The Impact of Education Expenditure, Gross Enrollment Ratio, Technological Innovation, and Foreign Direct Investment toward Employment and Job Mismatch

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ABSTRACT

Purpose: The study aims to analyze education expenditure patterns and the impact of the number of graduates in the employment of the Philippines, and evaluate the integration of technological innovation and foreign direct investment and its relationship with employment. Moreover, future researchers can utilize this paper to understand the factors affecting employment in the Philippines.

Methodology: This research utilized a descriptive-quantitative approach to explore and statistically analyze the relationships between the variables. Secondary data was collected mainly from the World Bank Database and Bangko Sentral ng Pilipinas and utilize Ordinary Least Square regression analysis using Gretl econometric software package to quantify the impact of the factors affecting the employment sector. Results were then presented in tables and graphs.

Findings: The results showed that among the variables namely education expenditure, gross enrollment ratio, technological innovation, and foreign direct investment, education expenditure had a positive and significant impact on employment with a p-value of 0.0041. The findings show that education spending is rooted in the understanding that higher education strengthens human capital, thereby improving future employment prospects and helping to increase employment in the country. Additionally, technological innovation has a negative and significant impact on job mismatch with a p-value of 0.0104. The findings indicate that technological innovation in the Philippines lessens job mismatch and thereby positively impacts employment growth.

Contribution to Theory, Policy and Practice: The study recommended that increased education expenditure, particularly for tertiary education, can significantly improve employment outcomes. It urged CHED to advocate for higher budget allocations to enhance access, quality, and relevance of education, ensuring curricula and training meet job market demands. Additionally, while technological innovation has direct impact on employment, policies promoting innovation, such as grants and public-private partnerships, could foster skill development and create a tech-savvy workforce. The government's ongoing efforts in R&D, digitalization, and broadband expansion are steps toward preparing the workforce for evolving industries and promoting innovation.

Keywords: *Employment, Foreign Direct Investment, Education Expenditure, Gross Enrollment Ratio, Technological Innovation*

1.0 INTRODUCTION

Employment is the lifeblood of a thriving economy. It stimulates consumption, increases productivity, increases government revenue, and fosters social well-being. Individuals and households get revenue from employment, stimulating economic activity and consumption. Working people have purchasing power, enabling them to purchase products and services and increasing economic demand. When people work, they pay income, payroll, and consumption taxes, which all go toward government funding.

The Philippines achieved a significant employment rate of 99.5% in September 2023, up from 95.0% in September 2022, reflecting economic growth and reduced government spending on social assistance. However, substantial job losses occurred in sectors like manufacturing, retail, agriculture, and forestry, with over 2.25 million jobs lost collectively. Underemployment remains a concern, rising from 14.7% to 15.9% between August 2022 and July 2023 due to job mismatches, where workers' skills do not align with their roles. To address these issues, the Marcos administration, led by NEDA Secretary Arsenio Balisacan, focused on enhancing job quality and resolving mismatches to create a more efficient labor market. Hence, the Philippine government offers labor market programs to boost employment. The labor market program can be classified into four groups: employment programs, either temporary or regular employment; job search assistance programs; subsequent skills training programs; and livelihood programs. Meanwhile, when it comes to the distribution of resources, training programs receive the most significant proportion of the national government's budget allocations to active labor market initiatives—that is, 63% of the budget allocations. The remaining 37% of the budget was allocated to employment, job-seeking, and livelihood initiatives (Asian Development Bank, n.d.).

Moreover, the administration plans to implement economic changes and use digital technology to improve employability and preserve the most recent improvements in the labor market conditions of the nation (National Economic Development Authority). The NEDA Secretary Arsenio Balisacan added that the government can employ digital technology to foster innovation, enhance services, and effectively manage workforce demands. Therefore, encouraging innovation and equipping the workforce with digital technology skills requires the complete implementation of the Philippine Digital Workforce Competitiveness Act. Moreover, the crucial role of collaboration between government agencies, technology companies, and educational institutions cannot be overstated. This collaboration is essential to close skill gaps and extend Filipinos' knowledge of technologies and artificial intelligence (AI). Reforms and digital technology improve the labor market by lowering underemployment and unemployment rates, increasing the likelihood that people will find fulfilling and steady employment. Consequently, this enhances the nation's economic prosperity (Ocampo, 2023).

Meanwhile, the Philippines desires to draw international investment to create jobs, advance economic growth, and support long-term expansion. The principal investment promotion agencies (IPAs) are PEZA and the Board of Investments (BOI). They offer investors incentives and

exclusive investment packages (US Department of State, 2019). Notably, the UNCTAD's World Investment Report 2023 states that local investors' acquisitions of foreign affiliates resulted in a drop in foreign direct investment inflows to the Philippines from USD 11.9 billion in 2021 to USD 9.2 billion in 2022 (-23.2%). The Central Bank's most recent data shows that FDI inflows from January to November of 2023 totaled USD 7.6 billion, a 13.3% decrease from the previous year's period (Lloyds Bank, 2024).

Furthermore, education significantly impacts employment in the Philippines, offering individuals the skills and credentials valued by employers and improving career prospects, earning potential, and job stability. However, enrollment rates dropped during the pandemic, with 25 million students enrolled in October 2020, about 90% of the previous year's total. Tertiary enrollment rose from 31.24% in 2019 to 34.89% in 2021. Recognizing the importance of education, the government allocated substantial funding, including P758.6 billion to the Department of Education (DepEd), P31.0 billion to the Commission on Higher Education (CHED), and P105.6 billion to State Universities and Colleges (SUCs), alongside programs to support technical and vocational training and student financial assistance.

