Impact of External Financial Inflows on Food Insecurity: Empirical Evidence from Least Developing Countries

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ABSTRACT
This paper investigates the impact of external financial inflow on the prevalence of undernourishment for least developing countries. Panel data estimation (fixed effect, random effect, and system GMM) was used from 2001 to 2019 for 35 least developing countries. Findings suggest that FDI inflow, official development assistance, and economic growth are positive impact on hunger, thus reducing prevalence to undernourishment in the least developing countries in the presence of financial development. However, population growth increases the prevalence of undernourishment in the least developing countries.

Keywords: *Prevalence to Undernourishment, Hunger, FDI, ODA, Economic growth.*

1. INTRODUCTION

In the last decade, global undernourishment has decreased from 18.7% to 11.3% and from 23.4% to 13.5% in emerging nations [1]. Furthermore, undernourishment in sub-Saharan Africa decreased from 33% to 23.8%, in Asia from 23.7 % to 12.7 %, and in Latin America and the Caribbean from 15.3 % to 6.1 %. No one would be hungry if hunger were merely a problem of food production. Even though more than enough food is produced each year to feed every living person a decent diet, millions of people suffer from food shortages, contaminated water, and hunger because hunger is a multifaceted political, economic, and ecological issue [2]. In the current world, by use to modern machinery and fertilizer the overall world agriculture production massively increase and current food production enough to food 7.7 billion people on Earth. However, approximately 9% of the world's population lives with hunger. Undernourishment is derived from the phenomenon of dietary energy consumption (DEC), which is calculated by counting the number of persons who are expected to consume less food than the recommended daily allowance, thus dietary energy needs (DER). Thus, at the household level, it is calculated by predicting the number of people whose dietary energy requirements are likely to fall below predetermined levels. Although malnutrition is a widespread occurrence worldwide, it acts as an important yardstick for evaluating progress in the fight against world hunger. Therefore the prevalence of undernourishment is widely used as a reciprocal of hunger and food insecurity. The undernourishment indicator examines food availability rather than food consumption.

On the other hand, food insecurity and hunger are not the only issue of developing countries; however, in rich countries, people are also living with hunger, and the primary reason behind it, is macroeconomic inequalities [3]. It is crucial to achieve food security and overcome undernourishment for poverty reduction in dry-land developing countries. Similarly, [4] mentioned six significant factors contributing to food insecurity in the least developing countries, modernity, economic dependency, urban bias, neo-Malthusian population pressure, ecological, evolutionary processes, and militarization. For facing the challenges of food insecurity and hunger, international donor agencies and developed countries continuously give food and other aid to developing countries. Currently, most of the population from Africa is living with severe food

insecurity (see figure 1). This paper aims to empirically analyze the impact of external financial inflow on the prevalence of undernourishment (hunger) for least developing countries.

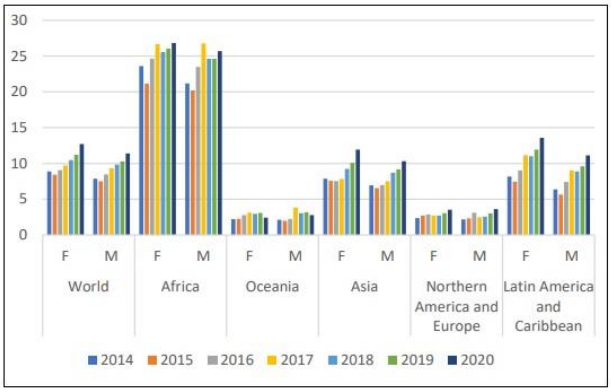

Figure 1 Prevalence of Undernourishment [24]

2. LITERATURE REVIEW

Theoretically, the effects of FDI on social well-being are complicated and inconsistent at times. As [5] claimed in his research work, FDI has both a direct and an indirect effect on welfare. FDI can directly impact economic well-being by stimulating the labor market and enhancing human capital, and higher economic activity and productivity may be responsible for the FDI-welfare connection. Food security relates to economic growth, focusing on the direct and indirect effects of increased public spending and investment in health, education, and greater access to clean drinking water on global malnutrition. Similarly, [6] highlighted that FDI inflow reduces food insecurity and hunger in her research work.

