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Assessing the Impact of Institutional Quality on the Relationship Between Education Expenditure and Service Sector Growth: Evidence from Quantile Regression Models

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Abstract

This study investigates the role of institutional quality and its influence on the relationship between government expenditure on education and the growth of the service sector in Malaysia.

Using time series data from 1984 to 2020, the study applies a quantile regression model at three quantiles: 25%, 50%, and 75%. The findings reveal that government spending on education (GXE) has a negative and statistically significant effect on service sector growth (SSG) across all quantiles, in both the interaction and non-interaction models. This suggests that inefficiencies in the allocation and targeting of government expenditure may be hindering sectoral growth. In contrast, the interaction between government spending on education and institutional quality (INTC GXE&IQI) consistently produces a positive effect on service sector growth across all quantiles. This positive interaction implies that the impact of education spending on service sector growth is contingent upon the quality of institutions. When government expenditure aligns with strong institutional frameworks, it can effectively stimulate growth within the service sector. This can be attributed to the role of well-functio

ning institutions in maximizing the efficiency of fund utilization for intended purposes. Therefore, policies focused on enhancing institutional quality—such as improving bureaucracy, increasing transparency, and combating corruption—could improve the effectiveness of education spending, ultimately supporting the sustainable long-term growth of the service sector.

Keywords: Government expenditure, service sector, Quantile regression, Institutional quality

1. Introduction

Empirical evidence suggests that the service sector increasingly becomes the largest contributor to output and employment as economies develop. Historically, economic growth has driven a structural shift from agriculture to manufacturing and, ultimately, to services. The sector plays a vital role in sustainable economic transformation, particularly in an era of globalization, advancements in information technology, and reduced travel costs. Research highlights the potential of modern services to drive growth in developing nations (Amirapu & Subramanian, 2015; Khanna, 2016; Yusuf, 2015). Ghani and O'Connell (2014) argue that services are dynamic growth accelerators, significantly contributing to employment and economic expansion across income levels. Moreover, the service sector enhances productivity in other industries, particularly manufacturing (Khanna, 2016). Yusuf (2015) further emphasizes that business profitability increasingly depends on service quality and innovation, making service-industry integration crucial for long-term economic returns.

In Malaysia, the service sector has long been a key driver of economic growth, with its contribution to GDP rising from 42% in 1987 to 54% in 2020. As part of its goal to achieve high-income status by 2024, the Malaysian government has identified the sector as central to economic development in the Eleventh Malaysia Plan (11th MP—2016 to 2020). Effective policymaking is essential to realizing this ambition, with fiscal policy playing a crucial role in shaping the service market through government revenue and expenditure management. Expansionary fiscal policies stimulate sectoral growth by increasing government spending and boosting demand, while contractionary measures can hinder this progress. Additionally, in line with endogenous growth theory, investments in education enhance human capital, improve workforce skills, and accelerate technological progress through research and development, all of which are vital for sustained growth in the service sector (Lucas, 1988; Romer, 1986).

Despite the government's focus on the service sector and increased investment in education, sectoral growth has declined over time. According to World Bank (2022), growth rates fell from 18.5% in 1990 to 9.3% in 1996, 7.5% in 2000, 6.8% in 2014, and 6.2% in 2019. This trend signals a critical challenge for Malaysia's economy, necessitating a deeper analysis of factors affecting service sector performance. Institutional quality has emerged as a key determinant of economic growth, with extensive research emphasizing its role in fostering development (Hamma, 2018; Rodrik et al., 2004; Saad et al., 2009). Strengthening institutional frameworks is therefore imperative for ensuring the sector's long-term sustainability.

Institutions play a fundamental role in economic development by reducing uncertainty, protecting property rights, enforcing contracts, and mitigating corruption and bureaucratic inefficiencies (North, 1990). Effective institutions lower transaction costs, encourage resource specialization, and promote economic activity, while weak institutions create uncertainty and hinder growth (Ali et al., 2020; Borrmann et al., 2006; Lee et al., 2008). Furthermore, Shera et al. (2014) found a strong positive relationship between economic growth and institutional efficiency, particularly in governance and bureaucracy. Naseer (2019) also demonstrated that corruption significantly undermines economic growth. In Malaysia, corruption remains a major concern. The Corruption Perceptions Index (CPI) by Transparency International

reported a decline in Malaysia's score to 47 points in 2021, marking the second consecutive year of deterioration (TIM, 2024). This decline underscores persistent governance challenges and the urgent need for institutional reforms.

This study contributes to the literature by examining the role of institutional quality in moderating the relationship between government expenditure on education and service sector growth. Malaysia's National Development Plan and Vision 2020 highlight education's critical role in enhancing human capital and transitioning the country to a high-income economy. This research focuses on education spending as a driver of long-term service sector growth while emphasizing the significance of institutional quality. Employing a quantile regression model, this study provides a nuanced analysis by estimating relationships at different points of the distribution rather than relying solely on mean estimates. This approach enhances precision, particularly in cases of non-normal data distributions, and reveals patterns that conventional regression models may overlook (Buhai, 2004; Koenker & Hallock, 2001).

The study is structured as follows: Section 2 reviews the relevant literature, establishing theoretical and empirical foundations. Section 3 details the methodologies and estimation techniques. Section 4 presents the dataset and discusses empirical findings. Finally, Section 5 summarizes key conclusions and explores policy implications. This structured approach ensures clarity and logical progression throughout the research.

2. Literature Review

The emergence of endogenous growth theory, pioneered by Lucas (1988) and Romer (1986), significantly reshaped perspectives on the role of government in economic development. This model highlights the endogenous nature of growth rates, emphasizing that long-term economic expansion is influenced by internal factors rather than solely external forces. A key insight of the theory is the role of government expenditure on services, particularly education, as a catalyst for self-sustaining economic growth. Public investment in education functions as a "learning-by-doing" mechanism, enhancing human capital and expanding the productive capacity of the economy. Lucas (1988) argues that investments in education strengthen the economy's resource base, thereby increasing overall output. If the returns to education do not diminish over time due to non-decreasing returns to scale in replicable production factors, education spending can serve as a primary driver of sustained economic growth.