2.0 LITERATURE REVIEW

Education Expenditure on Employment

Governments have increasingly invested in education to better prepare people for jobs and reduce unemployment. This emphasis stems from the fact that investing in higher education is beneficial for future employment prospects as education directly affects human capital (Mehmetaj & Xhindi, 2022; Boma et al., 2017). Acosta (2021) emphasized that investing in education and healthcare is crucial during this pandemic as these sectors are fundamental for public well-being. Apart from its effect on employment, efficiently allocating resources to healthcare and education is also essential for driving economic progress and enhancing labor productivity (Wahab & Kefeli, 2017)

Several studies have shown that increased education spending in selective countries from the authors' studies leads to higher employment levels in the long term. (Özaydin & Dağdemir, 2023; Primandani & Purbadharmaja, 2023; Yilmaz, 2023; Lee & Chung, 2015). Additionally, studies also reveal that educational expenditure has a negative effect on unemployment rates in the short term, highlighting that investing in education plays a critical role in reducing unemployment. (Kijjambu et al., 2024). On the other hand, Xia et. al (2023) stated that increased spending, improved educational systems, and a growing number of skilled workers all have varying positive and negative effects on job growth in the medium term. Abayasekara (2022) also added that public spending on education has no contribution to the increase in the employment rate. A study by Binuomoyo (2020) emphasized that increased educational spending has a limited impact because the economy can't absorb the growing number of graduates, highlighting the need for government policies that promote business growth and job creation.

It is suggested that investing in education can be a valuable tool for policymakers to create effective employment policies and for having a more robust economy, ultimately leading to more employment opportunities. (Özaydin & Dağdemir, 2023; Amiruddin et. al, 2021). Holzer (2015) concluded that investing government money in education will better prepare people for the jobs companies need to fill; hence, this can lead to a significant increase in employment and higher wages for citizens in the coming years and long term. Higher spending on education can decrease underemployment by ensuring graduates have the qualifications employers seek and allow for the development of training programs to address skill gaps in the existing workforce.

H1a: Educational expenditure has a significant impact on employment in the Philippines.

H1b: Educational expenditure has a significant impact on job mismatch in the Philippines.

Gross Enrollment Ratio on Employment

Based on the studies conducted by various authors, education and employment yield mixed results, both positive and negative. Gross Enrollment Ratio, as emphasized by Kuang (2023), is one of the culprits or contributors that are affecting unemployment. Some studies show that the gross enrollment ratio (GER) increases employment in some countries (Adejumo et. al, 2021; Anita, & Ravindran, 2020; Maneejuk & Yamaka, 2020). A continuous increase in gross enrollment rates will also lead to a more productive workforce over time (Sörensson, 2019). Though rising GER generally suggests more people entering education, a study of Yimer et. al (2022) indicates that as GER rises in the case of Ethiopia, graduation rates haven't kept pace. This raises a perception that GER translates to skilled workforce when in reality, there could be a growing pool of unemployed individuals with incomplete degrees.

On the other hand, other research points to potential drawbacks of a high GER. For instance, a study in China found an oversupply of college graduates despite a declining unemployment trend. While a high GER postulates a skilled workforce, this mismatch between graduate skills and employer needs highlights a downside which means high GER doesn't necessarily translate to improved employment (Xiang et. al, 2023). A high (GER) might not directly translate to lower unemployment, especially for recent graduates. Studies show these graduates face a period of higher unemployment and underemployment compared to experienced workers, regardless of economic conditions (Abel et. al, 2014; Knight et. al, 2017). A study of Algül (2024) shows that there's a potential causal relationship where an increase in graduates (Bachelor's, Master's, and PhD) is associated with a higher unemployment rate, particularly for Bachelor's degrees. This suggests that simply increasing enrollment (GER) might not be the answer to raise the employment rate.

Furthermore, the studies suggest a distinction between short-term and long-term effects. While secondary education might benefit short-term employment, the long-term picture seems more nuanced. Some research indicates that both primary and tertiary education contributes to long-term economic growth. There is some evidence that female education has a greater impact on economic

growth in the short-run, while male education has a stronger influence in the long-run (Singh et. al, 2018). With that, enrollment in higher education tends to rise during economic recessions, with community colleges experiencing a surge in demand (Hillman & Orians, 2014). In some developed countries, a high GER indicates that there is often a higher incidence of overqualification and job mismatch. However, this is not the case for all because the relationship between GER and job mismatch or underemployment is influenced by the quality and relevance of education, economic conditions, and labor market dynamics.

H2a: Gross Enrollment Ratio has a significant impact on employment in the Philippines.

H2b: Gross Enrollment Ratio has a significant impact on job mismatch in the Philippines.

Technological Innovation on Employment

Battista & Parry (2019) underscore the transformative power of internet and mobile technology, making remote work more accessible and manageable beyond traditional business hours. Despite the progressive adoption of the economy with new technologies, this shift has a positive effect on employment prospects. The key lies in the adaptability of workplaces to recalibrate a new division of labor, empowering employees to align their roles with emerging technologies. As evidenced in workplaces embracing new technologies, this positive effect on labor demand enhances competitiveness (Arnts et al., 2016). Furthermore, the study of Damijan et al. (2015) stated that technological innovation has a consistent positive effect on employment growth and the manufacturing and service sectors have a similar outcome. The study of Sharma & Mishra (2022) further bolsters this, stating that technology is not a job killer but a promoter of employment, enhancing absorptive capacity.

