Economics Bulletin

Volume 37, Issue 2

# Does external debt- poverty relationship confirm the debtoverhang hypothesis for developing counties?

Taha Zaghdoudi
*Faculty of Law, Economics and Management of Jendouba, Tunisia*

Abdelaziz Hakimi
*Faculty of Law, Economics and Management of Jendouba, Tunisia*

## Abstract

This paper investigates the impact of external debt on poverty for a panel of 25 developing countries over the period 2000-2015. By performing panel cointegration model, we found strong evidence of a positive and significant long-run relationship between poverty, external debt, GDP per capita, gross domestic and fixed investment. Findings indicate also the existence of negative and significant association between poverty, infrastructure, health condition and openness. The Granger-causality results indicate bidirectional causality between external debt and poverty in both short- and long-run. This paper supports the view that external debt increase poverty in developing countries.

**Citation:** Taha Zaghdoudi and Abdelaziz Hakimi, (2017) "Does external debt- poverty relationship confirm the debtoverhang hypothesis for developing counties?", *Economics Bulletin*, Volume 37, Issue 2, pages 653-665
**Contact:** Taha Zaghdoudi - zedtaha@gmail.com, Abdelaziz Hakimi - abdelazizhakimi@yahoo.fr.
**Submitted:** December 28, 2016. **Published:** April 09, 2017.

# 1 Introduction

Poverty is recognized as the most serious worldwide problem. Every society suffers from its economic and social consequences. The devastating implications of poverty can affect every person in society. The individual suffers from the socioeconomic impacts of poverty and the political leader should seek solutions for this problem. Hence, no one is exempt from this phenomenon.The World Bank defines poverty as multidimensional phenomenon, encompassing inability to satisfy basic needs, lack of control over resources, lack of education and skills, poor health, malnutrition, lack of shelter, poor access to water and sanitation, vulnerability to shocks, violence and crime, lack of political freedom and voice.

The United Nation defines poverty as absolute poverty or Overall poverty. Absolute poverty is a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services (United Nation (1995, p. 57)).

Overall poverty is defined as a lack of income and productive resources to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments and social discrimination and exclusion. It is also characterized by lack of participation in decision-making and in civil, social and cultural life. It occurs in all countries: as mass poverty in many developing countries, pockets of poverty amid wealth in developed countries, loss of livelihoods as a result of economic recession, sudden poverty as a result of disaster or conflict, the poverty of low-wage workers, and the utter destitution of people who fall outside family support systems, social institutions and safety nets. (United Nation (1995, p. 57)).

Another definition of poverty is given by the Organization for Economic Development (OECD) when poverty is considered as a level of minimum need, below which people are regarded as poor, for the purpose of social and government concern, and which does not change over time.(OECD (1976, p. 69)).

Poverty can be defined or measured taking into two dimensions. The first one is monetary and the second one is non-monetary. Monetary poverty is proxied by two main indicators; income and consumption. Between these two indicators, consumption is considered as a better outcome than income. However, Poverty is not associated only to insufficient income or consumption. There are other factors reflecting poverty. Health, nutrition, education, infrastructure and wealth represent the second dimension called non-monetary poverty.

An important part of empirical analysis founded on poverty used the monetary dimension (Imai et al. (2010),Pradhan and Mahesh (2014), Pradhan and Mahesh (2016). This dimension has several important social and economic implications. Its for this reason that we used in this study the monetary dimension.

Several studies conducted by academics, government agencies and organizations have reported that poverty has five main devastating consequence. The most serious implications are malnutrition, poor health, lack of education, crime and victimization ( Boamah and Moore (2009);McKernan and Ratcliffe (2010)).

In this literature, we will review possible link between external debts and poverty. This relationship can be either direct or indirect. Direct relationship arises from how the external funds will be used in the recipient country. However, indirect association can be analyzed through investment and growth. An important part of literature focused on the association between external debt and growth. The debt/growth relation is shaped by the level of external debt. A reasonable level of borrowing is likely to enhance economic growth. In contrary, large level of accumulated debt leads to lower growth (Ricci et al. (2004)).