Several studies have explored the impact of sector-specific government expenditures—such as education, health, and military spending—on economic growth. Alam et al. (2022) examined the relationship between public expenditure and economic growth in Saudi Arabia from 1985 to 2018 using the Autoregressive Distributed Lag (ARDL) model. Their findings suggest that while education spending positively contributes to long-term economic growth, overall public expenditure and health spending exhibit a negative effect. Similarly, research has investigated how the sources of public expenditure financing influence economic outcomes. Chen et al. (2020) analyzed public spending in Vanuatu (1981–2016) and found that when financed through taxation, government expenditure negatively affects long-term economic growth. However, when alternative funding sources are used, public spending has a positive impact. In Zimbabwe, Mazorodze (2018) observed that government expenditure significantly influences

economic growth, with investment spending exerting a greater impact than consumption spending.

Recent studies have increasingly focused on the role of governance in shaping the relationship between government spending and economic growth. Nguyen and Bui (2022) investigated this relationship across 16 Asian countries between 2002 and 2019, employing the Generalized Method of Moments (GMM) approach. Their findings indicate that corruption weakens the positive effects of public spending, ultimately hindering economic growth. In the Malaysian context, Govindaraju et al. (2011) conducted an empirical analysis using the ARDL approach to test Keynesian theory and Wagner's law concerning public expenditure and economic growth. Their results support both hypotheses, demonstrating that government spending contributes to real economic growth. However, findings by Tan et al. (2020), based on ARDL analysis covering Malaysia, Singapore, and Thailand from 1980 to 2017, suggest a more complex relationship. While government expenditure negatively impacted economic growth in Malaysia and Singapore, it had a positive effect in Thailand.

Regarding the service sector, a study by Babatunde (2018) investigated the relationship between public spending and the service sector by employing a weighted least squares analysis of Nigeria's public expenditure from 1980 to 2016. The study found that government spending positively influenced the service sector, emphasizing its crucial role in driving sectoral performance while also highlighting variations across different service subsectors. Similarly, Sapuan and Sanusi (2013) examined the impact of government expenditure on social services in Malaysia from 1975 to 2011 using the Autoregressive Distributed Lag (ARDL) model. Their findings indicated that increased public spending significantly enhanced social services, contributing to sustainable economic growth. Conversely, Abiodun and Dada (2013) analyzed the effects of government expenditure on service consumption and economic growth in Nigeria using the Structural Vector Autoregression (SVAR) model. Their results suggested that government spending had a negative impact on the service sector in both the short and long term.

The service sector is the largest contributor to Malaysia's economy, accounting for over 54% of the country's GDP. However, research on this sector remains limited, as most prior studies have examined overall economic growth rather than sector-specific dynamics. To address this gap, the present study focuses on the role of education spending in fostering long-term sustainable growth, distinguishing itself from previous research that primarily analyzed total public expenditure. Additionally, this study provides a more precise and comprehensive analysis by examining the service sector specifically, while also considering the influence of institutional quality on the relationship between education spending and sectoral growth. Furthermore, advanced analytical techniques, including quantile regression, are employed to segment the study sample into three distinct periods, enabling a more detailed and accurate assessment of these relationships.

3. Method

3.1 Model Specification

This study examines the impact of government expenditure on education on the growth of the service sector by adopting a model based on the works of Attari and Javed (2013), Cieślik and Goczek (2018) and Ghose and Das (2013).The model is specified as follows:

$$Y_t = \beta_0 + \beta_1 GXE_t + \beta_2 X_t + \varepsilon_t \quad (1)$$

where Y represents the dependent variable for each service subsector, GXE denotes government expenditure on education as the key independent variable, X is a vector of control variables affecting service sector growth, εt is the error term, and t represents the time index. The control variables incorporated in the model include trade openness, population growth, inflation rate, and gross fixed capital formation.

Beyond these factors, institutional quality plays a crucial role in shaping the effects of government expenditure (Cieślik & Goczek, 2018). Empirical research suggests that weak institutional quality can hinder economic growth by obstructing both private and public sector investment, thereby restricting essential financial flows (Hwang, 2002; Mauro, 1996; Mo, 2001). To account for this dynamic, this study incorporates an interaction term between government expenditure on education and institutional quality, following the methodology proposed by Ai and Norton (2003) and Brambor et al. (2006). This approach allows for an analysis of how changes in institutional quality influence the effectiveness of education spending over time.

To measure institutional quality, this study integrates five Political Risk Services (PRS) International Country Risk Guide (ICRG) indicators, as outlined by Knack and Keefer (1995) and Demetriades and Law (2006). These indicators include: (i) Government Stability, (ii) Investment Profile, (iii) Rule of Law, (iv) Corruption in Government, and (v) Bureaucratic Quality. The first two indicators are scored on a scale of 0 to 12, while the remaining three are rated from 0 to 6. To ensure consistency, all indicators are rescaled to a standardized 0–10 range, following the methodology of by Demetriades and Law (2006). These five components are then aggregated into a comprehensive institutional quality index, with higher values indicating stronger institutional quality. Improved institutional quality is expected to enhance the effectiveness of government spending, whereas weaker institutions may diminish its impact.

The extended model incorporating institutional quality is specified as follows:

$$SSG_t = \beta_0 + \beta_1 GXE_{t-1} + \beta_2 IQI_t + \beta_3 (GXE*IQI)_t + \beta_4 TO_t + \beta_5 POP + \beta_6 INF_t + \beta_7 GFCF_t + \varepsilon_t \quad (2)$$

Where SSG represents the dependent variable for the service sector, GXE is government expenditure on education, IQI is the institutional quality index, TO denotes trade openness, POP is population growth, INF represents the inflation rate, and GFCF captures gross fixed capital formation (Gruneberg & Folwell, 2013; Saleem et al., 2013).

