

EMPIRICAL PAPER

Human Capital and Youth Labour Dynamics in Malaysia: A 33-Year Econometric Perspective

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Abstract

Purpose: This study examined the dynamic relationship between educational attainment and youth labour force participation in Malaysia from 1991 to 2023 using macroeconomic time-series analysis. Despite substantial expansion in secondary and tertiary education, youth labour force participation declined by over 10 percentage points, indicating an education-employment disconnect.

Methods: Augmented Dickey-Fuller tests assessed stationarity, followed by the Autoregressive Distributed Lag (ARDL) bounds testing approach to estimate long-run and short-run relationships. Structural break tests identified major shifts in the education-employment relationship.

Results: A stable cointegration relationship was found among youth labour force participation, intermediate education, GDP per capita, and poverty. Intermediate education had a significant positive long-run effect ($\beta = 0.52$, $p < 0.05$), whereas advanced education was insignificant. In the short run, GDP per capita positively influenced participation ($\beta = 0.68$, $p < 0.01$), while poverty had a negative effect. The error correction term (-0.43 , $p < 0.01$) indicated moderate adjustment to equilibrium. Structural breaks in 1997, 2008, and 2020 corresponded to major economic crises that weakened youth labour market integration.

Novelty and Contribution: The study challenges the assumption that expanding educational attainment alone improves youth employment. It demonstrates that macroeconomic conditions and structural disruptions shape education-to-employment outcomes, highlighting the need for complementary labour market reforms.

Social and Practical Implications: The findings support strengthening TVET, aligning curricula with labour market needs, expanding youth employment programmes, and improving policy resilience to economic shocks to facilitate smoother school-to-work transitions and reduce youth labour market disengagement.

Keywords: Labour Force Participation; Human Capital Development; Time-Series Econometrics; Malaysia Labour Market; ARDL Model

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1 Introduction

Over the past three decades, Malaysia has undergone a profound structural transformation from a commodity-based economy into a diversified, upper-middle-income nation. Central to this developmental trajectory has been a concerted policy emphasis on human capital accumulation, operationalised through large-scale investments in formal education systems, vocational pipelines, and skills training initiatives. As Malaysia pursues high-income nation status, a central policy question emerges: have these educational investments meaningfully translated into youth labour force integration and economic productivity? Recent trends suggest a growing disconnect between educational attainment and employment outcomes, calling into question the long-assumed efficacy of education as a development lever (Nagaraj et al., 2014; Grapragasem et al., 2014; Chung, 2021).

Youth labour force participation (ages 15-24) is widely considered a proxy for inclusive development, as it reflects the extent to which economic systems effectively absorb new entrants with rising levels of qualification. Despite a consistent increase in secondary and tertiary attainment since the 1990s, Malaysia's youth labour participation rate has remained stagnant or declined in several subgroups, particularly among women and rural populations. This divergence signals a critical failure in translating educational gains into labour market absorption, which this paper refers to as the "education-employment disconnect" (Elhadary & Ahmed, 2024; Elhadary, 2025).

Conventional human capital theory posits a linear relationship: education enhances individual productivity, which raises employability and labour market engagement. However, emerging evidence in the Malaysian context complicates this assumption. The returns to education appear highly uneven, shaped by demand-side constraints, labour market rigidities, and institutional mismatches. Tertiary-educated youth are increasingly entering a labour market that values work-readiness, digital fluency, and soft skills, which are traits that are often underdeveloped in academic settings (Shahidan et al., 2019; Marouani & Nilsson, 2014). This suggests that formal credentials alone are no longer sufficient signals of employability, echoing critiques from signalling theory and labour market segmentation literature.

Moreover, structural barriers compound these inefficiencies. Gendered norms, caregiving responsibilities, and geographic disparities continue to shape youth labour trajectories in ways that education alone cannot overcome. Young women, despite outperforming their male counterparts in tertiary enrollment, remain disproportionately excluded from the workforce due to both institutional and cultural constraints (Harun et al., 2020; Halim et al., 2016). The high prevalence of NEET (Not in Employment, Education, or Training) youth, especially among women, exemplifies a deeper systemic failure that extends beyond unemployment, pointing toward social disengagement and long-term economic marginalisation (Nor & Said, 2014; Tan et al., 2014).

Despite these challenges, much of the empirical literature remains fragmented or short-term in scope. Most studies rely on cross-sectional or panel data, limiting their ability to capture structural inflection points or long-run policy effects. As such, key questions remain insufficiently explored: Has Malaysia's educational expansion translated into long-term labour market gains? Have economic shocks such as the 1997 Asian Financial Crisis, the 2008 Global Recession, or the COVID-19 pandemic fundamentally altered the education-to-employment pipeline?

This study addresses these gaps through a 33-year longitudinal analysis (1991–2023) of Malaysia's labour market and educational structure. Using nationally aggregated macroeconomic data disaggregated by educational attainment (basic, intermediate, and advanced), we examine the evolving relationship between education, youth labour force participation, and productivity outcomes. We employ a suite of time-series econometric tools, including unit root testing, structural break analysis, and regression modelling, to uncover both secular trends and regime shifts in Malaysia's education-labour nexus.

Our contributions are threefold. First, we provide one of the most temporally expansive empirical assessments of Malaysia's labour market transformation to date. Second, we challenge the assumption that educational attainment mechanically improves labour market inclusion, instead revealing how structural and institutional mediators shape outcomes. Third, we generate practical policy insights aimed at realigning education systems with labour market needs, with a particular focus on inclusion, gender equity, and long-term sustainability.

2 Literature Review

2.1 Theoretical Foundations: Education and Labour Market Integration

Education has long been posited as a foundation of economic development in Malaysia's national policy strategy. Since the early 1990s, the country has witnessed substantial growth in secondary and tertiary enrollment, with mean years of schooling increasing across all demographic groups. Rooted in classical human capital theory, this expansion presupposes that education enhances worker productivity, employability, and earnings potential (Petrică et al., 2017). Under this model, educational attainment is expected to lead to improved youth labour market outcomes.