Moreover, Acemoglu et al. (2019) stated in their study that automation has the capability of reducing the labor demand; it is also highlighted in their study that the stagnation of the labor demand is caused by the acceleration of automation in particular with the manufacturing sector which leads to deceleration in the creation of new tasks for the employees. Technological advances, especially in automation and artificial intelligence, can potentially displace human labor in several industries. Displaced workers searching for new jobs that fit their expertise and skill set may lead to underemployment. This is not just a local issue but a global one. In the United States, the growing number of robots, artificial intelligence, and other automation technologies has raised concerns over the future of employment and income (Restrepo et al., 2019).

Additionally, the study by Frey & Osborne (2017) stated that the total estimation of US employment in the high-risk category is 47%; these high-risk categories are the jobs that they expect to be entirely shifted to automation in the next decade or two. The developing countries in Asia have the same concerns that technology might displace workers; according to Bertulfo et al. (2019), the labor demand in domestic consumption has increased enough to offset the negative impact of technological change that results in the declining number of labor demands across all sectors. In some European countries, it is proven that technological innovation does not affect the

unemployment rate (Butkus et al., 2017; Qureshi et al., 2014). On the other hand, Irandoust (2023) emphasized that women are the most negatively impacted by technological shocks; his study also finds that technological innovation can be considered creative destruction, while in other countries, it can be considered creative creation.

Notably, the innovation on employment in the Turkish labor market has a negative impact in the short-run while it is considered to have a positive impact in the long run; it also stated that the increase in training and quality education of the workers along with the innovation could create a significant dynamic with employees and their productivity (Bolkol & Guleryuz, 2023). The study by Khatun & Saadat (2020) says that technological innovation can displace workers with machines. There is frequently a gap between the laborers' abilities and the skills that employers require due to the rapid advancement of technology. As a result, many workers can experience underemployment due to either finding jobs that do not fully utilize their skills or failing to find jobs that do. This skill mismatch adds to underemployment because it makes it more difficult for people to find fulfilling jobs that pay well. However, the silver lining is that it can also create new jobs. Therefore, the critical question is how technology develops and how rapidly educational institutions can equip workers with the necessary abilities, such as coding or data analysis skills. The consequences of the job demand required for coping with changes in employment characteristics include technological expertise, a willingness to adapt and change, time- and self-management skills, and the desire to advance one's professional and career development (Beer et al., 2020). In Sub-Saharan, according to the study of Avento (2016), technological innovation can impact employment and firms depending on the intensity of innovation. Additionally, technological innovation lowers unit costs, facilitates labor-intensive productions with less effort, and boosts productivity; however, it also results in the replacement of workers with machines, which drives them out of the workforce and raises the unemployment rate (Ayhan et al., 2023; Burgess et al., 2020).

H3a: Technological innovation has a significant impact on employment in the Philippines.

H3b: Technological Innovation has a significant impact on job mismatch in the Philippines.

Foreign Direct Investment on Employment

Foreign Direct Investment (FDI) significantly affects high labor market flexibility while only having a minor impact on low-flexibility areas (Rong et al., 2020). In South Africa, it has been proved that FDI and employment have a long-term relationship and that FDI positively impacted GDP growth and employment from 1990 to 2013 (Tshepo, 2014). It also supports the study of Aladelusi & Olayiwola (2021), who concluded that FDI is essential to providing Nigerian citizens with job opportunities. This is also supported by the study of Aslam et al. (2024), who stated that employment and FDI have a strong positive correlation in Balochistan. However, the study of Amaka et al. (2023) implies that FDI may create jobs in Nigeria, but only for short-term existence; in line with this, foreign corporations frequently establish new enterprises or grow already existing

ones when they invest in a nation, which might result in the creation of new job opportunities. As a result of the economy absorbing excess labor, underemployment may be lessened. It is also notable that FDI plays a significant role in unemployment reduction in Pakistan; the country's unemployment rate has decreased due to the increase in employment prospects brought about by foreign direct investment (Zeb et al., 2014).

Additionally, increased unemployment leads to an increase in FDI inflows, indicating that foreign investors seek out places where labor availability is not a concern; hence, the governments of Hungary, Malta, Bulgaria, and Estonia concentrate their efforts on making policies that attract the investors (Strat et al., 2015). Indeed, there is a considerable gap between investors from other developing countries and developed countries regarding salary premiums and the level of competence required for the jobs created (Coniglo et al., 2015). Thus, countries should not anticipate a similar effect on employment from foreign investment (Diego et al., 2017).

Moreover, similar to other countries, the effect of FDI on employment growth in the formal sector is positive in Vietnam. The more significant capability of jobs produced by foreign businesses compared to domestic firms is the primary source of FDI's contribution to employment growth. It has been discovered that the overseas sector's employment elasticity is significantly higher than that of the domestic sector, which results from international businesses outperforming domestic ones in terms of productivity (Cao et al., 2023); however, it is also notable that FDI can bring modern technology, managerial expertise, and transfer knowledge towards the receiving nation. This may result in the local workforce gaining new skills that increase their employability and decrease underemployment, particularly in fields that demand specialized knowledge. In addition, FDI holds significance since it presents avenues for international network development. Trade will lower the unemployment rate, increase job possibilities, and enable the home market to meet global demand for goods; the rise in FDI is directly correlated with the number of foreign workers in Malaysia, as many multinational businesses choose to use cheaper labor from other nations rather than domestic workers (Irpan et al., 2016).