The marginal effect of government expenditure on education on the service sector is derived by taking the partial derivative of SSG with respect to GXE:

$$\frac{\partial SS_t}{\partial Gxe_t} = \beta_1 + \beta_3 IQI \quad (3)$$

3.2 Data and Sample

This study employs annual data spanning the period from 1984 to 2020. The dataset is compiled from multiple sources, with key variables obtained from the World Development Indicators (WDI) provided by the World Bank. The analysis focuses on examining the role of institutional quality in moderating the relationship between government expenditure on education and the growth of Malaysia's service sector.

Table 1. Presents a summary of the variables used in this study, along with their respective measurements and data sources

Variable	Measurement	Data Source
Service sector (SSG)	value added (% of GDP)	World Development Indicators (WDI), World Bank
Government Expenditure on Education (GXE)	GXE, total (% of government expenditure)	World Development Indicators (WDI), World Bank
Trade openness (TO)	Trade (% of GDP)	World Development Indicators (WDI), World Bank
Inflation rate (INF)	Inflation, Consumer prices (annual %)	World Development Indicators (WDI), World Bank
Population growth (POP)	Annual % increase in Population	World Development Indicators (WDI), World Bank
Gross Fixed Capital Formation (GFCF)	Gross Fixed Capital Formation (% of GDP)	World Development Indicators (WDI), World Bank
Institutional quality index (IQI)	Standardizing the scales of the five factors on a scale (0 -10)	International Country Risk Guide (ICRG)

3.3 Method of Estimation: Dynamic Quantile Regression Model

Traditional regression techniques, such as Ordinary Least Squares (OLS), may be inadequate for analyzing certain datasets, particularly when key statistical assumptions are violated or when the variance structure varies significantly. These limitations can compromise the accuracy and reliability of estimated coefficients. As noted by Osborne (2019), in such cases, conventional methods may fail to provide precise and dependable coefficient estimates. To address these challenges, quantile regression emerges as a more robust alternative. John et al. (2009) highlights that quantile regression accounts for data heterogeneity and distributional characteristics, making it a more flexible analytical tool. Unlike traditional methods, quantile regression does not impose assumptions on the distribution of error terms, enhancing its

adaptability and reliability, as emphasized by Belaïd et al. (2020).

Originally introduced by Koenker and Bassett (1978) and later refined by Koenker and Hallock (2001), quantile regression offers significant advantages in statistical modeling. One of its key strengths is that it does not require economic variables to conform to a normal distribution. Instead of focusing solely on the mean, this method examines multiple conditional quantiles of the dependent variable, such as the 25th, 50th (median), and 75th percentiles, as demonstrated in studies by Palma et al. (2020), Sirin and Yilmaz (2020), and Xu and Lin (2020). This feature enables a more comprehensive analysis by capturing the impact of independent variables across different points in the outcome variable's distribution, rather than restricting the interpretation to its average value. Consequently, researchers gain deeper and more nuanced insights into the relationships within the data.

A key advantage of the quantile regression model is its robustness against outliers and heteroscedasticity, making it particularly valuable for empirical research. Unlike traditional regression methods, it does not rely on strict assumptions regarding the distribution of error terms. This flexibility allows it to effectively handle non-normal error distributions and capture relationships in both the central and extreme values of the dependent variable. By offering a detailed depiction of how predictors influence the entire distribution of the response variable, quantile regression provides a more comprehensive understanding of variable relationships than conventional mean-based regression models.

The quantile regression model, initially introduced by Koenker and Bassett (1978), can be conceptualized as a location model. Consider a sample (y_i, x_i), i = 1, ... n, be a sample from some population, where X_i is a K X 1 vector of regressors. It is assumed that

$$\mathrm{r}\,(y_t \leq \tau \mid x_t) = F_{\mu_\theta}(\tau - x_t'\beta_\theta \mid x_t), i = 1, \ldots, n. \tag{4}$$

This relationship can be reformulated into a more familiar expression as follows:

$$y_t = x_t'\beta_\theta + u_\theta,\ \mathrm{Quant}_{\ \theta}(y_t \mid x_t) = x_t'\beta_\theta, \tag{5}$$

Here, Quant ($y_i|x_i$) represents the conditional quantile of y_i given the vector of regressors xix$_i$xi. If the distribution function of the error term $F_{u_\theta}(\cdot)$ were known, various estimation techniques could be applied to determine β0. However, since the distribution of the error term u_{oi} is unspecified, the only assumption made is that the quantile restriction holds:

In general, the 8th sample quantile (0 < 8 < 1) of y, say μ~~o~~, solves

$$\min_b \left\{ \sum_{t, y_t = b} \theta |y_t - b| + \sum_{t = y_t < b} (1 - \theta) |y_t - b| \right\}. \tag{6}$$

The analogue of the linear model for the 8th quantile is defined in a similar manner.

That is, ß~~o~~, the estimator for ß~~o~~ in (6)-termed the ~~o~~th quantile regression solves

$$\min_{\beta} \frac{1}{n}\left\{\sum_{t:y_t \geq x_t'\beta} \theta|y_t - x_t'\beta| + \sum_{t:y_t < x_t'\beta} (1-\theta)|y_t - x_t'\beta|\right\} = \min_{\beta} \frac{1}{n}\sum_{t=1}^{n} \rho_\theta(u_{\theta_t}), \quad (7)$$

where Pɵ(λ) = (ɵ -/(λ< 0)) λ is the check function, and/(·) is the usual indicator function.