Most of studies focused on the External debt/poverty have investigated this relation indirectly either across investment or through growth. Results of empirical studies supported the significant and negative relation between debt, growth and/or investment (Borensztein (1990), Iyoha (2000),Were (2001), Lopes (2002). These authors argue that when the external debt is not canalized in income-

generating and productive activities, the ability of a debtor nation to repay the debt is significantly reduced. Also, they report that the high level of debt is considered as an impediment to sustainable economic growth and poverty reduction (Siddique et al. (1994), Maghyereh and Omet (2002); and Berensmann (2004)).

Siddique et al. (2016) examined the short-run and long-run relationships between external debt and economic growth in 40 heavily indebted poor countries (HIPCs) over the period 1970-2007. Using panel data estimation of an ARDL model, results indicate that debt as a share of GDP has a negative influence in the short-run as well as in the long-run. This result supports the debt overhang hypothesis.

Based on 93 countries over the period 1969-1998,Pattillo et al. (2002) investigated the association between debt and growth. Empirical results show that a doubling of the debt ratio would reduce annual per capita growth by between a half and a full percentage point. In the same line of idea,Nguyen et al. (2003) seek how external debts affect growth. To this end, they used a sample of 55 low-income countries during the period 1970-1999. Their findings support the debt overhang hypothesis. The negative relationship between external debt and growth was supported by Hameed et al. (2008) for the Pakistani context. By using data over 1970-2003, results show a negative long-run and short run relationship between the external debt and economic growth. Based on data related on 35 countries in sub- Saharan Africa for the period 1980-1990, Fosu (1999) studied the effect of external debt on the growth. He found that debt has a negative effect on economic growth. Also, a negative correlation between external debt and investment levels was detected.

The negative association between debt and growth is strongly explained by the debt overhang theory. According to this theory, further domestic and foreign investments are discouraged when the future debt will be larger than the countrys repayment ability ( Krugman (1988); Calvo and Díaz-Alejandro (1989)). Also, debt overhang affects growth not only through investment but via level of productivity.

There are some few studies that supported the positive association between external debt and growth or investment. This positive impact will be realized in two cases. The first one, if the external debt is canalized in income-generating and productive activities. The second one, if the external debt was contracted in a reasonable level. For example, Jayaraman and Lau (2009) used data related to six Pacific island countries over the period 1988-2004 to analyze the effect of debt on growth. Their results indicated that higher debt levels can enhance economic growth. An increase of 1% in the external debt is associated with a 0.25 percent increase in national output.

Otherwise, Loko et al. (2003) using annual data for 67 low-income countries, over the period of 1985-99, explored the impact of external indebtedness on poverty. Their results shows that once the effect of income on poverty has been taken into consideration, high debt service and related external indebtedness indicators have a limited impact on poverty.

Despite that studies on the indirect effect of external debt on poverty are abundant; there are few studies that investigated the direct relationship between external debt and poverty into its two dimensions monetary and non-monetary. Sheikh and Alam (2013) examined the effect of external debt on poverty in Pakistan during the period 1985-2010. Results of OLS regression indicate that external debt and external debt servicing increases the level of poverty in Pakistan. Findings show that the level of external debt and external debt servicing on poverty is positive and statistically significant.In another study,Kemal (2001) analyzed the effect of debt accumulation on growth and poverty in Pakistan. He found that there is an adverse effect of debt accumulation on poverty.

Loko et al. (2003) tested the association between external debt and three human development indicators (life expectancy, mortality rate and primary school enrolment rate). They used a dataset of 67 low income countries for the period of 1985 to 1999. Empirical findings indicate a negative but limited effect of the debt indicators on non-monetary poverty.

Education as human capital indicator plays crucial role in the development of countries. Nations cannot be properly developed without education. It is recognized as the first step in the path of development process (Raja (2005)). Pervez (2014) analyzed the impact of education on poverty reduction in Pakistan extracting 34 time series annually observations. The study employed Augmented

Dickey-Fuller (ADF), causality and Johansen cointegration methodology to test for the existence of a long run relationship between variables. He found that literacy rate and gross enrollment (Secondary) has negative and significant impact on poverty in long run.

Awan et al. (2011) evaluated the effect of different levels of education on poverty in Pakistan from 1998 to 2002. The logistic regression model is used to estimate the probability of an individual being poor with a set of educational levels, experience and gender as explanatory variables. They found that experience and educational achievement is negatively related with the poverty incidence in both years. Also results show that higher level of education increases chances of a person being non-poor.