However, according to the study of Mishra & Palit (2020), although it is simple to assume that FDI inflows can solve a wide range of economic problems, the impact of FDI on employment creation in India is more complex. Even in EU nations, a pattern has been noted that the employment impact of FDI is minimal compared to output growth and the restructuring of the economy (Jude, 2016). It is also notable that FDI inflows have a positive effect only on the manufacturing sector of the entire country. At the same time, it is also established that the low-skilled and high-skilled outcomes are inconclusive across econometric models (Saucedo et al., 2020). On the other hand, in Turkey, FDI is remarkably effective in creating employment opportunities within the investment sector, offering a glimmer of hope for other countries grappling with unemployment (Asici et al., 2014). Along with this, the study of Ayhan et al (2023) stated that in developing nations like Turkey, FDI is seen as a significant source of capital inflows.

FDI has a wide range of consequences, but it also has a significant impact on the host nation's employment rate.

2.1 Theoretical Review

Human Capital Theory

The theory used for the study is the Human Capital Theory. It is a theory that many economists have contributed to the study; however, Theodore Schultz and Gary Becker expounded the theory and are recognized as key proponents. Human capital theory assumes that investment in education and training is necessary to acquire skills that, in turn, will increase productivity (Becker, 1962; Schultz, 1961). This increased productivity as a result of investment in education and training leads to higher wages as employee's value is tied to their output.

Knowledge and skills enhance workplace productivity, which ideally leads to higher wages. As individuals invest in education, the private benefits should equal the private costs (Tan, 2014). Government spending on education helps create a skilled workforce, while the Gross Enrollment Ratio (GER) reflects the proportion of the population engaged in education, potentially expanding the pool of skilled workers. However, in terms of job mismatch, Human Capital Theory suggests that a well-educated workforce should align with labor market demands, but a high GER can also lead to job mismatch if there are insufficient job opportunities for the increasing number of educated individuals.

New Growth Theory

The New Growth Theory is a theory proposed by Paul Romer in 1986, which postulates that external forces don't simply dictate economic progress but instead thrive on human desire, needs, and the pursuit of profit. It is a specific strand within Endogenous Growth Theory that strongly emphasizes knowledge spillovers from Research and Development and Technological Innovation. Relating this to EGT, the aforementioned theory highlights how internal factors like investments in education (human capital) and R&D can drive growth. The theory is not directly related to employment since it focuses on economic growth but provides the framework for the long-term impact on employment.

Relating this theory to the study, the role of technological innovation on employment per se suggests that innovation and advancement on technology creates knowledge spillovers that benefits firms in the economy and the country's economy as a whole. Technological innovation may lead to the development of new technologies and products, which in turn can lead to employment generation by creating new job opportunities. Furthermore, Foreign Direct Investment acts as a driver of technology transfer and boosts a country's capabilities in terms of technology which leads to job creation. Not only FDI can drive technological advancements to a country but affects job creation directly through establishing and expanding businesses. In the context of job mismatch, while innovation can generate new job opportunities, it can also exacerbate job mismatch if the workforce lacks the skills required for newly created jobs.

Synthesis

The study showed how the relationship of education and technology impacts employment. Using Human Capital Theory by Becker (1962) and Schultz (1961) as the basis of the study, educational expenditure and gross enrollment ratio should directly affect employment because as education and training increase, employment also increases. Additionally, the New Growth Theory by Paul Romer (1986) showed the significance of foreign direct investment and technological innovation on employment. Since the theory shows how technology drives growth, the relationship between the two variables with employment should be positive. The second model displayed another conceptual framework in which the study will assess the relationship between the same independent variables and job mismatch with underemployment as the indicator.
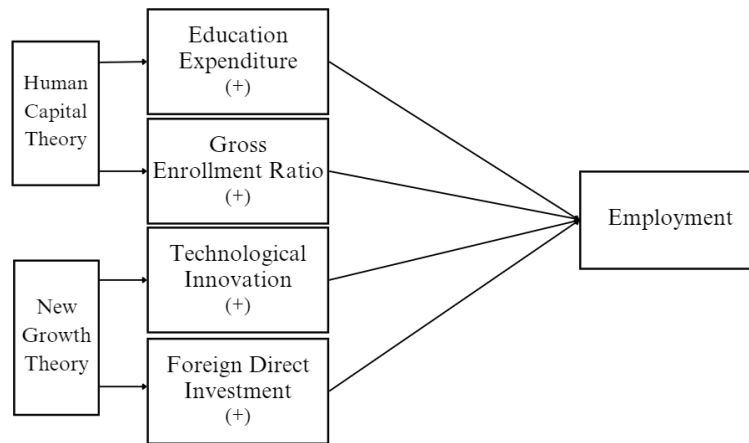
2.2 Conceptual Framework

Figure 1: Conceptual Framework for Employment

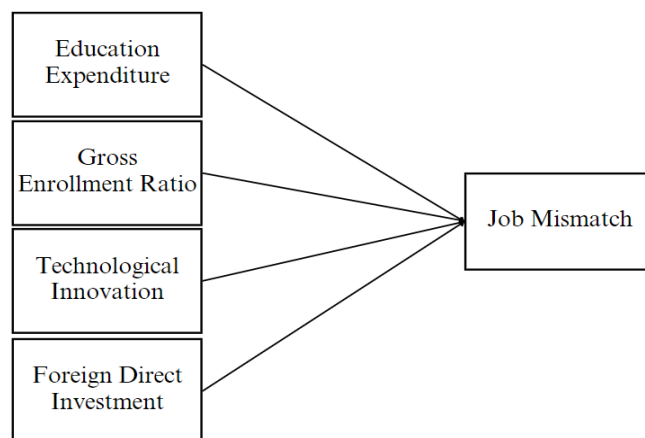*Source; Researchers (2024)*

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Figure 2: Conceptual Framework for Job Mismatch