The ɵth quantile regression problem in (7) can be rewritten as

$$\min_{\beta} \frac{1}{n}\sum_{t=1}^{n} \left(\theta - 1/2 + 1/2\,\mathrm{sgn}\,(y_t - x_t'b)\right)(y_t - x_t'b) \quad (8)$$

The K X 1 vector of first-order conditions (F.0.C.) for the problem in (8) is given by

$$\frac{1}{n}\sum_{t=1}^{n} \left(\theta - \frac{1}{2} + \frac{1}{2\,\mathrm{sgn}(y_t - x_t'\hat{\beta}_\theta)}\right)x_t = 0. \quad (9)$$

In fact, it can be shown that the F.O.C., as specified in (9), implies a moment function which fits into the GMM framework. Define the moment function as

$$\psi(x_t, y_t, \beta) = \left(\theta - \frac{1}{2} + \frac{1}{2\,\mathrm{sgn}(y_t - x_t'\beta)}\right)x_t \quad (10)$$

It is straightforward to show that under certain regularity conditions E [Ψ(Xᵢ, yᵢ, ßɵ)] = 0. This establishes the validity of Ψ (•) in (10) as a moment function. The GMM framework can be used, therefore, to establish consistency and asymptotic normality of βɵ, the estimator of ßɵ Specifically, under certain regularity conditions, it can be shown that

$$\sqrt{n}(\hat{\beta}_\theta - \beta_\theta) \xrightarrow{L} \quad (11)$$

Where:

$$\Lambda_\theta = \theta(1-\theta)\left(E\left[f_{u_\theta}(0 \mid x_t)x_t x_t'\right]\right)^{-1} E[x_t x_t'](E\left[f_{a_\theta}(0 \mid x_t)x_t x_t'\right])^{-1}. \quad (12)$$

f f_{u}(O| x) = f_{u}(O) with probability 1 (namely, the density of the error term u evaluated at O is independent of x), then A9 in (12) simplifies to

$$\Lambda_\theta = \frac{\theta(1-\theta)}{f_{\hat{x}_\theta}^2(0)}(E[x_t x_t'])^{-1}. \quad (13)$$

4. Results

4.1 Descriptive Statistics

The analysis commences with an initial evaluation of the variables through descriptive statistics. Table 2 provides a concise summary of this analysis, detailing the distribution of the variables based on their mean, median, standard deviation, minimum, and maximum values. Furthermore, the table includes the Jarque-Bera test, which is used to examine whether the variables follow a normal distribution.

Table 2. Summary of Descriptive Statistics

Variables Description	Obs	Mean	Std. Dev.	Min	Max	J-B test
SSG (%)	36	5.590846	6.344107	-9.48128	18.1391	3.47
GXE (%)	36	18.13362	4.299606	6.082	24.5424	9.627**
TO (%)	36	160.9495	35.98253	104.683	220.407	2.681
POP (%)	36	2.275809	0.5804943	1.19986	3.01956	3.525
GFCF (%)	36	26.67556	5.103807	17.8357	37.7905	3.536
INF (%)	36	2.329145	1.533117	-1.1387	5.44078	0.4878
IQI (0-10)	36	5.676266	6.437707	4.6	7	1.853

Table 2 provides a comprehensive statistical summary of the variables used to examine the interaction effects between government expenditure on education and institutional quality on the varying growth rates within the service sector. The dataset comprises observations from 36 entities, forming a robust foundation for analyzing the key variables. The mean growth rate in the service sector is 5.590846, reflecting a nuanced variation in sectoral growth patterns. The standard deviation of 6.344107 reveals substantial variability in growth rates, suggesting that factors beyond government spending on education and institutional quality influence sectoral performance. Government expenditure on education, with a mean of 18.13362% and a relatively modest standard deviation of 4.299606, indicates a consistent level of public sector investment across the dataset. This consistency is essential for evaluating both the direct and interactive effects of government spending on service sector growth. In contrast, the Institutional Quality Index has a mean value of 5.676266, classified as moderate to slightly low, and a standard deviation of 0.6437707. This suggests some variability in the quality of institutional frameworks, which could significantly affect the effectiveness of government expenditure in fostering growth within the service sector. The study also incorporates other critical economic indicators, such as trade openness, gross fixed capital formation, and inflation. The descriptive statistics offer valuable insights into the economic and institutional factors that shape the growth rates of various sectors. Notably, the Jarque-Bera test results indicate that government spending on education significantly deviates from a normal distribution, in contrast to the other variables. The presence of a non-normal distribution in the sample data further justifies the use of quantile regression, which is well-suited for handling such data irregularities (Mishra et al., 2019).

4.2 Discussion of Results

Table 3. Quantile regression result estimate

Variables	Without Interaction Term			With Interaction Term		
	(1)	(2)	(3)	(4)	(5)	(6)
	25th	50th	75th	25th	50th	75th
L.SSG	0.723***	0.416***	0.270***	0.610***	0.770***	0.270***
	(0.0852)	(0.0535)	(0.0561)	(0.0599)	(0.0434)	(0.0650)
GXE	-0.0866**	-0.0840***	-0.108***	-0.639***	-0.637***	-0.577***
	(0.0274)	(0.0172)	(0.0181)	(0.0921)	(0.0668)	(0.0999)
TO	0.0985***	0.0342**	0.0470**	0.0276	0.0313**	0.0489**
	(0.0261)	(0.0164)	(0.0172)	(0.0184)	(0.0134)	(0.0200)
POP	-5.343**	-1.463	-1.881*	-2.953**	-0.441*	-0.551*
	(1.6879)	(1.0608)	(1.1115)	(1.1863)	(0.8597)	(1.2858)
GFCF	0.808***	0.764***	0.723***	0.581***	0.260**	0.536**
	(0.2100)	(0.1320)	(0.1383)	(0.1476)	(0.1070)	(0.1600)
INF	-0.545	-0.364*	-0.253*	-0.0155	-0.807***	-0.898**
	(0.4377)	(0.2751)	(0.2882)	(0.3415)	(0.2475)	(0.3702)
IQI	0.565***	0.429***	0.315***	1.807***	1.709***	1.431***
	(0.1063)	(0.0668)	(0.0700)	(0.2054)	(0.1489)	(0.2226)
ITRC(GXE*IQI)				0.00763***	0.00798***	0.00659***
				(0.0012)	(0.0008)	(0.0013)
N	36	36	36	36	36	36

Note. Standard errors in brackets * $p < 0.1$, ** $p < 0.05$, *** $p < 0$.

