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Effect of Wage-Productivity Gap on Unemployment: Evidence from Emerging Economies

(*Kesan Jurang Upah-Produktiviti terhadap Pengangguran: Bukti dari Ekonomi Pesat Membangun*)

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ABSTRACT

The objectives of this study are to constructs the wage-productivity gap and its threshold effect on unemployment in emerging economies. The analysis involved the cross-section threshold regression method among 47 emerging economies from 2016 to 2018, where the Total Factor Productivity (TFP)/productivity is derived using the DEA Malmquist Productivity Index to generate the wage-productivity gap. The results demonstrate that as the wage-productivity gap widens and exceeds the negative threshold level with stronger productivity growth compared to wage growth, the unemployment rate rises. These results show that to keep the unemployment rate at the most manageable level, emerging economies must reduce the wage-productivity gap within the ideal range or threshold level. This gap is a significant indicator that impacts the unemployment rate and, consequently, contributes to enhancing workers' productivity, income, and living standards.

Keywords: Wage; productivity; gap; unemployment; emerging economies; cross sectional threshold

ABSTRAK

Kajian ini membina indeks jurang upah-produktiviti yang akan digunakan untuk menyiasat kesan ambangnya terhadap pengangguran dalam ekonomi sedang pesat membangun. Analisis melibatkan kaedah regresi ambang keratan rentas di kalangan 47 ekonomi sedang pesat membangun dari 2016 hingga 2018, di mana jumlah produktiviti faktor (TFP)/produktiviti diperoleh menggunakan Indeks Produktiviti DEA Malmquist untuk menjana jurang upah-produktiviti. Dapatan kajian menunjukkan bahawa apabila jurang upah-produktiviti melebar dan melebihi paras ambang yang bernilai negatif dengan pertumbuhan produktiviti yang lebih kukuh berbanding pertumbuhan gaji, kadar pengangguran meningkat. Keputusan ini menunjukkan bahawa untuk mengekalkan kadar pengangguran pada tahap yang paling boleh diurus, ekonomi sedang pesat membangun mesti mengurangkan jurang upah-produktiviti dalam julat atau tahap ambang yang ideal. Jurang ini merupakan penunjuk penting yang mempengaruhi kadar pengangguran dan seterusnya menyumbang kepada peningkatan produktiviti pekerja, pendapatan, dan taraf hidup.

Kata kunci: Upah; produktiviti, jurang; ekonomi pesat membangun; kaedah regresi ambang keratan rentas

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INTRODUCTION

The relationship between wages and productivity has garnered significant scholarly attention due to its implications for the standard of living among employed populations and its reflection of how workers are rewarded for their productive efforts in the workplace (Feldstein 2008; Fleck et al. 2011). Equal growth of wages and productivity indicates how strong an economy is, and its sustainability and competitiveness in the

long run. However, when wages are not increasing as quickly as productivity and workers are not paid fairly for the work they produce, this results in macroeconomic and labour market disturbances like inflation, income inequality, poverty, and migration (Dosi et al. 2020; Van Biesebroeck 2015; Yildirim 2015). Parallel growth of real wage and productivity is important as it dictates the equilibrium in labour supply and the macroeconomic stability in the long run. As labour market differs between countries due to economic disparities, including levels of development and industrial structures, the supply of labour is much influenced by the interaction between institutional and policy-related wage-setting and price-setting curves, where any changes will affect the distribution of wages and productivity.

The increasing gap between wage growth and productivity growth leads to a diverging trend between the two variables that varies between countries, whether among advanced countries or emerging countries (Compagnucci et. al 2021; Škare & Škare 2017; Brynjolfsson & McAfee 2013; ILO 2014; ADB 2014). A greater and more favourable gap between wages and productivity suggests that wages have grown more rapidly than productivity, which benefits workers because they will receive higher pay from the company. This will encourage the employee to work more and deliver higher-quality results, which will reflect the worker's efficiency wage.

On the contrary, a negative and smaller value of the wage-productivity gap shows that productivity is growing faster than wage, indicating a lower wage received by employees albeit their productivity level. There will be two outcomes. Workers may stop working because of the decreased wages, which raises the unemployment rate. Or firms might recruit more people at a reduced cost of labour, which would increase the demand for labour and reduce unemployment.

The earlier studies by Habanabakize & Meyer 2019; Basile & Benedictis 2008; Lo´pez-Villavicencio & Silva 2011; Škare & Škare 2017; Bande et al. 2007; Karanassou & Sala (2014) focused on the connection between wages and productivity, and unemployment. While their analyses can demonstrate that the relationship between real wages and productivity was found to significantly affect the unemployment rate, however, its impact when wage and productivity do not increase at the same rate is not measured. Therefore, the objectives of this study are twofold. The first objective is to build an index of the wage-productivity gap in emerging economies. Second, the study investigates how much the wage-productivity gap threshold affects unemployment in different economies.

The study can potentially make several contributions to the extant literature on the labour market. The first is towards labour market policy in emerging economies. The threshold level for the wage-productivity gap on unemployment, identified in the study, is a significant indicator of crucial importance that may serve as a benchmark for policymakers on the most appropriate level to which wages should be raised relative to productivity without affecting the unemployment rate in emerging economies. Since the wage- productivity gap will vary according to the country's level of development, the magnitude and direction of the gap will influence the unemployment rate as outlined in the marginal productivity theory and efficiency wage theory. However, its probable impact on unemployment will only takes place after a certain threshold level. As previous scholars studied the causality between the wage-productivity gap and unemployment (Habanabakize & Meyer 2019; Lo´pez-Villavicencio & Silva 2011; Škare & Škare 2017), the cross-section threshold regression will be able to divide the emerging and developing economies into two groups, namely those that are above and those that are below the wage-productivity gap threshold. This should provide greater insights to policymakers and hence guide them in identifying the contributing factors of wages and productivity and their effects on unemployment.