Source; Researchers (2024)

3.0 MATERIAL AND METHODS

This research utilized a descriptive-quantitative approach to explore and statistically analyze the relationships between the variables. Data will be collected mainly from the World Bank Database and utilize Ordinary Least Square regression analysis to quantify the impact of the factors affecting the employment sector. In addition to the OLS regression analysis, the study will utilize diagnostic tests such as Ramsey's RESET, Normality of Residual, Test for Heteroskedasticity, Autocorrelation, Augmented Dickey-Fuller Test, and Test for Multicollinearity to assess whether they meet the model's hypothesis. Every test is examined simultaneously, ensuring a comprehensive assessment of the significance and the relationship of education expenditure, gross enrollment ratio, technological innovation, and foreign direct investment towards employment and job mismatch in the Philippines, making our findings highly relevant to the local context.

This research paper focuses on employment and underemployment in the Philippines, analyzing the impact of educational expenditure, foreign direct investments, and technological innovations over a 40-year period (1981-2020) using secondary data. Data was collected from the World Bank Database and Bangko Sentral ng Pilipinas. The study examines the following variables: Educational Expenditure (measured by Adjusted Savings: Education Expenditure), Gross Enrollment Ratio (for tertiary education), Foreign Direct Investment (net inflows), Technological Innovation (number of patent applications), Employment (employment rate), and Job Mismatch (underemployment rate).

The objective of this study was to identify how variables pertaining to education and technology affect employment and job mismatch in the Philippines. The researcher will utilize Ordinary Least Squares (OLS) regression analysis to measure the relationship between the Employment Rate and Underemployment Rate and the four independent variables. According to the two theories appropriate for the study namely, Human Capital Theory by Becker (1962) and Schultz (1961) and New Growth Theory by Romer (1986), the relationship of the independent variables and the employment are positive. Based on the related literature, the relationship of EE and FDI with underemployment is negative while the relationship of GER and TI with underemployment is positive. To help identify whether to accept or refute the economic theories and related literature by testing the relationship of the variables, the following econometric model was used:

$$ER = \beta_o + \beta_1 EE + \beta_2 GER + \beta_3 TI + \beta_4 FDI + \varepsilon$$

$$and$$

$$UER = \beta_o - \beta_1 EE + \beta_2 GER + \beta_3 TI - \beta_4 FDI + \varepsilon$$

where:

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ER = Employment Rate

UER = Underemployment Rate

EE = Education Expenditure

GER = Gross Enrollment Ratio

TI = Technological Innovation

FDI = Foreign Direct Investment

β_o = Intercept or constant term

$\beta_1, \beta_2, \ldots, \beta_4$ = Beta coefficients

ε = Error term

4.0 FINDINGS

Table 1: Model 1 Regression Analysis, using observations 1981-2020 (T=40)

Dependent variable: ER

HAC standard errors, bandwidth 2, Bartlett kernel

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	83.7099	2.53757	32.99	<0.0001
EE	0.539603	0.175887	3.068	0.0041
GER	0.148947	0.0887085	1.679	0.1020
FDI	9.90801e-011	1.73679e-010	0.5705	0.5720
TI	0.00697617	0.00444971	1.568	0.1259

Mean dependent var	91.63500	S.D. dependent var	2.077048
Sum squared resid	111.3709	S.E. of regression	1.783823
R-squared	0.338067	Adjusted R-squared	0.262417
F(4, 35)	5.567933	P-value(F)	0.001411
Log-likelihood	−77.23727	Akaike criterion	164.4745
Schwarz criterion	172.9189	Hannan-Quinn	167.5278
rho	0.397226	Durbin-Watson	1.169205

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In our regression analysis, Ordinary Least Squares is employed with HAC (Heteroskedasticity and Autocorrelation Consistent) standard errors with a bandwidth of 2 and a Bartlett kernel to ensure robustness of the estimated coefficients. The positive constant coefficient of 83.7099 suggests that the employment rate is high when other variables are held constant which constitutes an upward-sloping trend. Based on the results of the OLS, education expenditure (% of GDP) is the only variable found to have a significant impact on employment. The coefficient of 0.539603 indicates that for every 1% increase in educational spending as a percentage of GDP, the employment rate increases by 0.54%. With a p-value of 0.0041, this result is statistically significant which highlights the critical role of education investment in improving employment growth. This finding aligns with existing literature that implies education as a key factor in improving employment outcomes. The increased focus of governments on education investments is rooted in the understanding that higher education strengthens human capital, thereby improving future employment prospects and helping to increase employment in the country. (Mehmetaj & Xhindi, 2022; Boma, Etim, & Ojochegbe, 2017).

On the other hand, the remaining variables in the model, namely Gross Enrollment Ratio, Foreign Direct Investment, and Technological Innovation, are found to have insignificant impact on employment. Gross enrollment ratio exhibits a positive coefficient of 0.149, and technological innovation has a small positive coefficient of 0.00698, indicating weak relationships with employment. However, their respective p-values of 0.1020 and 0.1259 suggest these variables do not have a statistically significant effect on employment during the period. Similarly, the gross enrollment ratio for tertiary education shows a negative coefficient of 0.0000000000990801, but with a p-value of 0.5720, this variable is found to have insignificant relationship with employment. These results suggest that while gross enrollment, FDI, and technology might play some role in employment dynamics, their effects are not substantial or consistent during the 1981-2020 where lack of observations and other external factors could be contributors.

