

Journal of Business and Economic Options



Exploring the Dynamics of GDP Growth and Unemployment Rates in Asian Economies: A Longitudinal Analysis

Syh Han Ang^a

Abstract

This study represents a significant contribution to our understanding of the relationship between GDP growth and unemployment rates in both developed and developing Asian countries. By applying the Okun's law framework and utilizing advanced econometric techniques such as co-integration analysis and Granger-causality testing, the study offers valuable insights into the dynamics of this relationship over a period spanning more than four decades. The findings reveal that both developed and developing Asian countries exhibit a negative relationship between GDP growth and unemployment rates, consistent with the theoretical underpinnings of Okun's law. However, the study goes beyond traditional Okun's law analysis by estimating long-run and short-run coefficients using the ARDL approach. Remarkably, the coefficients obtained for some developed and developing Asian countries are higher than those predicted by the original Okun's law, suggesting a robustness of the relationship in these contexts. This nuanced understanding of the relationship between GDP growth and unemployment rates in Asian economies underscores the importance of considering regional and developmental factors when analyzing macroeconomic phenomena. The findings of this study have implications for policymakers and practitioners seeking to address unemployment challenges and promote sustainable economic growth in the region. Furthermore, by identifying deviations from traditional Okun's law predictions, this study contributes to the refinement of economic models and frameworks tailored to the specific characteristics of Asian economies. This highlights the need for ongoing research and analysis to better understand the drivers of economic performance and inform evidence-based policy formulation. Overall, this study enriches our knowledge of the macroeconomic dynamics in Asian countries and provides a valuable foundation for future research on the relationship between GDP growth and unemployment rates in both developed and developing contexts.

Keywords: GDP Growth, Unemployment Rates, Okun's Law, Econometric Techniques, Asian Economies

JEL Codes: E24, J64, O53

1. INTRODUCTION

Since the aftermath of World War II, policymakers in the United States have grappled with the complex interplay between output growth and unemployment (Maier, 1977). Okun's seminal work in 1962 shed light on this issue by exploring the economy's capacity to produce output under conditions of full employment. In his research, Okun proposed a hypothesis wherein a 4% unemployment rate was considered indicative of full employment within the labor market. He observed that deviations from this target rate could have significant implications for output growth. Okun's analysis revealed a compelling relationship, now commonly referred to as Okun's Law. According to this law, for every additional percentage point increase in the unemployment rate above the 4% threshold, there was an associated decrease in output growth by approximately 3% (Feldmann, 2009). This empirical finding provided policymakers with valuable insights into the dynamics between unemployment levels and the overall performance of the economy. By quantifying the impact of unemployment on output growth, Okun's Law offered a framework for understanding the broader implications of labor market conditions on economic activity. It underscored the importance of achieving and maintaining optimal levels of employment to support sustained economic growth. Additionally, Okun's research laid the foundation for subsequent studies exploring the nuances of this relationship and its policy implications.

Okun's Law transcends mere academic theory, serving as a practical tool for policymakers grappling with real-world economic challenges. Phelps (1981) highlights how Okun's Law has facilitated the translation of macroeconomic insights into actionable policy measures aimed at addressing pressing social and economic issues. By quantifying the relationship between output growth and unemployment, Okun's Law offers policymakers a tangible framework for understanding the dynamics of the labor market and its implications for broader economic performance. This empirical relationship provides policymakers with valuable insights into the trade-offs involved in pursuing policies to combat unemployment while promoting economic growth. Moreover, Okun's Law serves as a communication bridge between economists and policymakers, facilitating the translation of complex economic concepts into language and metrics that policymakers can readily grasp and utilize in their decision-making processes. Its simplicity and intuitive nature make it a powerful tool for conveying the importance of achieving full employment and the potential costs of persistent unemployment.

^a School of Economics, College of Business and Economics, Yonsei University, Seoul, South Korea

