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The Impact of Infrastructure ODA Loans on Poverty Alleviation and Employment in the Philippines

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***Abstract*: The Official Development Assistance (ODA) fund is a funding source heavily used by the Philippine government for the construction of infrastructures in the Philippines. For an economy to have long-term effects on its people, infrastructures play a central role to ensure this. The Philippines has made extended efforts to assuage poverty and find means to increase employment through ODA funded infrastructures. This research acquired data from the National Economic Development Authority (NEDA) and Philippine Statistics Authority (PSA) to know the outcome of the impact of infrastructure ODA loans on poverty alleviation and employment. Pooled Ordinary Least Squares (OLS) was employed to estimate the relationship among the variables. Based on the estimation results, only a few sectors of the infrastructure ODA loans have a significant relationship with poverty alleviation, namely energy, power and electrification, urban infrastructures, and rural infrastructures. The rest not mentioned exhibited an insignificant relationship with poverty. Likewise, can be said about its impact on employment. Only transportation infrastructures are seen to have a significant impact on employment. Those infrastructure sectors not mentioned have an insignificant impact on employment.**

***Keywords*: impact on poverty and employment, infrastructure, loans, official development assistance fund.**

1. Introduction

There has been a wide recognition for infrastructures in lowering poverty and unemployment (Ali and Pernia, 2003). Inadequate infrastructure is widely recognized as a hindrance to economic growth The infrastructures in the Philippines are funded by different sources. The biggest source of funding in President Rodrigo Duterte's Build, Build, Build Program is the Official Development Assistance (ODA). The ODA, as defined in Republic Act 8182 – ODA Act of 1996, is a loan or a grant administered to promote sustainable social and economic development and welfare of the Philippines. ODA resources must be contracted with governments of foreign countries with whom the Philippines has diplomatic, trade relations, or bilateral agreements, or which are members of the United Nations, their agencies, and international or multilateral lending institutions (NEDA, 2020). Moreover, the infrastructure development sector recorded the largest share amounting to USD 14.55 billion (47%) of the active ODA portfolio in 2020 (NEDA, 2020). ODA implementation yielded outputs and outcomes which are aligned with the national development priorities indicated in the Philippine Development Plan Results Matrices (PDP-RM) 2017-2022.

The Official Development Assistance is deemed as the "gold standard" of foreign aid (OECD). The infrastructures funded by the Official Development Assistance (ODA) are critical for the growth of the Philippine economy and its people. As President Rodrigo Duterte has always reiterated, infrastructures will be built across the country to alleviate poverty and increase employment. As of 2020, The Philippines' active Official Development Assistance (ODA) portfolio reached USD 30.7 billion among which 76 were project loans. However, it was not only in President Duterte's regime that the Official Development Assistance (ODA) was heavily used.

With enough infrastructures funded by the Official Development Assistance (ODA), it has become the subject of scrutiny. According to former Socioeconomic Planning Secretary Ernesto M. Pernia, "The thrust of the development strategy is to bring development to the regions. That is where our infrastructure projects will be located". However, despite the merit of the said infrastructures, many people criticize them for being too ambitious and unbridled. As pointed out by the Congressional Policy and Budget Research Department (CPBRD), other than improving on the actual provision of infrastructure, the government should support and implement policy reforms that would ensure a conducive environment for both public and private investments in the infrastructure sector.

With enough time to validate the changes brought by the ODA funded infrastructures, it is essential to know if the said funding lived up to its promise, especially in fields of poverty and employment. The highlight of this paper is to assess the impact of the Infrastructure ODA Loans on poverty alleviation and employment since it is noted that the main objective of the said funded infrastructures is to increase overall economic welfare. Drawing theories on macroeconomics, this paper will present a comprehensive critique of the truest extent of the program.

Although addressing the infrastructure backlogs is reassuring, especially in terms of growth and development, is it

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adequate to be the Philippines' prime mover of its economy. This in effect, has motivated the researchers to delve more into the said program and its extent. However, due to the limited data provided by the National Economic Development Authority (NEDA), the researchers have used the historical list provided to them by the latter. While the findings of this paper are beneficial to the academe, it is hoped that this will be a valuable tool for policymakers both at the local and national levels to assist them to plan the next economic reforms for the country.

2. Literature Review

A. Infrastructure to Poverty Alleviation

Poverty remains one of the major economic issues in the Philippines. Nearly half, 48.8%, of the country's population reside in rural areas and depend on agriculture for their livelihood. Still, farmers and fisherfolk persist to be the poorest sectors since 2006. They were reported to have the highest poverty incidence rate, 31.6%, and 26.2% respectively, in 2018. Sta. Romana (2017) noted that a lack of connectivity in the form of poorly developed infrastructure for transport, especially roads, port facilities, and inter-island shipping impede the progress and development of the rural population in international trade. An unpaved network of roads or lack of all-weather access roads contributed to the inefficiency and inaccessibility of rural producers.

A study conducted by Dercon, Gilligan, Hoddinott, and Woldehanna (2009) on 15 Ethiopian villages, showed that access to all-weather roads reduced poverty by 6.9%. Another study done by Khandker, Bakht, and Koolwal (2009) showed that investment in rural roads directly reduced multidimensional poverty. Investment in rural roads had increased higher agricultural production, lower input and transport costs, and higher agricultural output prices at local village markets. They concluded that rural road investments have significantly benefited the poor more than the nonpoor.

Aderogba and Adegboye (2019) stated that increased rural road access resulted in greater poverty reduction in Nigeria's urban districts. As a result of better and more accessible road infrastructure in the cities, over-congestion exists causing high household poverty in urban areas. Rural road access encouraged urban-rural migration, which reduced urban poverty. The report concluded that improved road infrastructure directly alleviated poverty.