These results are consistent with existing literature that highlights potential reasons for the insignificance. For instance, a high gross enrollment ratio does not necessarily translate to improved employment, as a mismatch between graduate skills and employer needs can lead to higher unemployment among recent graduates (Xiang et al., 2023; Abel et al., 2014; Knight et al., 2017). Technological innovation often displaces workers when rapid advancements outpace laborers' skill development, limiting its impact on job creation (Khatun & Saadat, 2020). Moreover, FDI's effect on employment is often limited, with a more significant impact observed on economic restructuring and output growth rather than direct job creation (Mishra & Palit, 2020; Jude, 2016). These results suggest that while gross enrollment, FDI, and technology might play some role in employment dynamics, their effects are not substantial or consistent during the 1981-2020, where lack of observations and other external factors could be contributors.

Overall, the model emphasizes the importance of education expenditure in improving employment outcomes, with other factors showing weaker and statistically insignificant impacts. The R-squared

value of 33.81% indicates that while the model explains a moderate portion of the variation in employment rates, there are other factors not included in this model that may also play a significant role in determining employment outcomes.

Table 2: Model 2 Regression Analysis, using observations 1988-2020 (T=33)

Dependent variable: UER

HAC standard errors, bandwidth 2, Bartlett kernel

	coefficient	Std. error	t-ratio	p-value
const	24.0732	5.35284	4.497	0.0001
EE	0.599679	0.430940	1.392	0.1750
GER	-0.154704	0.147945	-1.046	0.3047
FDI	1.93866e-010	1.93951e-010	0.9996	0.3261
TI	−0.0112742	0.00410387	-2.747	0.0104

Mean dependent var	19.67273	S.D. dependent var	2.369635
Sum squared resid	68.76970	S.E. of regression	1.567182
R-squared	0.617277	Adjusted R-squared	0.562603
F(4, 24)	14.72055	P-value(F)	1.37e-06
Log-likelihood	−58.94019	Akaike criterion	127.8804
Schwarz criterion	135.3629	Hannan-Quinn	130.3980
rho	0.398156	Durbin-Watson	1.199204

The observed range from the regression analysis above is from 1988-2020 to test the impacts of the independent variables on the dependent variable namely Job Mismatch to be measured by Underemployment Rate. The positive constant coefficient of 24.0732 suggests that the underemployment rate is high when other variables are constant, constituting an upward-sloping trend. Based on the OLS results, Technological Innovation is the only variable that significantly impacts underemployment. The coefficient of −0.0112742 indicates that for every 1% increase in technological innovation, the underemployment rate decreases by 0.01%. With a p-value of 0.0104, this result is statistically significant, highlighting the critical role of technological innovation in the underemployment rate. Other studies can support these findings. In their research, Beer et al. (2020) states that technological innovation can help advance professional and career development. In addition, findings by Bolkol & Guleryuz (2023) states that technological

innovation can increase a positive dynamic between the employees and their productivity and skills. Furthermore, a noteworthy reason that shows technological innovation significantly impacts underemployment, as stated by the study of Battista & Parry (2019), is that businesses frequently invest in personnel training and development in addition to technology. Through this, employees are given a chance to upgrade and enhance their skills and be more productive, which will help decrease the underemployment rate.

Moreover, the regression analysis shows that foreign direct investment had an insignificant impact on the underemployment rate from 1988 to 2020. The coefficient of 1.000000000093866 indicates that for every 1% increase in foreign direct investment, the underemployment increases by 1%. The p-value 0.3261 from the regression indicates that FDI has an insignificant impact on the underemployment rate. Some studies share the same findings as well. FDI inflows do not guarantee a decrease in underemployment according to Irpan et al. (2016), most investors choose to use cheaper labor from other nations rather than domestic workers, which will not directly help those Filipinos seeking a stable job. In relation to this, a study by Cao et al. (2023) finds that international businesses outperform domestic ones in terms of productivity, limiting the underemployed seeking jobs for more opportunities. It is also notable that FDI impacts developing and developed countries differently. There is a considerable gap between the competence required for the jobs created in developed and developing countries (Coniglo et al. 2015), which does not guarantee that the receiving nation is well prepared for.

The regression analysis reveals that from 1988 to 2020, gross enrollment ratio and educational expenditure had no significant impact on the underemployment rate, with p-values of 0.1750 and 0.3047. While higher enrollment rates and spending increased access to education, a mismatch persists between academic curricula and labor market demands, leaving many graduates overqualified or underprepared for available jobs. Additionally, limited access to quality education and poor National Assessment Test scores highlight structural issues in the Philippine education system. Furthermore, as the number of graduates rises, economic growth and job creation have not kept up. This has resulted in an excess of educated people compared to the need for their talents, worsening underemployment (Binuomoyo, 2020). Yimer et al. (2022) also stated in their study that GER does not translate to a skilled workforce; in reality, there could be a growing pool of unemployed or underemployed individuals with incomplete degrees.