In practical terms, Okun's Law informs the design and implementation of various policy interventions aimed at stabilizing the economy and promoting employment. From fiscal stimulus measures to monetary policy adjustments, policymakers can use Okun's Law as a guide for calibrating the appropriate policy responses to prevailing economic conditions. Okun's Law has emerged as a cornerstone of macroeconomic theory, offering valuable guidance for governmental decision-making in economic policy. Lodewijks (1988) underscores the potential significance of this theory in shaping policy responses to the relationship between output growth and unemployment, highlighting its enduring relevance in the field of macroeconomics. Over the decades, economists and researchers have been drawn to the empirical investigation of the relationship between output growth and unemployment, with a particular focus on the United States. This focus reflects the foundational role of Okun's Law in shaping our understanding of macroeconomic performance and the interplay between key economic indicators. The empirical studies conducted in this area have sought to shed light on the nature and dynamics of the relationship between output growth and unemployment, examining how variations in one variable affect the other and vice versa (Boga, 2020). By analyzing historical data and econometric models, researchers have contributed to our understanding of the factors driving fluctuations in output and unemployment levels over time. Moreover, the insights gleaned from these empirical studies have not only enriched academic discourse but also informed policy debates and decision-making processes at the governmental level. Policymakers rely on evidence-based research to formulate effective strategies for promoting economic growth, reducing unemployment, and achieving macroeconomic stability (Feldman and Lowe, 2017). In essence, the enduring interest in Okun's Law and its implications for macroeconomic performance underscore its significance as a guiding principle in both academic inquiry and practical policymaking. As researchers continue to explore the intricacies of this relationship, policymakers stand to benefit from the insights generated, enabling them to make informed decisions that shape the economic landscape and contribute to overall prosperity and well-being.

Gordon (1984) re-examination of Okun's Law in the United States, spanning the period from 1949 to 1984, yielded significant insights into the relationship between output growth and unemployment. By analyzing quarterly data over this extensive timeframe, Gordon (1984) aimed to provide a nuanced understanding of the dynamics at play and assess whether Okun's original framework accurately captured the empirical reality. The results of Gordon (1984) analysis revealed coefficient values that differed from those posited by Okun's Law. Specifically, Gordon (1984) found that the coefficient values were higher than the original estimates proposed by Okun, indicating a stronger relationship between output growth and unemployment in the United States. In the short run, the coefficient value was calculated to be 0.23 percentage points, while in the long run, it stood at 0.5 percentage points. Moreover, Gordon (1984) findings confirmed the negative sign of the relationship between output growth and unemployment, consistent with Okun's original hypothesis. This negative correlation underscores the inverse relationship between these two key macroeconomic indicators: as output growth increases, unemployment tends to decrease, and vice versa. By providing updated coefficient values and shedding light on the magnitude of the relationship between output growth and unemployment, Gordon (1984) study contributed valuable insights to the ongoing discourse surrounding Okun's Law. The findings not only enhanced our understanding of macroeconomic dynamics in the United States but also underscored the importance of empirical research in refining economic theories and guiding policy decisions.

The robustness of Okun's Law in the United States has been a subject of investigation by various researchers over the years. Blackley (1991), Moosa (1999), Freeman (2000), Holmes and Silverstone (2006), Huang and Lin (2008), and Beaton (2010) are among those who have contributed to this body of research. Through their studies, they have consistently found empirical evidence supporting the negative relationship between output growth and unemployment, thus affirming the validity of Okun's Law in the context of the United States. These researchers utilized different methodologies and datasets spanning various periods to examine the relationship between output growth and unemployment in the United States. Despite these differences, their findings converged on the same conclusion: that there exists a negative correlation between output growth and unemployment, as predicted by Okun's Law. The consistency of findings across multiple studies underscores the robustness of Okun's Law in explaining the dynamics of the labor market and the broader economy in the United States. This consistency provides policymakers and economists with confidence in utilizing Okun's Law as a guiding principle for understanding and addressing fluctuations in unemployment rates and output growth.

Paldam's (1987) investigation into the relationship between GDP growth and unemployment across 17 OECD countries provides further empirical support for the negative correlation predicted by Okun's Law. By analyzing the percentage change in unemployment rates for each percent of GDP growth, Paldam found that, on average, there was a negative relationship between these two variables. The average change of -0.15% in unemployment rates for each percentage point of GDP growth across the 17 OECD countries suggests that as GDP grows, unemployment tends to decrease, and vice versa. This finding aligns with the basic premise of Okun's Law, which posits that there exists an inverse relationship between economic growth and unemployment rates. Paldam's study contributes to the broader understanding of Okun's Law by extending its applicability beyond the United States to a sample of OECD countries. By demonstrating a consistent negative relationship between GDP growth and unemployment across these diverse economies, Paldam's findings lend further credibility to the empirical validity of Okun's Law on an international scale. Kaufman (1988) and Lee (2000) contributed to the body of evidence supporting the robustness of Okun's Law by finding empirical support for its negative relationship between GDP growth and unemployment across OECD countries. Their studies reinforced the notion that as GDP grows, unemployment tends to decrease, consistent with the core tenets of Okun's Law.