Nugroho (2016) contradicted the inference made by Aderogba and Adegboye (2019) and Khandker, Bakht, and Koolwal (2009). His study showed that infrastructure affects poverty incidence indirectly through the human development index (HDI). HDI is a composite index of health quality (life expectancy), level of education (years of schooling), and standard of living (income per capita), and is used to rank countries into four tiers of human development. Nugroho (2016) concluded that the best strategy for poverty alleviation is to improve human capability through basic infrastructure development. Investment and improvements in infrastructures increase HDI; thus, reducing poverty incidence. This is also evident in the papers of Gachassin et al. (2010), and Hettige (2006).

Araujo, Campelo, França, and Marinho (2017) mentioned that infrastructure has been fundamental for poverty reduction. In their paper, investments in infrastructure exhibited poverty reversion. Organization for Economic Co-operation and Development (OECD, 2007) published that infrastructure is important for pro-poor growth. Infrastructures support pro-poor growth by enhancing economic activity, removing bottlenecks in the economy, and generating distributional effects on growth and poverty reduction. Moreover, the OECD stated that infrastructure affects non-income aspects of poverty - health, nutrition, education, and social cohesion.

The impact of infrastructure on poverty may be significant or insignificant. The World Bank in 2002 stated that urban infrastructures, such as waste management projects and environmental projects, impact poverty significantly. Impoverished people are dependent upon the environment. They use natural resources directly; thus, green infrastructure projects lead to poverty reduction.

However, poverty would imply that there would be fewer government funds for infrastructural development. If factors such as a low corruption index, good governance, stable political atmosphere aren't present, the impact of infrastructure would be insignificant (Tsaurai, Kunofiwa; Ndou, Adam, 2019).

Mindful of the fact that poverty is multidimensional, significant papers stated that infrastructure is simply one of the key elements in reducing poverty. Infrastructure investment, alongside policies that encourage sustainable growth, income distribution, and education, is crucial in fighting poverty intensity (Araujo, Campelo, Franca, and Marinho, 2017). As a caveat, the researchers expressed that if infrastructure investment, along with GDP growth and education programs, raises income disparity; these policies may produce very moderate results or worsen poverty.

H_1: Infrastructure ODA Loans have an insignificant impact on poverty.

H_2: Infrastructure ODA Loans have a significant impact on poverty.

B. Infrastructure to Employment

Galvez and Bulayog (2021) recommended that the industry sector be prioritized, especially the manufacturing and construction subsectors, in the development planning process. Infrastructure development, a part of the construction subsector, may transform into economic developments in terms of employment creation.

Infrastructure projects can serve as a potential source of immediate jobs (Estache, Ianchovichina, Bacon, and Salamon, 2020). This is corroborated by Berechman and Paaswell (2001); Haynes (1997); and, Rietveld (1989), which in summary, indicated that increasing spending on road infrastructure projects had an impact on job growth. The Middle East and North Africa's (MENA) infrastructure sector employs one-fifth of the regional workforce. In terms of job creation, the region could generate 2.5 million direct, indirect, and induced

infrastructure-related jobs simply by satisfying predicted yearly investment needs (Estache, Ianchovichina, Bacon, and Salamon, 2020).

Aside from infrastructure being a means of employment, Leigh and Neill (2011) established that higher government expenditure on roads substantially reduces local unemployment in Australia. Bastiaanssen, Johnson, and Lucas (2020) mentioned that higher levels of public transportation and car accessibility to jobs have been recommended to boost employment chances. Public transportation policies designed to increase job seekers' access may be beneficial. They also warned that certain groups of people who do not have private transportation and have limited access to public transportation will have their work possibilities severely restricted.

In developing countries, public transport plays a key role in providing the population with access to employment opportunities (Hernández, Hansz, and Massobrio, 2020). They found that improving accessibility to job opportunities via public transit may enhance individual labor outcomes. Laborda and Sotelsek (2019) discovered that middle-to-low-income countries have a Kuznets curve between road density and unemployment. As the road density level increases, unemployment decreases. Pogonyi (2014) saw that there is a significant, indirect relationship between public transportation possibilities and regional unemployment in Hungary. He recommended that establishing public transportation connections in a city is expected to lower the local unemployment rate by 0.13%.

Leigh and Neill (2011) discussed that federally funded infrastructure programs may only stimulate local employment in the short run. However, Estache, Ianchovichina, Bacon, and Salamon (2020) opposed it. They commented that if infrastructure investment is effectively directed and fostered, a substantial and far-reaching impact on economic and social development, and can improve long-term growth and employment through linked productivity gains. Bringing new job possibilities closer to unemployed individuals may be beneficial in the long run, but Bastiaanssen, Johnson, and Lucas (2020) mentioned that it is difficult to achieve.

Deininger and Okidi (2002) showed empirically that access to key public goods, such as electricity and clean water supply, critically determines a worker's ability to increase income in Uganda.

The International Labour Organization (ILO, 2022) stated that infrastructure development, poverty reduction, and employment creation are linked. Hence, there is a need for more standardized employment accessibility standards. Increased availability of private or public transportation does not always translate into an increase in employment prospects (Bastiaanssen, Johnson, and Lucas, 2020). Furthermore, they mentioned that in addition to the supply of

transportation, there are numerous other factors to take into account, such as employment opportunities and educational opportunities - these factors are largely ignored by aggregate models.

H_3: Infrastructure ODA Loans have an insignificant impact on employment.

H_4: Infrastructure ODA Loans have a significant impact on employment.

C. Synthesis

The studies mentioned above see a relationship between infrastructure poverty and employment.

The researchers of the respective studies concerning poverty identified that investing in infrastructure, roads specifically, contributes to agriculture production. Having paved roads in the rural sector can lead to efficiency and accessibility to rural producers. Investing in rural roads showed increased agricultural productivity, showing more benefits for the poor than the non-poor. Infrastructure is beneficial to the poor as it promotes economic activity and reduces poverty. It also contributes to the non-income aspects of poverty, such as health, nutrition, education, and social cohesion.