Table 3: Model 1 Regression Diagnostic Results of Employment, using observations 1981-2020 (T=40)

Diagnostic Tests	P-value	Results	Interpretation
Breusch-Pagan and White test for heteroskedasticity	0.342670 and 0.054775	P-value is > 0.05	There is no heteroskedasticity error present.
LM test for autocorrelation up to order 1	0.0231349	P-value is < 0.05	There is serial correlation up to order 1.
Test for normality of residual	0.427953	P-value is > 0.05	The model achieved the normality of residual.
RESET Test for specification	0.693	P-value is > 0.05	There is no misspecification error in model 1.
Multicollinearity (VIF)	GER 2.057 FDI 3.071 TI 3.701 EE 1.574	All independent variables have values less than 10 VIF	There is no evidence of collinearity between the variables.
Johansen Test	(see table below)	All p-values are > 0.05	The Johansen test results suggest no statistically significant cointegrating relationships in the dataset.

Rank	Eigenvalue	Trace test	p-value
0	0.51227	67.692	[0.0712]
1	0.34117	39.690	[0.2361]
2	0.29185	23.416	[0.2337]
3	0.21998	9.9569	[0.2893]
4	0.0068481	0.26799	[0.6047]

The Breusch-Pagan and White tests for heteroskedasticity showed a p-value of 0.342670, confirming no heteroskedasticity and fulfilling the homoscedasticity assumption. The normality of residuals was confirmed with a p-value of 0.427953, ensuring the validity of inferential tests like the t-test and F-test. The Ramsey RESET test yielded a p-value of 0.693, indicating no

model misspecification, suggesting that the regression model correctly includes all relevant variables and uses the appropriate functional form.

Furthermore, the Variance Inflation Factor (VIF) test showed that all independent variables (GER, FDI, TI, and EE) had VIFs below 10, indicating no severe multicollinearity and ensuring reliable coefficient estimates. However, the LM test for autocorrelation detected serial correlation at order 1, with a p-value of 0.0231, suggesting the need for adjustments like lagged variables or robust standard errors. Despite this, the model remains robust due to HAC standard errors addressing autocorrelation and heteroskedasticity. Additionally, the Johansen test for cointegration found no significant long-term equilibrium relationships among the variables, indicating the time series variables do not exhibit persistent trends over the study period.

In summary, the regression diagnostics confirm that the model satisfies the assumptions, such as homoscedasticity, normality, correct specification, autocorrelation (which is corrected by the HAC standard errors), and low multicollinearity. However, the lack of cointegration highlights areas where the model could be improved for more reliable results.

Table 4: Model 2 Regression Diagnostic Results of Underemployment, using observations 1988-2020 (T=33)

Diagnostic Tests	P-value	Results	Interpretation
Breusch-Pagan and White test for heteroskedasticity	0.371425 and 0.602213	P-value is > 0.05	There is no heteroskedasticity error present.
LM test for autocorrelation up to order 1	0.0249925	P-value is < 0.05	There is a serial correlation up to order 1.
Test for normality of residual	0.80136	P-value is > 0.05	The model achieved the normality of residual.
RESET Test for specification	0.79	P-value is > 0.05	There is no misspecification error in model 2.

Multicollinearity (VIF)	EE: 2.161 GER: 2.071 FDI: 3.421 TI: 4.114	All independent variables have values less than 10 VIF	There is no evidence of collinearity between the variables.
Johansen Test		All p-values are > 0.05	The Johansen test results suggest no statistically significant cointegrating relationships in the dataset.

Rank	Eigenvalue	Trace test	p-value
0	0.62241	91.492	0.0003
1	0.53548	53.508	0.0121
2	0.30126	23.605	0.2248
3	0.21819	9.6246	0.3165
4	0.00063822	0.024898	0.8746

The results of White's and Breusch-Pagan tests show no heteroskedasticity, as the p-values (0.602213 and 0.371425) are above the 5% significance level, indicating constant variance in the residuals. The Ramsey RESET test for model specification also showed no misspecification error, with a p-value of 0.79. Additionally, the normality of residuals was confirmed with a p-value of 0.80136, indicating that the residuals are normally distributed, ensuring the reliability and accuracy of the model's results. Moreover, the Variance Inflation Factor (VIF) test confirmed no multicollinearity among the independent variables (GER, FDI, Technological Innovation, and Educational Expenditure), indicating distinct information in the regression model. However, the LM test for autocorrelation detected serial correlation at order 1, with a p-value of 0.02499, suggesting the need for adjustments like lagged variables or robust standard errors. Despite this, the model remains robust as HAC standard errors address autocorrelation and heteroskedasticity. Additionally, the Johansen test for cointegration found no statistical evidence of a long-term equilibrium relationship among the variables, as all ranks had p-values above 0.05.

In summary, when considering both the results for employment (1981–2020) and underemployment (1988–2020), the diagnostic tests collectively show that both models meet essential assumptions such as normality, homoscedasticity, lack of multicollinearity, and correct specification. However, the presence of autocorrelation in both datasets indicates a shared area for improvement. To address this, HAC (Heteroskedasticity and Autocorrelation Consistent) standard errors, with a bandwidth of 2 and the Bartlett kernel, were used in the models to account for autocorrelation and heteroskedasticity, thereby improving the reliability of the standard error estimates. Additionally, the Johansen test results for employment (1981–2020) suggest no long-term equilibrium relationships within the variables.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The paper explored and determined the impact of Educational Expenditure, Gross Enrolment Ratio, Foreign Direct Investment, and Technological Innovation on Employment and Job Mismatch. Using the Ordinary Least Square, the significance of the independent variables on employment from periods 1981 to 2020 and on underemployment from periods 1988 to 2020 were examined.