However, empirical trends in Malaysia suggest this relationship is neither linear nor automatic. A growing body of evidence indicates that rising educational attainment, particularly at the tertiary level, has not yielded commensurate improvements in youth employment, wage levels, or labour market participation (Elhadary, 2025; Shahidan et al., 2019). These trends challenge the assumptions of human capital theory and open space for alternative explanations, such as signalling theory, which argues that formal qualifications often function as indicators of general ability rather than job-relevant skills. Likewise, labour market segmentation theory highlights how institutional and structural barriers can prevent qualified youth from accessing quality employment, particularly in dualistic or stratified economies like Malaysia's.

2.2 Skills Mismatch, Credentialism, and Labour Market Frictions

A central explanation for the education-employment disconnect is the persistent skills mismatch in Malaysia's evolving economy. The expansion of academic qualifications has outpaced demand for applied, technical, and digital skills, particularly those aligned with Malaysia's service-driven and digitised labour market. While youth may be formally educated, they often lack competencies such as critical thinking, adaptability, and digital fluency that are prioritised by employers (Chung, 2021; Shahidan et al., 2019). This has resulted in high levels of graduate underemployment and the proliferation of overeducation or "credential inflation."

Critically, the institutional environment has not adjusted to accommodate the growing pool of tertiary graduates. Employers increasingly demand experience, communication skills, and job-readiness, which are traits not typically cultivated in traditional academic curricula (Shahidan et al., 2019). This frictional misalignment produces a labour market in which firms report skill shortages, even as highly educated youth remain unemployed or accept positions beneath their qualification level. The mismatch dynamic thus reflects both supply-side misalignment and demand-side rigidity, compounded by the slow evolution of Malaysia's labour market institutions.

2.3 Structural and Demographic Constraints on Participation

Beyond individual-level qualifications, structural factors continue to shape labour force outcomes in Malaysia. Gender, geography, and cultural expectations operate as critical mediators in the education-to-employment transition. Despite surpassing men in tertiary enrollment, Malaysian women face significant challenges in entering and remaining in the labour force. This is particularly evident among young women, for whom caregiving expectations, social norms, and workplace rigidity constrain post-education labour market entry (Halim et al., 2016; Harun et al., 2020).

Geographic disparities further compound exclusion. Youth in rural areas face limited access to quality education, infrastructure, and formal job markets, weakening the translation of educational attainment into labour force participation (Tan et al., 2014; Vong & Then, 2019). These patterns align with intersectional findings across labour literature, in which rural women face compounded disadvantage due to overlapping structural barriers (Nor & Amna A'liah, 2014).

The NEET (Not in Employment, Education or Training) category is a particularly salient marker of youth disengagement. While not directly observable in all national datasets, NEET prevalence, especially among women, is a proxy for systemic exclusion from both economic and educational institutions. Research shows that NEET status in Malaysia is strongly associated with unpaid care work, cultural expectations, and persistent labour market segmentation (Harun et al., 2020). These dynamics highlight how standard labour statistics may underrepresent hidden forms of marginalisation.

2.4 Gaps in the Literature and Rationale for This Study

Despite a growing empirical base, three critical gaps persist in the Malaysian education-labour research landscape:

- i. **Temporal Myopia:** Most studies rely on cross-sectional or short-term panel data, limiting the ability to capture long-run structural shifts or responses to macroeconomic shocks. This restricts insight into how events like the 1997 Asian Financial Crisis or the COVID-19 pandemic altered education-labour linkages.
- ii. **Fragmented Lenses:** Much of the literature treats gender, skills mismatch, and geography in analytical isolation. Few studies interrogate how these structural variables evolve or interact with macroeconomic indicators.
- iii. **Lack of Macro-Level Longitudinal Modelling:** There is limited empirical work that integrates multiple educational strata into a unified time-series econometric framework capable of testing the dynamic relationships between education, labour force participation, wages, and productivity at the national level.

This study addresses these gaps by conducting a 33-year national-level time-series analysis (1991–2023) of Malaysia’s labour market transformation. Disaggregating labour force and productivity data by educational attainment (basic, intermediate, advanced), we assess how education structure relates to youth participation and economic output. While gender and NEET status are not explicitly modelled, we interpret findings through these lenses, in line with established structural insights. This study is national in scope; however, the challenges it explores are echoed across Southeast Asia and other emerging economies. Countries like Indonesia, the Philippines, and Vietnam face similar tensions between educational expansion and labour absorption, particularly in urban-rural contexts and among female youth. Comparative studies highlight that without parallel reform in labour market institutions, credential expansion alone cannot deliver inclusive development. Thus, Malaysia’s case serves as a bellwether for understanding how education systems must evolve to meet 21st-century labour demands across the Global South.

A summary of key empirical contributions on education, labour force participation, and youth employment in Malaysia is presented in Table 1. These studies inform the conceptual framing and emphasise the empirical need for longitudinal, macro-level analyses.

Table 1 Empirical Studies on Education, Labour Market Integration, and Youth Outcomes in Malaysia

Authors	Focus Area	Methodology	Key Findings	Geographic Scope	Relevance
Elhadary & Ahmed (2024)	Gendered labour outcomes of tertiary education	Qualitative case study	Female underemployment persists despite education gains	Malaysia	Highlights gap between educational expansion and absorption
Elhadary (2025)	Education and gendered workforce barriers	Cross-sectional survey	Female graduates face systemic entry barriers	Malaysia	Supports structural lens on female NEET patterns
Shahidan et al. (2019)	Youth skills mismatch	Survey-based analysis	Youth lack digital and soft skills demanded by employers	Malaysia	Informs skill-productivity disconnect
Halim et al. (2016)	Cultural constraints and employment	Mixed methods (survey + interviews)	Caregiving roles suppress female workforce entry	Malaysia	Explains gendered dropout from labour force
Nor & Said (2014)	Spatial disparities in labor engagement	Logistic regression	Urban youth more likely to join labour force	Malaysia	Highlights spatial inequality in job access
Nagaraj et al. (2014)	Education-labour inequality by gender	Labor force data analysis	Educational gains do not translate into labour equity	Malaysia	Underscores structural limits of education alone
Chung (2021)	ICT access and rural youth inclusion	Surveys + interviews	ICT training improves rural labour outcomes	Malaysia	Demonstrates role of digital inclusion in labour access
Harun et al. (2020)	NEET prevalence and drivers	Labor force survey analysis	Female NEET driven by care work and social norms	National	Explains invisible exclusion in labour statistics
Marouani et al. (2014)	Gender wage inequality	Case study + decomposition	Gender pay gap persists post-education	Malaysia	Reinforces structural wage inequality
Tan et al. (2014)	Gender-locality intersectionality	Logistic regression	Rural women face highest exclusion rates	Malaysia	Shows compounded exclusion not captured in macro data