Conversely, Moosa (1997) and Malley and Molana (2008) extended the examination of Okun's Law to the G7 countries and found significant evidence of a relationship between GDP growth and the unemployment rate. This suggests that the inverse relationship observed in Okun's Law extends beyond individual countries to a group of leading global economies. Furthermore, the applicability of Okun's Law has been demonstrated in various European Union countries. Attfield and Silverstone (1998) found support for Okun's Law in the United Kingdom, while Caraiani (2008) observed its significance in Romania. Villaverde and Maza (2009) provided evidence of Okun's Law in Spain, and Dritsaki and Dritsakis (2009) extended its validity to 15 EU countries as well as four Mediterranean countries, including Greece, Italy, Spain, and Portugal. Hamada and Kurosaka's (1984) examination of Okun's Law in the Japanese economy over the period 1953-1982 revealed an unstable coefficient, suggesting variability in the relationship between output growth and unemployment in post-war Japan. This instability may stem from the unique economic dynamics and policy responses characteristic of Japan's recovery and growth during this period.

The findings of Hamada and Kurosaka highlight the importance of considering historical and contextual factors when applying Okun's Law to specific countries or regions. Economic conditions, policy interventions, and structural changes can all influence the strength and stability of the relationship between GDP growth and unemployment rates, as observed in the case of Japan. Despite the instability observed in Okun's coefficient for the Japanese economy, the study contributes valuable insights into the challenges and complexities of applying macroeconomic theories such as Okun's Law in diverse economic contexts. Further research and analysis may provide deeper understanding and shed light on the factors driving the fluctuations in the relationship between output growth and unemployment in Japan and other Asian countries. Noor et al. (2007) identified the presence of Okun's Law in Malaysia, indicating a negative relationship between output growth and unemployment similar to observations in other economies. However, Lal et al. (2010) extended the analysis to several Asian countries, including Pakistan, India, China, Sri Lanka, and Bangladesh, over the period 1980-2006. Their empirical findings diverged from the conventional application of Okun's Law, suggesting that the relationship between GDP growth and unemployment may not align with Okun's Law in these Asian countries.

The discrepancy in the applicability of Okun's Law across different Asian economies underscores the importance of considering regional and country-specific factors when analyzing macroeconomic relationships. Factors such as labor market dynamics, structural characteristics of the economy, policy interventions, and external influences can all contribute to variations in the observed relationship between output growth and unemployment. The findings of Lal et al. (2010) highlight the need for nuanced approaches to understanding the drivers of unemployment and economic growth in diverse Asian contexts. While Okun's Law has provided valuable insights into the general relationship between these variables, its applicability may vary across regions and countries, necessitating careful empirical analysis and consideration of local factors. Further research in this area can contribute to a deeper understanding of the complexities of labor markets and economic performance in Asian economies. Moosa (2008) extended the application of Okun's Law to several Arab countries, including Algeria, Egypt, Morocco, and Tunisia. However, the empirical findings from these Arab countries diverged from the conventional expectations of Okun's Law.

Moosa (2008) research indicated that the relationship between output growth and unemployment did not conform to the patterns observed in other economies, suggesting that Okun's Law may not be valid in the context of these Arab nations. The lack of empirical support for Okun's Law in Arab countries adds to the growing body of evidence suggesting that the relationship between output growth and unemployment is not universally consistent across all economies. While Okun's Law has been a valuable tool for understanding macroeconomic dynamics in many contexts, its applicability may be limited in certain regions or under specific economic conditions. The distinct results observed in the application of Okun's Law across different countries underscore the importance of considering local factors, institutional frameworks, and policy environments when analyzing the relationship between output growth and unemployment. Economic structures, labor market dynamics, government policies, and external influences can all contribute to variations in this relationship, highlighting the need for context-specific empirical research. The findings of studies such as those by Moosa (2008) emphasize the need for caution when applying general macroeconomic principles to diverse economic contexts. While Okun's Law has provided valuable insights into the relationship between output growth and unemployment in many economies, its validity may vary, and careful empirical analysis is required to understand the specific drivers of labor market dynamics in different regions and countries.

2. METHODOLOGY

This study employed gross domestic product (GDP) growth and annual unemployment rates as proxies for output growth and unemployment, respectively. The relationship between GDP growth (GDPt) and unemployment (UEt) was measured using percentage (%) rates. Annual time series data spanning from 1980 to 2010 were utilized, sourced from the World Bank Database. The study focused on both developed Asian countries (Japan, South Korea, and Singapore) and developing Asian countries (Indonesia, Malaysia, and Thailand). To analyze the relationship between GDP growth and unemployment, the study applied the Okun's law model, which posits that unemployment is a function of GDP growth ($UE_t = f(GDP_t)$). Okun's law suggests an inverse relationship between changes in unemployment rates and changes in GDP growth rates. By applying this model to the empirical analysis, the study aimed to investigate the extent to which changes in GDP growth influenced unemployment rates in the selected Asian countries over the specified time period. This study aimed to contribute to the understanding of labor market dynamics and macroeconomic performance in both developed and developing Asian economies by examining the applicability of Okun's law and exploring the relationship between GDP growth and unemployment.

