}_{i,t-1}$ respectively. Then, regress $\hat{e}_{i,t}$ on $\hat{V}_{i,t-1}$

$$\hat{e}_{i,t} = \rho_i \hat{V}_{i,t-1} + \varepsilon_{it} \qquad (8)$$

Levin and Lin (1993) suggest the following normalization to control the heteroscedasticity in error.

$$\hat{\sigma}^2{}_{e_i} = \frac{1}{T - P_i - 1} \sum_{t=p+2} (\hat{e}_{i,t} - \hat{\rho}_i \hat{V}_{i,t-1})^2$$

$$\tilde{e}_{i,t} = \frac{\hat{e}_{i,t}}{\hat{\sigma}_{e_i}}$$

$$\tilde{v}_{i,t-1} = \frac{\hat{v}_{i,t-1}}{\hat{\sigma}_{e_i}}$$

In the next step, the LLC test statistic could be obtained from the following regression;

$$\tilde{e}_{i,t} = \rho\tilde{v}_{i,t-1} + \tilde{\varepsilon}_{i,t}$$

The t-statistic for testing $\delta = 0$ is given by

$$t_\delta = \frac{\hat{\delta}}{STD(\hat{\delta})}$$

where

$$\hat{\delta} = \frac{\sum_{i=1}^{N} \sum_{t=2+p}^{T} \tilde{v}_{it-1} \hat{e}_{it}}{\sum_{i=1}^{N} \sum_{t=2+p} \hat{v}^2_{it-1}}$$

Next, the paper also employs the IPS test which is based on the mean value of individual ADF statistics or *t*-bar (Im, Pesaran and Shin, 2003). There are two steps to estimate the IPS test statistic. In the first step, obtain the individual ADF statistics. According to Maddala and Wu (1999), a sample of *N* cross-section over period *T* and y_{it} is generated by the first-order autoregressive process;

$$y_{it} = (1-\varphi_i)\mu_i + \varphi_i y_{it-1} + \varepsilon_{it} \qquad i = 1.....N,\ t = 1.....T \qquad (9)$$

The null hypothesis of unit could be written as $\varphi_i = 1$ for all *i*. The equation could be expressed as;

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \varepsilon_{it}$$

where $\alpha_i = (1-\varphi_i)\mu_i$ and $\beta_i = -(1-\varphi)$. The null hypothesis of unit root became

$H_0 : \beta_i = 0$ for all *i*,

Against the alternative

$H_1 : \beta_i < 0$ for i = 1,2, ….N_1, $\beta_i = 0$ for i = N_1+1, N_1+2, ….N,

In the second step, obtain *t*-bar or mean values of individual ADF statistics.

$$t\text{-bar}_{NT} = \frac{1}{N}\sum_{i=1}^{N} t_{iT_i}$$

The corresponding standardised *t*-bar statistic is given by;

$$Z_{\text{tbar}} = \frac{\sqrt{N}\left\{tbar - N^{-1}E(t_{T_i})\right\}}{\sqrt{N^{-1}\sum_{i=1}^{N} Var(t_{T_i})}}$$

where $E(t_T)$ is the mean of t_T and $Var(t_T)$ is the variance of t_T. Im *et. al*. DATE provide Monte Carlo estimate of $E(t_T)$ and $Var(t_T)$. Finally, this paper also employs the MW test which is based on the combined significance levels (p-values) from the individual unit root tests. According to Maddala and Wu (1999), if the test statistics are continuous, the significance level π_i (i =1,2, …….N) are independent and uniformly (0,1) variable, the ($-2\Sigma \log \pi_i$) has a χ^2 distribution with two degree of freedom). They use combined p-values, or λ which is expressed as:

$$\lambda = -2\sum_{i=1}^{N} \log \pi_i \qquad (10)$$

λ has a χ^2 distribution with 2N degree of freedom.

Finally, this paper employs Pedroni's (1999, 2004) panel-co integration method in order to examine the long-run relationship between unemployment and inflation. If the independent and dependent variables are co-integrated or have a long-run relationship, the residual e_{it} will be integrated of order zero, denoted I(0). Pedroni uses two types of panel co-integration tests. The first is the "panel statistic" that is equivalent to a unit root statistic against the homogenous alternative; the second is the "group mean statistic" that is analogous to the panel unit root test against the heterogeneous alternative.

Pedroni (2004) argues that the "panel statistic" can be constructed by taking the ratio of the sum of the numerators and the sum of the denominators of the analogous conventional time series statistics. The "group mean statistic" can be constructed by first computing the ratio corresponding to the conventional time series statistics, and then computing the standardized sum of the entire ratio over the *N* dimension of the panel.

