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-RESEARCH ARTICLE-

WILL DELAYED RETIREMENT DECREASE YOUNG EMPLOYMENT? ROBUST RESULTS FOR MALAYSIA

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—Abstract—

Several economists, policymakers, and civil servants have raised concerns regarding the proposal to increase Malaysia's statutory retirement age from 60 to 65 years, arguing

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that such a change may exacerbate youth unemployment. This argument, however, stems from the long-discredited fallacy, which incorrectly posits that the number of jobs within an economy is fixed albeit what is deemed as "lump-of-labour". According to this fallacy, employment opportunities for younger individuals would be reduced with the consistent presence of senior (in terms of age) employees, resulting the labour market to be a zero-sum game where younger and older workers compete for a limited number of positions. This perspective has significantly influenced public resistance to raising the retirement age. Nevertheless, a considerable body of empirical evidence contradicts this assumption, suggesting that the employment of senior individuals does not necessarily diminish employment prospects for younger cohorts. This study offers robust empirical insights into the relationship between older and younger workers in Malaysia from 1982 to 2021. Specifically, it examines those aged 15–24 as younger workers and those aged 55–64 as older workers. Using various employment-related indicators—including total employment, employment rates, labour force participation rates, and unemployment rates, we employ several econometric techniques, including Ordinary Least Squares (OLS), robust regression, Fully Modified OLS (FMOLS), and quantile regression. Our findings consistently demonstrate that the employment of senior employees does not undermine the employment prospects of younger individuals. On the contrary, the results reveal a complementary nexus between these two age groups, suggesting that increasing the retirement age could be advantageous not only for younger workers but also for the broader economy.

Keywords: Delayed retirement, lump-to-labour fallacy, old and young workers, complement, Malaysia

INTRODUCTION

In 2019, the Malaysian government declined the Malaysian Trade Unions Congress (MTUC)'s suggestion to raise the statutory retirement age to 65 from 60 (Asia, 2019), citing concerns that such a move could increase unemployment among young people. This position was endorsed by the Malaysian Employers Federation (MEF). Despite this, the World Bank has highlighted that, as Malaysia moves towards becoming an ageing society, a gradual increase in the retirement age from 60 to 65 will become essential (Bank, 2020). As of April 2023, discussions around extending the retirement age have resurfaced, generating a variety of perspectives (Edge, 2023). In contrast, Abdullah (2020) maintained that Malaysia is currently ill-prepared for such a change, owing to prevailing economic conditions, graduate employment trends, and existing demographic and health dynamics.

A central argument against delaying retirement is the belief that retaining older workers in employment will displace younger individuals, thereby exacerbating youth unemployment. This argument is rooted in the "lump-of-labour" fallacy—a concept that

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persists despite having been discredited over a century ago. The fallacy is based on two erroneous assumptions: first, that the number of available jobs in an economy is fixed, reflecting a zero-sum view where each job gained by an older worker is presumed to be lost by a younger one; and second, that senior and younger workers are direct substitutes in the supply side of the labour market.

Rather than reflecting economic reality, this notion is often strategically employed by political actors, thereby influencing public opinion for political gain. When such beliefs become entrenched in the public consciousness, political parties across the spectrum are hesitant to oppose them (Kemmerling, 2016). For instance, in France, political narratives have long embraced the idea of generational displacement—older workers crowding out younger ones—as a means of addressing broader social and economic tensions (Yerkes et al., 2022). This belief influenced policy directions for over four decades (1977–2017), with the French Ministry of Finance enacting work-time reductions and other labour supply measures based on the assumption of a fixed labour market (Walker, 2007).

In contrast, actual economic systems are inherently dynamic. Economies evolve through continuous job creation and job destruction, driven by structural changes such as technological progress. While employment may decline in some sectors, expanding industries typically absorb the displaced labour. Moreover, as the economy grows, so does the workforce and consumer demand, leading to additional employment opportunities. New entrants to the labour force contribute to income generation, which in turn boosts consumption and elevates the demand for goods and services. This increased demand stimulates further job creation, illustrating that labour demand is not fixed but shaped by supply and demand forces. Over time, both the labour force and job availability tend to increase concurrently.

Indeed, Figures 1 through 3 illustrate a simultaneous upward trend in employment, employment rates, and labour force participation rates for both younger and older workers over the period from 1982 to 2021. These trends reflect the adaptable nature of Malaysia's economy in accommodating a growing and diverse labour force. Supporting this, a preliminary analysis by the World Bank Jasmin and Abdur Rahman (2021) using nationally representative data from 145 districts across 13 states and two federal territories between 2014 and 2016 found no negative impact of older workers' employment on that of younger individuals.

Figures 1 to 4 illustrate the temporal trends for unemployment rates, employment rates, employment, and labour force participation rates for both younger and older workers from 1982 to 2021.

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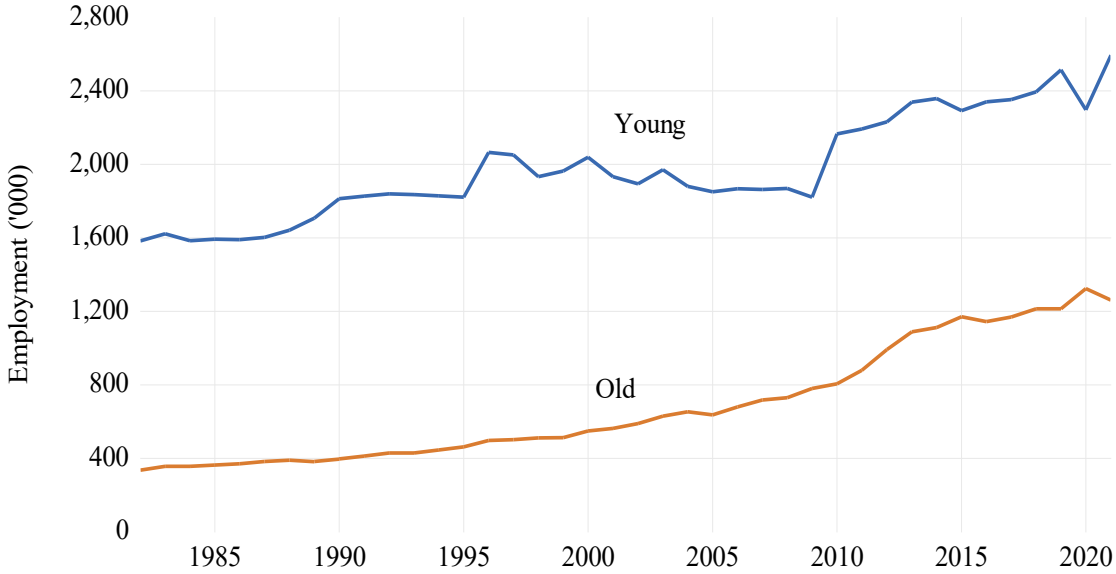

Figure 1: Trend in employment for young and older workers, 1982-2021

In Figure 1, youth and senior employment levels show a co-movement trend across the decades, reinforcing the notion of a dynamic and expanding labour market.