The variables have different measurements; FDI is measured by net inflows (BoP, constant US$), technological innovation is measured by number of patent applications, GER is measured by GER in tertiary education, both sexes (%), EE is measured by Adjusted Savings: Education Expenditure as % of GDP (%), ER is measured by employment rate (%), and Job Mismatch is measured by underemployment rate (%).

The researchers have drawn inferences from 40 observations on employment and 33 observations on job mismatch using annual time-series data). This secondary data was all sourced from the World Bank Database and to achieve the aim and objectives of this study, a descriptive-quantitative approach was applied. The impact of EE, GER, FDI, and TI on ER and UER were estimated through multiple regression, and all diagnostic tests applied are statistically significant; therefore, there are no issues present in the regression model. The authors accept the following null hypotheses: H1a, stating that educational expenditure significantly impacts employment in the Philippines, and H3b, stating that technological innovation significantly impacts job mismatch in the Philippines. Conversely, the authors reject the following null hypotheses: H1b, H2b, and H4b, which assert that educational expenditure, gross enrollment ratio, and foreign direct investment have a significant impact on the underemployment rate in the Philippines, respectively. Furthermore, the authors also reject H2a, H3a, and H4a, which propose that gross enrollment ratio, technological innovation, and foreign direct investment have a significant impact on the employment rate in the Philippines, respectively.

5.1.1 Education Expenditure to Employment

According to the analysis on regression for the employment rate, educational expenditure is the only significant variable that positively affects employment rate during the period of 1981 to 2020. This relationship aligns with the literature suggesting that increased investment in education leads to a more skilled workforce, which can stimulate employment opportunities. Therefore, when the government invests more in education, it can enhance individuals' skills, productivity, and employability, leading to higher employment rates.

Gary Becker's Human Capital Theory provides a strong theoretical foundation to support the positive relationship between educational expenditure and employment rates observed in the regression analysis. According to Human Capital Theory, investments in education and training are necessary to acquire skills that enhance individual productivity and employability, ultimately leading to higher employment opportunities (Becker, 1962; Schultz, 1961). When the government invests in education, individuals gain the knowledge and skills needed to compete in the labor

market, making them more productive and better equipped to secure employment. Moreover, research also supported this findings by indicating that educational spending negatively impacts short-term unemployment rates, emphasizing the importance of investment in education for lowering unemployment (Kijjambu et al., 2024). This suggests that funding education can serve as a powerful resource for policymakers aiming to develop effective employment strategies and strengthen the economy, which can ultimately foster greater job opportunities (Özaydin & Dağdemir, 2023; Amiruddin et al., 2021).

5.1.2 Technological Innovation to Job Mismatch

The regression analysis for the underemployment variable shows that the only significant independent variable is technological innovation which shows a negative relationship. This analysis is also supported by other studies that the researchers gathered. For instance, a study highlights how internet and mobile technology enable remote work, enhancing job accessibility and flexibility, which can open up opportunities beyond traditional business hours and reduce underemployment (Battista & Parry, 2019). Similarly, research also has found that technological innovation positively impacts employment growth, particularly in manufacturing and service sectors, supporting economic adaptability (Damijan et al., 2015). Technology promotes employment by increasing the capacity of industries to absorb labor, rather than displacing it. These studies underscore that when workplaces adapt roles to incorporate emerging technologies, underemployment can decrease as more workers find suitable, skill-matching opportunities (Sharma & Mishra, 2022).

The New Growth Theory, a subset of Endogenous Growth Theory, emphasizes that economic progress is driven by internal factors such as human aspirations, education, and R&D, with knowledge spillovers and technological innovation playing a pivotal role. This aligns with findings showing a negative relationship between technological innovation and job mismatch, as advancements in technology, supported by education and R&D, help align workforce skills with industry needs. By fostering innovation and human capital development, the theory highlights how tailored opportunities for workers can reduce mismatches and promote economic growth.

5.2 Recommendations

The models suggest that education expenditure has a significant impact on the employment rate and the policy implications for the data utilized is for tertiary education. To leverage this, The Commission on Higher Education (CHED), the Philippine government agency for higher education, should advocate and submit a proposal for an increased budget allocation to expand access to education and also enhance the quality and relevance of education itself. CHED should ensure that the budget is appropriately allocated and upgrade the educational facilities to accommodate all the learning opportunities and prepare the students well for their specific fields after college. There should be investments in up-to-date curricula, training for teachers/professors, and practical skills development which would better prepare graduates for the current job market.

The Department of Budget and Management (DBM) underscored the government's commitment to enhancing educational infrastructure and resources by allocating a record P924.7 billion to the education sector in the 2024 National Expenditure Program, marking a 3.3% increase. This funding focuses on subsidies, facilities, learning materials, and skills training to improve educational quality. By addressing these needs, the workforce will become more skilled and competitive, aiding career advancement for graduates. To sustain progress, the government should prioritize budgets for training professors, seminars, and vocational programs, ensuring future skilled workers receive expert guidance and comprehensive education.

Lastly, while technological innovation has had limited impact on the overall employment rate in the Philippines, it plays a crucial role in addressing underemployment and fostering workforce readiness. To enhance its influence, the government can implement policies such as grants, tax breaks, and partnerships with educational institutions like TESDA to encourage innovation and practical technological applications across industries. Public-Private Partnerships (PPPs) in R&D further support these efforts by leveraging private sector expertise and resources. Additionally, initiatives like public service digitalization, the national broadband plan, and cloud computing development strengthen infrastructure and prepare a tech-savvy workforce equipped to harness digital innovations and contribute to sustainable progress.

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