To study the role of education and income in poverty alleviation,Janjua and Kamal (2011) have used a dataset of 40 developing countries over the period 1999 to 2007. The econometric approach used in this study is the random effect generalized least squares (GLS) technique .First, they found that income growth plays a moderately positive role in alleviating poverty, but income distribution does not play a key role in poverty alleviation in the whole sample. Second, they reported that education is the most significant contributor to poverty alleviation.

It is obvious that poverty is associated with poor health. However, the important part of studies is focused on of effect of poverty on health condition. Many empirical researches fail to address the possibility of reverse causation; poor health causes low income. Several international organization have fixed as primordial objective to improve health condition ( World Bank (1997)). The relationship between individual income and health is non-linear. It is more sensitive to the level of education, the level of inequality and the quality of institution especially corruption.

Novignon et al. (2012) tested the relationship between health and poverty in Ghana. The three-step Feasible Generalized Least Squares (FGLS) estimation shows that about 56% of households are vulnerable to poverty in the future. Moreover, households with poor hygiene conditions were also vulnerable to future poverty. Based on 554 households in the 25 study villages between September and December 2004,Somi et al. (2009) reported that health shocks and their associated costs have both short and long run impacts on household welfare. Benzeval and Judge (2001) have focused on the time dimension in the income/health association. Results from participants in the British Household Panel Survey from 1991 to 1996-1997 confirm that long-term income is more important for health than current income. They suggest that there is a causal relationship between low income and poor health.

There are several studies that highlight the role of infrastructure in development and poverty reduction. Strong infrastructure services quality are considered as a crucial part of economic development (Kessides (2004).Infrastructure are beneficial for economic growth, poverty reduction, and environmental performance (Parikh and McRobie (2009), Parikh et al. (2015)).

Most of studies investigated the indirect impact of high indebtedness on poverty by reducing the growth through investment. However, the direct impact of external debt on poverty has been laking in most of the empirical literature. This paper is an attempt to this gap. Also, in this paper we have analyzed the effect of external debt on monetary poverty using indicator of non- income poverty such as education, health and infrastructure.

The rest of the paper is structured as follows. Section 2 presents the data and the model specification. Section 3 shows the model estimation and results and section 4 concludes.

# 2 Data and model specification

In this study, we use a balanced annual data of 400 observation for 25 developing countries. The period of the study spans from 2000 to 2015. All variables are collected from World Bank Development Indicators (WDI) online database. The 25 developing countries used in the sample include Argentina, Armenia, Bangladesh, Belarus, Columbia, Dominican Republic, Ecuador, Georgia, India, Indonesia, Kyrgyz Republic, Macedonia FYR, Madagascar, Mexico, Moldova, Montenegro, Panama, Paraguay, Peru, Romania, Serbia, Tunisia, Turkey, Ukraine, Uruguay.

In this study, eight macroeconomic variables are used. They include the poverty, external debt, real GDP per capita growth, gross xed capital formation (capital, K), education levels, infrastructure, health conditions and trade openness. All variables meet the international standard definition.

Poverty is the dependent variable and is measured by poverty hand-count ratio at $3.10 a day (PPP). Explicative variables include external debt witch is represented by external debt stocks in percentage of GNI, real GDP per capita growth, gross fixed capital formation in percentage of GDP, education levels which is represented by primary completion rate, infrastructure which is represented by telephone lines and mobile cellular connections per 100 people. In this study, we introduce an infrastructure variable to explain poverty. Infrastructure has largely been ignored in the assessment of poverty in developing countries. Strong infrastructure services quality are considered as a crucial part of economic development (Kessides (2004)). Hence, water and sanitation, telecommunications, ports and airports and road and rail links are considered as drivers for economic growth and poverty reduction. Several studies confirm that Infrastructure are beneficial for economic growth, poverty reduction, and environmental performance (Parikh and McRobie (2009) ;Parikh et al. (2015)). Also, good qualities of infrastructure are more attractive for foreign direct investments which created more jobs, decreased unemployment and improved the well-being of people. Infrastructure can spur labor productivity through time saved and cost transaction reduction (Straub (2008)). Health conditions in the economy represented by life expectancy at birth measured in years and trade openness measured as total trade as percentage of GDP.