In terms of remittances, [7] argue that remittance inflow decreases food insecurity thus hunger. Their research work used pane data from 1990 to 2013 for African countries. Another empirical analysis [8] also reveals that remittances inflow positively decreases hunger and food insecurities. Furthermore, remittance inflow also increases household consumption expenditure, mostly on food items [9-11], and [12]. Furthermore, empirical findings suggest that AID reduces hunger and food insecurity [13-14]. It is true to argue that one of the key factors impacting food insecurity and hunger is economic growth. Economic growth increases employment and positively impacts financial development and human development. Several pieces of evidence indicate that economic growth reduces hunger and the prevalence of undernourishment [15]. Nutritional consumption is also crucial for boosting labor productivity and economic growth. According to [16], improvements in nutrition intake will result in greater nutrition and health in human bodies, improved decision-making capabilities, and increased economic growth. Furthermore, according to this scholar, improving childhood nutrition will improve schooling outcomes, ensure better education, and raise labor output.

3. DATA AND METHODOLOGY

Based on Literature review and to achieve analysis goal, the research model is given below,

$$PN=f(FDI+REM+ODA+GDP+M2+INF+PG+AGR) \quad (1)$$

Panel data from 35 least countries were used from 2001 to 2019 for achieving research goals (see table 1) for source and description of variables used in equation 1, furthermore all variables are converted into logs, which further reduces estimated coefficients. For estimation, the data static and dynamic models were applied. Panel data estimation is usually used as it consists of both i cross-section and t time-series dimensions. Panel data estimation is used for multiple advantages such as, a) It provides a large number of observations, b) It increases the degrees of freedom, c) It reduces the co-linearity among explanatory variables, d) it identifies and measures the effects that time-series or cross-sectional methods are unlikely to detect (e.g., country-specific or time-specific effects).

Table 1. Source of Data

Abbreviations	Variable	Description	Source
Log.GDP	Economic growth	Gross Domestic Product per Capita	WDI
Log.FDI	Foreign Direct Investment inflow	Foreign direct investment inflow(% of GDP)	IMF

Log.REM	Remittance inflow	Remittance inflow (% of GDP)	WDI
Table 1. cont			
Log.ODA	Official Development Assistance inflow	Official Development Assistance inflow (% of GDP)	WDI
Log.PN	Hunger	Prevalence to Undernourishment	WDI
Log. FD	Financial Development	Money Supply	WDI
Log.INF	Inflation	Consumer Price Index	WDI
Log. PG	Population growth	Annual population growth	WDI
Log.AGR	Agriculture Production	Agriculture Value Added(% of GDP)	WDI

One of the primary uses of panel data analysis is to control heterogeneity. Countries, individuals, and firms vary, and ignoring this effect can lead to heterogeneity in model specification. Hence, the unobserved differences between countries and constant over time can be considered within the panel data analysis by using a country-specific effect [17], e) It helps study the dynamics of adjustments in that it can explain the adjustments to economic policy changes if the panels are long enough. Furthermore, see table 2 for summary statistics and correlation matrix (see table 3).

Table 2. Summary statistics

Variables	Mean	Std. Dev	Min	Max
Log. PN	2.986	0.693	1.163	4.403
Log.FDI	0.934	1.390	-4.836	4.637
Log.REM	0.568	1.930	-8.605	3.914
Log.ODA	1.982	1.275	-5.337	4.404
Log.GDP	6.790	0.587	5.555	8.359
Log.INF	1.666	0.996	-2.000	3.608
Log.ARG	3.065	0.739	-0.565	4.369
Log.M2	3.284	0.526	1.049	4.678
Log. PG	0.787	0.513	-4.587	1.532

In terms of a static model, Fixed and Random effects will be used as the primary model (model selection based on Hausman test), and System GMM will be used for Robustness check, which is also a dynamic model.

3.1. Fixed effect

We estimate the results by considering the possibility of heterogeneity by applying the fixed effect model. It incorporates the sampled country's specific policies and practices of the transport model and shows the effects in the intercept coefficient. " α_{1j} ". The intercept of one country differs from the other country but is time-invariant. The following equation 2 captures the countries' specific effects by takings the different economic, geological and social characteristics.

$$\log.\mathrm{PN}_{jt} = \alpha_1 + \beta_1 \log.\mathrm{FDI}_{jt} + \beta_2 \mathrm{Log.REM}_{jt} + \beta_3 \log.\mathrm{ODA}_{jt} + \beta_4 \log.\mathrm{GDP}_{jt} + \beta_5 \log.\mathrm{INF}_{jt} + \beta_6 \log.\mathrm{ARG}_{jt} + \beta_7 \log.\mathrm{M2}_{jt} + \beta_8 \mathrm{PG}_{jt} + u_{jt} \quad (2)$$