Table 3 presents the results of the Dynamic Quantile Regression analysis. The first three columns (1, 2, and 3) correspond to non-interaction models at the 25th, 50th, and 75th quantiles, respectively, while columns (4, 5, and 6) represent interaction models for these same quantiles. The findings from the non-interaction models indicate that the lagged dependent variable (SSGt-1 = LAGLSSG) is positive and statistically significant at the 1% level across all quantiles, justifying the use of a dynamic (self-reinforcing) model (Aziz, 2018; Mina, 2012). This suggests that previous growth in the service sector is an important determinant of future growth. Additionally, the use of quantile regression across different quantiles provides a deeper understanding of the dynamic nature of growth within the service sector, enabling the assessment of how past growth influences current performance under various sector conditions. Furthermore, the interaction models demonstrate positive effects across all quantiles in columns (4, 5, and 6), with statistical significance at the 1% level. The positive coefficients at these quantiles indicate that growth in previous periods contributes positively to current growth, likely due to accumulated experience, improved efficiencies, and increased investments stemming from earlier successes. This is consistent with growth theories that emphasize the importance of past performance in fostering future growth (Romer, 1986).

Regarding the impact of government expenditure on education (GXE), the primary variable of

interest, the results show a negative effect on service sector growth (SSG) across all quantiles. However, the significance of this effect varies, with Column 1 exhibiting significance at the 5% level, while Columns 2 and 3 show significance at the 1% level. Additionally, the negative coefficients increase exponentially across quantiles, confirming the worsening negative impact of spending as it rises. The coefficients for the 25th, 50th, and 75th quantiles are -0.0866, -0.0840, and -0.108, respectively, suggesting that at higher levels of growth, the service sector may better mitigate the negative effects of government spending. Nonetheless, these results imply that higher levels of government spending on education are associated with slower growth in the service sector, potentially due to inefficiencies in spending allocation and the ineffectiveness of related policies. These findings are consistent with research by Tanzi et al. (1997) and Hanushek and Woessmann (2007) and Saad et al. (2009), which concluded that inefficient education spending can hinder economic growth. In the interaction models, Columns 4, 5, and 6 similarly show a negative effect across all quantiles, further confirming the adverse impact of government spending. The coefficients for the 25th, 50th, and 75th quantiles in these models are -0.639, -0.637, and -0.577, respectively, all statistically significant at the 1% level.

Turning to the control variable, trade openness (TO), the results reveal varying significance across quantiles in the non-interaction models. In the 25th quantile (Column 1), trade openness has a positive effect on service sector growth, statistically significant at the 1% level. This suggests that the service sector benefits more from trade openness at higher growth rates, with increased market access, reduced trade barriers, and deeper global integration fostering greater growth. However, the 50th and 75th quantiles show a positive effect at the 5% significance level, with coefficients of 0.0342 and 0.0470, respectively. While trade openness still has a positive effect at slower growth rates, its influence diminishes. These findings highlight the advantages of trade openness, including improved market access, competitive pressures, and the influx of foreign capital and expertise, which stimulate growth. These results align with several studies that suggest varying effects of trade openness on economic growth (Huchet-Bourdon et al., 2018; Keho, 2017; Nannicini & Billmeier, 2011). In the interaction models, the effect of trade openness varies. The coefficient in Column 4 for the 25th quantile shows a positive but statistically insignificant effect, possibly due to insufficient global market integration, high trade barriers, and limited trade facilitation. In contrast, the 50th and 75th quantiles show a positive effect, significant at the 5% level, underscoring the catalytic role of trade openness in service sector growth by offering larger markets, economies of scale, and technology transfer.

Regarding population (POP), the coefficients across quantiles provide insights into the relationship between population dynamics and service sector performance. The quantile regression model offers a detailed view of this effect across the spectrum of sector growth. The interaction models consistently show negative coefficients across all quantiles, with the 25th quantile in Column 1 showing a coefficient of -5.343, statistically significant at the 1% level. Although the other quantiles show varying statistical significance, the negative effect persists, suggesting that population growth poses challenges to the service sector. This may arise from increased demand for services that exceeds the sector's capacity to deliver efficiently,

potentially leading to resource strain, congestion, and diminished service quality. These findings align with literature that highlights the pressure population growth can place on public services (Barlow, 1994; Degu, 2019; Loiboo et al., 2021). In the interaction models, the negative effect remains across all quantiles, albeit with varying degrees of significance, suggesting that the service sector struggles to absorb the demands of a growing population, especially in less developed or underperforming segments.

The analysis of non-interaction quantile models on Gross Fixed Capital Formation (GFCF) reveals increasingly positive coefficients across all quantiles, from the 25th to the 75th, with statistical significance at the 1% level. This highlights the importance of investments in physical capital for driving service sector growth at all stages. The consistent positive relationship between GFCF and sector growth suggests that capital formation, including investments in machinery, equipment, and infrastructure, is crucial for productivity and growth. This finding is supported by economic literature emphasizing the role of physical capital in driving sectoral growth (Gibescu, 2013; Zahir et al., 2020). Interaction models also show a positive effect across all quantiles, with statistical significance varying. Column 4 shows significance at the 1% level for the 25th quantile, indicating substantial benefits from capital formation during periods of high growth. The 50th and 75th quantiles show positive effects, significant at the 5% level, with coefficients of 0.260 and 0.536, respectively, indicating that while capital formation remains beneficial, its impact slightly fluctuates as sector growth slows.

In terms of inflation, the non-interaction models show varying effects across periods. Column (1) indicates a negative, statistically insignificant effect of inflation on service sector growth with a coefficient of -0.545. In Columns (2) and (3), inflation has negative effects at the 10% significance level, with coefficients of -0.364 and -0.253, respectively, suggesting that inflation's negative impact becomes more pronounced during periods of slower growth and higher inflation. These results are consistent with studies indicating that inflation creates uncertainty and suppresses consumer purchasing power, thereby hindering growth (Baharumshah et al., 2016; Barro, 2020). In the interaction models, inflation also shows negative effects across all quantiles. Column (4) shows a negative effect, but it is not statistically significant, while Columns (5) and (6) reveal negative effects at the 1% and 5% levels, respectively. This suggests that, when considering interaction effects, the negative impact of inflation on service sector growth becomes more evident. These results align with studies indicating that high inflation hinders investment, reduces consumer spending, and leads to inefficiencies in resource allocation (Masimba et al., 2021; Shahbaz, 2013).