To find out the effect of external debt on poverty in developing countries we estimate the following equation model:

$$pov_{it} = \alpha + \lambda_1 exdb_{it} + \lambda_2 gdpc_{it} + \lambda_3 gfc_{it} + \lambda_4 edu_{it} + \lambda_5 infr_{it} + \lambda_6 health_{it} + \lambda_7 tra_{it} + \varepsilon_{it} \quad (1)$$

where, "pov" is poverty headcount ratio at $3.10 a day (PPP). "gdpc" is the annual percentage growth rate of GDP per capita based on constant local currency. "gfc" is the gross domestic fixed investment. "edu" is the levels of education which is represented by primary completion rate. "infr" the infrastructure variable which is represented by telephone lines and mobile cellular connections per 100 people. "health" measures the health conditions in the economy represented by life expectancy at birth measured in years. "tra" is the trade openness measured as total trade as percentage of GDP. $\varepsilon$ is the error term.

The econometric approach is based on three steps. In the first one, the stationarity of each variable is examined by performing three unit roots tests, namely, Levin et al. (2002) , Im et al. (2003), and Maddala and Wu (1999), these three tests incorporate both cross-sectional independence (LLC, IPS and Maddala and Wu tests) and cross sectional dependence cases. In the second one, if the variables are found to contain a unit root, we checked the cointegrating relationships between the variables are determined. In the third one, we apply the integrated modified OLS (IM-OLS) method for cointegrated panel data recently developed by Vogelsang and Wagner (2014) to estimate our model. The equation for which the IM-OLS estimator is calculated:

$$S_y = \delta \cdot S_D + \beta \cdot S_x + \gamma \cdot x + \mu \quad (2)$$

where $S_y$, $S_x$ and $S_D$ are the cumulated sums of y, x and D (with D as the deterministic matrix). Then $\theta = (\delta^{'}, \beta^{'}, \gamma^{'})^{'}$ is the full parameter vector.

# 3 Model estimation and results

## 3.1 Panel unit root tests

Results of panel unit root tests are reported in Table 1. From this table it can be noted that the null hypothesis of the unit root cannot be rejected at the 1% level of signicance for seven panel time series taken in level except GDP per capita. However, by testing for the unit root in the first difference (Table 2), all panel unit root tests reject the null hypothesis at the 1% level of signicance.

Table 1: Panel unit root test in level

| Variables | LLC | IPS | ADF fisher | PP fisher |
|---|---|---|---|---|
| pov | -4.40390 (0.0000) | -0.17675 (0.4299) | 40.3147 (0.3682) | 53.3057 (0.0507) |
| gdpc | -10.7648 (0.0000) | -7.48029 (0.0000) | 144.592 (0.0000) | 159.864 (0.0000) |
| gfc | -1.25530 (0.1047) | 0.72392 (0.7654) | 40.0228 (0.8426) | 34.3464 (0.9553) |
| edu | -3.67503 (0.0001) | -0.71707 (0.2367) | 73.6743 (0.0163) | 47.9209 (0.5572) |
| infr | -3.73485 (0.0001) | 0.05049 (0.5201) | 65.3245 (0.0716) | 54.0247 (0.3233) |
| health | -12.0977 (0.0000) | -1.50116 (0.0667) | 102.741 (0.0000) | 190.258 (0.0000) |
| exdb | -6.54856 (0.0000) | -2.00511 (0.0225) | 78.8514 (0.0018) | 92.5423 (0.0001) |
| tra | -4.15545 (0.0000) | -1.89217 (0.0292) | 67.5258 (0.0498) | 54.0521 (0.3224) |

Based on results in Table 2, we conclude that all panel time series are integrated with the first order.

Table 2: Panel unit root test (first difference)

| Variables | LLC | IPS | ADF Fisher | PP Fisher |
|---|---|---|---|---|
| pov | -14.3799 (0.0000) | -9.94006 (0.0000) | 155.823 (0.0000) | 159.875 (0.0000) |
| gfc | -12.6207 (0.0000) | -9.32682 (0.0000) | 172.393 (0.0000) | 182.592 (0.0000) |
| edu | -9.08247 (0.0000) | -5.95987 (0.0000) | 136.215 (0.0000) | 130.042 (0.0000) |
| infr | -7.52956 (0.0000) | -5.13138 (0.0000) | 116.151 (0.0000) | 163.746 (0.0000) |
| health | -13.6724 (0.0000) | -11.8945 (0.0000) | 227.794 (0.0000) | 140.173 (0.0000) |
| tra | -16.3891 (0.0000) | -12.3317 (0.0000) | 224.060 (0.0000) | 267.104 (0.0000) |
| exdb | -9.44291 (0.0000) | -7.99896 (0.0000) | 143.899 (0.0000) | 191.699 (0.0000) |