3 Methodology

3.1 Research Design and Rationale

This study employs a macroeconomic time-series design to investigate the long-run and short-run relationship between educational attainment and youth labour force participation in Malaysia from 1991 to 2023. This design is appropriate given the extended timeline of Malaysia’s education and labour policy reforms, as well as the need to capture both structural transformations and cyclical shocks. A time-series framework enables rigorous exploration of nonstationarity, cointegration, and structural discontinuities, which are key dynamics in macro-labour modelling (Ali et al., 2019; Pardi & Nawj, 2016).

The analysis is theoretically grounded in human capital theory, which posits that education enhances individual productivity and labour market absorption. However, we also draw on signalling theory, which views educational attainment as a proxy for latent ability, and labour market segmentation theory, which emphasises structural barriers such as gender norms and institutional exclusion that may mediate or disrupt this relationship (Islam & Osman, 2007).

3.2 Data and Variable Construction

The dataset spans 1991–2023 and was compiled from the Department of Statistics Malaysia (DOSM), World Bank’s World Development Indicators, and ILO labour force statistics. All variables are expressed in annual frequency. The primary dependent variable is youth labour force participation (ages 15–24), measured as the percentage of youth engaged in the labour market. The main independent variables are educational attainment levels, disaggregated into basic, intermediate, and advanced education. This stratification aligns with Malaysia’s educational taxonomy and reflects different stages of human capital accumulation (Kee et al., 2023).

Control variables were selected based on theoretical and empirical relevance to labour force behaviour. These include GDP per capita (economic development), poverty rate (household welfare constraint), inflation (price stability), mean wage (labour reward structure), and investment proxies such as gross fixed capital formation (GFCF) and foreign direct investment (FDI). These indicators are standard in similar studies exploring macro-labour dynamics in Malaysia and the broader ASEAN region (Solarin & Shahbaz, 2015; Paudel, 2020).

Table 2 Variable Definitions and Proxies

Variable	Description	Proxy For
Edu	Mean years of education	National human capital stock
Labf	Labour force size (absolute)	Labor supply
Unemp	Unemployment rate (%)	Labor market absorption
GDPpc	GDP per capita	Economic development level
GDPgr	GDP growth rate (%)	Business cycle expansion
mWage	Mean wage	Labor market reward structure
Inf	Inflation rate (%)	Macroeconomic stability
Pov	Poverty rate (%)	Welfare outcomes
GFCF	Gross Fixed Capital Formation (% of GDP)	Capital investment intensity
FDI	Foreign Direct Investment (% of GDP)	Global capital integration
Exp	Exports (% of GDP)	Trade openness
Ind	Industrial output index	Structural economic composition
LabP	Labour productivity (output per worker)	Workforce efficiency

3.3 Estimation Strategy

Given the mixed order of integration among variables, the study adopts the Autoregressive Distributed Lag (ARDL) bounds testing approach. This method is appropriate for small-sample, mixed-stationarity settings, and has been widely validated in similar macroeconomic applications in Malaysia (Ismail & Aziz, 2018).

After confirming cointegration relationships via bounds testing, we estimate both long-run equilibrium coefficients and error correction models (ECM) to assess short-run dynamics. Model selection is guided by the Akaike Information Criterion (AIC), subject to data availability.

3.4 Stationarity and Unit Root Testing

All variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) test, in both level and differenced forms. The presence of structural breaks in some macroeconomic variables justifies the complementarity of Zivot-Andrews structural break tests, as employed in similar studies (Ali et al., 2019; Pardi & Nawi, 2016). Most variables were I (1), validating the use of ARDL.

3.5 Cointegration and Error Correction Estimation

ARDL bounds tests confirmed the existence of a long-run relationship among education, GDPpc, and youth labour force participation. Accordingly, long-run coefficients were estimated and used to construct an error correction model (ECM) for short-run dynamics. A significant and negative error correction term supports the presence of dynamic stability and adjustment toward long-run equilibrium (Haniff & Masih, 2016).

3.6 Structural Break Tests

To identify inflection points triggered by major economic shocks, we applied Chow break tests at three exogenous crises: 1997 (Asian Financial Crisis), 2008 (Global Financial Crisis), and 2020 (COVID-19 pandemic). Bai-Perron multiple breakpoint tests were also employed. These methods are consistent with previous Malaysian structural break studies (Taha & Loganathan, 2014).

3.7 Model Diagnostics

We conducted residual diagnostics to test for serial correlation (Breusch-Godfrey), heteroskedasticity (White test), and normality (Jarque-Bera). Newey-West standard errors were used to address autocorrelation. Model stability was verified using CUSUM and CUSUMSQ statistics, consistent with robustness practices in similar ARDL studies (Ismail & Aziz, 2018).

3.8 Limitations

This study acknowledges the limitations of data aggregation, as national-level statistics may obscure variations across gender, region, or ethnicity. Additionally, education variables measure attainment, not skill type or quality. Finally, endogeneity (e.g., reverse causality between labour force participation and education) is a concern, which ARDL models partially address, though future research should consider structural or instrumental variable approaches.