3. RESULTS AND DISCUSSION

The table 1 presents the results of unit root tests for various variables across developed and developing Asian countries, including Japan, South Korea, Singapore, Indonesia, Malaysia, and Thailand. For each country panel, unit root tests are conducted using three different methods: Augmented Dickey-Fuller (ADF), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), and the Elliott-Lothman-Stock (DF-GLS) test. Under the ADF test, the values in parentheses represent the t-statistics, with values indicating the presence or absence of unit roots. A negative t-statistic suggests the rejection of the null hypothesis (the presence of a unit root), while a positive value indicates failure to reject the null hypothesis. Similarly, for the KPSS test, the values indicate whether the null hypothesis (no unit root) is rejected. A value in parentheses followed by asterisks denotes the significance level of the rejection. The DF-GLS test provides additional insights into the presence of unit roots. Overall, the results suggest variations in the presence of unit roots across different variables and countries. These tests are crucial for understanding the stationarity properties of time series data, which is essential for further econometric analysis and modeling.

Table 1: Unit Root Tests Results

Variables	ADF		KPSS		DF-GLS	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Developed Asian						
Panel 1: Japan						
UE _t	-3.31(3)	-3.56(0)	0.14(1)**	0.08(1)	-2.34(1)	-3.54(0)**
GDP _t	-3.57(0)	-3.75(0)**	0.17(10)**	0.05(0)	-2.11(0)	-3.23(0)**
Panel 2: South Korea						
UE _t	-3.01(1)	-4.59(1)*	0.17(1)**	0.05(1)	-2.90(1)	-4.38(0)*
GDP _t	-2.00(5)	-4.82(6)**	0.16(3)**	0.06(1)	-2.71(2)	-5.65(0)*
Panel 3: Singapore						
UE _t	-2.70(0)	-5.43(0)*	0.16(1)**	0.04(1)	-2.81(0)	-5.63(0)*
GDP _t	0.23(4)	-4.48(0)**	0.18(12)*	0.06(1)	-2.35(4)	-3.38(0)**
Developing Asian						
Panel 4: Indonesia						
UE _t	-1.68(0)	-4.99(0)*	0.24(1)*	0.13(4)	-1.51(0)	-5.18(0)*
GDP _t	-2.33(4)	8.72(0)*	0.15(12)**	0.04(1)	-2.01(4)	-7.92(0)*
Panel 5: Malaysia						
UE _t	-1.14(0)	-5.14(7)*	0.17(2)*	0.11(2)	-1.28(0)	-4.41(0)*
GDP _t	-3.27(1)	-4.02(2)**	0.17(12)**	0.05(1)	-1.34(5)	-5.72(1)*
Panel 6: Thailand						
UE _t	-3.52(0)	-5.13(1)*	0.16(10)*	0.08(1)	-2.92(0)	-5.78(0)*
GDP _t	-2.12(0)	-4.15(1)**	0.16(1)**	0.04(1)	-2.53(1)	-4.58(1)*

The table 2 outlines the optimal lag lengths derived from the Autoregressive Distributed Lag (ARDL) modeling technique, categorized by regions: Asian, Developed, and Developing countries. Each entry in the table represents the recommended lag order for the dependent variable (UE_t) and the independent variable (GDP_t), denoted as (p, q), respectively. For Japan, the optimal lag length is indicated as (2, 0), implying that a lag of 2 is suggested for the dependent variable UE_t while no lag is recommended for the independent variable GDP_t. Similarly, for South Korea, the recommended lag lengths are (2, 1), meaning a lag of 2 for UE_t and 1 for GDP_t. In the case of Singapore, both UE_t and GDP_t exhibit an optimal lag length of 1, denoted as (1, 1). For Indonesia and Malaysia, the optimal lag lengths differ slightly; Indonesia has a lag of 1 for UE_t and 0 for GDP_t, represented as (1, 0), while Malaysia has both UE_t and GDP_t with a lag order of 1, denoted as (1, 1). Finally, Thailand also demonstrates a lag order of 1 for both UE_t and GDP_t, as shown by (1, 0). These optimal lag lengths are determined based on statistical criteria to ensure the appropriate specification of lag structures in ARDL models, which are widely employed in econometric analyses to capture relationships between variables with varying orders of integration.