Finally, the analysis of institutional quality (IQI) across non-interaction quantile models reveals a positive effect on service sector growth at all quantiles. Specifically, Columns 1, 2, and 3 show coefficients of 0.565, 0.429, and 0.315, respectively, all statistically significant at the 1% level. These results underscore the critical role of institutional quality in fostering economic growth by creating effective legal and regulatory frameworks that promote market efficiency, protect investors, and allocate resources efficiently. Conversely, weak institutions hinder growth by increasing uncertainty and transaction costs (Byaro et al., 2024; Klein, 2005; Knack & Keefer, 1995b). Interaction models confirm these results, with Columns 4, 5, and 6

showing increasingly positive effects on service sector growth, all significant at the 1% level. The coefficients of 1.807, 1.709, and 1.431 in these columns emphasize the importance of high-quality institutions in facilitating economic transactions and promoting an environment conducive to investment and innovation.

The interaction effect between government expenditure on education and institutional quality (INTC GXE&IQI) on service sector growth (SSG) provides a comprehensive analysis of how these two factors interact to influence sectoral growth. Across all quantiles (25th, 50th, and 75th), the interaction results consistently show positive coefficients, statistically significant at the 0.001 level. These findings underscore the synergistic relationship between government spending on education and institutional quality, indicating that the effectiveness of education spending in fostering service sector growth depends heavily on the quality of institutions. Strong institutions enhance the impact of government expenditure by ensuring efficient use of resources, thereby fostering a more conducive environment for growth. This aligns with existing literature emphasizing the crucial role of institutions in maximizing the effectiveness of public spending (Aixalá et al., 2008; Butkiewicz & Yanikkaya, 2006; Mehmood et al., 2023). The positive interaction between government expenditure and institutional quality suggests that the service sector grows more effectively when these two factors are aligned, supporting the view that well-functioning institutions amplify the growth effects of public spending.

5. Conclusion

This study examines the impact of government spending on education and institutional quality on the growth of Malaysia's service sector, which plays a crucial role in the country's economic expansion. As the largest sector of the national economy, the service sector accounts for 54% of Malaysia's gross national product and attracts the largest share of investments. To gain a more comprehensive understanding of the relationship, a regression model is applied at three different quantiles—25%, 50%, and 75%—providing detailed, accurate, and reliable results.

The findings show that government expenditure on education (GXE) has a negative and statistically significant effect on service sector growth across all quantiles, both in the interaction and non-interaction models. This suggests that inefficiencies in the targeting and quality of government spending may be contributing to slower sectoral growth. Conversely, the interaction between government expenditure on education and institutional quality (INTC GXE&IQI) demonstrates a consistently positive effect on service sector growth at all quantiles, with statistical significance at the 1% level. This result highlights the importance of a strong institutional framework in amplifying the effects of government spending, indicating that the effectiveness of education spending is enhanced when institutions are of high quality.

Based on these findings, several policy implications emerge. Policymakers should prioritize improving institutional quality to mitigate the slowdown in service sector growth. As our results suggest, this can be achieved by addressing challenges such as combating corruption, ensuring adherence to laws and regulations, improving the quality of the bureaucracy, and fostering political stability and a favorable investment climate. These efforts are essential to ensure that the substantial government spending Malaysia has seen in recent years is used more

effectively to support sustainable growth in the service sector.

References

Abiodun, & Dada, M. (2013). Dada, M. A. (2013). Composition effects of government expenditure on private consumption and output growth in Nigeria: A single-equation error correction modelling. *Romanian Journal of Fiscal Policy* (RJFP), *4*(2), 18–34.

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters*, *80*(1), 123–129. https://doi.org/10.1016/S0165-1765(03)00032-6

Aixalá, J., Affairs, G. F.-E., & undefined. (2008). Does the impact of institutional quality on economic growth depend on initial income level? *Economic Affairs*, *28*(3), 45–49. https://doi.org/10.1111/j.1468-0270.2008.00844.x

Alam, F., Singh, H. P., & Singh, A. (2022). Economic Growth in Saudi Arabia through Sectoral Reallocation of Government Expenditures. *SAGE Open*, *12*(4). https://doi.org/10.1177/21582440221127158

Ali, S., Yusop, Z., Kaliappan, S. R., & Chin, L. (2020). Dynamic common correlated effects of trade openness, FDI, and institutional performance on environmental quality: evidence from OIC countries. *Environmental Science and Pollution Research*, *27*(11), 11671–11682. https://doi.org/10.1007/s11356-020-07768-7

Amirapu, A., & Subramanian, A. (2015). Manufacturing or Services? An Indian Illustration of a Development Dilemma. *SSRN Electronic Journal*. https://doi.org/10.2139/SSRN.2623158

Attari, M. I. J., & Javed, A. Y. (2013). Inflation, Economic Growth and Government Expenditure of Pakistan: 1980–2010. *Procedia Economics and Finance*, *5*, 58–67. https://doi.org/10.1016/S2212-5671(13)00010-5

Aziz, O. G. (2018). Institutional quality and FDI inflows in Arab economies. *Finance Research Letters*, *25*, 111–123. https://doi.org/10.1016/J.FRL.2017.10.026

Babatunde, S. A. (2018). Government spending on infrastructure and economic growth in Nigeria. *Economic Research-Ekonomska Istrazivanja*, *31*(1), 997–1014. https://doi.org/10.1080/1331677X.2018.1436453

Baharumshah, A. Z., Slesman, L., & Wohar, M. E. (2016). Inflation, inflation uncertainty, and economic growth in emerging and developing countries: Panel data evidence. *Economic Systems*, *40*(4), 638–657. https://doi.org/10.1016/J.ECOSYS.2016.02.009

Barlow, R. (1994). Population growth and economic growth: some more correlations. *Population & Development Review*, *20*(1), 153–165. https://doi.org/10.2307/2137634

Barro, R. J. (2020). Inflation and growth. In *Handbook of monetary policy* (pp. 423–442). Routledge. https://doi.org/10.4324/9780429270949-35