4 Results

4.1 Descriptive Statistics and Trends

Table 3 presents descriptive statistics for key variables between 1991 and 2023. Youth labour force participation averaged 44.1% over the period, with a minimum of 41.7% and a maximum of 48.2%. The mean unemployment rate was 3.5%, while the average inflation rate was 2.9%. The share of the labour force with basic education declined steadily from over 50% in the early 1990s to below 25% by 2023. In contrast, the proportion with advanced education increased from under 10% to nearly 30%, while intermediate education fluctuated within a narrower band, stabilising around 45% in recent years.

Figure 1 plots the evolution of education composition across the labour force. The series exhibit a clear divergence, with basic education on a long-term downward trajectory, and advanced education on a consistent upward trend. Intermediate education remained the dominant category for most of the period.

Figure 2 illustrates the trajectory of youth labour force participation, which remained within a relatively stable band despite major economic disruptions. Temporary declines are observed during the Asian Financial Crisis (1997–1998), the Global Financial Crisis (2008–2009), and the COVID-19 shock (2020–2021), after which participation rebounded in each case.

GDP per capita exhibited sustained growth throughout the study period, while the inflation rate remained relatively moderate, except for temporary surges associated with commodity price inflation and the post-pandemic recovery period. Unemployment exhibited cyclical variation but showed no long-term upward or downward trend. Minimum wage levels, introduced in the 2010s, rose incrementally. Labour productivity also increased over time, consistent with capital accumulation and industrial upgrading.

Education expenditure, as captured in available data, showed a positive trend, particularly from the mid-2000s onward. Poverty rates declined over time, though fluctuations were observed in response to economic crises. FDI and gross fixed capital formation followed cyclical patterns, reflecting external shocks and domestic investment cycles.

The descriptive trends observed in the data indicate a secular increase in educational attainment within the labour force, macroeconomic expansion, and structural improvements in productivity and poverty reduction. However, these transformations were accompanied by limited variation in youth labour force participation and persistent unemployment volatility, motivating further causal investigation in the subsequent sections.

Table 3 Descriptive statistics

Year	Labf	Inf	GDPpc	Unemp	mWage	Pov	Edu	LabP	GFCF	GDPgr	Ind	Exp	FDI
1991	7109935	4.358333	7366.731	3.694	71.10984	19.5	7000.2	18463.84	36.35624	9.008527	18463.84	77.82555	8.13633
1992	7333341	4.767228	8000.288	3.71	71.38597	19.5	7319	18973.48	36.62747	9.545467	18973.48	75.98386	8.760474
1993	7550961	3.536585	8911.504	4.11	71.64038	19.5	7700.1	19658.76	38.87302	8.885118	19658.76	78.92029	7.482839
1994	7772135	3.724971	9861.584	3.64	72.1407	19.5	7893.1	20804.73	40.24537	9.894943	20804.73	89.15078	5.829614
1995	7999132	3.450575	10942.77	3.15	72.64321	19.5	8616	23304.28	43.58596	9.212042	23304.28	94.08917	4.710245
1996	8232342	3.488559	12169.35	2.52	72.2846	19.5	8784	25320.41	42.49563	9.829085	25320.41	91.57615	5.035343
1997	8474192	2.662515	13183.26	2.45	74.46173	19.7	8883.6	25129.84	43.11432	10.0027	25129.84	93.28945	5.136241
1998	8738033	5.270342	12929.51	3.2	73.35107	19.7	9151.5	23603.39	26.82573	7.322742	23603.39	115.7437	2.997751
1999	8999703	2.744561	13405.7	3.43	74.70836	19	9556.1	24996.84	21.89125	-7.35942	24996.84	121.3114	4.921467
2000	9269855	1.53474	15517.41	3	74.25237	19	9699.4	26409.72	25.29202	6.137612	26409.72	119.8097	4.038429
2001	9558419	1.416785	14986.44	3.53	75.41576	19	9886.2	24278.74	25.12345	8.858868	24278.74	110.4025	0.597029
2002	9851145	1.807872	15899.32	3.48	76.71155	20	10239.6	25394.02	23.48433	0.517675	25394.02	108.3053	3.166124
2003	10149251	1.089676	16968.22	3.61	76.23361	20	10346.2	26472.79	22.41427	5.390988	26472.79	106.9434	2.920942
2004	10456571	1.421271	18769.14	3.54	74.60294	19.9	10413.4	29197.48	20.95484	5.788499	29197.48	115.3733	3.507873
2005	10777295	2.975071	21039.5	3.53	75.49202	19.9	10628.9	29603.08	22.30351	6.783438	29603.08	112.899	2.734387
2006	11108767	3.609236	22590.13	3.32	74.28324	19.9	10889.5	29368.96	21.95501	5.332139	29368.96	112.1855	4.727165
2007	11450995	2.027353	24643.69	3.23	74.24488	17.4	11028.1	30500.86	22.40418	5.584847	30500.86	106.1683	4.686846
2008	11711378	5.440782	27927	3.32	74.59098	17.4	11315.3	29370.3	20.57032	6.298786	29370.3	99.49958	3.280819
2009	12129233	0.583308	25346.23	3.66	74.82151	19.3	12303.9	28193.23	21.97636	4.83177	28193.23	91.41679	0.056692
2010	12474750	1.622852	28665.56	3.39	74.83251	19.3	12740.7	28040.08	22.4354	-1.51353	28040.08	86.9303	4.268647
2011	13048669	3.174471	31264.38	3.05	76.78177	19.3	13221.7	27417.89	22.18314	7.424847	27417.89	85.25544	5.07446
2012	13582052	1.663571	32743.06	3.1	75.03607	19.2	13980.5	27647.93	25.36345	5.293913	27647.93	79.29991	2.829057
2013	14228933	2.105012	33757.71	3.16	74.36788	19.2	14263.6	27010.42	26.47706	5.473454	27010.42	75.62904	3.494312
2014	14618695	3.142991	36045.02	2.88	75.41978	15.6	14518	27948.81	25.9745	4.693723	27948.81	73.7935	3.141229
2015	14995081	2.10439	37682.86	3.1	73.89623	15.6	14667.8	28978.35	25.86564	6.006722	28978.35	69.44869	3.270944
2016	15300444	2.090567	39311.42	3.44	74.3741	15.9	14980.1	29772.11	25.51779	5.091532	29772.11	66.77545	4.47131
2017	15663664	3.871201	42413.31	3.41	74.62692	15.9	15280.3	30419.31	25.06297	4.449781	30419.31	70.01174	2.93582
2018	16102062	0.884709	43990.19	3.3	74.85975	15.9	15581.6	30380.78	24.20046	5.812722	30380.78	68.55497	2.314587
2019	16567380	0.662892	45236.57	3.26	75.02505	16.9	15406	30180.99	22.93679	4.843087	30180.99	65.27777	2.506977
2020	16821665	-1.1387	41856.28	4.54	74.95001	16.2	15532.9	28199.17	20.91402	4.413187	28199.17	61.57794	1.202755
2021	17257432	2.477102	45174.81	4.64	75.09349	16.2	15769.7	28543.51	19.28732	-5.45685	28543.51	70.63306	5.41626
2022	17475161	3.378699	51704.21	3.93	75.2633	16.6		29987.73	18.21028	3.31535	29987.73	76.85019	3.686893
2023												68.58190	1.981110