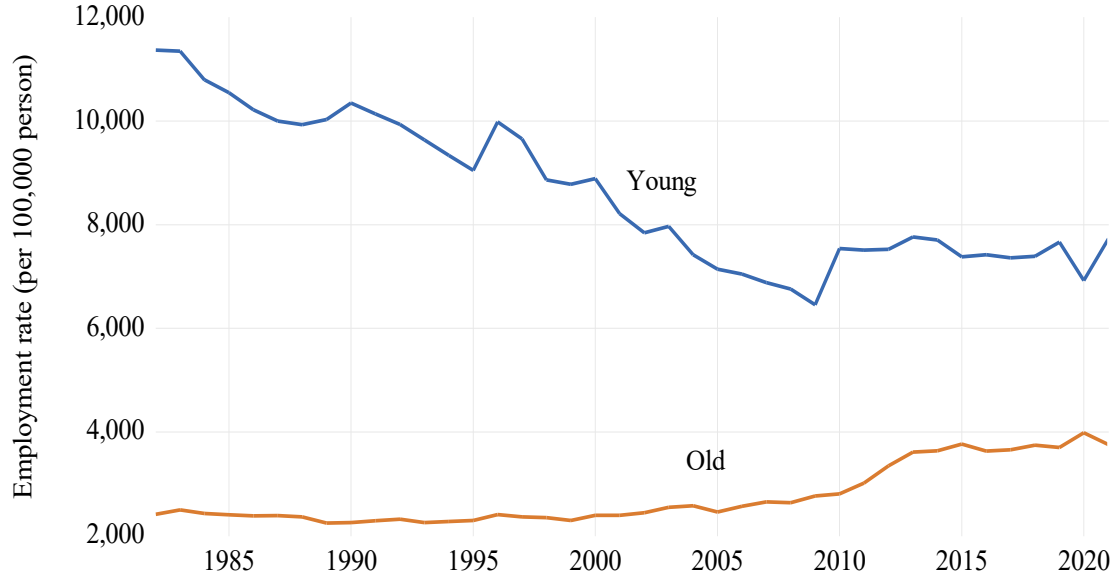

Figure 2: Trend in employment rates for young and older worker, 1982-2021

Figure 2 reveals that between 1982 and 2008, the employment rate for older individuals steadily increased, while the rate for younger workers declined. Post-2009, both employment rates began to rise together.

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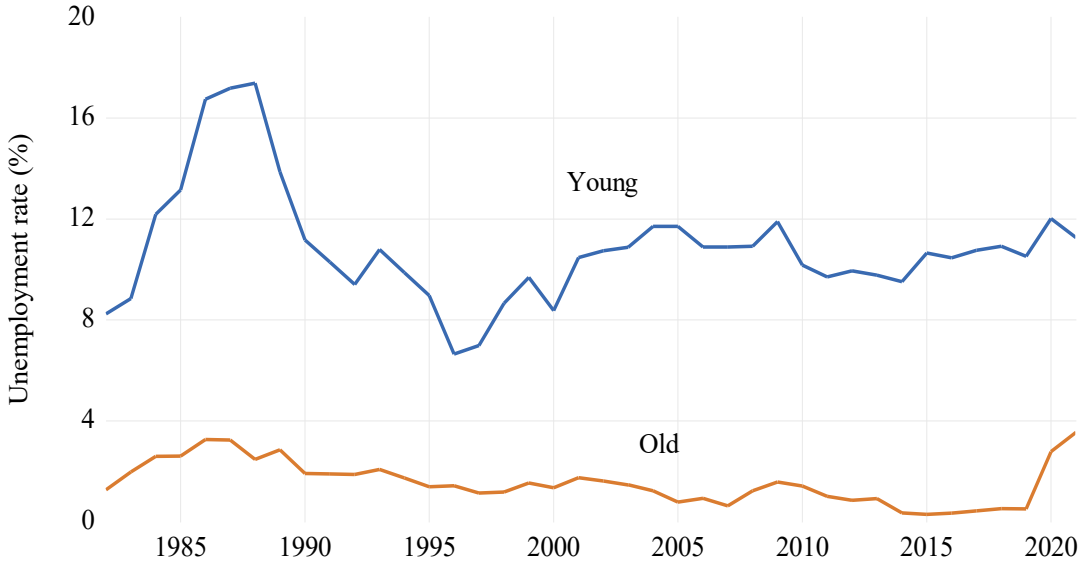

Figure 3: Trend in unemployment rates for young and older workers, 1982-2021

As for unemployment trends shown in Figure 3, apart from the mid-1980s, both groups experienced generally increasing unemployment over a 20-year period.

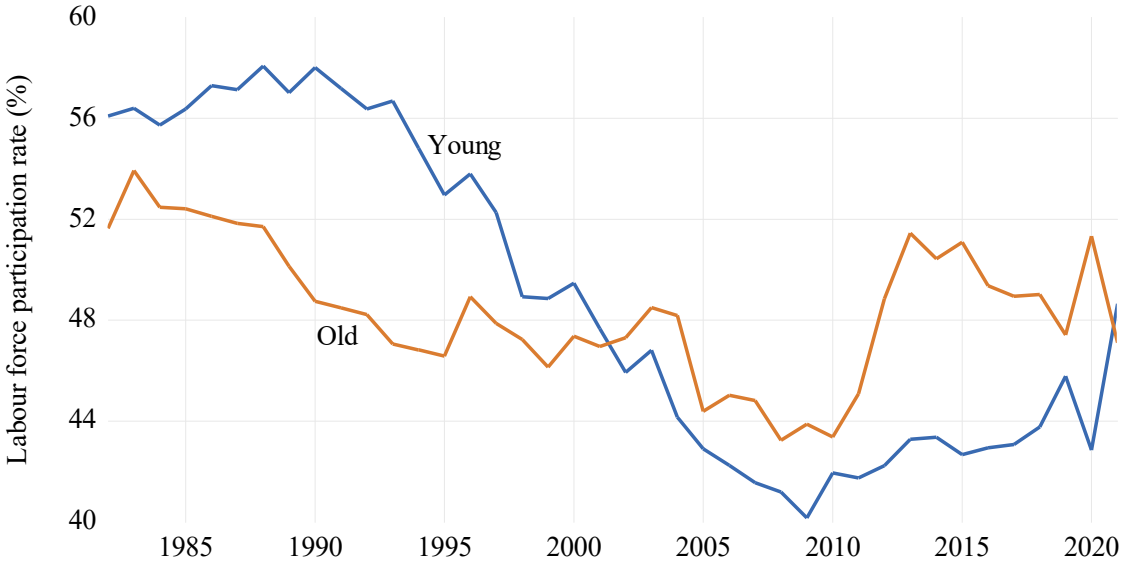

Figure 4: Trend in labour force participation rates for young and older workers, 1982-2021

Labour force participation trends in Figure 4 also indicate a long-term upward trend for both age groups.