On the other hand, the researchers of the respective studies concerning employment identified that infrastructure development promotes economic development by employment creation. It can also lead to productive labor outcomes as infrastructure can also improve the accessibility to job opportunities, namely public transport, and reduce unemployment. If investing in infrastructure is nurtured, it can significantly impact economic and social development and can lead to long-term growth.

Overall, the studies show that only some sectors of infrastructure have a significant impact on employment and poverty. As there is an activity with regard to infrastructure, it can lead to labor productivity and can increase employment.

D. Theoretical Framework

Government expenditure through infrastructures can help stimulate the economy by providing employment and eventually alleviating poverty. This was further supported by John Maynard Keynes called the Keynesian Theory. Furthermore, the theory reiterated that any fluctuations in any component of spending including government expenditure can cause a change in output. If government expenditure increases through the means of building infrastructure, the output will also increase by providing job creation.

E. Simulacrum

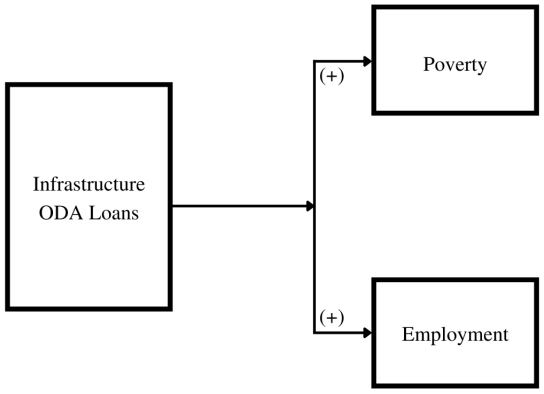

Fig. 1. Simulacrum of Infrastructure ODA Loans, Poverty, and Employment

This figure represents the central idea of this study. It shows the relationship between infrastructure ODA loans and poverty, and employment.

3. Research Methodology

For the initial data for this study, data for infrastructure ODA loans were collected as well as data for poverty and employment. The data for infrastructure ODA loans contained the project details such as its name and description, location, source of funding and cost, target start and end of the project's implementation, feasibility study status, and remarks. Poverty statistics in the Philippines from the year 2006 to 2018 contained the history of poverty per region in the country per year.

The researchers acquired data from the National Economic and Development Authority (NEDA) and Philippine Statistics Authority (PSA) to assess the impact of the infrastructure ODA loans on poverty and employment. For each region per year, the corresponding number for poverty and employment was collected, respectively.

The projects were categorized into the sector that they will affect. Under each sector, it is further categorized into specific utilities, namely water resources; transportation; irrigation; energy, power and electrification; social infrastructure; and urban infrastructure.

Water resources refer to the natural waters. Transportation refers to the movement of goods and people from one place to another. Irrigation refers to supplying land and crops with water to help with their growth. Energy, power and electrification refers to supplying power to technology for its operation. Social infrastructure refers to the infrastructures that contribute to the quality of life. Urban infrastructure refers to the infrastructures that are found in cities.

In a similar study conducted by Palei (2014), regression analysis was used as the statistical process for estimating the relationships among variables. The regression analysis further aids in identifying how the typical value of the dependent variable changes when one of the independent variables is varied and the other one is fixed. The model used for measuring infrastructure impact on poverty and employment is derived from the function below:

$$Poverty_{(r,y)} = f(Water\ Resources_{(r,y)}, Transportation_{(r,y)}, Irrigation_{(r,y)}, Energy, Power, and\ Electrification_{(r,y)}, Social\ Infrastructure_{(r,y)}, Rural\ Infrastructure_{(r,y)}, Urban\ Infrastructure_{(r,y)})$$

$$Employment_{(r,y)} = f(Water\ Resources_{(r,y)}, Transportation_{(r,y)}, Irrigation_{(r,y)}, Energy, Power, and\ Electrification_{(r,y)}, Social\ Infrastructure_{(r,y)}, Rural\ Infrastructure_{(r,y)}, Urban\ Infrastructure_{(r,y)})$$

The impact of infrastructure ODA loans was then measured through the use of the multiple linear regression model:

$$P_{(r,y)} = \beta_0+\beta_1 WR_{(r,y)1}+\beta_2 T_{(r,y)2}+\beta_3 I_{(r,y)3}+\beta_4 EPE_{(r,y)4}+\beta_5 SI_{(r,y)5}+\beta_6 RI_{(r,y)6}+\beta_7 UI_{(r,y)7}+u$$

$$E_{(r,y)} = \beta_0+\beta_1 WR_{(r,y)1}+\beta_2 T_{(r,y)2}+\beta_3 I_{(r,y)3}+\beta_4 EPE_{(r,y)4}+\beta_5 SI_{(r,y)5}+\beta_6 RI_{(r,y)6}+\beta_7 UI_{(r,y)7}+u$$

where:

P	=	Poverty Incidence Among Population
E	=	Employment Rate
WR	=	Water Resources
T	=	Transportation
I	=	Irrigation
EPE	=	Energy, Power and Electrification
SI	=	Social Infrastructure
RI	=	Rural Infrastructure
UI	=	Urban Infrastructure
r	=	Region
y	=	Year
u	=	Error term

The study employed a unit root test to see if the series of data is stationary. The researchers then used the Pooled Ordinary Least Squares (OLS) regression to see the unknown parameters of the linear regression model and the significance of the p-value. Afterward, heteroskedasticity was tested as well through the use of White's test. Durbin-Watson test was used to see if there is any autocorrelation between the variables. The Woolridge Test for autocorrelation in panel data is also used to determine if there is autocorrelation in the data set. The Chow Breakpoint is employed to see if there is a structural breakpoint among the given data. Lastly, the Ramsey Reset is utilized to test if there is a specification error among the variables.