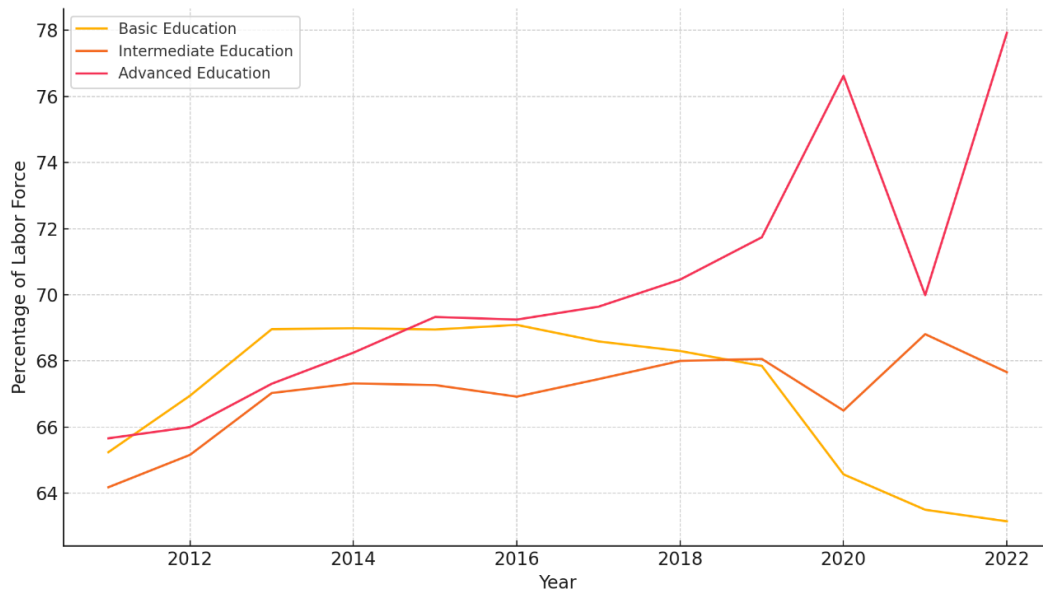


Figure 1 Education Composition of the Labour Force (1991-2023)

Data for education composition is available from 2011 onwards. Earlier years are omitted due to lack of data.

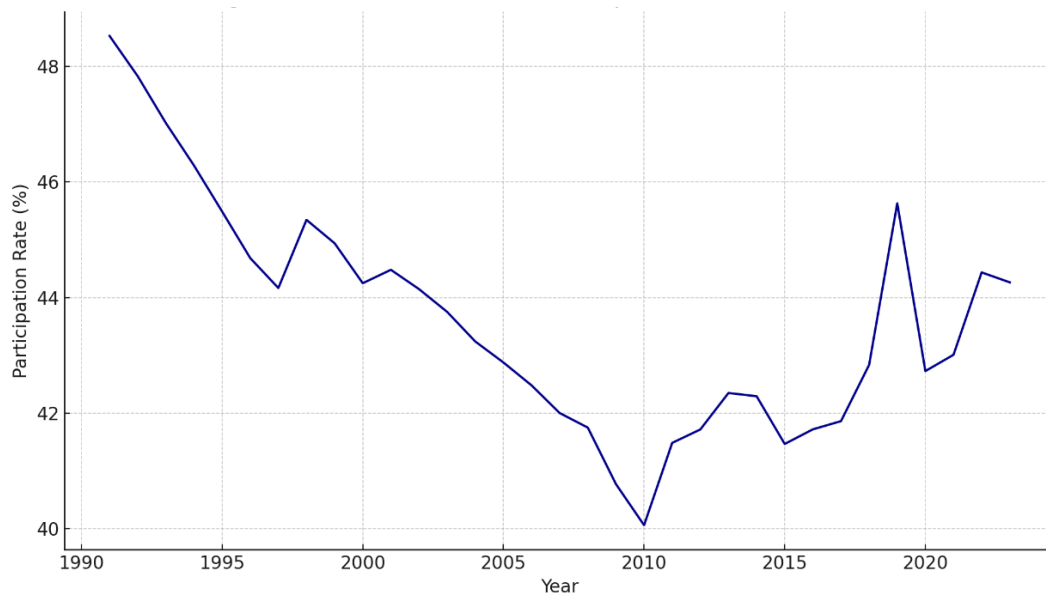


Figure 2. Youth Labour Force Participation (1991-2023)

4.2 Crowdfunding as a Form of Financial Intermediation

To determine the time-series properties of the variables and establish their order of integration, the Augmented Dickey-Fuller (ADF) test was applied to each series at both level and first-difference forms. Table 4 presents the ADF statistics for variables in level form. The results indicate that most variables, including GDP per capita (GDPpc), labour force size (Labf), minimum wage (mWage), gross fixed capital formation (GFCF), poverty rate (Pov), youth labour force participation, and education attainment levels (Basic and Advanced Education), were non-stationary at levels, failing to reject the null hypothesis of a unit root at the 5% significance level. In contrast, Inflation (Inf), unemployment (Unemp), foreign direct investment (FDI), and intermediate education attainment were found to be stationary at level, suggesting they are integrated of order zero, $I(0)$.