## 3.2 Panel cointegration test

The panel unit root tests confirm that all variables are integrated in order I(1), then we test for evidence of a long-run relationship. The Kao's residual cointegration tests (Kao (1999)) is used to test the null hypothesis of the nonexistence of cointegration against the alternative of cointegration. The results reported in Table 3 provide strong evidence for panel cointegration between the poverty, external debt, GDP per capita, gross domestic fixed investment, education, health condition, infrastructure and trade openness.

Table 3: Kao cointegration test, 2000-2015.

| | t-Statistic | Prob. |
|---|---|---|
| ADF | -4.287980 | 0.0000 |
| Residual variance | 19.90432 | |
| HAC variance | 16.06418 | |

## 3.3 Panel IM-OLS estimates and causality tests

Given the evidence of panel cointegration among variables, we perform the integrated modified OLS (IM-OLS) technique. The results of the IM-OLS estimation are reported in Table 4.

Table 4: Parameter estimation using IM-OLS, 2000-2015.

| Variables | t value | Prob. | |
|---|---|---|---|
| exdb | 3.9297 | 0.0001166 | *** |
| gdpc | 2.4827 | 0.0138496 | * |
| gfc | 5.9434 | 1.200e-08 | *** |
| edu | 0.9217 | 0.3577835 | |
| health | -7.1664 | 1.398e-11 | *** |
| infr | -5.6696 | 4.870e-08 | *** |
| tra | -4.3322 | 2.321e-05 | *** |
| Bandwidth (Newey-West) | 2.276562 | | |

Signif. codes: 0 (***) 0.001 (**) 0.01 (*) 0.05 (.) 0.1 ( ) 1

All the coefficients are significant at the 1% significance level except education with no significant effect, the coefficients can be interpreted as elasticity estimates. The results indicate that a 1 percent increase in external debt increases poverty by 0.35 percent. Several studies indicate that when debt is not canalized in income-generating and productive activities, the ability of a debtor nation to repay the debt is significantly reduced. Hence, when debts are contracted to cover public debts or fixed charges instead of investment opportunity, these debts can not allowed added value by reduction unemployment, and improving social conditions. Another explanation is advanced to justify the positive relation between external debt and poverty. The high level of debt is considered as an impediment to sustainable economic growth and poverty reduction. Our results are in line with the works of (Siddique (1994),Maghyereh and Omet (2002) and Berensmann (2004))which support the debt overhang hypothesis.

Results indicate also that there is a positive and significant associateship between growth and poverty. An increase of 1% in GDP per capita increases poverty by 1.76%. Results on the growth/poverty relationship are not definitive.In some cases, economic growth leads to reduction in poverty. In other cases the effect can be negative and economic growth increases poverty. The economic growth/ poverty association depends highly on the level of inequalities and the institutions quality especially corruption that are prevailing in an economy.According to the report of United Nations Development Program UNPD (2013), income inequality increased by 11 percent in developing countries between 1990 and 2010. Also, more than 75 percent of the population are living today in societies where income is more unequally distributed than it was in the 1990s. The UNDP report said also that inequality harms growth and poverty reduction. In our study, our sample is based on developing countries which are qualified by weak quality of institution. Institutional variables reflect the quality of governance. These values run from -2.5 to 2.5, with higher values corresponding to better governance. As for example, during the period 2002-2015, the average of all institutional variables is negative. We have -0.472 for the control of corruption, -0.455 for the regulatory quality and -0.481 for the rule of law. These values indicate on weak quality of institutions which are enable to fairly distribute national wealth.

These findings are not surprisingly since most of developing countries suffers from inequality. The average level of growth does not represent the intraregional growth. There are several geographic and historical factors that explain inequality. Weak resource endowments, poor infrastructure and distance from markets are the most determinant of inequality. So, the average rate of growth recorded by each country does not hide the gap between poorer and richer regions. The highest level of growth is not certainly associated with the lowest level of poverty.