3.2. Random effect

Equation 3 of the fixed-effect model raises the degree of freedom in the small sample, and the dummies for the cross-section reduce the degree of freedom. The intercept α_{1j} in FE assumes that countries' effect is time-invariant. Nevertheless, in RE, we assume that

intercepts of the sampled countries are random variables drawing from the larger sample. The following equation 3 shows the random effect model of the study:

$$\log.\mathrm{PN}_{jt} = \alpha_1 + \beta_1 \log.\mathrm{FDI}_{jt} + \beta_2 \mathrm{Log.REM}_{jt} + \beta_3 \log.\mathrm{ODA}_{jt} + \beta_4 \log.\mathrm{GDP}_{jt} + \beta_5 \log.\mathrm{INF}_{jt} + \beta_6 \log.\mathrm{ARG}_{jt} + \beta_7 \log.\mathrm{M2}_{jt} + \beta_8 \mathrm{PG}_{jt} + w_{jt} \quad (3)$$

Where $w_{jt} = \varepsilon_j + u_{jt}$, where εj is a random term with mean 0 and constant variance.

Table 3. Correlation Matrix

Variable	Log. PN	Log.FDI	Log.REM	Log.ODA	Log.GDP	Log.INF	Log.AGR	Log.M2	Log. PG
Log.PN	1								
Log.FDI	0.001	1							
Log.REM	-0.286	0.161	1						
Log.ODA	0.037	0.422	0.418	1					
Log.GDP	-0.411	0.163	0.415	-0.179	1				
Log.INF	0.300	0.002	-0.268	-0.098	-0.129	1			
Log.ARG	0.002	-0.122	-0.029	0.077	-0.469	0.093	1		
Log.M2	-0.481	0.008	0.322	-0.103	0.423	-0.245	-0.347	1	
Log. PG	0.177	0.337	-0.172	0.214	-0.088	0.005	0.182	-0.339	1

3.3. System GMM

The panel data usually violates the autocorrelation and homoscedastic OLS assumptions. So, there are the chances of serial correlation and heteroskedasticity problems that may unbiased the estimates. The disturbance term correlates to any variable in the model cause the serial correlation problem [18]. The variations in the variance of error terms across the observation cause the issue of heteroskedasticity.

Auto-correlation and heteroskedasticity problems can be resolved by applying the GMM models proposed by [19] and [20].

Usually, heteroskedasticity, autocorrelation, and heterogeneity are the potential problems in the dynamic panel data sets. These problems are solved by applying the panel GMM [18]. GMM is suitable for the panel data with more significant cross-section identifiers than periods [19]. The following equation 4 captures the dynamic effects of the model to test the hypotheses.

$$\mathrm{Log.PN}_{jt} = \alpha_1 + (1-\beta_1)\log.\mathrm{PN} + \beta_1 \log.\mathrm{FDI}_{jt} + \beta_2 \mathrm{Log.REM}_{jt} + \beta_3 \log.\mathrm{ODA}_{jt} + \beta_4 \log.\mathrm{GDP}_{jt} + \beta_5 \log.\mathrm{INF}_{jt} + \beta_6 \log.\mathrm{ARG}_{jt} + \beta_7 \log.\mathrm{M2}_{jt} + \beta_8 \mathrm{PG}_{jt} + v_t + \varepsilon_{i,t} \quad (4)$$

Where $v_t = u_t - (1-\beta_1)\, u_{t-1}$

4. RESULTS AND DISCUSSION

According to table 4, the lag of dependent variable prevalence to undernourishment shows a 1% increase in the previous year, prevalence to undernourishment increase in the current year by 1.44% in the system GMM estimator. Furthermore, according to the Hausman test, the fixed-effect model is the primary model. As per the fixed-effect model, a 1% increase in economic growth lead to a decrease in 0.78% of prevalence to undernourishment thus hunger (see figure 2). The results imply that higher and enhanced economic growth increases living standards and the income pool of inhabitants, thus reducing hunger. Furthermore, economic growth reduces hunger via multiple channels. Initially, higher economic growth led countries to allocate more funds to food security programs and provide subsidies on food items. Secondly, with the help of surplus budgets, country's can allocate funds on investment projects, thus creating more jobs that directly impact poverty and hunger. Similar findings are also indicated by [21]. A similar relationship was also confirmed by System GMM estimation.