Taken together, these preliminary observations suggest a complex but evolving

relationship between older and younger workers. Whether these groups function as substitutes or complements over the three-decade period is the subject of the econometric analysis that follows.

Thus, the primary objective of this analysis is to empirically investigate whether the employment of older workers in Malaysia leads to a displacement of younger workers, which would results youth unemployment. The unique contribution of this paper lies in its use of four distinct indicators— labour force participation rate, total employment, unemployment rate, and employment rate, to examine whether older workers function as substitutes for, or complements to, younger workers. To ensure the robustness of our findings, we utilise several econometric techniques, including Ordinary Least Squares(OLS) with robust standard errors, Fully Modified OLS (FMOLS), and Quantile regression.

Section 2 looks objectively on past studies and relevant theories on the interaction between older and younger workers, while the subsequent Section 3 discusses the data and methodology employed. Section 4 explains the empirical results, and followed by concluding Section 5 with policy implications.

LITERATURE REVIEW

A substantial body of international research indicates that increased labour market participation by older individuals does not diminish employment opportunities for younger cohorts. In fact, many empirical studies suggest that the positive effects of engaging older workers often outweigh any potential drawbacks for youth employment. According to Bank (2016), enhancing the participation of older workers can benefit the wider economy by boosting overall labour demand, thereby creating additional employment opportunities, including for younger individuals. Given the differences in job types and skills between older and younger workers, the two groups are typically not considered direct substitutes.

Kalwij et al. (2010) explored this relationship across 22 OECD nations from 1960 to 2008, focusing on workers aged 55–64 and those aged 15–24. They found that changes in older workers' employment levels generally had a modest but positive influence on youth employment. Similarly, studies from other countries reinforce this conclusion. Gruber and Milligan (2010) found no consistent evidence in the U.S. to suggest that older workers' employment affects younger workers. In Canada, Michael Baker (2010) reached a comparable conclusion, while Banks et al. (2010) reported no long-term evidence of employment displacement in the UK. In France, Ben Salem et al. (2008) observed that a rise in older workers' participation was linked with both increased employment rates and reduced unemployment among younger individuals.

Research by Bingley et al. (2010) revealed no discernible relationship between the

employment patterns of older and younger age groups, and no statistical indication that the two act as substitutes. In Denmark, regression analyses indicated a complementary dynamic—youth employment tended to rise and fall in tandem with that of older individuals. In Spain, Boldrin et al. (2010) found little to no association between the employment levels of the two groups, with only slight evidence suggesting that youth employment rose as older workers exited the labour market. Börsch-Supan and Schnabel (2010) similarly rejected the notion of crowding out in Germany, finding no empirical basis for the belief that senior workers displace younger workers. As for the Italian context, Brugiavini and Peracchi (2010) discovered a procyclical relationship, where increased participation of older workers coincided with lower youth unemployment, thereby contradicting the "lump-of-labour" hypothesis.

Palme and Svensson (2010) found no evidence in Sweden that high participation rates among older workers reduce employment chances for the younger demographic. On the contrary, most findings indicated a positive association. Oshio et al. (2010) showed that youth employment is more likely to be positively linked with the participation of older workers. Kapteyn et al. (2010) reported in the Netherlands that greater employment among the elderly slightly increased youth employment and decreased youth unemployment.

Recent research continues to challenge the lump-of-labour assumption. Kondo (2016), using Japanese data from the Basic Survey on Wage Structure (1998–2011), found no support for the idea that elderly employment reduces opportunities for younger full-time workers. The study also noted that lowering elderly wages did not translate into increased youth employment. Similarly, Wijayanti (2018) examined ASEAN nations—including Indonesia, Malaysia, the Philippines, Singapore, and Thailand—and found that older workers did not hinder the career advancement of younger individuals. Rather than substituting one another, the groups were found to be complementary.

In China, Hu and Yang (2021) constructed a dynamic optimisation model to simulate the long-term effects of delayed retirement on labour market welfare. Their findings suggest that postponed retirement enhances, rather than reduces, workforce well-being, and is associated with higher per capita income, which in turn promotes greater consumption, savings, and intergenerational support.

Jin (2017), analysing United States also found no conclusive evidence of employment displacement caused by older workers. Zhang (2012), drawing on micro-level data from China, reported that the employment rates of the two age groups are positively correlated. Fan (2022) argued that a rise in older worker employment does not harm the prospect of younger workers', in fact it also contributes to economic growth and increased job creation for youth.

Labour market theory maintains that substitution depends primarily on the degree of

similarity in skills and experience among workers. Freeman (1998) asserted that individuals with differing skills are unlikely to act as perfect substitutes. Given the distinct educational and experiential backgrounds of younger and older workers, they are widely regarded as imperfect substitutes (Card & Lemieux, 2001; Fitzenberger & Kohn, 2006). Supporting this, Hebbink (1993) found a negative elasticity of substitution, reinforcing the notion that the two groups function more as complements than as competitors.

Nevertheless, some studies offer limited support for the substitution hypothesis. An et al. (2022), in their examination of China from 2003 to 2020, observed that the higher youth unemployment is indeed contributed by delayed retirement, attributing this to economic constraints and a saturated job market. Dai et al. (2022), using U.S. data, identified increased youth unemployment resulting from retirement policy changes that affected job matching across labour markets. These effects, influenced by capital-skill complementarities, were detrimental to younger workers' wages while benefiting older ones.

Boeri et al. (2022), analysing firm-level data from private companies with over 15 employees between 2008 and 2014, identified a crowding-out effect, where retaining three additional older workers led to the reduction of two mid-aged worker positions. Though less severe for younger workers, the study still estimated that one in five retained older employees displaced a younger counterpart. Similarly, Bertoni and Brunello (2017), using data from the Italian Labour Force Survey (2004–2015), reported that increasing the number of senior workers by 1,000 led to a decline in employment among youth and prime-aged workers by 189 and 86, respectively—although senior employment concurrently rose by 149.

METHODOLOGY

The Estimating Model

The main objective of this analysis is to explore the nexus between an increase in the retirement age for older individuals in Malaysia and a reduction in employment opportunities for the youth. This concern lies at the core of the empirical analysis.

Guided by the framework developed by Munnell and Wu (2012a, 2012b), the following reduced-form log-linear model is employed to investigate the long-run relationship between older and younger workers:

$$\text{young}_{jt} = \alpha_0 + \beta_0 \text{old}_{jt} + \theta_k Z_{kt} + \epsilon_t \quad (1)$$

Where young_{jt} and old_{jt} denote the respective labour market outcomes (employment-related indicators) for younger (aged 15–24) and older (aged 55–64) individuals at time

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t, Z_{kt} is a vector of control variables comprising real GDP, foreign direct investment (FDI), and fertility rate, α_0, β_0, and θ_k are coefficients to be estimated, and ϵ_t is the stochastic error term.