The second contribution will be to the methodology adopted in this research. The wage-productivity gap was derived from the ratio between wage growth and productivity growth. This approach varies from Erumban and de Vries (2016), Bivens and Mishel (2015), and Karanassou and Sala (2014) who defined the gap as the difference between wage and productivity as a proxy to productivity, TFP measurement takes into account all factors involved in the production process that are more representative of the whole economy as compared to standard labour productivity. This study follows Wolszczak (2018) to derive the TFP index by using Malmquist Productivity Index (MPI). This method enables us to determine the sources of productivity change which are decomposed into the catch-up and technical change factors. This approach allows further deliberations on the long-term efficiency and changes of the emerging economies on the frontier of production.

The rest of the paper is organized as follows. The second section presents background of study, and section 3 presents a brief literature review on the link between the wage-productivity gap and unemployment and the control variables involved. Section 4 describes the data and the methodology. Section 4 discusses the findings of the study. Section 5 concludes the paper.

BACKGROUND OF THE STUDY

In emerging economies, the unique characteristics of the economy and labour market have a profound impact on real wages, productivity, employment levels, and the skills of workers (Coşkun 2019). These nations have the challenge of increasing economic efficiency and growth while bolstering social protection for workers as they

attempt to overcome the gap in living standards with the advanced economies (Johnson & Papageorgiou 2020). Rising productivity, as the engine of economic growth, is a critical development stage, particularly for emerging nations.

The labour market in emerging economies is commonly challenged by informality issues which are associated with lower productivity among workers. The workers normally have no access to social security systems, job security, collective bargaining, compliance with labour standards, and work rights. With high informal sector employment in most emerging economies, reaching up to 81% of the labour market, as compared to 13% for developed countries, was attributed to low job creation in the formal sector (International Labour Organisation 2019). Since there are more workers employed in the informal sectors, their productivity is negatively impacted because they are frequently underpaid and have limited access to social protection and technology (World Bank 2015).

In the last 20 years, the rapid economic development in emerging economies had contributed to the threefold growth of real wages as compared to developed countries. However, the average real wage remains low and inadequate to cover the increasing cost of living, which eventually contributes to working poverty particularly among low income households (International Labour Organisation 2022). Since the global financial crisis in 2007-2008, the real wage growth had steadily increased until 2017 when it dipped to its lowest since 2008 with only 3.3% growth in contrast to the 4.2% in 2016 (International Labour Organisation 2019). Since the downward trend of wage growth is evident worldwide, the steeper decline of wages in low and middle- income countries is more prominent, indicating that a lesser portion of wealth is distributed to labour in these countries (International Labour Organisation 2018). As a result, it affects the income of majority wage and salaried workers. Figure 1 shows real wage growth in low and middle income countries from 2000 to 2017.

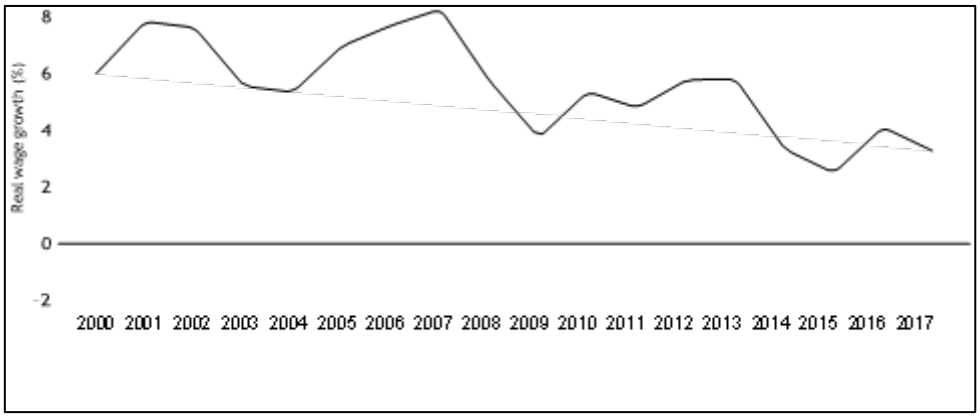

FIGURE 1. Real wage growth in low and middle income countries 2000-2017.
Source: ILO WESO 2019

Figure 2 show productivity growth in emerging economies from 1981 to 2018. The majority of the emerging economies showed slower productivity growth in 2018 at a 3.8% growth rate (Dieppe 2021). The World Bank (2020) attributed this to the slowdown in key productivity indicators, namely education, urbanization, and institutions. Workers in emerging economies produce only less than one-fifth of the production in advanced economies. On a larger scale, the slowdown in productivity growth is also reflected in the reduction in investment and TFP growth under equivalent measures. Aggregate TFP growth for emerging economies had slowed to 1.9% for the 2013-2017 period in contrast to 2.5% growth in the previous decade (World Bank 2018). This trend may be due to the declining physical and human capital quality and intensity, slow efficiency gains, slow technological adoption, and less productive production (Dieppe 2021, I) and will reduce workers' chances to earn higher wages and improve the standard of living (International Labour Organisation 2023).

FIGURE 2. Productivity growth in emerging economies.
Source: World Bank 2020

LITERATURE REVIEW

WAGE-PRODUCTIVITY GAP

The relation between wages and productivity has been underlying the basic supply side of the labour market. As productivity acts as an indicator of standard of living, wages reflect the purchasing power of workers. These two indicators work in hand to assess the benefit received by workers from economic growth (Fleck et. al 2011). Productivity increases with constant wages will lead to higher labour demand and an increase in profit. Consequently, greater labour demand will result in rising wages. The process continues until the point where wages are equal to the marginal productivity of labour (Meager 2011).

There are two basic theories that explain the relationship between wages and productivity: the theory of marginal productivity of labour and the efficiency wage theory. The efficiency wage theory reflects an inverse relationship where wages are expected to drive the productivity of the workers (Akerlof et al.1986). Wages have an impact on worker productivity because greater compensation will motivate workers to work harder and produce more. The marginal productivity of labour theory on the other hand shows that firms will continue to hire a worker as long as the added value and revenue from hiring an additional worker is larger than the extra cost of hiring. The marginal product of labour and efficiency wage theory is always adopted interchangeably by scholars to explain the relationship between productivity and wages.