4. Results & Discussion

It was observed that the infrastructure ODA loans have a direct impact on poverty alleviation and employment. Exhibiting an insignificant relationship, this further proved that only some of the said infrastructures affect poverty and employment. A sample of 72 observations was collected from the National Development Authority (NEDA) and Philippine Statistics Authority (PSA) to determine the results. After the data transformation, a sample of 54 observations was used in the remaining tests. However, due to the limited data provided, the researchers opted to examine the impact of the infrastructure ODA loans on poverty alleviation and employment from years 2009 to 2018. Hence, panel data regression was employed.

A. Results

1) Descriptive statistics

The poverty incidence rate has an average of 27.685%. Half of the sample size has a rate of 26.650% and below, while the remaining half has a rate of 26.650% and above. The data gathered reported a minimum poverty incidence rate of 2.2000% and a maximum of 61.800%. Moreover, 75% of all the observation lies within the -2/+2 standard deviation away from the mean. The ratio of the standard deviation from the mean is 0.50284%. The data has low variability. With a sample

Table 1
Mean, median, and mode of poverty incidence, employment, and infrastructure ODA loans

	Mean	Median	Minimum	Maximum
Poverty Incidence	27.685	26.650	2.2000	61.800
Employment Rate	94.332	94.600	87.200	97.700
Energy, Power and Electricity	7.7796	0.0000	0.0000	495.59
Irrigation	4.9624	0.0000	0.0000	126.33
Rural Infrastructure	2.8772	0.0000	0.0000	103.40
Social Infrastructure	4.3361	0.0000	0.0000	278.48
Transportation	28.114	0.0000	0.0000	890.96
Urban Infrastructure	5.0833	0.0000	0.0000	306.66
Water Resources	8.9422	0.0000	0.0000	155.23

Source: Gretl Software

Table 2
Standard deviation, coefficient of variation, skewness, and kurtosis of poverty incidence, employment, and infrastructure ODA loans

	Std. Dev.	C.V.	Skewness	Ex. Kurtosis
Poverty Incidence	13.921	0.50284	0.24843	-0.44728
Employment Rate	2.0424	0.021651	-0.97047	1.0593
Energy, Power and Electricity	58.793	7.5573	8.1119	64.703
Irrigation	19.811	3.9923	4.7276	22.783
Rural Infrastructure	17.112	5.9576	5.7470	31.029

Source: Gretl Software

Table 3
Margin for error, confidence level, IQ range, and missing observations of poverty incidence, employment, and infrastructure ODA loans

	5% perc.	95% perc.	IQ range	Missing obs.
Poverty Incidence	4.0078	54.890	22. 350	0
Employment Rate	90.380	97.070	2.6500	0
Energy, Power and Electricity	0.0000	0.0000	0.0000	0
Irrigation	0.0000	48.297	0.0000	0
Rural Infrastructure	0.0000	0.0000	0.0000	0
Social Infrastructure	0.0000	0.0000	0.0000	0
Transportation	0.0000	124.57	17.439	0
Urban Infrastructure	0.0000	1.5117	0.0000	0
Water Resources	0.0000	84.960	0.0000	0

Source: Gretl Software

size of more than 27.685%, the data is skewed to the right and has a distribution of platykurtic. The difference between the 75% and first 25% of the poverty incidence rate is 22.350%.

The average rate of employment is 94.332%. Half of the sample size has an employment rate of 94.600% and below; while the remaining half has an employment rate of 94.600% and above. The Employment Rate showed a minimum rate of 87.200% and a maximum of 97.700%. Moreover, 75% of all the observation lies within the -2/+2 standard deviation away from the mean. The ratio of the standard deviation from the mean is 0.021651%. The data also has low variability. There is less sample size that has an employment rate of 94.332% and above; thus, the data is skewed to the left. Additionally, the distribution of the sample is leptokurtic. The difference between the 75% and the first 25% of the employment rate is 2.6500%.

The Electricity sector computed an average of 7.7796 in million USD. It reported a maximum loan of 495.59 million USD. Moreover, 75% of all the observation lies within the -4/+4 standard deviation away from the mean. The ratio of the standard deviation from the mean, 7.5573, is greater than one, which indicates that the data has high variability. The data is skewed to the right and has a leptokurtic distribution.

The ODA loans for Irrigation computed an average of 4.9624 in million USD. This specific sector reported a maximum loan of 126.33 in millions USD. Seventy-five percent of all the observation lies within the -4/+4 standard deviation away from the mean. The ratio of the standard deviation from the mean is 3.9923. It reflects high variability within the data. The data is skewed to the right and has a leptokurtic distribution.

Rural Infrastructure computed an average loan of 2.8772 in millions USD and a maximum loan of 103.40 in millions USD. Moreover, 75% of all the observation lies within the -9/+9 standard deviation away from the mean. Given that the ratio of the standard deviation from the mean is 5.9576, the data for this specific sector shows high variability. However, the data is skewed to the right and has a leptokurtic distribution.

The computed average loan for Social Infrastructure is 4.3361 million USD, while the maximum loan is 278.48 in millions USD. Moreover, 75% of all the observation lies within the -9/+9 standard deviation away from the mean. Social infrastructure determined the ratio of the standard deviation from the mean is 7.6113, which indicates a high variability within the data. However, the data is skewed to the right and has a leptokurtic distribution.

The Transportation sector computed an average of 28.114 in millions USD and had a maximum loan of 890.96 in millions USD. Moreover, 75% of all the observation lies within the -4/+4 standard deviation away from the mean. The ratio of the standard deviation from the mean is 3.9109, which also indicates high variability within the data. However, the data is skewed to the right and has a leptokurtic distribution. The transportation sector had an interquartile range of 17.439.