To comprehensively examine the potential substitutability or complementarity between older and younger workers, the model is estimated using four distinct dependent variables:

$$\text{young\_emp}_t = \alpha_1 + \beta_1 \text{old\_emp}_t + \theta_k Z_{kt} + \varepsilon_t \quad (2)$$
$$\text{young\_emprate}_t = \alpha_2 + \beta_2 \text{old\_emprate}_t + \theta_k Z_{kt} + \mu_t \quad (3)$$
$$\text{young\_urate}_t = \alpha_3 + \beta_3 \text{old\_urate}_t + \theta_k Z_{kt} + \eta_t \quad (4)$$
$$\text{young\_lfpr}_t = \alpha_4 + \beta_4 \text{old\_lfpr}_t + \theta_k Z_{kt} + \omega_t \quad (5)$$

Where young_emp_t and old_emp_t denote the number of employed individuals in each age group, young_emprate_t and old_emprate_t refer to their respective employment rates, young_urate_t and old_urate_t represent unemployment rates, and young_lfpr_t and old_lfpr_t are the labour force participation rates. The important assumption of the error terms albeit ε_t, μ_t, η_t, and ω_t of being independent and follows normal distribution with zero mean and a constant variance.

The parameters of central interest are β_1, β_2, β_3, and β_4. If any of these parameters are negative and statistically significant, it implies a substitutive relationship between older and younger workers, supporting the notion of "crowding out" associated with the lump-of-labour hypothesis. Specifically, a negative β_1 in Equation (2) suggests that a marginal increase in senior workers' employment diminishes youth employment levels. A negative β_2 in Equation (3) would indicate that higher employment rates among older individuals reduce employment rates among younger individuals. In Equation (4), a negative β_3 implies that an increase in older workers' unemployment corresponds with a decrease in youth unemployment—an inverse relationship. Lastly, a negative β_4 in Equation (5) would mean that increased labour force participation by older workers leads to a reduction in the participation rate of the young.

Should any of these coefficients be negative and significant, it would substantiate the argument that older and younger individuals compete for a fixed set of job opportunities—aligning with the lump-of-labour fallacy. Conversely, positive and significant coefficients would suggest a complementary relationship among the two age groups.

Method of Estimations

To estimate Equations (2) through (5), we utilise the Ordinary Least Squares (OLS) technique with robust standard errors, adopting the Newey–West procedure (Newey & West, 1987). This approach offers reliable estimates even when both/either

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heteroskedasticity and/or autocorrelation are present.

Given that many of the variables in our analysis are likely to be non-stationary, there is a risk that conventional regression results may be spurious. To mitigate this, we test for cointegration between the variables. Specifically, we apply the standard (Engle & Granger, 1987) two-step cointegration procedure. In the first stage, we estimate Equation (2) using OLS and save the residuals. In the subsequent stage, we subject these residuals to a order of integration test. A rejection of the null hypothesis of a unit root would confirm the presence of cointegration. If cointegration is verified for Equations (2) to (5), it validates the use of OLS in capturing long-run relationships, ensuring that the estimates are efficient and the regression results are not spurious.

In addition to OLS, we adopt the Fully Modified Ordinary Least Squares (FMOLS) to estimate the long-run equations. FMOLS is particularly useful for addressing problems such as endogeneity, serial correlation, and non-normality in error terms, and is especially effective in small-sample contexts.

On top of that, we also apply Robust Regression, which is designed to address the issue of outliers in the data. According to Rousseeuw (1984), robust regression methods—particularly the M-estimator introduced by Huber (1964)—are well-suited for identifying and reducing the influence of outliers. Figure 5 illustrates the presence of outliers in several key variables, including Young_urate, Old_urate, and FDI, which are seen at the extremities of the boxplot whiskers. To handle these anomalies effectively, we include the robust regression approach in our analysis. As Barnett and Lewis (1994) note, outliers can significantly distort statistical inference by increasing error variance and biasing parameter estimates. Pérez et al. (2013) similarly highlight that outliers can undermine statistical power and violate assumptions of normality.

It is worth noting that a key limitation of OLS is its focus on estimating the conditional mean of the dependent variable. This assumption may mask important distributional variations. To address this, we apply Quantile Regression, introduced by Koenker and Bassett Jr (1978), which enables us to examine how explanatory variables influence different points (quantiles) of the conditional distribution of the dependent variable.

Quantile regression is defined as:

$$\text{young}_t = x_t'\beta_\tau + \mu_{\tau t} \quad 0<\tau<1 \tag{5}$$

$$\text{Quantile}_\tau(\text{young}_t|x_t) = x_t'\beta_\tau \tag{6}$$

where x_t' represents the vector of independent (explanatory) variables as previously defined, β_τ is the vector of quantile-specific coefficients associated with the τ-th percentile, $\mu_{\tau t}$ is the error term, and $\text{Quantile}_\tau(\text{young}_t|x_t)$ represents the τ-th conditional quantile of young_t given x_t, with $\tau \in (0,1)$.

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Estimating β_τ for various values of τ, the quantile regression indeed allows for variation in the impact of predictors across the distribution of the outcome variable. This technique captures a fuller picture of the relationship between dependent and explanatory variables than the mean-based OLS approach. The τ-th quantile regression estimates β_τ by solving the following optimisation problem:

$$\hat{\beta}(\tau) = \arg\min_{\beta}\left[\tau \sum_{\{young_t \geq x_i'\beta\}} |young_t - x_t'\beta| + (1-\tau) \sum_{\{young_t < x_t'\beta\}} |young_t - x_t'\beta|\right].$$

This method provides more robust estimates when the data exhibit skewness or contain outliers. In particular, the median regression occurs at τ=0.5, where equal weight is given to observations above and below the median.