The neoclassical theory outlining the marginal productivity theory forms the basis relationship between wages and productivity. Workers will be paid according to their marginal productivity of labour simply known as labour productivity. When workers' productivity increases, they should be compensated equally to their marginal product of labour. The impact of wage growth on productivity is evident in the lagging sectors where the productivity growth is below average (Bande et al. 2007).

As a result of the bargaining nature of the local labour market, this unintentionally led to the regional inequality in wage-setting (Bande et al. 2007). For example, productivity growth in recent decades in the United States has had a substantial impact on median and real wage compensation, although, for the typical worker, there might be other factors that might suppress their income (Stansbury & Summers 2017). Previous research by Stansbury (2017) has shown that productivity growth induced by technology or policy will contribute to an increment in wages for the typical worker in the United States. Wages were determined by productivity and other macroeconomic variables, such as exchange rate and foreign prices (Forslund et. al 2008).

Contrarily, greater wages given by firms in accordance with the efficiency wage theory will increase worker productivity. Paying greater compensation to workers is more beneficial to firms and has a positive effect on reducing turnover and helps retain highly productive labour although it will contribute to higher labour costs for the firms (Katz 1986).

Furthermore, the pay mechanism through the efficiency wage creates a long-term attachment between employer and employee and generates bonding (Katz 1986). Wages were found to drive productivity growth by several scholars, in line with the efficiency wage theory (Bester & Petrakis 2003; Ozturk et. al 2020; Bílková 2020). At the aggregate level, the impact of real wage on productivity was significant and positive both in the short run and long run (Bílková 2020) while at the industry level, the causality between wage and productivity,

in the long run, will be determined by the number and size of firms and their labour costs (Bester & Petrakis 2003). Similar results by Ozturk et al. (2019) in the New Zealand construction sector also confirm this causal relationship. The greater wages received will boost employees' loyalty and trust in their employer, which will lead to them being more productive employees.

Numerous studies have revealed a sizable wage–productivity difference. Numerous factors, including institutional issues and macroeconomic conditions, contribute to the gap, which drives a wedge between the two variables. For instance, it was discovered that the wage productivity gap was caused by education level (Kampelman 2018; Ilmakunnas & Maliranta 2005), and that academic credentials have a greater impact on productivity than labour costs. When highly educated workers replace less educated workers, the wage-productivity gap widens (Kampelman 2018). The wage productivity gap is also influenced by other demographic variables such as age, and gender (Ilmakunnas & Maliranta 2005), location and ownership type (Dosi et al. 2020).

RELATIONSHIP BETWEEN WAGE-PRODUCTIVITY GAP AND UNEMPLOYMENT

As an important indicator of economic efficiency, the interconnection of wages, productivity, and unemployment has been proven in various economic theories. The basic macroeconomic theory of labour supply and demand denotes that the cross-country unemployment rate in an economy is attributed to the interaction between wage-setting and price-setting variables (Carlin & Soskice 2014). The equilibrium rate of unemployment will shift due to changes in the intersection between the wage-setting and price-setting curves. The wage-setting curve shifts due to changes in unemployment benefits, minimum wage, union, employment protection, and government intervention. Whereas the shifts in the price-setting curve are attributed to changes in competition policy and taxation. Apart from the efficiency wage theory, several theories on unemployment such as the matching or flow approach, and the hysteresis model are used by researchers to explain the unemployment trend worldwide.

Interaction between wage, productivity, and unemployment is of interest to many scholars. The relationship between real wages and productivity was found to significantly affect the unemployment level (Basile & Benedictis 2008; Škare & Škare 2017; Bande et al. 2007). However, due to economic conditions such as recession and slower economic growth, the growth of real wages was observed to be slow, as compared to growth in productivity, and will stagnate in some parts of the world. At some point, this situation contributed to the increasing unemployment sensitivity rate as a result of the deterioration function of labour market institutions (Gregg et al. 2014). In addition, the standardized wage-setting determination at the national level caused productivity to contribute more to the disparity in regional unemployment as compared to wages (Basile & Benedictis 2008). A high unemployment rate contributes to increased competition for job seekers who are wont to settle for a wage lower than expected and that is associated with lesser bargaining power. This will lead to a larger gap between wages and productivity.

Karanassou and Sala (2014) however have indicated a significant and negative relationship between wage-productivity gap and employment in the short and long run. This is because slower wage growth, relative to productivity, leads to falling labour share and employment gains. Similar findings by Abdullah (2008) and Ball and Moffitt (2001) also indicated that wages and productivity do not affect unemployment in a different environment and stages of country development. Basu and Felkey (2008) also discovered that in zero-unemployment equilibrium, labour will be compensated more relative to high unemployment equilibrium. That is workers earn salaries higher than efficiency wages and the labour market will be under full employment. In addition, the level of unemployment does not depend on how fast productivity growth is but is reliant on the demand for aggregate output (Blanchard et al. 1997). As Brynjolfsson & Mcafee (2013) stated in their decoupling theory, the divergence between productivity and employment has a more prominent impact on wage growth as compared to job growth due to the advancement in technology.

Over the years, most empirical studies focused on the interaction between wages, productivity, and unemployment in the labour market in advanced countries. Of late, however, several researchers including Abdullah (2008), Habanabakiz and Meyer (2019), and Basu and Felkey (2008) have centered their efforts on developing countries. The diverging trend between wages and productivity in these economies, triggered by suppressed wage growth relative to higher productivity growth, has generated various issues such as income inequality and poverty. Due to the high demand for jobs, the unemployment rate in these countries remains low as any available job vacancy, in both the formal and informal sectors, will be filled up instantly.