Urban infrastructure computed an average loan of 5.0833 in millions USD and had a maximum loan of 306.66 in millions

USD. Moreover, 75% of all the observation lies within the -8/+8 standard deviation away from the mean. The given data has high variability, given its ratio of the standard deviation from the mean is 7.1853. However, the data is skewed to the right and has a leptokurtic distribution.

Water resources computed an average loan of 8.9422 in millions USD and had a maximum loan of 155.23 in millions USD. Moreover, 75% of all the observation lies within the -3/+3 standard deviation away from the mean. This specific sector also has high variability, given that the ratio of the standard deviation from the mean is 3.1867. However, the data is skewed to the right and has a leptokurtic distribution.

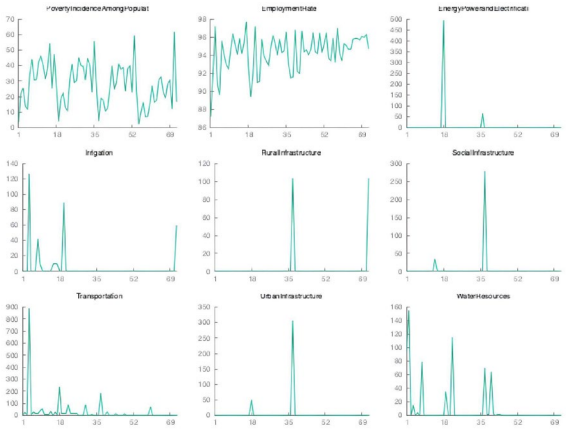

Fig. 2. Graphs of both dependent and predictor variables

Figure 2 shows the different graphs of the variables included in the study.

2) Multicollinearity Test

To test whether the predictor variables or regressors have interdependence, the Variance Inflation Factor (VIF) test was employed.

All the predictors have a VIF value less than 10. Hence, no multicollinearity problem was found among the predictor variables.

Table 4
Multicollinearity Test of Infrastructure ODA Loans

	VIF
Rural Infrastructure	1.327
Irrigation	1.797
Transportation	1.909
Water Resources	1.038
Social Infrastructure	3.218
Urban Infrastructure	4.788
Energy, Power and Electrification	2.612

Source: JASP Software

H_0: There is stationarity among the variables.
H_a: There is non-stationarity among the variables.

All the variables are lesser than alpha. Therefore, the researchers accept the null hypothesis that there is stationarity among the variables. This means that the statistical properties do not change overtime.

3) Pooled Ordinary Least Squares (OLS) Regression and diagnostic checking for poverty incidence model

The Gretl Software was used in modeling the Generalized Least Squares for the data. There are seven (7) infrastructures present in the data set, namely: energy, power and electrification; irrigation; rural infrastructure; social infrastructure; urban infrastructure; transportation; and water resources. All sectors are present in conducting the estimates and no sectors were removed in the further transformation and analysis.

Table 6 shows the results of the regression model when plugged in. All infrastructures except for water resources infrastructures are statistically insignificant. Hence, the researchers accept the null hypothesis that the Infrastructure ODA Loans have an insignificant impact on poverty. Meanwhile, water infrastructure is statistically significant at 0.05 alpha. Therefore, the researchers reject the null hypothesis and accept the alternative. Water resources infrastructure wielded positive and negative effects on poverty. It is noted that the R-squared of the model is at 0.1331, which means that 13.31% of the variability in the poverty incidence variable is explained by the predictors. The Durbin-Watson test was also

Table 5
Unit Root Test of Poverty, Employment, and Infrastructure ODA Loans

Augmented Dickey-Fuller test		
		asymptotic p-value
Poverty Incidence Among Population	with constant	0.0007351
	with constant and trend	0.001925
Employment Rate	with constant	0.01366
	with constant and trend	0.001459
Energy Power and Electrification	with constant	2.177e-14
	with constant and trend	3.77e-14
Irrigation	with constant	2.108e-13
	with constant and trend	5.807e-14
Rural Infrastructure	with constant	7.404e-08
	with constant and trend	6.073e-07
Social Infrastructure	with constant	2.21e-14
	with constant and trend	8.87e-14
Urban Infrastructure	with constant	1.957e-14
	with constant and trend	7.669e-14
Transportation	with constant	7.208e-15
	with constant and trend	5.544e-17
Water Resources	with constant	7.074e-07
	with constant and trend	2.64e-06

Source: Gretl Software

Table 6
OLS regression and diagnostic checking for poverty incidence

	Coefficient	Std. error	T-ratio	P–value
Constant	29.5641	1.76421	16.76	4.32e-25***
Energy, Power and Electrification	0.0120152	0.0472150	0.2545	0.7999
Social Infrastructure	0.151102	0.399800	0.3779	0.7607
Transportation	-0.0114512	0.0244094	-0.4691	0.6406
Urban Infrastructure	-0.142981	0.369020	-0.3875	0.6997
Water Resources	-0.127638	0.0591663	-2.157	0.0347
Irrigation	-0.0201600	0.137758	-0.1463	0.8841
Rural Infrastructure	-0.117485	0.154189	-0.7620	0.4489

Mean dependent var	27.668486	S.D. dependent var	13.92101
Sum squared resid.	111926.86	S.E. of regression	13.65127
R-squared	0.133185	Adjusted R-squared	0.038377
F(7, 64)	1.404790	P-value (F)	0.218943
Log-likelihood	-286.1193	Akaike criterion	588.2386
Schwarz criterion	606.4250	Hannan-Quinn	595.4894
rho	0.217101	Durbin-Watson	1.211571

Source: Gretl Software

Pooled Ordinary Least Squares (OLS) Estimates for First Difference Transformed Data

Table 7
OLS estimates for first difference transformed data for poverty incidence

