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Human Development and Competitive Industrial Performance Index: Predictors of Poverty Incidence Across Countries

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Abstract

The occurrence from claiming destitution in the world is higher over the previous estimates have proposed. The main reason is that it has implicitly underestimated the cost of living in most developing countries. Conclusively, the latter indicates that to explain poverty incidence is to consider several explicit dynamics. Economies considered an industrial advancement for a better performance, human development, and resources to have an impact in alleviating poverty incidence of the entire populace. Human Development Index (HDI) ranking and Competitive Industrial Performance (CIP) Index were used in the study as the predictors in determining the poverty incidence. Moreover, it aimed to generate a linear model on the poverty occurrence using these predictors in a given country. Based on the result, these two explanatory variables found to have significant effect on the poverty incidence. Therefore, in addressing poverty, the government should consider the human development and competitive industrial performance index in formulating policies and programs that were found in this study to have impact on poverty incidence.

Keywords: human development index, competitive industrial performance index, poverty threshold, linear model

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1.0 Introduction

The incidence of poverty in the world is higher than past estimates have suggested (World Bank, 2016). Poverty persisted to be a precarious social problem as the number of households living below the poverty threshold that calls to address for feasible solutions. For many decades, the world is experiencing a foremost population shift that could alter the progression of global development. The direction and pace of this transition to discourse poverty incidence varies dramatically from country to country, with differing repercussions depending on where a country stands on the spectrum of individual and economic development (World Bank, 2016). In other words, economies of a given country should have a performance in industrial development that is higher to have better opportunities and resources to improve the overall quality of life of their population. Industrial competitiveness is generally measured as the Competitive Industrial Performance (CIP), while the quality of life is normally explained through the Human Development Index (HDI) of a country. This study aimed to generate a model on the poverty incidence using human development and competitive industrial performance index across different countries.

Despite the poverty reduction as the core objective of international development discourses and policies, evolvement to this end remains inadequate (UNDP, 2003). The said reduction is predominantly evident in the extent to which the world is off target to achieve most of the Millennium Development Goals, globally and in most regions and countries (UNDP, 2003). Thus, this leads to raising important questions about the factors associated with poverty incidence. Economists, demographers, and other social scientists have long debated the relationship between demographic change and economic outcomes (Igbalajobi *et al*., 2013). In recent years, general agreement has emerged to the effect that improving economic conditions for individuals lead to lower poverty incidence (Sinding, 2009). Moreover, current studies enumerated different statistical models associated to factors of poverty from the changing trends in a country's economy, lack of education, government, corruption, limited employment opportunities, poor infrastructure, deprived resource usage (Korankye, 2014), having a culture of poverty, overpopulation, epidemic diseases such as AIDS and malaria (Lusted, 2010), and environmental problems such as lack of rainfall (White and Killick, 2001). Still, poverty is a universal phenomenon nowadays that affects socio-economic and political well-being of its victims whether in a developed or underdeveloped country. Nonetheless, no further studies have used the HDI and CIP index in explaining the poverty incidence in a given country, hence this study.

Human Development Index, as defined by United Nations, is a summary measure of average achievement in vital dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living (UNDP, 2003). A country scores greater HDI when the lifespan is higher; the education level is advanced, the GDP per capita is higher, the fertility rate is lower, and the inflation rate is lower. On the other hand, Competitive Industrial Performance (CIP) Index building on a concept of competitiveness that emphasizes countries' manufacturing development, implying that industrial competitiveness is multidimensional. Industrial competitiveness defines as the capacity of countries to increase their presence in international and domestic markets while developing sectors and activities with higher value added and technological content (UNIDO, 2002). Furthermore, the success of a country in the process of competition is closely related to the degree at which it can simultaneously increase the real income of its citizens and produce internationally demanded goods and services. Also, a country's or a region's competitiveness includes the provision of high living standards and employment opportunities. Consequently, considering these two factors in the study contribute at explaining the poverty incidence of a country.

The study generated the model through Linear Regression Analysis since it attempted to model the relationship between variables by fitting a linear equation to observed data. Further, the created model was tested over diagnostic checking on the basic assumptions for its robustness.