Given the unique characteristics of the labour market in emerging economies, it is thus imperative to identify the threshold level of the wage-productivity gap which may importantly influence the unemployment rate, especially in the situation of high informal employment. This is particularly the case since past research mostly focuses on causality and various determinants of wage and productivity on employment. The threshold level of the wage-productivity gap will provide an intuitive indicator for policymakers in wage determination that may help confine the unemployment rate in emerging economies to a minimum.

In measuring the effect of the wage-productivity gap on unemployment, many empirical studies have used labour productivity as a proxy for productivity. Instead of focusing solely on labour productivity, TFP accounts for all inputs such as capital, labour, and material (Ilmakunnas & Maliranta 2005), making it more reflective of the manufacturing process. Furthermore, by identifying the threshold level of wages and productivity, these findings may provide insights into, along with a strong recommendation for, wage and productivity growth in emerging economies. This is because previous researchers only looked at the causality between the wage, productivity and unemployment (Habanabakize & Meyer 2019; Basile & Benedictis 2008; Lo´pez-Villavicencio & Silva 2011; Škare & Škare 2017; Bande et al. 2007).

DATA AND METHODOLOGY

The analysis involved the cross-section threshold regression method where the Total Factor Productivity (TFP)/productivity is derived using the DEA Malmquist Productivity Index to generate the wage-productivity gap.

TOTAL FACTOR PRODUCTIVITY (TFP)

The total factor productivity (TFP) growth of the emerging economies was derived by using the Data Envelopment Analysis through the Malmquist Productivity Index. In contrast to the Tornqvist index, Malmquist Productivity Index does not require behavioral assumptions like profit maximisation or cost minimization, as well as details on input and output prices. Furthermore, this method is more general than the Tornqvist index and can eliminate the production function needed for other TFP measurements such as the requirement of the growth accounting method (Christopoulos 2007).

The Malmquist Productivity Index is reflected in equation (1) below. The change in total factor productivity (TFPCH) is decomposed into two sub-indexes, technical efficiency change (EFFCH) and technological change (TECHCH) as in equation (2) and equation (3). Total factor productivity change (TFPCH) represented by the Malmquist Productivity Index (M_0) is the combination of efficiency change (EFFCH) and technology change (TECHCH).

$$Mo(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)}\right]\left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})}\frac{D_o^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)}\right]^{\frac{1}{2}}$$

$$M_0 = (Efficiency\ Change)x(Technical\ Change)$$

Where :

$$Efficiency\ change\ = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (2)$$

$$Technical\ change = \left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})}\frac{D_o^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)}\right]^{\frac{1}{2}} \quad (3)$$

Productivity growth and its components are calculated for a sample of 47 countries using the Malmquist Productivity Index. Multiple inputs are included in producing the output. Using aggregate country data, capital and labour are the two main inputs needed to produce output in the form of GDP. Sourced from Penn World Table 10, the inputs in this research are the capital stock and aggregate labour measured by the number of persons engaged (in millions) while the output is the expenditure-side of real GDP. Both data on GDP and capital stock use current PPPs in 2017 international prices (in mil. US$) that are constant across countries but depend on the current year. This data is suitable for the comparison of living standards across countries at a single point in time (Feenstra et al. 2015). Since the GDP statistics are in real value, the capital stock data were deflated using the CPI to allow for a more insightful interpretation (Lu & Lu 2019). In addition, the capital stock data only covers the produced capital, such as buildings and equipment. The natural capital like land or subsoil resources which is important for developing countries (Caselli & Feyrer 2007) are not covered due to the limitation of data.

WAGE – PRODUCTIVITY GAP

To determine the wage-productivity gap, the ratio between real wage growth and TFP productivity growth is calculated. The data utilised consists of annual observations for the following 47 emerging economies from 2016 to 2018. Similar to Ilmakunnas & Maliranta (2005), the wage-productivity gap is constructed using data on TFP growth as a proxy for productivity.

The ILO Statistics, which uses the mean nominal monthly wages of workers at the 2017 purchasing power parity (PPP) price, is the source of the data on aggregate wage growth. This enables for cross-country comparison. The earnings includes direct wages and salaries, remuneration for time not worked (excluding severance and termination pay), bonuses and gratuities, and housing and family allowances paid by the employer directly to the employee (ILO Stat). The data was then deflated using the customer price index (CPI) to reflect the real cost borne by the employer and the productivity gains for the employer and workers (Stansbury & Summers 2017). Although other deflators, such as the producer price deflator, have been utilised by some researchers as wage deflators (Feldstein 2008), this study uses the CPI to maintain consistency. We compare the TFP growth rate and real wage growth for 47 emerging economies as follows;

$$G = \frac{\Delta Wage\ Growth}{\Delta TFP\ Growth} \qquad (4)$$

where G represents the ratio between real wage growth and TFP growth. This approach is different from Karanassou and Sala (2014) who defined the gap as the difference between wage and productivity. A positive gap is indicated by a gap value of 1 or above, meaning that wage growth has outpaced productivity growth and vice versa. The threshold value that affects unemployment in the regression analysis is determined by the gap. The size and direction of the wage-productivity gap are important to explain the unemployment trend in emerging economies.

CROSS-SECTION THRESHOLD REGRESSION

We use the non-dynamic panel model with thresholds developed by Hansen (1996, 2000) to study the threshold effects of the wage-productivity gap on unemployment in emerging economies. They offer a straightforward, concise, and interpretable technique to represent nonlinear interactions between a result and a predictor. This type of modelling also allows the role of the unemployment rate to differ depending on whether the wage-productivity gap is below or above some unknown level of λ. The wage-productivity gap will only impact the unemployment rate after a certain level threshold which may provide policymakers with a meaningful guideline for the most acceptable wage-productivity gap, particularly in determining wages. The empirical model on unemployment is based on López-Villavicencio & Silva (2011) where the relationship between the wage-productivity gap and unemployment is non-linear. The potential nonlinearities associated with unemployment are gauged using the wage-productivity gap as a threshold indicator and other wage-setting and macroeconomic variables using the following linear cross-country equation;

$$UE_i = \beta_0 + \beta_1 Gap_i + \beta_2 x_i + \varepsilon_i \qquad (i=1,2,3...N) \qquad (5)$$

where, UE_i is the unemployment rate for country i. Gap_i is the wage-productivity gap for country i, and the control variables that affect unemployment in this research are human capital (HC_i), labour freedom (LF_i), foreign direct investment (FDI_i), tax burden (TAX_i), and inflation (INF_i), and εi is the error term, as depicted in equation (6) below.