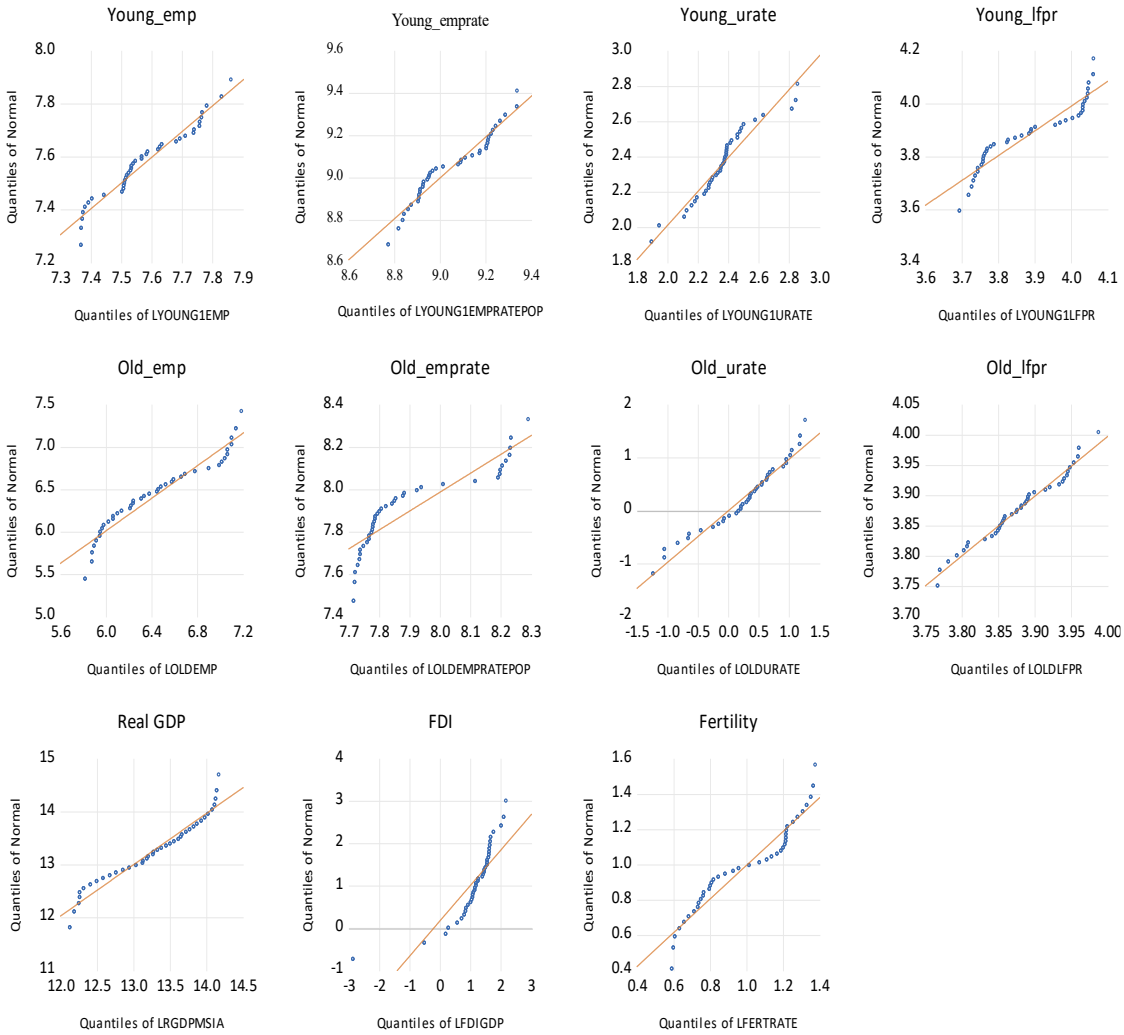

Figure 5: Q-Q plots for all series

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To assess the suitability of quantile regression in our analysis, we examined the distributional characteristics of all variables using quantile–quantile (Q–Q) plots, presented in Figure 6.

The plots indicate that the data do not align closely with a normal distribution. This observation is further supported by the results of the Jarque–Bera test (Table 1), which rejects the null hypothesis of normality for variables such as young_urate_t, old_emp_t, and old_emprate_t. While some variables show approximately normal behaviour, the overall deviation justifies the use of quantile regression as a complementary estimation method. This approach is particularly useful for capturing the nuanced relationships between young_t and its explanatory variables—especially the various forms old_t.

Data Sources

The dataset employed in this study spans the period from 1982 to 2021. Labour market indicators—including employment figures, unemployment rates, and labour force participation rates—were obtained from Department of Statistics Malaysia via https://www.dosm.gov.my/portal-main/time-series. The employment rate was derived as the number of employed persons per 100,000 of the population.

In addition, macroeconomic variables—namely real Gross Domestic Product (GDP), foreign direct investment (FDI), total population, and the total fertility rate—were sourced from the World Development Indicators (WDI) database via https://data.worldbank.org/indicator?tab=all. To ensure consistency and facilitate logarithmic transformation, all variables were converted into their natural logarithms prior to estimation. These transformed variables are used throughout the empirical analysis.

THE EMPIRICAL RESULTS

Descriptive Statistics and Correlation Matrix

Before estimating Equations (2) through (5), we begin by presenting the descriptive statistics for all variables included in the analysis. These statistics are reported in Table 1. On average, all variables exhibit positive values, indicating that the series generally trend upward over time.

Employment among younger individuals surpasses that of older individuals, with a mean employment level of 1,974.4 for the youth compared to 685.7 for the older group. Similarly, the mean employment rate is higher for younger workers (8,612.7) than for older workers (2,755.9).

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Table 1: Descriptive statistics

Series	Unit	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Obs
Young_emp	'000	1974.4	2594.6	1582.7	279.7	0.44	2.22	2.29	40
Young_emprate	person	8612.7	11369.1	6454.5	1411.9	0.34	1.79	3.20	40
Young_urate	%	10.85	17.38	6.64	2.30	1.23	5.09	17.42***	40
Young_lfpr	%	48.96	58.07	40.16	0.06	0.19	1.39	4.55	40
Old_emp	'000	685.7	1323.4	335.3	315.0	0.71	2.06	4.84*	40
Old_emprate	person	2755.9	3986.1	2243.2	569.6	0.99	2.31	7.38**	40
Old_urate	%	1.55	3.54	0.28	0.85	0.58	2.64	2.46	40
Old_lfpr	%	48.38	53.93	43.24	0.03	-0.02	2.27	0.89	40
RealGDP	RM mil	686542.6	1423952.0	184832.0	392006.1	0.43	1.96	3.04	40
FDI	%	3.80	8.76	0.06	1.86	0.53	3.54	2.38	40
Fertility	rate	2.77	3.96	1.80	0.70	0.15	1.54	3.70	40

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. Jarque-Bera is a test of non-normality of the series.

When examining unemployment rates, younger individuals experience higher joblessness, with a mean rate of 10.9%, compared to just 1.6% for older individuals. As for labour force participation, the average rate is 49.0% for the youth and 48.4% for older individuals, indicating a relatively balanced engagement in the labour market between the two age groups.

In terms of dispersion and distributional characteristics, several variables display notable standard deviations, kurtosis, and skewness. All eleven variables exhibit skewness, suggesting asymmetrical distributions. Among them, Young_urate and FDI show kurtosis values exceeding 3(three), indicating a leptokurtic distribution—i.e., longer or heavier tails on the right side of the distribution. These patterns suggest the presence of extreme values or outliers in the data.

Jarque–Bera(JB) test results further confirm that most series deviate from normality. The null hypothesis of normality is rejected for all variables except Young_urate, Old_emp, and Old_emprate. Given these findings, many of the series demonstrate non-normal distributions with significant skewness and kurtosis. To address these issues and stabilise variances, all variables were log-transformed prior to econometric estimation, in line with practices suggested by McKinney et al. (2009), Naidoo and Adamowicz (2001), and Ehrhardt-Martinez et al. (2002).