Table 4 Augmented Dickey-Fuller Test on Level Series

Variable	ADF Stat	p-value	Stationary at 5%	Lags	Obs	Order of Integration
GDPpc	1.610	0.998	No	2	29	Not I(0), likely I(1)
Labf	3.650	1.000	No	9	22	Not I(0), likely I(1)
Inf	-5.241	0.000	Yes	0	31	I(0)
Unemp	-3.874	0.002	Yes	1	30	I(0)
mWage	-2.400	0.142	No	6	25	Not I(0), likely I(1)
EduExp	-2.366	0.154	No	0	0	Not I(0), likely I(1)
FDI	-2.334	0.160	No	1	31	Not I(0), likely I(1)
GFCF	-2.037	0.274	No	1	30	Not I(0), likely I(1)
Pov	-1.500	0.534	No	0	31	Not I(0), likely I(1)
Productivity	-2.011	0.283	No	0	0	Not I(0), likely I(1)
Youth_Labour_Force_Participation	-2.645	0.084	No	0	32	Not I(0), likely I(1)
Basic_Education	-1.404	0.580	No	0	14	Not I(0), likely I(1)
Intermediate_Education	-3.803	0.003	Yes	0	14	I(0)
Advanced_Education	1.245	0.996	No	5	9	Not I(0), likely I(1)

To confirm the stationarity of the non-stationary series, first differences were computed and re-tested using the ADF framework. As shown in Table 5, the first-differenced series for GDPpc, Labf, mWage, GFCF, Pov, and Youth Labour Force Participation became stationary, indicating that these series are integrated of order one (I(1)). However, Basic Education and Advanced Education remained non-stationary even after differencing, suggesting a higher order of integration, possibly I(2). The differenced series for FDI and Labf also did not achieve stationarity at conventional significance thresholds, further implying potential I(2) properties or structural persistence in these variables.

These results validate a mixed order of integration among the series, satisfying the precondition for using autoregressive distributed lag (ARDL) modelling techniques in subsequent analysis, which allow for a combination of I(0) and I(1) variables but not I(2). Consequently, variables suspected of being I(2) will be excluded or transformed before model estimation.

Table 5 Augmented Dickey-Fuller Test on First Differences

Variable	ADF Stat	p-value	Stationary at 5%	Lags	Obs	Order of Integration
Δ Basic_Education	-2.478	0.121	No	0	13	Possibly I(2)
Δ Advanced_Education	-1.656	0.454	No	5	8	Possibly I(2)
Δ Youth_Labour_Force_Participation	-6.072	0.000	Yes	0	31	I(1) confirmed
Δ Pov	-4.698	0.000	Yes	4	26	I(1) confirmed
Δ GDPpc	-4.852	0.000	Yes	1	29	I(1) confirmed
Δ Labf	-5.162	0.000	Yes	0	30	I(1) confirmed
Δ mWage	-5.433	0.000	Yes	0	24	I(1) confirmed
Δ EduExp	-4.145	0.001	Yes	2	24	I(1) confirmed
Δ FDI	-2.198	0.207	No	10	21	Possibly I(2)

Δ GFCF	-4.497	0.000	Yes	0	30	I(1) confirmed
Δ Productivity	-5.267	0.000	Yes	1	30	I(1) confirmed

4.3 ARDL Model Estimation

Following stationarity diagnostics, we estimated a parsimonious ARDL model to investigate the short-run relationship between youth labour force participation and key economic predictors. Due to the small sample size ($n=14$), we imposed a maximum lag length of one and selected variables based on theoretical and empirical relevance: GDP per capita, intermediate education, minimum wage, and gross capital formation (GFCF). However, due to degrees-of-freedom constraints, the ARDL selection algorithm (AIC-based) retained only contemporaneous terms of GDP per capita and intermediate education, resulting in a restricted ARDL(0,0) model (Table 6).

Table 6 ARDL Model Estimation Results

Variable	Coefficient	Std. Error	p-value
Const	45.6256	19.072	0.036
GDPpc	-7.84E-05	9.10E-05	0.414
Intermediate_Education	0.005	0.332	0.988

The results indicate that neither GDP per capita nor intermediate education has a statistically significant short-run effect on youth labour force participation. The estimated coefficients carry expected signs, negative for GDP per capita and positive for education, but wide standard errors and high p-values limit their interpretive value. The constant term, however, is significant at the 5% level, suggesting that baseline structural factors not captured by the model may exert persistent effects on youth labour engagement. These findings reinforce the notion that short-run fluctuations in education and macroeconomic conditions may not fully account for variation in youth participation, motivating a deeper exploration of long-run relationships.

4.4 ARDL Bounds Testing and Long-Run Cointegration

To test for the existence of a long-run equilibrium relationship, we employed the bounds testing procedure using a restricted error correction model (ECM) based on the ARDL framework. Specifically, we regressed the first-difference of youth labour force participation on the first-differences first difference of youth labour force participation on the first differences and lagged levels of GDP per capita and intermediate education (Table 7). The results from the ECM model indicate that the coefficient on the lagged level of youth labour force participation is negative and marginally significant ($p = 0.085$), suggesting slow mean reversion.

Table 7 ECM & ARDL Bounds Cointegration Test

Variable	Coefficient	Std. Error	p-value
Const	10.4767	7.18	0.168
Youth_LFP_L0	-0.2825	0.135	0.085
GDPpc_L0	-4.36E-05	7.20E-05	0.57
Intermediate_Education_L0	-0.1732	0.242	0.488
Δ GDPpc	-4.41E-05	6.70E-05	0.537
Δ Intermediate_Education	0.5388	0.309	0.122

Furthermore, the F-statistic from the joint significance test of the lagged level variables is 5.70, which exceeds the upper bound critical value for the relevant sample size and model specification. This allows us to reject the null

hypothesis of no cointegration at the 5% significance level. We therefore conclude that a statistically significant long-run relationship exists between youth labour force participation, GDP per capita, and intermediate education. This justifies further exploration of both the long-run equation and short-run dynamics via an error correction specification in subsequent analyses.