2.0 Variable in the Study

The study had looked into the potentials of using human development index (X_1) and competitive industrial performance

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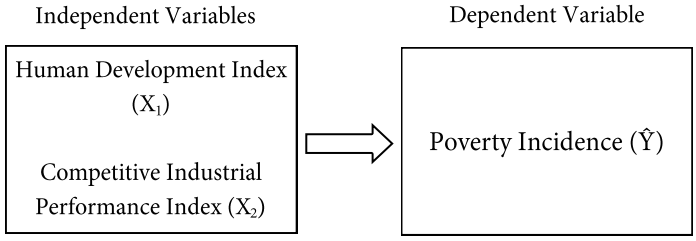
index (X_2) as factors in predicting poverty incidence across countries. The concept of the study anchored on the following theoretical considerations:

According to Gallardo (2009), many local governments and authorities have used the human development index (HDI) for advocacy as a tool for calling the attention of central government when allocating public investment funds, aid funds coming from international cooperation or funds destined to alleviate poverty.

According to UNIDO (2004), there is a strong positive association between the CIP index and GDP per capita. An increase of 0.01 of the former would lead to a rise of between $250 and $300 (in 1990 prices) in the latter, which indirectly explains the association of CIP index and the poverty incidence.

The independent variables (IV) in the study are Human Development Index (X_1) and Competitive Industrial Performance Index (X_2) while Poverty Incidence is the dependent variable (DV).



3.0 Research Design and Methods

Source of Data

The study utilized the secondary data obtained from different sources available from each respective site. The data on Human Development Index (HDI) were retrieved from the Human Development Report of 2013, entitled "The Rise of the South: Human Progress in a Diverse World" conducted by United Nations Development Programme (UNDP). Human Development Index (HDI) is a composite statistic of life expectancy, education, and income per capita indicators, which are used to rank countries into four tiers of human development.

The data on the Competitive Industrial Performance (CIP) Index obtained from the publication prepared by United Nations Industrial Development Organization (UNIDO). CIP index is a composite measure of the competitive industrial performance of countries based on eight indicators reflecting their capacities to produce and export, technological deepening and upgrading and impact on global industrial production. CIP index derived on the normalization procedure of individual indices and their aggregation based on given weight to the component of the composite measure. Lastly, the data on Poverty Rate Incidence from the Central Intelligence Agency World Factbook were obtained. It is the national estimates of the percentage of the population falling below the poverty line based on surveys of sub-groups, with the results weighted by the number of people in each group.

Table 1 presents the summary of the current data of Poverty Incidence, Human Development Index, and Competitive Industrial Performance Index across countries during 2012. These are the countries that have completed data on poverty incidence, human development index and competitive industrial index.

Table 1. Data set on the poverty incidence (%), human development and competitive industrial performance index across countries

Country	Population below Poverty Line (%)	Human Development Index (2012)	Competitive Industrial Performance Index (2012)
Austria	6.2	0.895	0.2589
Botswana	30.3	0.634	0.0215
Bulgaria	21.8	0.782	0.0547
Cameroon	48	0.495	0.0111
Canada	9.4	0.911	0.2267
Chile	15.1	0.819	0.0686
Costa Rica	24.8	0.773	0.0462
Croatia	21.1	0.805	0.0552
Czech Republic	9.8	0.873	0.2215
Denmark	13.4	0.901	0.1810
Dominica	29	0.702	0.0000
Ecuador	25.6	0.724	0.0233
Estonia	17.5	0.846	0.0752
Fiji	31	0.702	0.0109
France	7.9	0.893	0.2978
Gambia	48.4	0.439	0.0008
Hungary	14	0.831	0.1578
Ireland	5.5	0.916	0.3038
Kenya	43.4	0.519	0.0100
Lebanon	28	0.745	0.0231
Lesotho	49	0.461	0.0000
Madagascar	50	0.483	0.0054
Malawi	53	0.418	0.0036
Malta	15.1	0.847	0.0501
Mongolia	29.8	0.675	0.0083
Netherlands	9.1	0.921	0.3170
Niger	63	0.304	0.0035
Paraguay	34.7	0.669	0.0095
Peru	25.8	0.741	0.0473
Portugal	18	0.816	0.1116
Republic of the Congo	46.5	0.534	0.0115
Romania	22.2	0.786	0.1124
Slovenia	13.5	0.892	0.1164
South Africa	31.3	0.629	0.0839
Switzerland	7.6	0.913	0.3395
Tonga	24	0.71	0.0000
United Arab Emirates	19.5	0.818	0.0653
United Kingdom	16.2	0.875	0.2751
Uruguay	18.6	0.792	0.0286

4.0 Results and Discussion

Multiple Linear Regression Procedures in Building the Model for Poverty Incidence Using HDI and CIP Index

Diagnostic Checking

Diagnostic checking of the assumptions of the Multiple Linear Regression is presented to determine the adequacy of the identified model. It is important to evaluate the aptness of the generated model for the said data and testing it whether it satisfy the required assumptions for its appropriateness. The data

analysis utilized the different formal tests and generated the results from Statistical software.