	Coefficient	Std. error	T-ratio	P–value
Constant	1.07452	2.43765	0.4408	0.6614
Energy, Power and Electrification	-0.514678	0.227724	-2.260	0.0286 **
Irrigation	0.0601330	0.164642	0.3652	0.7166
Rural Infrastructure	-0.481211	0.183219	-2.626	0.0117 **
Social Infrastructure	0.194649	0.485802	0.4007	0.6905
Transportation	-0.0232028	0.1291209	-0.7968	0.4297
Urban Infrastructure	4.74572	2.26696	2.093	0.0419 **
Water Resources	-0.0136064	0.0767493	-0.1773	0.8601

Mean dependent var	-0.607387	S.D. dependent var	17.40239
Sum squared resid	12038.80	S.E. of regression	16.17755
R-squared	0.249951	Adjusted R-squared	0.135813
F(7, 64)	2.189899	P-value (F)	0.052604
Log-likelihood	-222.6092	Akaike criterion	461.2183
Schwarz criterion	477.1302	Hannan-Quinn	467.3549
rho	-0.1944490	Durbin-Watson	1.424884

employed to test if there is an autocorrelation problem among the variables. It was recorded that the Durbin-Watson statistics of the model is 1.21. Hence, there is a need to transform the model.

Table 7 shows the results of the estimates of the first difference transformed data. Irrigation, social infrastructure, transportation, and water resources are statistically insignificant. Hence, the researchers accept the null hypothesis that the Infrastructure ODA Loans have an insignificant impact on poverty. However, energy, power and electricity, rural infrastructure, and urban infrastructure are statistically significant at 0.05 alpha. Therefore, the researchers reject the null hypothesis and accept the alternative. Water resources infrastructure wielded positive and negative effects on poverty. It is noted that the R-squared of the model is at 0.250, which means that 25% of the variability in the poverty incidence variable is explained by the predictors. The Durbin-Watson test was also employed to test if there is an autocorrelation problem among the variables. Leaning towards 2.0, there is no autocorrelation problem found in the model.

4) Pooled Ordinary Least Squares (OLS) regression and diagnostic checking for employment rate

The Gretl software was also utilized to know the regression estimates for the employment rate model. The following are the achieved results (See Table 8).

Table 8 shows the results of the regression model when plugged in. All infrastructures except for water resources infrastructures are statistically insignificant. Hence, the researchers accept the null hypothesis that the infrastructure ODA loans have an insignificant impact on poverty alleviation. Meanwhile, water resources are proven to be statistically significant. Therefore, the researchers reject the null hypothesis and accept the alternative. Water resources infrastructure wielded positive and negative effects on employment respectively. The computed R-squared is 0.3405, which means that 34.05% of the variability in employment is explained by the predictors. The Durbin-Watson test was also employed to test if there is an autocorrelation problem among the variables. The result is 1.74, this means that it is leaning towards 2.0. Hence, an autocorrelation problem does not exist in the given dataset.

Table 9 shows the results of the estimates of the first difference transformed data of the employment model. All infrastructures except for Transportation are statistically insignificant. Hence, the researchers accept the null hypothesis

Table 8
OLS regression and diagnostic checking for employment rate

	Coefficient	Std. error	T-ratio	P–value
Constant	94.7980	0.225756	419.9	8.09e-112***
Energy, Power and Electrification	-0.00213754	0.00604185	-0.3538	0.7247
Social Infrastructure	0.00204965	0.0511603	0.4006	0.6900
Transportation	-0.00106208	0.00312353	-0.3400	0.7349
Urban Infrastructure	-0.00239593	0.0472214	-0.5074	0.6136
Water Resources	-0.0352097	0.00757119	-4.650	1.71e-05***
Irrigation	-0.0204364	0.0176283	-1.159	0.2506
Rural Infrastructure	0.0103068	0.197307	0.5224	0.6032

Mean dependent var	94.33194	S.D. dependent var	2.04245
Sum squared resid	195.3013	S.E. of regression	1.746878
R-squared	0.340592	Adjusted R-squared	0.268469
F(7, 64)	4.722388	P-value (F)	0.000255
Log-likelihood	-138.0872	Akaike criterion	292.1743
Schwarz criterion	310.3876	Hannan-Quinn	299.4251
rho	-0.144694	Durbin-Watson	1.742738

Source: Gretl Software

Pooled Ordinary Least Squares (OLS) Estimates for First Difference Transformed Data

Table 9
OLS estimates for first difference transformed data for employment rate

	Coefficient	Std. error	T-ratio	P–value
Constant	0.521979	0.385677	1.353	0.1825
Energy, Power and Electrification	-0.0554499	0.0360297	-1.539	0.1307
Irrigation	0.0186615	0.0260491	0.7164	0.4774
Rural Infrastructure	-0.0312749	0.0289884	-1.079	0.2863
Social Infrastructure	0.0478462	0.0768621	0.6225	0.5367
Transportation	-0.0105424	0.00460742	-2.288	0.0268**
Urban Infrastructure	0.480879	0.358672	1.341	0.1866
Water Resources	-0.0116019	0.0121430	-0.9554	0.3444

Mean dependent var	0.092593	S.D. dependent var	2.78815
Sum squared resid	301.3623	S.E. of regression	2.559561
R-squared	0.268533	Adjusted R-squared	0.157223
F(7, 64)	2.412474	P-value (F)	0.034324
Log-likelihood	-123.0446	Akaike criterion	262.0891
Schwarz criterion	278.0010	Hannan-Quinn	268.2257
rho	-0.106605	Durbin-Watson	1.522953

Source: Gretl Software

Test for Heteroskedasticity - Poverty:

Table 10
Heteroskedasticity test for poverty

	Coefficient	Std. error	T-ratio	P-Value
Constant	253.338	82.0068	2.870	0.0067***
Energy, Power, and Electricity	0.0599850	21.3323	0.002812	0.9978
Irrigation	27.4044	40.1060	0.6833	0.4986
Rural Infrastructure	-1.93092	14.0404	-0.1375	0.8913
Social Infrastructure	-7.66136	13.9716	-0.5484	0.5867
Transportation	3.87243	10.1951	0.3798	0.7062
Urban Infrastructure	50.7946	176.203	0.2883	0.7747
Water Resources	-1.76238	11.9535	-0.1474	0.8836

Unadjusted R-squared	0.090226
TR^2	4.872189
P-value	0.993154

Source: Gretl Software

that the Infrastructure ODA Loans have an insignificant impact on poverty. However, transportation showed to be statistically significant at 0.05 alpha. Therefore, the researchers reject the null hypothesis and accept the alternative. Water resources infrastructure wielded positive and negative effects on employment. It is noted that the R-squared of the model is at 0.2685, which means that 26.85% of the variability in the poverty incidence variable is explained by the predictors. The Durbin-Watson test was also employed to test if there is an autocorrelation problem among the variables. Leaning towards 2.0, there is no autocorrelation problem found in the model.

H_0: The variances are constant.

H_a: The variances are not constant.

Yielding a p-value of 0.99 which is greater than 0.05 alpha. The researchers accept the null hypothesis that the variances are constant. Therefore, at 5% level of significance, the error terms

Test for Heteroskedasticity - Employment:

Table 11
Heteroskedasticity test for employment

	Coefficient	Std. error	T-ratio	P-Value
Constant	4.70522	1.46333	3.215	00.0027***
Energy, Power, and Electricity	-0.00234660	0.380653	-0.006165	0.9951
Irrigation	-0.574412	0.715651	-0.8026	0.4272
Rural Infrastructure	0.226569	0.250536	0.9043	0.3715
Social Infrastructure	-0.236149	0.249308	-0.9472	0.3495
Transportation	0.196290	0.181922	1.079	0.2874
Urban Infrastructure	-1.45329	3.14417	-0.4622	0.6466
Water Resources	0.113491	0.213298	0.5321	0.5978

Unadjusted R-squared	0.424787
TR^2	22.938493
P-value	0.085455

Source: Gretl Software

are homoskedastic. No further transformations are required.

H_0: The variances are constant

H_a: The variances are not constant

Yielding a p-value of 0.085 which is greater than 0.05 alpha. The researchers accept the null hypothesis that the variances are constant. Therefore, at 5% level of significance, the error terms are homoskedastic. No further transformations are required.

Test for Normality of Residuals:

Table 12
Test for normality of residuals for poverty incidence and employment

Test for Normality of Residuals		
d_Poverty Incidence	Chi-square (2)	5.386
	P-Value	0.06769
d_Employment	Chi-square (2)	5.31536
	P-Value	0.0701107

Source: Gretl Software

H_0: The residuals are normally distributed.

H_a: The residuals are not normally distributed.

The p-value of poverty incidence, 0.067, is greater than 0.05 alpha. For employment, the p-value of 0.701 is greater than 0.05 alpha. Thus, the researchers accept the null hypothesis for both variables - that the residuals are normally distributed as well.

Serial Correlation Test:

Table 13
Serial Correlation Test for Poverty Incidence and Employment.

Wooldridge test for autocorrelation in panel data: P-Value = P(|t| > 2.37661)	
d_Poverty Incidence	0.0979173
d_Employment	0.25452

Source: Gretl Software

H_0: There is no serial correlation among the variables.

H_a: There is a serial correlation among the variables.

The p-value of poverty incidence, 0.098, is greater than 0.05 alpha. While, the p-value of employment, 0.25, is greater than 0.05 alpha. Therefore, the researchers accept the null hypothesis for both variables. It shows that there is no serial correlation among the variables. No further transformation is required.

Chow Breakpoint:

H_0: There is a structural breakpoint in the dataset.

H_a: There is no structural breakpoint in the dataset.

Table 14
Chow breakpoint for poverty incidence and employment

Chow Breakpoint	
d_Poverty Incidence	0.9396
d_Employment	0.2894

Source: Gretl Software

Poverty incidence has a p-value of 0.94, which is greater than 0.05 alpha. While, employment has a p-value of 0.289, which is also greater than 0.05 alpha. Therefore, the researchers accept the null hypothesis and reject the alternative hypothesis for both variables. It further proves that there is a structural breakpoint. No further transformation is required.

Ramsey Reset:

Table 15
Ramsey reset for poverty incidence and employment

Ramsey Reset		
d_Poverty Incidence	Squares and Cubes	0.616
	Squares only	0.555
	Cubes only	0.498
d_Employment	Squares and Cubes	0.712
	Squares only	0.927
	Cubes only	0.577

Source: Gretl Software

H_0: There is no specification error among the variables

H_a: There is a specification error among the variables

The p-values of the Ramsey Reset for poverty incidence are 0.616, 0.555, and 0.498, and all are greater than 0.05 alpha. Employment's Ramsey Reset p-values are 0.712, 0.927, and 0.577 which are all greater than 0.05 alpha. Therefore, the researchers accept the null hypothesis for both variables that there is no specification error among the variables.

B. Discussion

1) Poverty incidence model

Based on the estimation results, energy, power and electrification, rural infrastructures, and urban infrastructures have a significant relationship with poverty incidence. Thus, contributing to the overall welfare of the Filipinos. Rural infrastructure investments can lead to higher farm and non-farm productivity leading to increased availability of wage goods (Ali and Pernia, 2003). Likewise, these investments can lead to income distribution as well. Energy, power and electrification

are seen to have a significant impact on poverty due to the increase in productivity in the Philippines leading to poverty reduction. In addition, electricity reflects access to technology. Hence, contributing to the incomes of the poor (Balisacan and Pernia, 2002). Urban infrastructures such as waste management projects and environmental projects also impact poverty significantly. Green projects lead to poverty reduction because the poor are often dependent upon the environment and direct use of natural resources (World Bank, 2002).