$$UE_i = \beta_0 + \beta_1 Gap_i + \beta_2 HC_i + \beta_3 LF_i + \beta_4 FDI_i + \beta_5 TAX_i + \beta_6 INF_i + \varepsilon_i \qquad (6)$$

For the two-regime threshold regression, the model is as follows;

$$UE_i = \begin{cases} \beta 0^1 + \beta 1^1 Gap_i + \beta 2^1 x_i + \varepsilon_i\,, Gap \le \lambda \\ \beta 0^2 + \beta 1^2 Gap_i + \beta 2^2 x_i + \varepsilon_i\,, Gap \ge \lambda \end{cases} \qquad (7)$$

where Gap is the sample-splitting (or threshold) variable used to split the sample into two regimes. λ is the unknown threshold parameter where the unemployment rate is expected to differ when the wage-productivity gap is below or above the unknown level of λ. In this study, the wage-productivity gap (Gap) is the threshold or sample-splitting variable. This modeling strategy allows the role of the wage-productivity gap to differ based on whether the emerging countries are below or above the threshold level λ .

Equation (7) can also be written in general form;

$$y_i = \begin{cases} \beta_1^{'} x_i + \varepsilon_i\,, q_i \le \lambda \\ \beta_2^{'} x_i + \varepsilon_i\,, q_i > \lambda \end{cases} \qquad (8)$$

Where $y = g$, $\chi = Gap(1, Gap)^{'}$, $\beta_1 = (\beta_{10}, \beta_{11})^{'}$, $\beta_2 = (\beta_{20}, \beta_{21})^{'}$, $\varepsilon \sim (0, \sigma^2)$ and threshold variable is $q = Gap$.

Equation (8) can then be expanded into equation (9) below

$$y_i = \beta_1^{'} x_i I(q_i < \lambda) + \beta_2^{'} x_i I(q_i \geq \lambda) + \varepsilon_i = \beta_1^{'} x_i(\lambda) + \varepsilon_i \quad (9)$$

where I(.) is the function indicator, $\beta = (\beta_1^{'}, \beta_2^{'})$ and

$$x_i(\lambda) = \begin{pmatrix} x_i I(q_i < \lambda) \\ x_i I(q_i > \lambda) \end{pmatrix}$$

where q_i is the threshold variable, and λ is the threshold parameter that split the equation into two regimes, β_1 and β_2. y_i is the dependent variable, x_i is the independent variable, and $\varepsilon_i$is the error terms.

The impact of the wage-productivity gap on unemployment are represented by the vectors of the parameters $\beta 1^1$ and $\beta 1^2$ that indicate the positive and negative gap respectively. The two threshold that affect the hypotheses are $H_0: \beta 1 = \beta 2$, and $H_1: \beta 1 \neq \beta 2$. The null hypothesis is a linear regression while the alternative hypothesis is a nonlinear regression. If the null hypothesis is rejected, it leads to a two-regime, nonlinear threshold regression. The identified threshold level is used to evaluate the threshold regression model against a linear specification. Thus the sample for $Gap \leq \lambda$ refers to the first regime, while $Gap \geq \lambda$ refers to the second regime. As the threshold level λ is not identified under the null hypothesis of no threshold effect $\beta 1 = \beta 2$, the p-value is computed using the heteroscedasticity-consistent Lagrange Multiplier (LM) bootstrap procedure (Hansen 1996, 2000) which produces asymptotically correct p-values.

If the hypothesis of β1 = β2 is rejected and a threshold level is identifed, we should test again the threshold regression model against a linear specifcation after dividing the original sample according to the threshold thus identifed. This procedure is carried out until the null of β1 = β2 can no longer be rejected.

DATA AND VARIABLES

This study employs cross-country regression for 47 emerging economies. The sample period from 2016 to 2018 was selected due to critical economic developments impacting emerging economies during these years. Specifically, the widening income per capita gap between emerging and advanced economies, coupled with a significant decline in global wage growth in 2017—reaching its lowest point in a decade—intensified poverty levels in these regions. These factors make this period particularly relevant for analysing economic challenges and trends in emerging markets. (International Labour Organisation 2019). The core data used for the analysis are derived from Penn World Table 10, Index of Economic Freedom and World Development Indicator. A detailed explanation of the variables involved in the regression and their descriptive statistics are in Table 1.

The dependent variable of unemployment rate had an average value of 7.3%, with the lowest value being 0.13% and the highest being 21.6%. According to the International Labour Organization's 2018 report, the jobless rate in the 49 emerging economies is higher than the global average of 5.6%. This is a result of the slower economic growth during this time period, which reduces the likelihood of real wage increases and job creation, especially for higher productivity jobs in modern sectors. The high unemployment rate in these nations also suggests that there isn't full employment in the work market.

The wage-productivity gap computed for the threshold variable has a range of -3.58 to 8.6, with a mean value of 1.09. A positive number for the wage-productivity gap shows that wages have grown more rapidly than productivity. Other control variables are reported as in Table 1.

Based on the statistical analysis, we confirm that variables are not correlated, and multicollinearity does not exist in the regression model as indicated by all Variance Inflation Factor (VIF) values at 1.0 for all variables.