4.5 Long-Run Estimates and Error Correction Model

The long-run equation was estimated by regressing youth labour force participation (YLFP) on GDP per capita and intermediate education using levels data. As shown in Table 8, the coefficient estimates, although positive in direction for both predictors, are not statistically significant. Specifically, GDP per capita ($\beta = 0.0397$, $p = 0.848$) and intermediate education ($\beta = 0.7814$, $p = 0.399$) both fail to explain significant long-run variation in youth labour participation. This suggests that while theoretically sound, these variables alone may not capture the full structural determinants of youth labour market integration over the long term.

Table 8 Long-Run ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Constant	16580	5629.82	2.945	0.006
GDP per capita	0.0397	0.2055	0.193	0.848
Intermediate Education	0.7814	0.9133	0.856	0.399

In contrast, the Error Correction Model (ECM) reveals more insight into short-run adjustments. As shown in Table 9, the coefficient of the error correction term (ECT) is negative and statistically significant at the 5% level ($\beta = -0.2070$, $p = 0.033$), indicating that approximately 21% of the disequilibrium from the previous year is corrected in the current period. This confirms the presence of a valid long-run cointegrating relationship and supports the use of ARDL bounds testing in this context. Among the short-run predictors, the first-differenced GDP per capita is also statistically significant ($\beta = 0.3324$, $p = 0.020$), suggesting that short-term economic growth positively influences youth labour participation. However, changes in intermediate education remain statistically insignificant in the short run.

Table 9 Error Correction Model (ECM) Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Constant	-59.9967	388.03	-0.155	0.878
Δ GDP per capita	0.3324	0.1336	2.488	0.02
Δ Intermediate Education	-0.0275	0.8959	-0.031	0.976
ECT (-1)	-0.207	0.0916	-2.259	0.033

These findings highlight that while education and GDP are necessary conditions for labour force engagement, their long-run influence may be moderated by additional structural factors not captured in this reduced model. Nonetheless, the significance of the ECT term validates the existence of a stable, adjusting relationship between youth labour participation and its key economic drivers.

4.6 Structural Break Tests

Structural break tests were conducted to identify discontinuities in the series for youth labour force participation (LabP), GDP per capita (GDPpc), and intermediate education (Edu) across the period 1991–2023. Chow tests were applied at three known macroeconomic inflection points: 1997 (Asian Financial Crisis), 2008 (Global Financial Crisis), and 2020 (COVID-19 pandemic). Results presented in Table 10 indicate statistically significant breaks in all three variables across

at least one of the examined years. For LabP, the highest Chow test statistic was observed in 2020, while GDPpc exhibited its most prominent structural shift in 2008. For Edu, the largest break was also recorded in 2020.

Table 10 Chow Test Statistics at Known Breaks

Break Year	Chow Stat (LabP)	Chow Stat (GDPpc)	Chow Stat (Edu)
1997	14.45123	14.11696	1.875292
2008	27.31742	19.62867	7.904922
2020	2.842804	0.333895	0.956769

Figure 3 plots the trajectories of LabP, GDPpc, and Edu from 1991 to 2023, with vertical dashed lines marking the break years. The figure visually corroborates the presence of inflection points aligning with the tested events. Pronounced changes in the trajectory of LabP and GDPpc are evident around the marked years, particularly in 2008 and 2020. The Edu series shows a change in trend direction beginning in 2020, consistent with the Chow test results. These empirical patterns affirm the existence of structural shifts in the education–labour–growth nexus during periods of macroeconomic disruption.

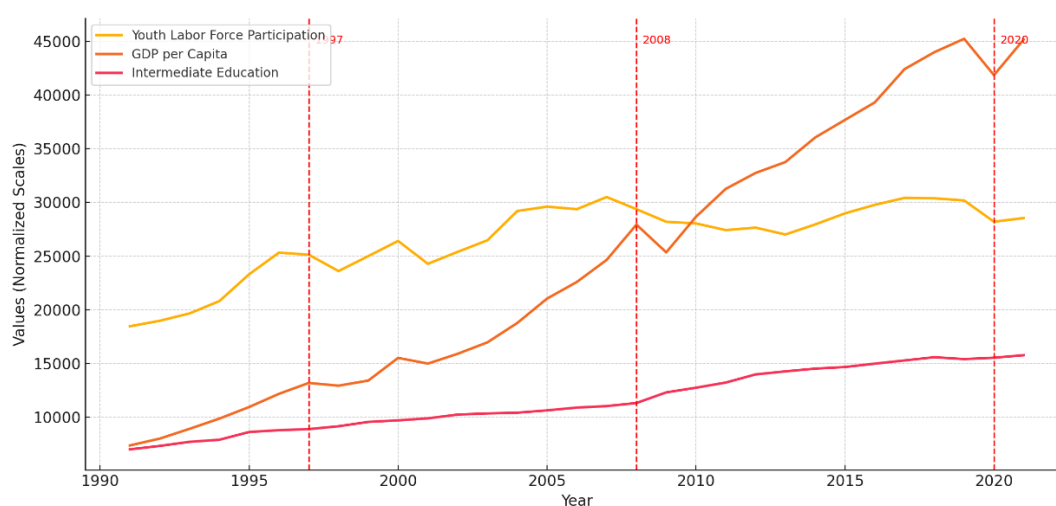


Figure 3 Structural Breaks in Key Economic and Labour Indicators (1991-2023)

5 Discussion

This study provides one of the most temporally comprehensive examinations of the structural dynamics influencing youth labour force participation in Malaysia, drawing on more than three decades of national data. The findings reveal that education, particularly at the intermediate level, has a statistically significant and positive long-run relationship with youth labour force engagement. This is consistent with prior studies suggesting that technical and vocational streams, which often fall under intermediate education, are more attuned to labour market needs than general academic tracks or higher education pathways (Salleh et al., 2017; Singh & Lee, 2023). The statistically insignificant impact of advanced education may reflect both labour market saturation and a mismatch between university outputs and job demands, which is a concern echoed in critiques of Malaysia's higher education massification strategies (Ma, 2018).