Domestic investment is associated positively and significantly at 1% with the dependent variable. Findings show that an increase of 1% in real gross fixed capital formation increases poverty by 3.63%. Domestic investment is divided into public and private investments. In generally, these two types of investment are dependent to the institution quality. In most of developing countries, there are inefficiencies and distortions associated with the process of public investment. In this case, public investment hasnt a larger direct effect on growth (Khan and Reinhart (1990), Khan and Kumar (1997)). Another factor can explain the positive relation between domestic investment and poverty,

it is corruption. Political corruption, is often tied to capital projects.Generally, Investment projects are based on infrastructure such as roads, dams, irrigation canals, power plants,ports, airports, schools, and hospitals. These projects tend to be large and, sometimes, very large. Hence their returns are usually very profitable. Managers are often ready to pay commission as a bribe to get these projects. In some cases, the amount of bribe is very high. This sum can be reduced later from the spending on the project which can affect the basic design and the quality of the project (Tanzi and Davoodi (1998)).

Contrary to the effect of growth and domestic investment; Health conditions, infrastructure and trade openness are seemed to decrease poverty in developing countries. Results show that an increase in 1% in health condition decreases poverty by 1.68%. Also, a 1 percent increase in infrastructure decreases poverty by 4.53 percent. Finally, poverty is can decreased by 1% when trade openness increases by 1 percent.

Investing in infrastructure creates income opportunities and generates jobs directly and indirectly. Also, countries that benefit from strong infrastructure can attract more foreign investors since its able to work in a well business environment. These foreign investments can create more jobs which reduce unemployment and poverty. The air and/maritime transport will developed when the airport and port infrastructure are also developed. Infrastructures may also cover hospitals, schools, road-sthe highest advanced infrastructure, the weakest level of poverty.The negative association between trade openness and poverty can be explained also through infrastructure and institutional factors. In a country with a sound maritime and air transport, trade activity is more developed. Also, trade can be influenced by several institution quality such as legal environment, rule of law, business environment. Countries that fighting corruption, offering a stable and attracting business environment can accelerate trade which reduce poverty and enhance economic growth.

To determinate the causal relationship between the variables, we estimate a panel vector error correction model and the Engle and Granger (1987) two-step procedure is used. In the first step we estimate the long-run model specified in (IMOLS). In the second step we get the first lag residuals from (IMOLS) witch is used as the error correction terms. We performed The Arellano and Bover (1995) and Blundell and Bond (1998) system GMM for each equation above :

$$\Delta pov_{it} = \theta_{1j} + \sum_k^q \theta_{11ik}\Delta pov_{it-k} + \sum_k^q \theta_{12ik}\Delta exdb_{it-k} + \sum_k^q \theta_{13ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{14ik}\Delta gfc_{it-k} + \sum_k^q \theta_{15ik}\Delta edu_{it-k} + \sum_k^q \theta_{16ik}\Delta health_{it-k} + \sum_k^q \theta_{17ik}\Delta infr_{it-k} + \sum_k^q \theta_{18ik}\Delta tra_{it-k} + \lambda_{1i}\varepsilon_{it-1} + \mu_{1it} \tag{3}$$

$$\Delta exdb_{it} = \theta_{2j} + \sum_k^q \theta_{11ik}\Delta pov_{it-k} + \sum_k^q \theta_{22ik}\Delta exdb_{it-k} + \sum_k^q \theta_{23ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{24ik}\Delta gfc_{it-k} + \sum_k^q \theta_{25ik}\Delta edu_{it-k} + \sum_k^q \theta_{26ik}\Delta health_{it-k} + \sum_k^q \theta_{27ik}\Delta infr_{it-k} + \sum_k^q \theta_{28ik}\Delta tra_{it-k} + \lambda_{2i}\varepsilon_{it-1} + \mu_{2it} \tag{4}$$

$$\Delta gdpc_{it} = \theta_{3j} + \sum_k^q \theta_{31ik}\Delta pov_{it-k} + \sum_k^q \theta_{32ik}\Delta exdb_{it-k} + \sum_k^q \theta_{33ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{34ik}\Delta gfc_{it-k} + \sum_k^q \theta_{35ik}\Delta edu_{it-k} + \sum_k^q \theta_{36ik}\Delta health_{it-k} + \sum_k^q \theta_{37ik}\Delta infr_{it-k} + \sum_k^q \theta_{38ik}\Delta tra_{it-k} + \lambda_{3i}\varepsilon_{it-1} + \mu_{3it} \tag{5}$$