TABLE 1. Descriptive statistics, average, 2016-2018

Variable	Unit of measurement	Mean	Std. dev.	Min	Max
Unemployment (UE)	Unemployment, total (% of total labour force) (modeled ILO estimate)	7.3312	4.9304	0.1350	21.5925
Wage-Productivity Gap (GAP)	Ratio between real wage growth and TFP growth	1.0907	2.3734	-3.5844	8.6201
Inflation (INF)	Inflation, consumer prices (annual %)	3.3856	2.9897	0.2675	13.4353
Foreign direct investment (FDI)	Foreign direct investment, net inflows (% of GDP)	4.0957	4.7406	-0.7875	30.8207
Tax Burden (TAX)	Index scale of 0 to 100.	82.2696	8.6017	58.6750	99.7000
Labour Freedom (LF)	Index scale of 0 to 100.	61.0781	12.3238	31.3250	84.7000
Human Development Index (HDI)	Based on the average years of schooling, linearly interpolated from Barro and Lee (2013), and an assumed rate of return for primary, secondary, and tertiary education, as in Caselli (2005)	0. 7725	0.0957	0. 4268	0.9065

RESULTS AND DISCUSSION

TOTAL FACTOR PRODUCTIVITY (TFP) GROWTH

Table 1 summarises the productivity change and the summary of growth from 2016 until 2018 using the Malmquist Productivity Index. The Malmquist index does not apply to the first year (2016) because it was used as the base year for the second year (2017). TFP change (TFPCH) progressed by 1.1% from the period 2016-2017 (1.019) to 2017-2018 (1.032) which was attributed mainly to a 7.1% (1.071) increase in efficiency change (EFFCH) as the TECHCH seems to have a decrease in rate at 3.6% per cent (0.964). A similar trend also occurred between 2016-2018 where the 2.5% (1.025) increase in TFPCH was mainly attributed to an increase in EFFCH (1.028) as opposed to the regressed TECCH (0.998).

Further, Malmquist Productivity Index decomposition enables us to identify the sources of productivity increase for growing countries. That is whether it is impacted by the technical efficiency change (EFFCH) and, or the technology change (TECHCH). The value of the decomposition of TFP change provides information on the sources of the overall productivity change among economies.

TABLE 2. TFP/productivity growth and its composition, Model 1, 2 and 3

Year	TFP Change (TFPCH)	Technical efficiency change (EFFCH)	Technological change (TECHCH)	Pure technical efficiency change (PTECH)	Scale efficiency change (SECH)
Model 1 [2016-2017]	1.019	0.986	1.033	0.974	1.013
Model 2 [2017-2018]	1.032	1.071	0.964	1.132	0.945
Model 3 [2016-2018]	1.025	1.028	0.998	1.05	0.979

In the 2016-2017 period, the decomposition trend of TFP growth reflects the dominance of technological change. However, in the subsequent period (2017-2018), productivity is determined mostly by efficiency change. The 'catch-up' stage to the production frontier is evident here, demonstrating that emerging economies are still increasing their production efficiency. The transition of emerging nations to higher-income countries is difficult since the level of TFP is controlled by efficiency change, and technology is one of the key drivers of economic growth.

WAGE-PRODUCTIVITY GAP

The fundamental components that reflect the standard of living are the link between wage and productivity. Following Lee and Ramayake (2018), the gap between wage and productivity is measured as the ratio of wages over productivity. From Figure 4, the average wage-productivity gap for the 47 emerging economies is at 0.437 points, which was derived from the ratio of wage growth of 1.227% and productivity growth of 2.806%. The negative wage-productivity gap from 2016 to 2018 indicates a lower growth of wages as opposed to productivity, leading to the decoupling trend between wages and productivity. The trend is more apparent in recent years (Brynjolfsson & McAfee 2013; Škare & Škare 2017).

TABLE 3. Average growth of real wage, productivity, and wage-productivity gap, model 1, 2 and 3

Year	Wage Growth (%)	Productivity Growth	Wage-productivity gap
Model 1 [2016-2017]	0.16%	2.48%	0.0636
Model 2 [2017-2018]	2.28%	3.60%	0.6323
Model 3 [2016-2018]	1.23%	2.81%	0.4372

The average value of the wage-productivity gap from 2016 to 2018 is attributed to the variation in year-on-year growth of the wage-productivity gap. The negative wage-productivity gap for the three time periods was linked to the wage growth that was outpacing productivity growth in the negative direction. With the average of high unemployment rate at 7.6%, the slow wage growth could force workers to leave their jobs and work in the informal sectors. Employers would provide low-paying jobs where the economy would be biassed towards labour-intensive industries. When this situation happens, the economic benefit from productivity growth is not channeled to workers' wages. For emerging economies with high informal sectors, firms continue to hire a worker if the added value and revenue from hiring an additional worker is larger than the extra cost of hiring.

Table 4 shows that only 19 nations had positive wage-productivity gaps, whereas more than half of rising economies had negative wage-productivity gaps. The highest gap was registered by Moldova (8.6) while the lowest gap was Mauritius (-3.6).

TABLE 4. Wage-productivity gap in emerging economies 2016-2018

No	Country	2016-2017	2017-2018	Average 2016-2018
1	Moldova	3.0	-9.9	8.6
2	Estonia	2.6	-5.0	8.4
3	Turkiye	-4.1	13.2	5.3
4	Dominican Republic	-2.0	6.3	4.6
5	Brazil	-6.4	2.1	4.0
6	El Salvador	4.1	3.7	3.8
7	Hungary	-8.5	1.6	3.3
8	Honduras	3.2	2.9	3.1
9	Romania	3.6	2.4	3.0
10	Thailand	1.1	8.1	2.9
11	Namibia	2.0	2.8	2.3
12	Albania	1.3	3.1	2.0
13	Slovenia	-0.5	1.4	1.9
14	Panama	0.9	-1.4	1.7
15	Mali	0.5	0.8	1.5
16	Poland	1.1	1.5	1.4
17	Mongolia	0.3	-3.4	1.1
18	Latvia	0.4	5.2	1.1
19	Costa Rica	0.0	-20.7	1.1