Table 2 provides the correlation matrix for the dependent variables—Young_emp, Young_emprate, Young_urate, and Young_lfpr—and the independent variables: Old_emp, Old_emprate, Old_urate, real GDP, FDI, and fertility rate. The correlation coefficients between matching indicators for older and younger individuals (e.g.

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Young_emp and Old_emp, Young_urate and Old_urate, Young_lfpr and Old_lfpr) are all positive, indicating a complementary relationship. However, for employment rates, the correlation between Young_emprate and Old_emprate is negative, suggesting a possible substitutive relationship in this specific context.

Looking at macroeconomic variables, Young_emp is positively correlated with real GDP and negatively correlated with fertility. Young_emprate, on the other hand, exhibits a negative relationship with GDP but positive associations with both FDI and fertility. Young_urate is negatively associated with FDI only. Meanwhile, Young_lfpr shows a negative correlation with GDP and positive correlations with FDI and fertility.

For older workers, the number of employed individuals Old_emp is positively correlated with real GDP and negatively associated with fertility rates. The employment rate for older individuals Old_emprate shows a negative relationship with GDP, but is positively linked to both FDI and fertility. Meanwhile, both the unemployment rate Old_urate and the labour force participation rate Old_lfpr exhibit negative correlations with GDP and positive correlations with fertility, indicating consistent patterns across these two indicators.

Table 2: Correlation matrix

Series	Old-emp	Old_emprate	Old_urate	Old_lfpr	Real GDP	FDI	Fertility
Young_emp	0.9131***				0.9106***	0.0753	-0.8529***
	(13.807)				(13.579)	(0.4655)	(-10.072)
Young_emprate		-0.6290***			-0.8978***	0.3209**	0.9194***
		(-4.9880)			(-12.564)	(2.0884)	(14.409)
Young_urate			0.3577**		-0.2236	-0.3733**	0.0437
			(2.3611)		(-1.4139)	(-2.4806)	(0.2697)
Young_lfpr				0.5160***	-0.8799***	0.2834*	0.8977***
				(3.7134)	(-11.418)	(1.8217)	(12.563)
Real GDP	0.9657***	-0.8978***	-0.6536***	-0.4446***	1	-0.1173	-0.9699***
	(22.943)	(-12.564)	(-5.3239)	(-3.0596)		(-0.7280)	(-24.554)
FDI	-0.1577	0.3209**	-0.0965	0.0405		1	0.1835
	(-0.9847)	(2.0884)	(-0.5976)	(0.2500)			(1.1506)
Fertility	-0.9760***	0.9194***	0.6089***	0.3832**			1
	(-27.603)	(14.409)	(4.7313)	(2.5578)			

Notes: Asterisk *** denotes statistically significant at 1% level. Figures in round bracket, (…) are t-statistics. All variables are in logarithm.

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Results of Unit Root Tests

Before conducting the regression analysis, it is essential to assess the stationarity properties of all-time series variables. This step is crucial because the presence of non-stationary data may produce misleading or spurious regression results. To this end, we employ three commonly used unit root tests:

1) Augmented Dickey–Fuller (ADF) test,
2) Phillips–Perron (PP) test, and
3) Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test.

Whilst ADF and PP tests operate under the null hypothesis that a unit root is present in the time series—that is, the series is non-stationary, the KPSS test assumes stationarity under the null hypothesis and tests whether the series deviates from that assumption.

The results of these unit root tests are summarised in Table 3. Across all three tests, the variables in their level forms generally fail to reject the null hypothesis of non-stationarity, indicating that they are not stationary at level. However, after first differencing, each variable becomes stationary, as evidenced by the rejection of the unit root null hypothesis in the ADF and PP tests, and the failure to reject the null of stationarity in the KPSS test. Thus, all series are integrated of order one, or I(1).

Table 3: Results of unit root tests

Variables	Level:		First-difference	
	Intercept	Intercept+trend	Intercept	Intercept+trend
Young_emp	-0.66 (0)	-2.59 (0)	-7.41***(0)	-7.30***(0)
Young_emprate	-1.75 (0)	-1.67 (0)	-7.06***(0)	-7.22***(0)
Young_urate	-2.26 (0)	-2.35 (0)	-5.04***(0)	-4.98***(0)
Young_lfpr	-2.14 (4)	0.38 (1)	-6.68***(0)	-6.83***(0)
Old_emp	0.38 (0)	-1.92 (0)	-5.69***(0)	-5.76***(0)
Old_emprate	0.54 (0)	-1.66 (0)	-5.30***(0)	-5.81***(0)
Old_urate	-0.81 (6)	-2.51 (7)	-4.26***(5)	-4.05***(5)
Old_lfpr	-2.12 (0)	-2.12 (0)	-6.70***(0)	-6.75***(0)
Real GDP	-1.88 (0)	-0.60 (0)	-4.89***(0)	-5.20***(0)
FDI	-2.59 (4)	-2.82 (4)	-6.98***(1)	-6.88***(1)
Fertility	-0.64 (1)	-3.11 (3)	-2.91* (0)	-2.84 (0)

Notes: Asterisk ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. Figures in round bracket, (…) are optimal lagged length. All variables are in logarithm. Using DF-GLS unit root test proposed by Elliott, Rothenberg & Stock (1992), the DF-GLS test statistic for Fertility in first-difference is -2.82**(0) with intercept, and -2.91*(0) with intercept and trend.

These findings justify the subsequent use of cointegration techniques, which are appropriate when variables are non-stationary in levels but stationary in first differences. The confirmation that all variables are I(1) ensures that long-run

relationships can be reliably estimated using cointegration-based regression models.

Results of Cointegration Tests

The regression results for Equations (2) through (5) are presented in Table 4. All estimations were carried out using Ordinary Least Squares (OLS) bundled with Newey–West robust standard errors (denoted as OLS-robust). For each model, we retained the residuals and applied unit root tests to determine their stationarity. If the Dickey–Fuller t-statistics for these residuals are significant, we reject the null hypothesis of a unit root, implying that the residuals are stationary. This, in turn, provides evidence of cointegration among the variables in the respective models. The presence of cointegration validates the OLS estimations, indicating that the long-run relationships are not spurious.

As shown in Table 4, the Dickey–Fuller t-statistics consistently reject the null hypothesis at the 1% significance level across all regressions, confirming cointegration. Thus, the estimated OLS-robust regressions can be interpreted as valid representations of the long-term equilibrium relationships among the studied variables.