This paper uses two panel co-integration tests as suggested by Pedroni (1999, 2004), namely the "panel ADF statistic" and "group mean ADF statistic". The two versions of the ADF statistics could be defined as:

Panel $$Z_t = (\tilde{s}^{2}{}_{NT}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{e}^{2}{}_{i.t-1})^{-1/2}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{e}_{i,t-1}\Delta\hat{e}_{i,t} \qquad (11)$$

Group Mean $$N^{-1/2}Z_t = N^{-1/2}\sum_{i=1}^{N}(\sum_{t=1}^{T}\hat{s}_i\hat{e}^{2}{}_{i,t-1})^{-1/2}\sum_{t=1}^{T}\hat{e}_{i,t-1}\Delta\hat{e}_{i,t} \qquad (12)$$

where $\hat{e}_{i,t}$ represents the residuals from the ADF estimation, $\tilde{s}_{NT}$ is the contemporaneous panel variance estimator, and $\hat{s}_i$ is the standard contemporaneous variance of the residuals from the ADF regression.[2] The asymptotic distribution of panel and group mean statistics can be expressed in:

$$\frac{\kappa_{N,T} - \mu\sqrt{N}}{\sqrt{\nu}} \Rightarrow N(0,1)$$

where $\kappa_{N,T}$ is the appropriately standardised form for each of statistics, μ is the mean adjustment term and ν is the variance adjustment term. Pedroni provides Monte Carlo estimates of μ and ν (Pedroni, 1999).

It should be noted that pooled panel data regression is valid under the assumption that the slope coefficients are homogenous across the countries. If homogenous coefficients are falsely imposed, the pooled estimator is biased. However, pooled data regression is more efficient and it has no small sample bias as would be the case if the model is estimated for each country separately (Bjornstad and Nymoen, 2008).

In other words, due to a lack of sufficient observations in the time-series data, this paper's main motivation for considering pooled panel data is to estimate the "common" Phillips curve in the region, rather than "individual" Phillips curves.

EMPIRICAL FINDINGS

The findings of the fixed-effects model are reported in Table 1. Without taking into account the fixed effect, the coefficient of determination (R^2) is 0.345. Incorporating for country-effects causes R^2 to increase slightly to 0.346. Conditioning on both country- and time-effects leads to a further improvement of R^2 to 0.863.

To compare the pooled OLS model and one-way fixed effects model with the two-way fixed effects model, the null hypothesis that time-effects equals zero is rejected at the 0.01 level of significance. This result seems to indicate that only the two-way fixed effect analysis is better than the one-way fixed effect model and pooled OLS model. In other words, the inflation rate in the five ASEAN countries is apparently influenced by country- and time-effects.

Furthermore, comparing the two-way fixed effects model with the two-way random effects model, the Hausman test indicates that the fixed-effects model is a better choice for the analysis. These findings indicate that the two-way fixed effects model is the best model to examine the relationship between inflation rate and unemployment rates in these ASEAN countries.

As the two-way fixed effects model shows, unemployment is strongly influenced by both country-specific effects (i.e. the countries' specific socio-economic backgrounds) and time-specific effects (i.e. fluctuations of socio-economic conditions over the period). On the

[2] This paper uses the un-weighted versions of statistics. Pedroni (2004) maintained that in Monte Carlo simulation un-weighted statistics tended to outperform the weighted statistics.

other hand, empirical findings also show that there is no independent variable with a significant relationship with the dependent variable. This fact seems to indicate that the there is no trade-off relationships between the unemployment rate and the inflation rate in these ASEAN countries. In other words, according to the findings of the two-way fixed effects model, there is no "common" Phillips curve in the region.

Table 1. Panel Data Analysis (Pooled OLS, One-Way Fixed Effects and Two-Way Fixed Effects): Dependent Variable: IFR_{it}

	Pooled OLS	**One-Way Fixed Effects**	**Two-Way Fixed Effects**
UER_{it}	-0.009 (-0.051)	-0.027 (-0.146)	-0.041 (-0.385)
IFR_{it-1}	0.444 (7.678)**	0.442 (7.507)**	-0.031 (0.748)
R^2	0.345	0.346	0.863
Adjusted R^2	0.333	0.310	0.816
Lagrange Multiplier Test (One-way) (Pooled OLS vs. Random-effects)			2.35
Lagrange Multiplier Test (Two-way) (Pooled OLS vs. Random-effects)			107.66**
Hausman Specification Test (One-way) (Random-effects vs. Fixed-effects)			0.24
Hausman Specification Test (Two-way) (Random-effects vs. Fixed-effects)			8.44*
F Test for Model Specification (Pooled OLS vs. One-Way Fixed Effects)			0.064
F Test for Model Specification (Pooled OLS vs. Two-Way Fixed Effects)			12.09**
F Test for Model Specification (One-Way Fixed Effects vs. Two-Way Fixed Effects)			14.79**