No	Country	2016-2017	2017-2018	Average 2016-2018
1	Lithuania	0.5	1.6	0.8
2	Qatar	0.7	0.8	0.7
3	Ukraine	0.5	1.3	0.7
4	Czechia	0.2	1.4	0.5
5	Kazakhstan	1.9	-2.9	0.5
6	Belarus	0.3	0.9	0.5
7	Sri Lanka	0.2	15.7	0.4
8	Georgia	0.1	0.8	0.3
9	Armenia	0.5	0.0	0.2
10	Montenegro	0.1	-0.1	0.0
11	Malaysia	2.5	-0.6	0.0
12	Slovak Republic	0.0	1.3	-0.1
13	Greece	-0.7	0.7	-0.2
14	Bulgaria	-0.9	1.0	-0.2
15	Maldives	0.1	-0.2	-0.2
16	Vietnam	-0.8	0.4	-0.3
17	Philippines	-0.3	-0.4	-0.3
18	Guatemala	-0.1	-0.8	-0.4
19	Bolivia	-0.7	0.1	-0.4
20	Saudi Arabia	0.4	-0.1	-0.4
21	Pakistan	1.3	-1.7	-0.5
22	Kyrgyz Republic	-0.6	-0.6	-0.6
23	Bangladesh	-7.5	1.6	-0.8
24	Uruguay	4.0	-4.1	-0.9
25	Azerbaijan	-3.0	0.1	-1.1
26	Serbia	0.3	1.5	-1.9
27	Cyprus	-0.1	0.7	-2.5
28	Mauritius	-1.3	-11.7	-3.6

CROSS-SECTION THRESHOLD REGRESSION

TABLE 5. Threshold estimates of wage-productivity gap (Gap_i) for Model 1, 2, and 3

	Model 1 = $UE_{i,2016-2017}$	Model 2 = $UE_{i,2017-2018}$	Model 3= $UE_{i,2016-2018}$
Threshold Estimate	-0.1121	0.6516	-0.1906
LM-test for no threshold	7.5023	16.9703	15.2169
Bootstrap P-Value	0.9588	0.0066***	0.0266**
95% confidence interval		[0.1026, 1.0137]	[-0.2089, -0.1879]

Bootstrap replication 5000 for each sample, trimming percentage at 15%.
Notes: ***, **, and * denote signifcant at 1%, 5% and 10% levels, respectively

The results of Equation (5) using the wage-productivity gap (GAP) as the threshold variable are shown in the threshold estimation in Table 5. In Models 2 and 3, the bootstrap method's calculated p-value for the test of no threshold effects can be rejected at a 90% confidence level with 5000 replications and a 15% trimming. For Model 1, however, the outcome for the time span between 2016 and 2017 indicates no threshold effects. A better explanation for a dynamic interaction between these variables is provided by the non-linear relationship between the wage-productivity gap and unemployment for Models 2 and 3. The threshold estimates also imply that there are two possible regimes for the sample, one below and one above the threshold level. The second sample split's bootstrap p-value is not significant. Hence, there is only one threshold is required for Models 2 and 3.

For Model 2 and Model 3, the point estimate of the threshold value of the wage-productivity gap are 0.6516 and -0.1906 respectively. Since Model 2 and Model 3's threshold point estimates have different values, the next section explains the threshold models in more depth to determine whether the regression results for the two models differ significantly.

TABLE 6. Threshold regression of wage-productivity gap (Gap_i) for Model 1, Model 2, and Model 3

	Model 1: $UE_{i,2016-2017}$	Model 2 $UE_{i,2017-2018}$			Model 3=$UE_{i,2016-2018}$		
Variable	Linear Model OLS without threshold	Linear Model OLS without threshold	Regime 1 $Gap_i \leq 0.3926$	Regime 2 $Gap_i > 0.3926$	Linear Model OLS without threshold	Regime 1 $Gap_i \leq 0.1902$	Regime 2 $Gap_i > 0.1902$
Intercept	18.5402 (7.5541)	18.1520 (7.0705)	14.0983 (11.9279)***	10.1404 (5.6515)***	18.3670 (7.4951)	9.0499 (8.8822)**	15.3188 (6.9671)***
Gap	0.0797 (0.2248)*	0.0614 (0.0822)*	0.1910 (0.1247)**	0.1342 (0.1188)*	-0.0085 (0.2285)*	0.0109 (0.7230)*	-0.3126 (0.2410)*
Inflation	-0.0255 (0.1452)*	0.0807 (0.1646)*	-0.5879 (0.3478)***	0.5381 (0.1405)	0.0542 (0.1750)*	-0.2036 (0.0625)*	0.5330 (0.2084)
FDI	0.0559 (0.063)*	0.2184 (0.0720)	0.2456 (0.0679)	0.8326 (0.2015)	0.2048 (0.1437)**	-0.1029 (0.0713)**	0.9735 (0.2185)
Labour Freedom	0.0947 (0.0603)**	0.0921 (0.0550)**	0.0970 (0.0958)*	0.1545 (0.0702)***	0.0945 (0.0604)**	-0.0014 (0.0939)*	0.1853 (0.0521)
Tax Burden	-0.2596 (0.1140)***	-0.2603 (0.1031)	-0.3793 (0.0724)	-0.1187 (0.0651)***	-0.2537 (0.1080)***	-0.2995 (0.0899)	-0.1574 (0.0542)
Human Development	5.8305 (7.4252)*	4.6574 (6.3921)*	26.6960 (13.0938)***	-10.7470 (5.0845)***	3.9523 (6.7979)*	31.4190 (8.0372)	-13.3944 (6.4258)***
R-squared	0.2184	0.2747	0.5535	0.5777	0.2500	0.7467	0.5557
Heteroscedasticity test (p-value)	0.5071	0.3610	-	-	0.8572	-	-
No. of Observation	47	47	20	27	47	15	32

Notes: The standard errors are reported in parentheses (White corrected for heteroskedasticity). Results correspond to a trimming percentage of 15%, ***, **, and * *denotes significance at 1%, 5% and 10% levels, respectively*

The presence of a threshold level for Model 2 and Model 3 indicates that the sample can be split into two different groups depending on the level of the wage-productivity gap. Countries that fall below the threshold have a smaller level of the wage-productivity gap, whereas those that are above the threshold level have a bigger wage-productivity gap. The sample division of the threshold model specifications for Models 2 and 3 is shown in Table 6.