Table 2: ARDL Optimal Lag Length

Asian ARDL Optimal lag length UE _t =f(GDP _t)	Japan	Developed South Korea	Singapore	Indonesia	Developing Malaysia	Thailand
	(2,0)	(2, 1)	(1, 1)	(1, 0)	(1, 0)	(1, 0)

The table 3 presents the results of the Autoregressive Distributed Lag (ARDL) bound tests categorized by regions: Asian, Developed, and Developing countries. These tests are conducted to determine the presence of a long-run relationship between the dependent variable (UE_t) and the independent variable (GDP_t), as denoted by the equation UE_t=f(GDP_t). For Japan, the computed F-statistic value is 410.73, which exceeds the critical values for all significance levels (1%, 5%, and 10%). Similarly,

for South Korea and Singapore, the F-statistic values are 30.77 and 19.66, respectively, both surpassing the critical values for all significance levels. In the case of Indonesia, Malaysia, and Thailand, the computed F-statistic values are 235.46, 159.87, and 9.31, respectively. These values also exceed the critical values for all significance levels, indicating significant evidence of a long-run relationship between UEt and GDPt for these countries. The critical values for the bound tests are provided for different significance levels (1%, 5%, and 10%) to assess the statistical significance of the computed F-statistic values. If the computed F-statistic value exceeds the critical value at a certain significance level, it indicates evidence of a long-run relationship between the variables at that level of significance.

Table 3: ARDL bound test results

Asian	Japan	Developed South Korea	Singapore	Indonesia	Developing Malaysia	Thailand
$UE_t=f(GDP_t)$	410.73*	30.77*	19.66*	235.46*	159.87*	9.31*
Critical value		I(0)			I(1)	
1%		6.03			6.76	
5%		4.09			4.66	
10%		3.30			3.79	

The table 4 provides the results of Error Correction Model (ECM) analysis for different regions: Asian, Developed, and Developing countries. The dependent variable considered in the ECM is UEt (unemployment rate), and various independent variables are assessed for their impact. In Panel A, the long-run estimates of the impact of GDPt (Gross Domestic Product) on UEt are provided. Negative coefficients indicate an inverse relationship between GDP and unemployment. For Japan, the coefficient is -0.78, statistically significant at the 5% level, suggesting that a 1% increase in GDP leads to a 0.78% decrease in unemployment. Similar interpretations can be made for the other regions. Panel B presents short-run estimates, capturing the immediate impact of changes in GDP (ΔGDP_t) on unemployment. The coefficients provide insights into short-term dynamics between GDP and unemployment rates. ECM t-1 (Panel B) displays the coefficient estimates of the lagged error correction term. This term indicates the speed at which the system corrects back to its long-run equilibrium after a shock. Panel C presents diagnostic tests for the ECM. These tests assess the goodness-of-fit and validity of the ECM model. X^2_{Serial} , $X^2_{Function}$, and $X^2_{Heteros}$ are chi-square statistics for serial correlation, functional form, and heteroscedasticity, respectively. The values in parentheses represent p-values, with significance levels typically set at 5% or 1%. The presence of asterisks indicates statistical significance. Overall, the ECM results provide insights into the relationship between GDP and unemployment rates in different regions, capturing both long-run and short-run dynamics while ensuring model validity through diagnostic tests.

Table 4: ECM Results

Asian	Japan	Developed South Korea	Singapore	Indonesia	Developing Malaysia	Thailand
Dependent Variables : UE_t						
Panel A: Long run estimates						
GDP_t	-0.78 [-4.52]*	-0.47 [-1.99]	-0.49 [-3.27]*	-1.24 [-0.68]	-2.22 [-0.77]	-0.23 [-1.03]
Panel B: Short run estimates						
ΔGDP_t	-0.11 [-8.65]*	-0.22 [-7.28]*	-0.05 [-1.27]	-0.04 [-1.26]	-0.10 [-4.42]*	-0.07 [-1.60]
ECM_{t-1}	-0.14 [-4.43]*	-0.24 [-2.45]**	-0.50 [-4.18]*	-0.03 [-0.74]	-0.04 [-0.80]	-0.30 [-1.84]
Panel C : Diagnostic Test						
X^2_{Serial}	0.28 (0.60)	2.10 (0.16)	0.07 (0.79)	1.25 (0.27)	1.34 (0.26)	0.20 (0.66)
$X^2_{Function}$	0.15 (0.71)	0.52 (0.48)	1.24 (0.28)	3.27 (0.08)	0.05 (0.83)	1.79 (0.19)
$X^2_{Heteros}$	0.02 (0.88)	6.73 (0.02)**	3.20 (0.09)	2.37 (0.14)	14.77 (0.00)*	1.16 (0.29)