Table 2 shows the Kolmogorov-Smirnov result. The statistic associated with the test yielded of 0.083 with *p*-value equal to 0.200 which is greater than 0.05 level of significance has been shown. Hence, the error term is normally distributed. The result implies that the distribution of the error terms of the identified model for the number of poverty incidence is normal. Thus, few consequences associated with a violation of the normality assumption have been eliminated, such as it does contribute to bias or inefficiency in regression model (Statistics Solutions, 2013a).

Table 2. Normality test of the error terms in the model

	Kolmogorov-Smirnov		
	Statistic	***df***	**Sig.**
Unstandardized Residual	0.083	39	0.200

In testing the constancy of variance, Breush-Pagan test was utilized. From Table 3, it can be observed that the statistic yielded a value of 0.210 with a *p*-value of 0.900 which shows not significant result. This finding indicates that variance of error terms of the identified model is constant. Thus, it satisfies the assumption of homoscedasticity. A more serious problem associated with heteroscedasticity that the standard errors are biased have been disregarded (Statistics Solutions, 2013b).

Table 3. Test for constancy of variance of the error terms in the model

	Breusch-Pagan	
	Statistic	**Sig.**
Unstandardized Residual	0.210	0.900

For the multicollinearity of independent variables included in the model, Variance Inflation Factors are each computed and are summarized in Table 4. As shown, the VIF values of the two independent variables are both equal to 2.042. These all yielded values are less than 10. Thus, this indicates that there is no presence of multicollinearity among independent variables in the identified model, which means the prediction is accurate and the overall R^2 (or adjusted R^2) quantifies how well the model predicts the dependent variable (Paul, 2014). In this study, the model will estimate the poverty incidence.

Table 4. Variance inflation factor of the independent variable in the model

Model	**Collinearity Statistics**	
Constant	Tolerance	**VIF**
Human Development Index (X_1)	0.490	**2.042**
Competitive Industrial Performance Index (X_2)	0.490	**2.042**

Table 5 presents the portion of the probabilities for the D^2 scores after sorting in ascending order to find the smallest probability value. It shows that there are no values less than 0.001. The result implies that there are no cases designated as outliers. Thus, accuracy tended to increase significantly and substantially, and errors of inference tended to drop significantly and substantially since extreme scores were excluded in the data analysis (Osborne and Overbay, 2004).

Table 5. Mahalanobis distance for an outlier observation

Observation	**Mahalanobis Distance**	***p*-value**
1	0.121631	0.059003
2	0.351432	0.161144
3	0.430100	0.193499
4	0.465561	0.207673
5	0.473578	0.210842
⋮	⋮	⋮
39	8.807360	0.987768

Model Building for Poverty Incidence

Table 6 presents the parameter estimates of the model for poverty incidence. It shows the outcome in identifying independent variables that will predict the poverty incidence. In this study, the analysis applied the Backward Elimination procedure. The model will drop the variables by their contribution to the reduction of error sum of squares.

Table 6. Parameter estimates of the model for poverty incidence

Model	**β Coefficients**	**Std. Error**	**t - statistic**	**Prob. Value**
Constant	88.157	2.173	40.576	0.000
HDI (X_1)	-84.249	3.363	-25.051	0.000
CIP (X_2)	-11.227	5.175	-2.170	0.037
R-Square Adjusted				0.976
R-Square				0.974

As observed in Model, the estimated coefficients are 88.157 for the constant, -84.249 for human development index (HDI), and -11.227 for competitive industrial performance (CIP) index. The *t*-test was utilized in testing the significance of the two independent variables. From Table 6, the two variables obtained *p*-values less than 0.05 level of significance. Thus, it indicates that these variables yielded a significant result. Further, the procedure for Backward Elimination terminates the step.