As was already established, there is no threshold effect for Model 1 because the coefficient of the wage-productivity gap is not significant for any regime. However, for Model 2 ($UE_{i,2017-2018}$), the coefficient of the wage-productivity gap is positive and significant in influencing unemployment for above the threshold $Gap_i > 0.3926$, and below the threshold $Gap_i \leq 0.3926$. This indicates that the wage-productivity gap is a significant determinant of unemployment among emerging economies regardless of the threshold level. On one hand, for countries above the threshold level, a 1% increase in the wage-productivity gap would increase the unemployment rate by 0.1342%. On the other hand, for the countries below the threshold level, a 1% decrease in the wage-productivity gap would reduce the unemployment rate by 0.1910%. Therefore, the wage-productivity gap correlates positively with unemployment for both levels below and above the threshold, but only after its value has exceeded or fallen below the threshold value of 0.3926. This scenario is consistent with the efficiency wage theory as well as marginal product of labour theory.

Similar to Model 2, the coefficient of the wage-productivity gap in Model 3 is significant both below and above the threshold level ($Gap_i = 0.1902$). This suggests that the wage-productivity gap, both below and beyond the threshold level, correlates with the unemployment rate. The relationship between wage-productivity gap and unemployment is significant and positive for countries below the threshold level ($Gap_i \leq 0.1902$). For the countries below the threshold level, a 1 percent reduction in the wage-productivity gap would reduce the unemployment rate by 0.0109 %. However, the relationship between wage-productivity gap and unemployment is significant and negative for the countries above the threshold ($Gap_i \geq 0.1902$). That is 1 percent increase in the wage-productivity gap would reduce the unemployment rate by 0.3126 %.

The wage-productivity gap in Models 2 and 3 has a negative threshold value, which denotes that productivity growth has outpaced wage growth. The marginal product of labour theory states that firms will hire more employees due to the lower labour costs if this situation occurs. Therefore, it results in a decrease in unemployment. However, this scenario only corresponds with Model 3, wherein a larger wage-productivity gap causes the unemployment rate to decline in situations above the threshold level of ($Gap_i = 0.1902$). A higher value of the wage-productivity gap is thus advantageous because when wages is growing faster than productivity, it increases workers' purchasing power and, in this situation, it lowers the unemployment rate. To make this scenario a reality, emerging nations must adopt labour market reforms like the minimum wage that will boost wage and help keep the unemployment rate at a manageable level. In summary, these results are in line with those of López Villavicencio & Silva (2011) and Karanassou & Sala (2014).

To ensure the structural validity of the regression model, a robustness check was undertaken to confirm the validity of the regression and whether it can be interpreted as the causal effect of the regressors (Lu & White 2013). It can also verify the sensitivity of threshold estimation and reinforce the empirical findings. As a robustness check, the wage-productivity gap will be derived using different measurement of variables that is the subtraction method and performed the same analysis to see whether it will generate a consistent result with the

currently used ratio method. By using this method, we would like to see whether the wage-productivity gap has a similar impact on the unemployment rate and yields the same result among emerging economies. Similar approach was undertaken by Teichgraeber, A. & Van Reenen, J. (2021) to test the robustness of the decoupling trend between compensation and productivity by using different measurement of variables. The results suggest that the sample can be split into two regimes, below or above the threshold level for Model 2 and Model 3. However, for Model 1, the result shows no threshold effects for the period between 2016 and 2017. The robustness analysis shows consistent and statistically significant findings, particularly in Model 2 where the wage-productivity gap is positive and significant in influencing unemployment for above and below the threshold level, affirming the reliability and stability of our findings.

CONCLUSION

The emerging economies plays a significant role as the engine of growth of the global economy. The contribution of the emerging economy to global output has been increasing over the years. Given the unique nature of the labour market in the emerging economies with high informal sectors, understanding the relationship between the wage-productivity gap and unemployment has important policy implications particularly in the emerging economies scenario.

We have examined the effect of the wage–productivity gap on unemployment using data from 47 emerging economies over the period of 2016-2018. We presented a series of supportive evidence, which provides reliability to the findings and the robustness of our results. The finding suggests a positive and significant relationship between the wage-productivity gap and unemployment at below and above the threshold level for Model 2 and below the threshold in Model 3. It's interesting to note that in Model 3, the wage-productivity gap and unemployment above the threshold have a negative and substantial relationship that corresponds to the marginal productivity of labour theory. Despite the fact that the threshold value is only relevant at negative wage-productivity gap values, it nonetheless identifies the labour's marginal output when productivity growth outpaces wage growth. However, if the emerging countries can close the wage-productivity gap by promoting higher wages for workers, unemployment will be positively impacted and managed at the most practical rate among the rising nations. Nevertheless, firms must ensure that wage growth keeps pace with increases in worker productivity, which includes investing in training and skill development to sustain productivity levels.

These findings confirm those by Karanassou & Sala (2014) and López-Villavicencio & Silva (2011) who also established a significant relationship between the wage-productivity gap and unemployment under the influence of other factors such as labour share and employee legislation. Similarly, foreign direct investment (FDI), tax burden, labour freedom, and human capital have a significant effect on lowering or raising the unemployment rate at a certain threshold level of the wage-productivity gap in the three models.

The emerging economies need to retain their competitiveness as the engine of growth for the global economy by closing the gap in living standards with the advanced economies. Through productivity initiatives and improvement in output, real wages, and employment, this will provide greater social protection to workers in emerging economies with high informal sectors. The findings of the threshold effect of the wage-productivity gap on unemployment pave more opportunities for further research while the policy recommendations are beneficial for policymakers and stakeholders in emerging economies.

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