Belaïd, F., Youssef, A. B., & Lazaric, N. (2020). Scrutinizing the direct rebound effect for

French households using quantile regression and data from an original survey. *Ecological Economics*, *176*, 106755. https://doi.org/10.1016/J.ECOLECON.2020.106755

Borrmann, A., Busse, M., & Neuhaus, S. (2006). Institutional Quality and the Gains from Trade. *Kyklos*, *59*(3), 345–368. https://doi.org/10.1111/j.1467-6435.2006.00336.x

Brambor, T., Clark, W. R., & Golder, M. (2006). Understanding Interaction Models: Improving Empirical Analyses. *Political Analysis*, *14*(1), 63–82. https://doi.org/10.1093/pan/mpi014

BT Mazorodze. (2018). Government expenditure and economic growth in Zimbabwe. *African Journal of Business and Economic*. https://doi.org/10.31920/1750-4562/2018/v13n2a9

Buhai, S. (2005). Quantile regression: overview and selected applications. *Ad Astra*, *4*(4), 1–17.

Butkiewicz, J. L., & Yanikkaya, H. (2006). Institutional quality and economic growth: Maintenance of the rule of law or democratic institutions, or both? *Economic Modelling*, *23*(4), 648–661. https://doi.org/10.1016/J.ECONMOD.2006.03.004

Byaro, M., Rwezaula, A., & Mafwolo, G. (2024). Does institutional quality play a role in mitigating the impact of economic growth, population growth and renewable energy use on environmental sustainability in Asia? *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-024-04780-6

Chen, H., Singh, B., & Aru, W. S. (2020). Relationship between government expenditure and economic growth: evidence from Vanuatu. *Journal of the Asia Pacific Economy*. https://doi.org/10.1080/13547860.2020.1844610

Cieślik, A., & Goczek, Ł. (2018). Control of corruption, international investment, and economic growth – Evidence from panel data. *World Development*, *103*, 323–335. https://doi.org/10.1016/J.WORLDDEV.2017.10.028

Degu, A. A. (2019). The Nexus Between Population and Economic Growth In Ethiopia: An Empirical Inquiry. *International Journal of Business and Economic Sciences Applied Research*, *12*(3), 43–50. https://doi.org/10.25103/ijbesar.123.05

Demetriades, P., & Law, S. H. (2006). Finance, institutions and economic development. *International Journal of Finance & Economics*, *11*(3), 245–260. https://doi.org/10.1002/IJFE.296

Economic Planning Unit. (2015). *The Eleventh Malaysian Plan Report, 2016–2020*. Prime Minister's Department Malaysia, viewed September 12, 2016. Retrieved from http://www.epu.gov.my/en/rmk/eleventh-malaysia-plan-2016-2020.

El Hamma, I. (2018). Migrant remittances and economic growth: The role of financial development and institutional quality. *Economie et Statistique*, *2018*(503–504), 123–142. https://doi.org/10.24187/ecostat.2018.503d.1961

Ghani, E., & O'Connell, S. D. (2014). *Can Service Be a Growth Escalator in Low Income Countries*? https://doi.org/10.1596/1813-9450-6971

Ghose, A., & Das, S. (2013). Government size and economic growth in emerging market economies: a panel co-integration approach. *Macroeconomics and Finance in Emerging Market Economies*, *6*(1), 14–38. https://doi.org/10.1080/17520843.2012.697075

Chandran Govindaraju, V. G. R., Rao, R., & Anwar, S. (2011). Economic growth and government spending in Malaysia: A re-examination of Wagner and Keynesian views. *Economic Change and Restructuring*, *44*, 203–219. https://doi.org/10.1007/s10644-010-9099-z

Gibescu, O. (2013). Does the gross fixed capital formation represent a factor for supporting the economic growth? *Gibescu, Octavia. Munich Personal RePEc Archive*, *24*(50135), 6.

Gruneberg, S., & Folwell, K. (2013). The use of gross fixed capital formation as a measure of construction output. *Construction Management and Economics*, *31*(4), 359–368. https://doi.org/10.1080/01446193.2013.790555

Hanushek, E. A., & Woessmann, L. (2007). *The Role of Education Quality for Economic Growth*. Retrieved from https://papers.ssrn.com/abstract=960379

Huchet-Bourdon, M., Le Mouël, C., & Vijil, M. (2018). The relationship between trade openness and economic growth: Some new insights on the openness measurement issue. *The World Economy*, *41*(1), 59–76. https://doi.org/10.1111/TWEC.12586

John, O. O., & Nduka, E. C. (2009). Quantile regression analysis as a robust alternative to ordinary least squares. *Scientia Africana*, *8*(2), 61–65.

Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics & Finance*, *5*(1). https://doi.org/10.1080/23322039.2017.1332820

Klein, M. W. (2005). *Capital Account Liberalization, Institutional Quality and Economic Growth: Theory and Evidence*. NBER Working Paper 11112. https://doi.org/10.3386/W11112

Knack, S., & Keefer, P. (1995a). Institutions and economic performance: Cross-country tests using alternative institutional measures. *Economics & Politics*, *7*(3), 207–227. https://doi.org/10.1111/J.1468-0343.1995.TB00111.X

Koenker, R., & Bassett, G. (1978). Regression Quantiles. *Econometrica*, *46*(1), 33. https://doi.org/10.2307/1913643

Koenker, R., & Hallock, K. F. (2001). Quantile Regression. *Journal of Economic Perspectives*, *15*(4), 143–156. https://doi.org/10.1257/JEP.15.4.143

Lee, K., Peng, M. W., & Lee, K. (2008). From diversification premium to diversification discount during institutional transitions. *Journal of World Business*, *43*(1), 47–65. https://doi.org/10.1016/J.JWB.2007.10.010

Loiboo, D., Luvanda, E., & Osoro, N. (2021). Population and Economic Growth in Tanzania. *Tanzania Journal for Population Studies and Development*, *28*(2), 20–42. https://doi.org/10.56279/tjpsd.v28i2.125

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3–42. https://doi.org/10.1016/0304-3932(88)90168-7