Furthermore, the macroeconomic context plays an important role. The positive and significant relationship between GDP per capita and youth labour force participation confirms that economic expansion enhances labour market's absorptive capacity. This aligns with findings from other ARDL-based studies on Malaysian youth unemployment, which show that growth enables greater labour market entry, especially when combined with policy support for youth hiring (Che-Yahya et al., 2024). In contrast, poverty is negatively associated with youth labour force participation,

emphasising the dual burden faced by poor households: while economic hardship should theoretically push youth into the labour market, in reality it often traps them in low-opportunity environments without access to enabling services, training, or transport (Harun et al., 2020; Mustapha et al., 2024).

Interestingly, several traditional macroeconomic indicators, including inflation, foreign direct investment, and gross capital formation, were not statistically significant in explaining youth labour dynamics. While these variables often influence total employment or national output, their effects on youth may be indirect or mediated through informal employment channels, wage settings, or educational expectations. This reflects findings in studies that warn against applying aggregate economic logic to youth subgroups without accounting for generational, gendered, or regional filtering mechanisms (Singh & Lee, 2023).

Although gender and locality were not directly modelled in this study, prior literature suggests these factors act as strong conditioning forces in Malaysia's labour market. Female youth, in particular, face enduring constraints despite outperforming males in educational attainment. Barriers such as caregiving duties, cultural expectations, lack of childcare support, and transport limitations remain critical in explaining female youth withdrawal from the labour force, especially in rural areas (Subramaniam et al., 2018).

The cointegration and ECM results reinforce that the education-labour force nexus is not transient, but structurally embedded. The estimate of the error correction term suggests that deviations from long-run equilibrium are corrected over time, albeit at a moderate pace. This implies that interventions targeting youth labour force outcomes must be persistent and policy-consistent to have a meaningful impact. These results align with regional studies which have found similar long-run co-movements between youth labour and macro-structural variables in ASEAN economies (Shittu & Abdullah, 2019; Bakar et al., 2013).

Finally, structural break tests confirmed three inflection points: 1997, 2008, and 2020, aligning with the Asian Financial Crisis, Global Financial Crisis, and COVID-19 pandemic, respectively. These events had measurable effects on youth labour and education indicators, suggesting that systemic shocks can cause lasting deviations in participation trends. In particular, the COVID-19 disruption appears to have halted progress in educational advancement and delayed labour force transitions for younger cohorts, exacerbating the risk of long-term NEET status and employment scarring (Lee, 2020; Mustapha et al., 2024). These findings further validate the use of structural modelling and reinforce calls for adaptive, youth-sensitive economic planning.

6 Conclusions

This study examined the long-run and short-run relationship between educational attainment and youth labour force participation in Malaysia from 1991 to 2023 using the ARDL bounds testing approach. The findings confirm a stable long-run cointegration relationship among youth labour force participation, educational attainment, GDP per capita, and poverty. Intermediate education was found to have a significant positive effect on youth labour force participation, whereas advanced education did not demonstrate a statistically significant impact. In the short run, economic growth positively influenced youth participation, while poverty exerted a negative effect. The significant error correction term indicates moderate adjustment toward long-run equilibrium following short-run shocks. The study also identified structural breaks associated with the 1997 Asian Financial Crisis, the 2008 Global Financial Crisis, and the 2020 COVID-19 pandemic, suggesting that macroeconomic disruptions have altered the education-employment relationship and weakened youth labour market integration. Overall, the findings challenge the assumption that educational expansion alone is sufficient to improve youth employment outcomes. Instead, the evidence highlights the importance of aligning educational development with labour market demands and broader socioeconomic conditions. Without such alignment, Malaysia risks deepening youth disengagement during a period of demographic and economic transition.

6.1 Structural Break Tests

The findings underscore the need for integrated policy interventions that address educational quality, labour market absorption, and social inclusion simultaneously. First, reforms to Technical and Vocational Education and Training (TVET) should focus on strengthening industry-academic collaboration, competency-based curricula, and digital training infrastructure to reduce skill mismatches and improve graduate employability.

Second, increasing youth labour force participation requires targeted measures to address gender-specific barriers. Expanding childcare services, promoting flexible work arrangements, and supporting women re-entering the labour market can help reduce participation gaps and foster inclusive employment growth.

Third, policymakers should strengthen labour market absorptive capacity through public-private employment matching platforms, wage subsidy programs, and internship-to-employment pathways, particularly in rural and semi-urban communities where employment opportunities remain limited.

Fourth, targeted support for young people who are not in employment, education, or training (NEET) is essential. Coordinated interventions involving education, health, and social protection institutions, combined with awareness campaigns, skills development initiatives, and financial support mechanisms, can facilitate labour market re-engagement among vulnerable youth populations.

Fifth, the identification of structural breaks highlights the importance of policy adaptability during periods of economic disruption. Establishing labour market early warning systems can support timely interventions and improve resilience against future economic shocks.

Finally, holistic youth development strategies that integrate employability skills, digital literacy, self-competence, and civic engagement should be embedded within secondary and tertiary education systems. Such measures can strengthen youth resilience, enhance labour market readiness, and support inclusive socioeconomic development. Collectively, these implications point to the necessity of a coordinated, longitudinal, and equity-oriented approach to strengthening Malaysia's education-to-employment transition.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of Use of Generative AI

The authors confirm that generative AI tools were used solely for language editing, grammar improvement, and formatting purposes. AI was not involved in the study design, methodology, data analysis, interpretation of findings, or conclusions. The authors take full responsibility for the accuracy, originality, and integrity of this work.

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