Table 4: Results using OLS-robust for young workers

Independent variables	Depandent variables: Young_emp	Young_emprate	Young_urate	Young_lfpr
Constant	1.9194**	4.6263***	15.327***	1.8170
	(2.0839)	(4.4444)	(4.3857)	(1.2331)
Old_emp	0.4092***			
	(4.2203)			
Old_emprate		0.4532***		
		(6.6473)		
Old_urate			0.0614	
			(1.0714)	
Old_lfpr				0.4592**
				(2.3291)
Real GDP	0.1784***	0.0001	-0.8241***	-0.0082
	(4.2685)	(0.0040)	(-3.5635)	(-0.1278)
FDI	0.0266***	0.0273***	-0.0443*	0.0202**
	(3.7160)	(4.4945)	(-1.7528)	(2.0484)
Fertility	0.6382***	0.8010***	-2.0278***	0.3756**
	(3.5253)	(6.0936)	(-4.9022)	(2.2588)
$\widehat{R}^2$	0.930	0.939	0.575	0.840
DF	-3.83***	-4.21***	-4.08***	-1.63*

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. $\widehat{R}^2$ is adjusted R-square. DF denotes Dickey-Fuller unit root test on the residuals. Figures in round bracket, (…) are t-statistics.

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The results offer several important insights. First, in column (1), the coefficient on Old_emp is positive and statistically significant at the 1% level, indicating that a 1% increase in employment among older individuals is associated with a 0.41% rise in youth employment. Second, column (2) shows that the employment rate of senior individuals (Old_emprate) has a positive and statistically significant effect on the youth employment rate (Young_emprate), with an elasticity of 0.45%. These findings suggest a complementary relationship between older and younger workers in terms of employment and employment rates.

Third, the results in column (3) indicate that the unemployment rate of older individuals (Old_urate) does not have a statistically significant effect on youth unemployment, suggesting no link between the two. Finally, column (4) reveals a positive relationship between labour force participation among older individuals (Old_lfpr) and that of the youth (Young_lfpr), again supporting a complementary dynamic.

Table 5: Results using FMOLS for young workers

Independent variables	**Depandent variables:**			
	Young_emp	**Young_emprate**	**Young_urate**	**Young_lfpr**
Constant	2.1172***	4.5024***	14.206***	0.6738
	(2.7477)	(5.6898)	(5.7140)	(0.3179)
Old_emp	0.4197***			
	(5.6319)			
Old_emprate		0.5049***		
		(9.0905)		
Old_urate			0.0790	
			(1.6124)	
Old_lfpr				0.6515**
				(2.3292)
Real GDP	0.1594***	-0.0205	-0.7523***	0.0161
	(3.3059)	(-0.5508)	(-4.6844)	(0.1641)
FDI	0.0332***	0.0318***	-0.0669**	0.0526***
	(3.9571)	(4.5527)	(-2.3227)	(3.0073)
Fertility	0.6199***	0.7904***	-1.8675***	0.4289*
	(4.4723)	(7.4344)	(-4.9194)	(1.8021)
$\widehat{R}^2$	0.924	0.929	0.581	0.770

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. $\widehat{R}^2$ is adjusted R-square. Figures in round bracket, (…) are t-statistics. We used lag one period for pre-whitening.

To strengthen the validity of these OLS-robust findings, we re-estimate the long-run models using two additional techniques: Fully Modified Ordinary Least Squares (FMOLS) and Robust Regression. The FMOLS results, shown in Table 5, reinforce the earlier findings. All three variables—Old_emp, Old_emprate, and Old_lfpr—remain

positively and significantly associated with their youth counterparts. The estimated elasticities are even higher than those from the OLS-robust estimations: a 1% increase in older workers' employment, employment rate, and labour force participation rate leads to increases of 0.42%, 1.81%, and 0.65%, respectively, in the corresponding youth indicators. These results offer further confirmation of complementarity between the two groups. Again, the coefficient on Old_urate is statistically insignificant, indicating no discernible impact on youth unemployment.

Table 6 presents the results from the Robust Regression approach, which accounts for potential outliers—such as those observed during the 1985 commodity price downturn (see Figure 3). The estimated elasticities from this model show that a 1% increase in older workers' employment, employment rate, and labour force participation rate results in increases of 0.39%, 0.41%, and 0.47%, respectively, among younger workers. These findings are consistent with those obtained from OLS and FMOLS, further supporting the conclusion that older and younger workers function as complements in the labour market. Once again, no statistically significant relationship is found between the unemployment rates of older and younger individuals.

Table 6: Results using Robust regression for young workers

Independent variables	Depandent variables:			
	Young_emp	Young_emprate	Young_urate	Young_lfpr
Constant	1.5946**	4.4572***	18.801***	1.3380
	(2.1332)	(5.5850)	(11.128)	(1.2486)
Old_emp	0.3851***			
	(5.3328)			
Old_emprate		0.4423***		
		(8.0446)		
Old_urate			0.0028	
			(0.0857)	
Old_lfpr				0.4658***
				(3.2740)
Real GDP	0.2107***	0.0160	-1.0580***	0.0178
	(4.6191)	(0.4362)	(-9.7288)	(0.3635)
FDI	0.0242***	0.0268***	-0.0349*	0.0130
	(2.9652)	(3.8217)	(-1.7151)	(1.4703)
Fertility	0.6902***	0.8432***	-2.3802***	0.4857***
	(5.0922)	(7.8693)	(-9.0142)	(4.0533)
$\widehat{Rw}^2$	0.960	0.968	0.819	0.923

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. $\widehat{Rw}^2$ adjusted measure of goodness of fit in Robust regression. Figures in the slash bracket, /…/ are z-statistics.

We further explore the heterogeneity of these relationships across the distribution using

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Quantile Regression, with results displayed in Table 7. In Panel A, the employment of older workers significantly and positively affects youth employment at the 20th, 40th, 50th, and 60th percentiles. A 1% increase in older worker employment raises youth employment by between 0.30% and 0.44%. However, at the 80th percentile, the effect is no longer significant, suggesting that the complementarity diminishes at higher quantiles.

Panel B focuses on the employment rate. The relationship between the employment rate of older and younger workers remains consistently positive across quantiles: 0.47% at the 20th, 0.45% at the 40th, 0.44% at the 50th, 0.41% at the 60th, and 0.30% at the 80th. These patterns reinforce the conclusion that older workers do not displace their younger counterparts; rather, their employment appears to facilitate or coincide with higher employment among youth.

In Panel C, the unemployment rate of older individuals is found to have no significant impact on youth unemployment at any quantile, aligning with the findings from OLS, FMOLS, and Robust Regression.

Lastly, Panel D presents the quantile-specific effects of older workers' labour force participation on that of younger individuals. Significant positive effects are observed at the 20th and 40th percentiles (at the 1% level), and marginally significant effects at the 50th and 60th percentiles (at the 10% level). These results suggest that the positive influence of older individuals' participation on youth participation is stronger at the lower end of the distribution.

Taken together, the quantile regression results support the overall conclusion that senior and younger workers are more likely to be complements rather being substitutes in Malaysia's labour market.