Numbers in parentheses are t-statistics
* indicates significance at the 0.05 level
** indicates significance at the 0.01 level

Table 2: Panel Unit Root Test

Panel Unit Root Tests				
	Levels		**First Differences**	
	Individual effects	**Individual effects and linear trends**	**Individual effects**	**Individual effects and linear trends**
LLC test				
UER	-1.414	-1.891*	-7.700**	-6.070**
IFR	-3.957**	-1.241	-5.593**	-0.169
IPS test				
UER	-0.448	-1.276	-6.980**	-5.711**
IFR	-3.061**	-2.104*	-8.243**	-5.367**
MW test				
UER	13.301	14.112	61.369**	46.864**
IFR	25.929**	19.207*	70.929**	43.428**

* indicates significance at the 0.05 level
** indicates significance at the 0.01 level

The results of the panel unit root tests are presented in Table 2. Before conducting the test for panel co-integration, there is a need to ensure that both variables are integrated of order one, or I(1).

Despite minor differences, the LLC test, IPS test and MW test for unemployment rate could not reject the null hypothesis of unit root at levels, with or without linear trends included. However, these unit root tests could reject the null hypothesis of unit root in first differences, with or without trend included.

On the other hand, despite minor differences, the LLC test, IPS test and MW test for the inflation rates could reject the null hypothesis of unit root at levels, with or without trend included. Also, these panel unit root tests could reject the null hypothesis of unit root in first differences, with or without trend included.

These results seem to indicate that there is strong evidence of a stationary process for the inflation rate at the levels. On the other hand, the unemployment rate could be stationary at first differences. This means that the inflation rate could be considered as integrated of order zero, I(0). The unemployment rate could be considered as integrated of order one, I(1). In other words, these variables do not seem to have the integrating property for panel cointegration analysis. Thus, this paper could not apply panel cointegration methods to examine the long-run relationship between the unemployment rate and the inflation rate.

In short, the two-way fixed effects model shows that no independent variable has a significant relationship with the dependent variable. This implies that there could be no trade-off relationship between the inflation rate and the unemployment rate in these ASEAN

countries. The main research findings are that there is no "common" Phillips curve in the region.

A reason why there is no common Phillips curve in the region is that ASEAN economies are open economies. In these open economies, supplies shocks and changing inflation expectations can be responsible for the failure of the Phillips curve. Additionally, previous research found a trade-off relationship between inflation and unemployment in a country (Tang and Lean, 2007, Furuoka, 2007). On the other hand, the findings of this paper indicated that there is no "common" Phillips curve in the ASEAN countries.

The differences in the findings can be explained by methodological discrepancy. The previous studies used the time-series data regression analysis. This paper uses panel data regression analysis. The main contribution of this paper is to add some values to the existing literature in the use of panel data analysis. In other words, this paper aims to contribute methodologically to the literature.

CONCLUDING REMARKS

This paper uses three different panel data methods to examine the relationship between the unemployment rate and inflation rate or to test the validity of the "Phillips Curve" in five ASEAN countries (i.e. Malaysia, Singapore, Indonesia, Thailand and the Philippines). Specification tests indicate that the two-way fixed model could be considered as the best model to examine the relationship between them.

The two-way fixed model shows that there is no significant relationship between inflation rates and unemployment rates in the five ASEAN countries. In other words, there is no trade-off relationship between the unemployment rate and the inflation rate in these countries. In short, empirical findings did not support the existence of a Phillips curve in the region. Furthermore, since the panel unit root tests show that inflation rate could be considered as integrated of order zero and unemployment rate could be considered as integrated of order one, the paper could not use the panel cointegration methods to examine the long-run relationship between unemployment.

One of main reasons why there is no common Phillips curve in ASEAN is heterogeneity among ASEAN countries. On the one hand, Singapore is a small but very wealthy country. On the other hand, Indonesia is a large country with relatively lower income. The discrepancy in economic conditions among ASEAN countries seems to prevent the establishment of a significant relationship between inflation rates and unemployment rates in ASEAN.

The empirical findings of this study encourage a closer look at other elements which might influence the unemployment rate in these ASEAN countries. Other socio-economic aspects of these countries, for example, economic fluctuations, labour costs, might influence the unemployment rate in these countries. Future research may incorporate other variables, such as output gaps, to examine the "common" Phillips curve in the region.

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