Table 5 presents the results of Granger Causality tests for different regions: Japan, South Korea, Singapore, Indonesia, Malaysia, and Thailand. Granger Causality tests assess the causal relationship between two variables by examining whether the past values of one variable provide information about future values of another variable. In Panel 1, for Japan, the Granger

Causality test indicates that there is a significant weak causality running from ΔGDP_t to ΔUE_t , with a chi-square statistic of 74.78 (p-value < 0.05). This suggests that changes in GDP Granger-cause changes in unemployment in the short run. Similarly, there is significant strong causality from ΔGDP_t to ECT (Error Correction Term) with a chi-square statistic of 78.83 (p-value < 0.05), indicating a long-term relationship between GDP and unemployment rates. In Panel 2, for South Korea, there is significant weak causality from both ΔUE_t to ΔGDP_t and from ΔGDP_t to ΔUE_t , indicating bidirectional causality between GDP and unemployment rates in the short run. Moreover, strong causality exists from both ΔGDP_t to ECT and ΔUE_t to ECT, suggesting a long-term relationship between GDP and unemployment rates. Similar interpretations can be made for Panels 3 to 6, where Granger Causality tests reveal the direction and significance of causal relationships between GDP and unemployment rates in Singapore, Indonesia, Malaysia, and Thailand. Overall, the Granger Causality results provide insights into the dynamic interactions between GDP and unemployment rates in different regions, capturing both short-term causality and long-term equilibrium relationships.

Table 5: Granger Causality Results

Dependent Variables	ARDL Optimal lag length	Weak Causality (X^2 statistics)			Strong Causality (X^2 statistics)	
		Short Run Granger Causality ΔUE_t	ΔGDP_t	ECT (t -statistics)	ΔUE_t & ECT	ΔGDP_t & ECT
Panel 1: Japan						
ΔUE_t	(2, 0)	-	74.78 (0.00)*	-4.44 (0.00)*	-	78.83 (0.00)*
ΔGDP_t	(0, 2)	74.93 (0.00)*	-	N.A	N.A	-
Panel 2: South Korea						
ΔUE_t	(2, 1)	-	53.01 (0.00)*	-2.44 (0.02)**	-	86.95 (0.00)*
ΔGDP_t	(1, 2)	67.09 (0.00)*	-	-2.64 (0.01)*	98.70 (0.00)*	-
Panel 3: Singapore						
ΔUE_t	(1, 1)	-	1.62 (0.20)	-4.18 (0.00)*	-	21.74 (0.00)*
ΔGDP_t	(0, 0)	0.37 (0.55)	-	N.A	N.A	-
Panel 4: Indonesia						
ΔUE_t	(1, 0)	-	1.59 (0.21)	-0.74 (0.47)	-	1.93 (0.38)
ΔGDP_t	(0, 0)	0.94 (0.33)	-	N.A	N.A	-
Panel 5: Malaysia						
ΔUE_t	(1, 0)	-	19.55 (0.00)*	-0.80 (0.43)	-	21.69 (0.00)
ΔGDP_t	(0, 1)	19.55 (0.00)*	-	N.A	N.A	-
Panel 6: Thailand						
ΔUE_t	(1, 0)	-	2.56 (0.11)	-1.84 (0.08)	-	9.62 (0.01)*
ΔGDP_t	(1, 1)	1.31 (0.25)	-	-3.38 (0.00)*	11.63 (0.00)*	-

4. CONCLUSIONS

The study delved into the intricate dynamics between GDP growth and unemployment rates, recognizing the diverse economic landscapes across developed and developing Asian countries. By including nations like Japan, South Korea, and Singapore, which boast advanced economies and robust infrastructures, alongside Indonesia, Malaysia, and Thailand, characterized by emerging markets and unique socio-economic challenges, the research aimed to capture a broad spectrum of experiences. Understanding the relationship between GDP growth and unemployment is crucial for policymakers and economists alike, as it sheds light on the effectiveness of economic policies and the overall health of an economy. In developed nations, where advanced technology and infrastructure often lead to lower unemployment rates, the study sought to uncover any nuances in the relationship that could inform policy decisions aimed at sustaining economic growth while ensuring employment opportunities for the workforce. Conversely, in developing countries grappling with issues like poverty, infrastructure

development, and industrialization, the study aimed to elucidate how fluctuations in GDP growth impact unemployment levels. By examining countries like Indonesia, Malaysia, and Thailand, the research aimed to provide insights into the challenges and opportunities faced by emerging economies in managing unemployment amid efforts to stimulate economic growth and development.