Moreover, the identified model yielded the coefficient of determination $R^2 = 0.976$ which is relatively high. This statistic implies that the contribution of the identified independent variables accounts for 97.60% of the total variation in poverty incidence rate (Y). Therefore the generated model in this study is

$$\hat{Y} = 88.157 - 84.249\, X_1 - 11.22\, X_2$$

From the regression equation of the generated model, the coefficient of X_1 (HDI) is negative, which implies that X_1 affects the Y inversely. This inverse relationship means that for every one point decrease in human development index (X_1), there is

84.249 increase in the poverty incidence rate (Y) while another independent variable is held fixed. On this note, the welfare of the human person, realized in its totality, must intrigue policy-makers and their executives since health intervention can evidently produce economic gains for patients and national economies (Garau *et al.*, 2015), good health of a person turns into his riches, and his skills improved through prudently deliberated educational programmes and responsible socialization that provide a vital factor in production (Oyeshola, 2007). In this respect, his several endeavours add to the wealth of his nation. Conversely, when well-being and educational facilities are overreached, expansive quantities of the society remain an advantage for goods and services. However, the rest may constitute a chronic obligation particularly amid any hardship the nation may experience. Therefore, development strategy should be a people-centred, and then community participation must be manifested in the process.

In addition, the coefficient of X_2 (CIP) index is also negative, which implies that X_2 affects the Y inversely. This inverse relationship means that for every one point decrease in competitive industrial performance (X_2) index, there is 11.227 increase in the poverty incidence rate ($\hat{Y}$) while another independent variable is held constant. This result comes as no surprise, considering the generally held view that advancement of a competitiveness of manufacturing industry is very likely to increase incomes in the cumulative economy that is regarded as one of the basic determinants of long run sustainable growth of a country (UNIDO, 2004), which effectively decreases the poverty incidence. Therefore, it is important to establish an efficient, industrially competitive economic structures that will be able to meet the growing demands and challenges of the market, such that a properly designed and consistently applied industrial policy should be formulated for the developments in the future.

The result of this study revealed that human development and competitive industrial performance index have an impact on the poverty incidence rate across different countries. This implies that as HDI and CIP index increases of a certain country, the poverty incidence decreases and vice versa.

Predictive Ability of the Model

Table 7 shows the evaluation of the predictive ability of the identified model in this study using Mean Absolute Percentage Error (MAPE %). The MAPE % measures the size of the error in percentage terms that focuses primarily on the forecast accuracy assessment. It is calculated as the average of the unsigned percentage error. The model with great errors is subject to re-evaluation. The final model equation in this study takes the form

$$\hat{Y} = 88.157 - 84.249\,X_1 - 11.22\,X_2$$

In this study, 20 cases as hold out data were used to check if the model can generate a good prediction. Table 7 revealed the MAPE value of the model is equal to 0.1458. This result indicates that the model gives less error. Thus, the predictive ability of the generated model is appropriate in forecasting the new cases.

Table 7. The mean absolute percentage error and the predicted values of the identified model in the original form

Country	Y_i	X_1	X_2	$\hat{Y}_i$	$\left\lvert\frac{Y_i - \hat{Y}_i}{Y_i}\right\rvert$
Algeria	23.0	0.713	0.0223	27.84	0.21
Brazil	21.4	0.730	0.1095	25.43	0.19
Burundi	68.0	0.335	0.0011	58.24	0.14
Colombia	32.7	0.719	0.0410	27.12	0.17
Côte d'Ivoire	42.0	0.432	0.0162	51.58	0.23
El Salvador	36.5	0.680	0.0333	30.49	0.16
Eritrea	50.0	0.351	0.0000	58.59	0.17
Kyrgyzstan	33.7	0.622	0.0056	35.69	0.06
Macedonia	30.4	0.740	0.0245	25.54	0.16
Mozambique	52.0	0.327	0.0069	60.53	0.16
Nicaragua	42.5	0.599	0.0000	37.69	0.11
Panama	26.0	0.780	0.0081	22.35	0.14
Philippines	26.5	0.654	0.0659	32.32	0.22
Rwanda	44.9	0.434	0.0027	51.56	0.15
Senegal	54.0	0.470	0.0114	48.43	0.10
Tajikistan	35.6	0.622	0.0044	35.70	0.00
Ukraine	24.1	0.740	0.0647	25.09	0.04
Venezuela	31.6	0.748	0.0547	24.52	0.22
Yemen	45.2	0.458	0.0042	49.52	0.10
Zambia	60.5	0.448	0.0086	50.32	0.17
MAPE %				**0.1458**	

5.0 Conclusion and Policy Recommendation

The human development and competitive industrial performance index have the significant effect on the poverty incidence. This represents a linear model as Poverty Incidence = 88.157—84.249 (HDI) - 11.227 (CIP). Moreover, the generated model is appropriate in forecasting the new cases based on the value of MAPE %. Therefore, in addressing the poverty incidence and formulating programs and policies in alleviating poverty, the government should consider the human development and competitive industrial performance index that were found to have an impact on its rate across different countries.

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