Table 4. Model estimation based on fixed effect, Random Effect and System GMM

Variable	Fixed Effect	Random Effect	System GMM
Lag.Log.PN	-	-	1.444 (0.134)***
Log.FDI	-0.021 (0.010)**	-0.020 (0.11)*	-0.013 (0.019)*
Log.REM	0.028 (0.010)	0.023 (0.0102)	0.012 (0.276)
Log.ODA	-0.036 (0.015)**	-0.034 (0.016)**	-0.016 (0.029)*
Log.GDP	-0.781 (0.053)***	-0.750 (0.052)***	-0.209 (0.111)**
Log.INF	0.011 (0.013)	0.014 (0.011)*	0.015 (0.023)
Log.ARG	-0.021 (0.496)	-0.067 (0.047)	0.117 (0.058)*
Log.M2	-0.185 (0.037)***	-0.202 (0.037)***	-0.178 (0.075)*
Log.PG	0.149 (0.033)***	0.143 (0.033)***	0.037 (0.058)
Hausman	61.03 (0.000)		
Number of groups	-		35
Num. of instrument	-		27
AR(2)	-		0.141
Hansen	-		0.546

Along with economic growth, many other factors reduce hunger in the least developing countries. Similarly, a 1% increase in FDI inflow in the least developing countries decreases 0.02 % of prevalence to undernourishment. The results indicate that FDI inflow in LDC countries enhances economic growth, which further impacts on employment sector and also increases consumption; thus. As a result, the prevalence to undernourishment also decreases. The inflow of FDI reduces hunger in the least developing countries. The robustness model system GMM also affirms it. These results are supported by previous studies such as [6]. As higher economic growth induces more financial development in the presence of FDI inflow, therefore increase in financial development also causes a reduction of prevalence to undernourishment in the least developing countries. Thus 1% increases in financial development led to the 0.18% and 0.17% of prevalence undernourishment according to fixed effect and system GMM estimation. The AID programs by the UN and other donors are also helpful in reducing the prevalence of undernourishment in selected the least developing countries. Similar findings were also suggested by [22] and [23]. Furthermore, it is true to argue in context of the least developing countries, FDI is effective in poverty reduction and for hunger reduction, when it collectively collaborate with AID programs financed by international donors. Thus, a 1% increase in AID in the least developing countries reduces 0.03% and 0.01% of prevalence to undernourishment as per fixed effect and system GMM estimation, respectively.

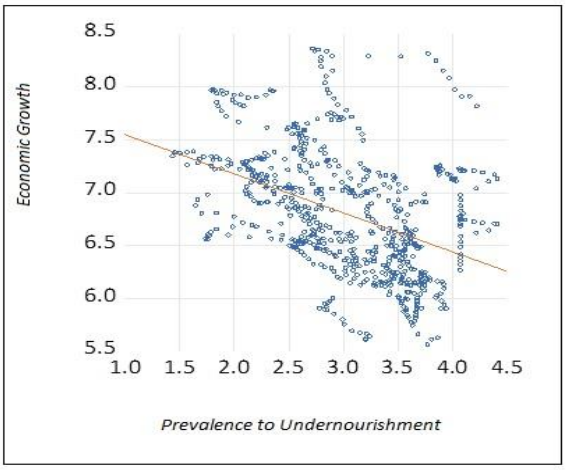

Figure 2 Economic growth and undernourishment

On the other hand, population growth in the least developed countries increases people living in poverty and hunger. Similarly, the relationship is also indicated by [8]. According to the fixed-effect model, a 1% increase in population growth also increases 0.14% prevalence to undernourishment thus hunger in the least developing countries. This might be due to the fact lack of available resources as compare to the population growth which could be beneficial for reduction in hunger and poverty.

5. CONCLUSIONS

This study provides fundamental contributions to the existing literature in multiple ways. Initially, there are gaps in the previous empirical studies regarding how foreign capital can help reduce hunger. This study offers a comprehensive analysis of the relationship between foreign external inflows and hunger and other control variables in an integrated framework. Undernourishment and hunger are critical issues in the majority of developing countries. However, high-level severe undernourishment has been observed in the least developing countries. The findings imply that FDI inflows, official development assistance, and economic growth are favorable factors in reducing the prevalence of Undernourishment in LDCs with financial development. In the least developed countries, however, population growth increases the prevalence of malnutrition and hunger. The least developing countries should create a friendly investment environment for foreign investors in terms of policy recommendations. Furthermore, as this study highlights, FDI and ODA both are helpful in hunger reduction collectively. Therefore, least developing countries should adopt those policies by which AID effectively works for the people and contribute positively to social well-being.

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