The study's application of the Okun's law framework to both developed and developing Asian countries represents a comprehensive effort to understand the dynamics of unemployment and GDP growth across diverse economic contexts. By examining a range of nations, from advanced economies to emerging markets, the research aimed to uncover common patterns and differences in the relationship between these two key economic indicators. The empirical findings indicating a significant long-run relationship between unemployment rates and GDP growth in all the studied countries suggest the robustness of Okun's law across diverse economic landscapes. This implies that, regardless of their stage of economic development, Asian countries exhibit a consistent pattern wherein changes in GDP growth have a discernible impact on unemployment levels over the long term. This empirical evidence underscores the importance of economic growth as a driver of employment opportunities, highlighting the interdependence between macroeconomic performance and labor market dynamics. It suggests that sustained GDP growth is essential for reducing unemployment and fostering job creation in both developed and developing economies. Furthermore, the study's findings have implications for policymakers seeking to address unemployment challenges and promote economic stability. By recognizing the significance of GDP growth in influencing unemployment rates, policymakers can prioritize measures to stimulate economic activity and investment, thereby fostering job creation and reducing unemployment levels over time. The study's exploration of the short-run relationship between unemployment rates and GDP growth in Japan, South Korea, and Malaysia adds depth to our understanding of the dynamics between these two variables. The evidence of a short-run relationship suggests that fluctuations in GDP growth can have an immediate impact on unemployment levels in these countries, highlighting the sensitivity of labor markets to changes in economic activity over shorter time horizons. Moreover, the consistent negative sign in both the long-run and short-run coefficients between unemployment and GDP growth across developed and developing Asian countries underscores the enduring nature of this relationship. This suggests that regardless of economic maturity, Asian countries tend to exhibit a similar pattern wherein improvements in GDP growth are associated with reductions in unemployment rates over both short and long time periods.

The findings from the Granger causality tests offer additional insights into the causal relationship between unemployment and GDP growth in these countries. The evidence of bidirectional causality in weak causal relationships in Japan, South Korea, and Malaysia suggests that changes in both unemployment rates and GDP growth can influence each other over time, albeit with a weaker causal impact. Furthermore, the identification of bidirectional causality in strong causal relationships in South Korea and Thailand suggests a more pronounced and mutually reinforcing link between unemployment and GDP growth in these countries. This implies that changes in one variable can exert a more substantial and direct influence on the other, underscoring the interdependence between labor market conditions and economic performance.

On the other hand, the evidence of one-directional causality in strong causal relationships in Japan and Singapore suggests a more asymmetric relationship between unemployment and GDP growth in these countries. This implies that changes in GDP growth may have a more dominant effect on unemployment rates, highlighting the importance of economic policies aimed at promoting sustainable growth and employment opportunities. Indeed, the policymakers' attention to labor force participation rates, working hours, and technological factors is crucial for achieving microeconomic development objectives. Given that a significant portion of the population is engaged in the labor force, labor can serve as a substitute for capital in the production process. Therefore, inefficient allocation of economic resources at the microeconomic level can have detrimental effects on macroeconomic development. Efforts to enhance the efficiency of labor allocation are essential for promoting sustainable macroeconomic performance in both developed and developing Asian countries. By optimizing the utilization of labor resources, policymakers can bolster productivity and output levels, thereby contributing to overall economic growth and stability. This entails implementing policies and initiatives that facilitate skills development, job creation, and workforce training to ensure that labor resources are utilized effectively and productively. Moreover, addressing technological factors is paramount in the context of microeconomic development. Embracing technological advancements and innovation can lead to significant improvements in productivity and efficiency across various sectors of the economy. Policymakers should prioritize investments in research and development, digital infrastructure, and technology adoption initiatives to harness the transformative potential of technology for microeconomic advancement. By focusing on labor force allocation and technological enhancement at the microeconomic level, policymakers can lay the foundation for sustainable macroeconomic development in Asian countries. This holistic approach to economic policymaking can drive inclusive growth, create employment opportunities, and enhance the competitiveness of economies in the region, ultimately fostering long-term prosperity and well-being for their citizens.

REFERENCES

Attfield, C. L. F., & Silverstone, B. (1998). Okun's law, Cointegration and gap variables, *Journal of Macroeconomics* 20(3), 625-637.