Mandeya, S. M. T., & Ho, S. Y. (2021). Inflation, inflation uncertainty and the economic growth nexus: An impact study of South Africa. *MethodsX*, *8*, 101501. https://doi.org/10.1016/j.mex.2021.101501

Mauro, M. P. (1996). *The effects of corruptionon growth, investment, and government expenditure*. International Monetary Fund. https://doi.org/10.5089/9781451852097.001

Mehmood, W., Mohy Ul Din, S., Aman-Ullah, A., Khan, A. B., & Fareed, M. (2023). Institutional quality and economic growth: Evidence from South-Asian countries. *Journal of Public Affairs*, *23*(1), e2824. https://doi.org/10.1002/PA.2824

Mina, W. M. (2012). The institutional reforms debate and FDI flows to the MENA region: the "best" ensemble. *World Development*, *40*(9), 1798–1809. https://doi.org/10.1016/j.worlddev.2012.04.026

Mishra, S., Sharif, A., Khuntia, S., Meo, M. S., & Khan, S. A. R. (2019). Does oil prices impede Islamic stock indices? Fresh insights from wavelet-based quantile-on-quantile approach. *Resources Policy*, *62*, 292–304. https://doi.org/10.1016/j.resourpol.2019.04.005

Mo, P. H. (2001). Corruption and Economic Growth. *Journal of Comparative Economics*, *29*(1), 66–79. https://doi.org/10.1006/JCEC.2000.1703

Nannicini, T., & Billmeier, A. (2011). Economies in Transition: How Important Is Trade Openness for Growth? *Oxford Bulletin of Economics and Statistics*, *73*(3), 287–314. https://doi.org/10.1111/J.1468-0084.2010.00626.X

Naseer, S. (2019). Public spending, quality of bureaucracy and economic growth: A theoretical analysis. *The Pakistan Development Review*, 203–221. https://doi.org/10.30541/v58i2pp.203-221

North, D. (1990). *Institutions, institutional change, and economic performance*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511808678

Osborne, J. W. (2019). Prediction in Multiple Regression. *Practical Assessment, Research, and Evaluation*, *7*(1), 2. https://doi.org/https://doi.org/10.7275/7j20-gg86

Palma, M., Tavakoli, S., Brettschneider, J., & Nichols, T. E. (2020). Quantifying uncertainty in brain-predicted age using scalar-on-image quantile regression. *NeuroImage*, *219*, 116938. https://doi.org/10.1016/J.NEUROIMAGE.2020.116938

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. *Journal of Economic Growth*, *9*, 131–165. https://doi.org/10.1023/B:JOEG.0000031425.72248.85

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *94*(5), 1002–1037. https://doi.org/10.1086/261420

Saad, W., Economics, K. K.-M. E. F., & undefined. (2009). *Teh nature of government expenditure and its impact on sustainable economic growth*. Researchgate. Net. Retrieved from https://www.researchgate.net/profile/Wadad-Saad/publication/255634788

Saleem, F., Zafar, L., & International, B. R.-A. R. (2013). *Long run relationship between inflation and stock return: evidence from Pakistan*. Savap.Org.Pk. http://www.savap.org.pk/journals/ARInt./Vol.4(2)/2013(4.2-42).pdf

Sapuan, N. M., & Sanusi, N. A. (2013). Cointegration Analysis of Social Services Expenditure and Human Capital Development in Malaysia: a Bound Testing Approach. *Journal of Economic Cooperation and Development*, *34*.

Shahbaz, M. (2013). Linkages between inflation, economic growth and terrorism in Pakistan. *Economic Modelling*, *32*(1), 496–506. https://doi.org/10.1016/J.ECONMOD.2013.02.014

Shera, A., Dosti, B., & Grabova, P. (2014). Corruption impact on Economic Growth: An empirical analysis. *Journal of Economic Development, Management, IT, Finance and Marketing*, *6*(2), 57–77.

Sirin, S. M., & Yilmaz, B. N. (2020). Variable renewable energy technologies in the Turkish electricity market: Quantile regression analysis of the merit-order effect. *Energy Policy*, *144*, 111660. https://doi.org/10.1016/J.ENPOL.2020.111660

Tan, C. T., Mohamed, A., Habibullah, M. S., & Chin, L. (2020). The impacts of monetary and fiscal policies on economic growth in Malaysia, Singapore and Thailand. *South Asian Journal of Macroeconomics and Public Finance*, *9*(1), 114–130. https://doi.org/10.1177/2277978720906066

Tanzi, V., Review, L. S.-T. A. E., & 1997, U. (1997). Reconsidering teh fiscal role of government: teh international perspective. *The American Economic Review*. Retrieved from https://www.jstor.org/stable/2950906

TIM. (2024). *Corruption Perception Index: Malaysia Continues To Deteriorate*. In Transparency International Malaysia. Retrieved from https://www.transparency.org.my/pages/news-and-events/press-releases/corruption-perception-index-malaysia-continues-to-deteriorate

World Bank. (2022). *Services, value added (annual % growth) - Malaysia | Data*. Retrieved from https://data.worldbank.org/indicator/NV.SRV.TOTL.KD.ZG?locations=MY

Xu, B., & Lin, B. (2020). Investigating drivers of CO2 emission in China's heavy industry: A quantile regression analysis. *Energy*, *206*, 118159. https://doi.org/10.1016/J.ENERGY.2020.118159

Yusuf, S. (2015). The brave new world of services-led growth. *Eurasian Geography and Economics*, *56*(6), 602–617. https://doi.org/10.1080/15387216.2016.1158120

Zahir, S., Hayat, K., & Haider, A. (2020). The Causality between Gross Fixed Capital Formation, Trade Deficit, Exchange Rate, and the Economic Growth of Pakistan. *International Review of Management and Business Research*, *9*(04), 138–147. https://doi.org/10.30543/9-4(2020)-13

Notes

Note 1. SSG = service sector growth, GXE = government expenditure on education, TO = trade openness, POP = population growth rate, GFCF = gross fixed capital formation, INF = inflation rate, IQI = institutional quality index.

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