Table 7: Results on Quantile Regressions for Young Workers

Dependent variable:	constant	Old_emp	Real GDP	FDI	Fertility
Panel A: $Young\_emp_t$					
Q(0.20)	2.0190	0.4355***	0.1557**	0.0191**	0.6494***
	(1.7389)	(6.1346)	(2.1692)	(2.2811)	(3.2176)
Q(0.40)	1.4074	0.4130***	0.2085***	0.0245**	0.7195***
	(1.3183)	(4.4413)	(3.7271)	(2.5552)	(3.6064)
Q(0.50)	1.4552	0.4010***	0.2114***	0.0259***	0.7163***
	(1.4181)	(4.2627)	(4.2689)	(2.9644)	(3.6400)
Q(0.60)	2.0687	0.3011**	0.2246***	0.0310***	0.5727**
	(1.5241)	(2.1019)	(4.7255)	(3.3988)	(2.0546)
Q(0.80)	2.9270***	0.1992	0.2241***	0.0327***	0.3890
	(2.6216)	(1.4973)	(5.7590)	(4.2124)	(1.6393)

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Table 7: Results on Quantile Regressions for Young Workers (cont…)

Dependent variable:	constant	Old_emprate	Real GDP	FDI	Fertility
Panel B: Young_emprate$_t$					
Q(0.20)	4.9261***	0.4681***	-0.0292	0.0222***	0.7538***
	(4.0913)	(7.4747)	(-0.4801)	(2.9322)	(4.3521)
Q(0.40)	4.7596***	0.4473***	-0.0052	0.0276***	0.7781***
	(3.3189)	(5.5796)	(-0.0810)	(3.0331)	(3.8991)
Q(0.50)	4.4924***	0.4424***	0.0138	0.0278***	0.8363***
	(3.4866)	(5.8493)	(0.2462)	(3.4323)	(4.7343)
Q(0.60)	4.3471***	0.4097***	0.0412	0.0299***	0.8814***
	(3.2654)	(4.8894)	(0.7532)	(3.5956)	(4.8946)
Q(0.80)	6.1532***	0.2989**	-0.0090	0.0271	0.6405***
	(3.8315)	(2.5374)	(-0.1687)	(1.5029)	(3.1458)
Dependent variable:	**constant**	**Old_urate**	**Real GDP**	**FDI**	**Fertility**
Panel C: Young_urate$_t$					
Q(0.20)	16.262***	0.0507	-0.8898***	-0.0236	-2.1752***
	(5.2660)	(1.0552)	(-4.4303)	(-1.3358)	(-5.0901)
Q(0.40)	17.538***	0.0235	-0.9687***	-0.0489	-2.3356***
	(5.1396)	(0.5434)	(-4.3820)	(-0.9853)	(-4.8546)
Q(0.50)	18.342***	0.0140	-1.0207***	-0.0408	-2.4372***
	(5.2787)	(0.3306)	(-4.5340)	(-1.0445)	(-4.9375)
Q(0.60)	17.212***	0.0120	-0.9484***	-0.0409	-2.2532***
Dependent variable:	**constant**	**Old_emp**	**Real GDP**	**FDI**	**Fertility**
	(4.8394)	(0.2887)	(-4.1144)	(-1.0165)	(-4.4733)
Q(0.80)	18.564***	-0.0096	-1.0436***	-0.0350	-2.2303***
	(3.5236)	(-0.2648)	(-3.0257)	(-0.3180)	(-2.7817)
Dependent variable:	**constant**	**Old_lfpr**	**Real GDP**	**FDI**	**Fertility**
Panel D: Young_lfpr$_t$					
Q(0.20)	-1.5214	0.7976***	0.4116***	0.0062	0.5173***
	(-1.5898)	(6.2467)	(9.9631)	(0.9030)	(5.0917)
Q(0.40)	-1.8366	0.8681***	0.4174***	0.0112	0.4973***
	(-1.4833)	(5.4233)	(8.2548)	(1.3115)	(3.9229)
Q(0.50)	-0.0342	0.6498*	0.3571***	0.0212	0.3400
	(-0.0121)	(1.8296)	(3.5959)	(1.5257)	(1.3410)
Q(0.60)	1.4241	0.4422*	0.3158***	0.0299***	0.2333
	(0.6982)	(1.7149)	(4.2118)	(2.9367)	(1.2193)
Q(0.80)	2.6793*	0.2538	0.2835***	0.0242	0.1566
	(1.8882)	(1.1625)	(5.8601)	(1.3891)	(1.2645)

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively. Figures in round bracket, (…) are t-statistics.

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CONCLUSION

This study set out to investigate a key question: Does the extension of the retirement age for older workers reduce employment opportunities for younger individuals in Malaysia? Using annual time series data from 1982 to 2021, we examined the relationship between labour market outcomes for older (ages 55–64) and younger (ages 15–24) cohorts across four key indicators—employment, employment rate, unemployment rate, and labour force participation.

Our empirical analysis produced consistent and robust evidence across a range of estimation techniques, including OLS with Newey–West standard errors, Fully Modified OLS (FMOLS), Robust Regression, and Quantile Regression. The results indicate that increases in employment, employment rates, and labour force participation among older individuals are positively and significantly associated with the corresponding outcomes for younger workers. This suggests a complementary relationship between the two age groups, rather than one of substitution.

Interestingly, across all estimation methods, the unemployment rate of older individuals showed no statistically significant effect on youth unemployment. These findings contradict the so-called "lump-of-labour" fallacy, which posits that there is a fixed number of jobs in the economy and that older individuals working longer displace younger workers. Our results support the dynamic job creation hypothesis, whereby both older and younger workers can jointly benefit from overall labour market expansion.

The quantile regression analysis adds further nuance by revealing that the complementary relationship is more pronounced at the lower to middle quantiles of the conditional distribution. For instance, the impact of older workers' employment and participation is strongest for younger individuals in the lower employment or participation quantiles. However, these effects tend to diminish and become statistically insignificant at higher quantiles, indicating potential heterogeneity across different segments of the youth labour market.

From a policy perspective, these findings carry important implications. Firstly, efforts to raise the retirement age or encourage longer working lives for older Malaysians are unlikely to adversely affect employment prospects for younger individuals. On the contrary, such policies could foster intergenerational complementarities, where the experience and economic activity of older workers enhance demand and productivity, ultimately creating more opportunities across the board.

Secondly, the evidence suggests that labour market reforms should not be based on the assumption that older and younger workers compete for the same jobs. Instead, policies should focus on enhancing labour market flexibility, investing in education and skill

development, and promoting inclusive economic growth that benefits all age groups.

Finally, given the projected demographic shifts and ageing population in Malaysia, the findings underscore the importance of integrated employment policies that take into account intergenerational dynamics. Rather than viewing older workers as barriers to youth employment, they should be considered valuable contributors to labour market resilience and economic vitality.

In conclusion, the empirical results strongly indicate that delaying retirement does not harm, and may in fact support, youth employment in Malaysia. These insights offer valuable guidance for policymakers as they navigate demographic transitions and labour market reforms in the decades ahead.

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