- Beaton, Kimberly. (2010). Time variation in Okun's law: A Canada and U.S comparison. *Working Paper 2010-7, International Economic Analysis Department Bank of Canada.*
- Blackley, P. R. (1991). The measurement and determination of Okun's law: Evidence from State economics, *Journal of Macroeconomics* 13(4), 641-656.
- Boga, S. (2020). Investigating the asymmetry between economic growth and unemployment in Turkey: A hidden cointegration approach. *Journal of Economics Finance and Accounting*, 7(1), 22-33.
- Caraiani, Petre. (2008). Asymmetry in the Okun coefficient in Romanian Economy, *Institut for Economic Forecasting, Romanian Academy*, 2008 competition.
- Dickey, D., & Fuller, W. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root, *Journal of the American Statistical Association* 74, 427-431.
- Dritsaki, Chaido., & Dritsakis, Nikolaos. (2009). Okun's coefficient for four Mediterranean member countries of EU: An empirical study, *International Journal of Business and Management* 4(5), 18-26.
- Elliott, G., Rothenberg, T., & J. Stock. (1996). Efficient test for an autoregressive unit root. *Econometrica*, 64, 813-836.
- Feldman, M., & Lowe, N. (2017). Evidence-based economic development policy. *Innovations: Technology, Governance, Globalization*, 11(3-4), 34-49.
- Feldmann, H. (2009). The unemployment effects of labor regulation around the world. *Journal of Comparative Economics*, 37(1), 76-90.
- Freeman, D. G. (2000). Regional Tests of Okun's law, *International Advances in Economic Research* 6(3), 557-570.
- FTSE (2012). FTSE Global Equity Index Series Country Classification, London, England: FTSE Group.
- Gordon, R. J. (1984). Unemployment and potential output in the 1980s, *Brooking Papers on Economic Activity* 15, 537-564.
- Granger, C. W. J. (1988). Some recent development in a concept of causality, *Journal of Econometrics* 39, 199-211.
- Hamada, K., & Kurosaka, Y. (1984). The relationship between production and unemployment in Japan: Okun's law in comparative perspective, *European Economic Review* 25, 71-94.
- Holmes, M. J., & Silverstone, B. (2006). Okun's law, asymmetries and jobless recoveries in the United States: A Markov-switching approach, *Economics Letters* 92, 293-299.
- Huang, Ho-Chuan., & Lim, Shu-Chin. (2008). Smooth-time-varying Okun's coefficients, *Economic Modelling* 25, 363-375.
- Kaufman, R. T. (1988). An international comparison of Okun's laws, *Journal of Comparative Economics* 12, 182-203.
- Kwiatkowski, D., Phillips, P., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: how sure are we that economic time series have a unit root? *Journal of Econometrics* 54, 159-178.
- Lal, Irfan., Muhammad, Sulaiman.D., Jalil, M. A., Hussain, Adnan.(2010). Test of Okun's law in some Asian countries: Cointegration approach, *European Journal of Scientific Research* 40(1), 73-80.
- Lee, Jim (2000). The robustness of Okun's law: Evidence from OECD countries, *Journal of Macroeconomics* 22, 331-356.
- Lodewijks, J. (1988). Arthur M. Okun: Economics for Policy Making, *Journal of Economic Surveys* 3, 245-264.
- Maier, C. S. (1977). The politics of productivity: foundations of American international economic policy after World War II. *International organization*, 31(4), 607-633.
- Malley, Jim., & Molana, Hassan. (2008). Output, unemployment and Okun's law: Some evidence from the G7, *Economics Letters* 101, 113-115.
- Moosa, I. A. (1997). A cross-country comparison of Okun's coefficient, *Journal of Comparative Economics* 24, 335-356.
- Moosa, I. A. (1999). Cyclical output, cyclical unemployment, and Okun's coefficient: A structural time series approach, *International Review of Economics and Finance* 8, 293-304.
- Moosa, I. A. (2008). Economics growth and unemployment in Arab countries: Is Okun's law valid? International Conference on The Unemployment Crisis in the Arab Countries, Department of Accounting and Finance, Monash University, Australia.
- Noor, Zaleha Mohd., Mohamad, Nor Norashidah., and Abdul Ghani, Judhina. (2007). The Relationship between Output and Unemployment in Malaysia: Does Okun's Law Exist? *International Journal of Economics and Management* 1(3), 337-344.
- Okun, A. M. (1962). Potential GNP: Its measurement and significance, In Proceedings of the Business and Economic Statistics Section, *American Statistical Association*, 98-104.
- Paldam, M. (1987). How much does one percent of growth change the unemployment rate: A study of 17 OECD countries 1948-1985, *European Economic Review* 31, 306-313.
- Phelps, E. (1981). Okun's Micro-Macro System: A Review Article, *Journal of Economic Literature* 19(3), 1063-73.

Villaverde, J., & Maza, A. (2009). The robustness of Okun's law in Spain, 1980-2004 Regional evidence, *Journal of Policy Modeling* 31, 289-297.