While the rest of the infrastructures have an insignificant relationship with poverty incidence. The insignificant infrastructures are irrigation, social infrastructure, transportation, and water resources This is because only a few of the infrastructures are situated in the poorest areas of the country. The irrigation ODA loans infrastructure is not found in all regions across the country. Hence, the poor cannot benefit from the infrastructure built. The social infrastructures built from the years 2009 to 2018 are fewer compared to the other subsectors. This can be the reason for its result. Meanwhile, most of the transportation infrastructures are centered in Luzon. It must be recognized that the poorest areas in the country still lack access to proper roads. Moreover, constructing bridges and bypassing roads is counterproductive. These infrastructures are more likely to congest areas because of the phenomenon called induced demand. Likewise, can be said for water resources infrastructures. In addition, there are only a few nationwide infrastructures for irrigation, social infrastructure, transportation, and water resources. This reason could have probably led to the result of it being insignificant. There is a reverse causality from infrastructure to poverty alleviation (Seetanah et. al, 2009). More poverty would imply that there would be fewer government funds for infrastructural development. Moreover, aside from the factors aforementioned, a low corruption index, good governance, stable political atmosphere, among others which are not taken into account in the current study, must be ubiquitous for infrastructure development and poverty to be significant (Tsaurai, Kunofiwa; Ndou, Adam, 2019).

2) Employment rate model

Similar to the poverty incidence model, almost all of the infrastructures have an insignificant impact on employment except transportation. In contrast with the result in the poverty incidence model, transportation infrastructures are seen to be significant and a major key player in increasing employment. Almost all of the transportation ODA loans infrastructures are situated in the busiest areas in Luzon making the accessibility to jobs more convenient for the people who live in the neighboring areas. Although, it must still be acknowledged that the Philippines is an archipelago, and concentrating transportation infrastructures in the fast-paced and bustling cities in the country would not imply a huge difference in the overall welfare.

On the other hand, energy, power and electrification, irrigation, rural infrastructures, social infrastructures, urban infrastructures, and water resources are seen to have an insignificant relationship with employment. One possible reason could be that the infrastructures are not able to meet the expectations of the people. In the water resources sub-sector, it was highly criticized for the failure of mitigating the perennial floods in the area making employment growth unrealizable. Furthermore, the infrastructure ODA loans are positioned in the richest cities in the country. Findings also support the work of Deininger and Okidi (2002) on Uganda who shows empirically that access to key public goods, such as electricity and clean water supply, critically determines a worker's ability to increase income. The impoverished people would not be able to access the infrastructure on a daily basis. For rural households to be able to take advantage of the benefits of urban development, rural-urban linkages should be strengthened (Parel, 2014). Aside from the factors aforementioned, delays, insufficient provision of developmental resources, shortages of funds, and poor repair and maintenance, among others are not taken into account in the current study, they must be ubiquitous for infrastructure development. Thus, this could be the reason for their insignificance.

5. Conclusion

Almost all of the infrastructure ODA loans sectors, namely irrigation, social infrastructures, transportation, and water resources have an insignificant impact on poverty alleviation and employment. Most of these infrastructures are mostly located in Luzon or in the center of their respective provinces leaving the poorest outskirts underdeveloped. On the other hand, infrastructure sectors such as energy, power and electrification, rural infrastructure, urban infrastructure, and transportation appear to have a significant impact on poverty alleviation. They contribute to poverty reduction by increasing high farm yields and productivity.

Meanwhile, infrastructure ODA loans, namely energy, power and electrification, irrigation, rural infrastructures, social infrastructure, urban infrastructure, and water resources are seen to have an insignificant relationship with employment. Likewise, the same reason why almost all infrastructure ODA loans sectors have an insignificant impact on poverty alleviation. However, transportation infrastructures appear to have a significant impact on employment as those infrastructures help bring people to their destinations especially when headed to their workplace, which promotes productivity.

1) Policy recommendations

The results of this study will be beneficial not only to the academe but also to policymakers in making future reforms for the country. The research findings appeared that most infrastructures funded by the Official Development Assistance (ODA) loans are insignificant to the country's poverty reduction and employment boost. The researchers suggest that there would be a reassessment of the current policies involving the funding of infrastructures. Furthermore, policymakers should be prompted to venture out into other forms of funding such as the Private and Public Partnerships or PPP, and proper public budget allocation. Likewise, taking out too many loans can lead to a budget deficit and unsustainable fiscal plans. Furthermore, relying on Official Development Assistance (ODA) loans as the center point can lead to unnecessary spending- a constraint that is not welcome at any moment.

The researchers also suggest that situating infrastructures in the outskirts of the country's poorest areas will benefit the Filipinos, connecting them to the center of their respective regions. This suggestion will enhance employment directly and indirectly and lead to poverty alleviation with proper implementation. Since only a limited number of infrastructures are found in those areas, saturating these infrastructures to the Visayas and Mindanao regions and the different rural areas will make them more accessible, and there will be different job opportunities for people residing in those locations. With that, those job opportunities must be offered long-term.

The researchers also suggest that policymakers target the 17 Sustainable Development Goals of the United Nations. This study is aligned with SDGs 1 and 8, No Poverty and Decent Work & Economic Growth, respectively. The poor are the ones who are greatly affected when there are changes in the country's economic performance. Creating policies aligned with the United Nations' goals will make our country a more sustainable place to live, not just for the poor but for the whole country. Having policies aligned with SDGs 1 and 8 will create a vibrant economy for the country and create a more inclusive environment for all Filipinos where no one will be discriminated against based on their economic status.

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