$$\Delta gfc_{it} = \theta_{4j} + \sum_k^q \theta_{41ik}\Delta pov_{it-k} + \sum_k^q \theta_{42ik}\Delta exdb_{it-k} + \sum_k^q \theta_{43ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{44ik}\Delta gfc_{it-k} + \sum_k^q \theta_{45ik}\Delta edu_{it-k} + \sum_k^q \theta_{46ik}\Delta health_{it-k} + \sum_k^q \theta_{47ik}\Delta infr_{it-k} + \sum_k^q \theta_{48ik}\Delta tra_{it-k} + \lambda_{4i}\varepsilon_{it-1} + \mu_{4it} \tag{6}$$

$$\Delta edu_{it} = \theta_{5j} + \sum_k^q \theta_{51ik}\Delta pov_{it-k} + \sum_k^q \theta_{52ik}\Delta exdb_{it-k} + \sum_k^q \theta_{53ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{54ik}\Delta gfc_{it-k} + \sum_k^q \theta_{55ik}\Delta edu_{it-k} + \sum_k^q \theta_{56ik}\Delta health_{it-k} + \sum_k^q \theta_{57ik}\Delta infr_{it-k} + \sum_k^q \theta_{58ik}\Delta tra_{it-k} + \lambda_{5i}\varepsilon_{it-1} + \mu_{5it}$$

(7)

$$\Delta health_{it} = \theta_{6j} + \sum_k^q \theta_{61ik}\Delta pov_{it-k} + \sum_k^q \theta_{62ik}\Delta exdb_{it-k} + \sum_k^q \theta_{63ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{64ik}\Delta gfc_{it-k} + \sum_k^q \theta_{65ik}\Delta edu_{it-k} + \sum_k^q \theta_{66ik}\Delta health_{it-k} + \sum_k^q \theta_{67ik}\Delta infr_{it-k} + \sum_k^q \theta_{68ik}\Delta tra_{it-k} + \lambda_{6i}\varepsilon_{it-1} + \mu_{6it}$$

(8)

$$\Delta infr_{it} = \theta_{7j} + \sum_k^q \theta_{71ik}\Delta pov_{it-k} + \sum_k^q \theta_{72ik}\Delta exdb_{it-k} + \sum_k^q \theta_{73ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{74ik}\Delta gfc_{it-k} + \sum_k^q \theta_{75ik}\Delta edu_{it-k} + \sum_k^q \theta_{76ik}\Delta health_{it-k} + \sum_k^q \theta_{77ik}\Delta infr_{it-k} + \sum_k^q \theta_{78ik}\Delta tra_{it-k} + \lambda_{7i}\varepsilon_{it-1} + \mu_{7it}$$

(9)

$$\Delta tra_{it} = \theta_{8j} + \sum_k^q \theta_{81ik}\Delta pov_{it-k} + \sum_k^q \theta_{82ik}\Delta exdb_{it-k} + \sum_k^q \theta_{83ik}\Delta gdpc_{it-k} + \sum_k^q \theta_{84ik}\Delta gfc_{it-k} + \sum_k^q \theta_{85ik}\Delta edu_{it-k} + \sum_k^q \theta_{86ik}\Delta health_{it-k} + \sum_k^q \theta_{87ik}\Delta infr_{it-k} + \sum_k^q \theta_{88ik}\Delta tra_{it-k} + \lambda_{8i}\varepsilon_{it-1} + \mu_{8it}$$

(10)

Where $\Delta$ is the first-difference operator; $\theta$ are the short-run parameters; q is the lag length which is determined by the Schwarz Information Criterion (SIC); $\varepsilon_{it-1}$ is the lagged error term obtained from the long-run estimation; $\lambda$ represent the adjustment coefficient toward the long run equilibrium and $\mu$ the serially uncorrelated error term. According to equation (1)-(8), short-run causality is determined by examining the statistical significance of the lagged variables using the Wald F-statistic test. Long-run causality is determined by the statistical significance of the respective error correction terms using a t-test.

Short-run and long-run Granger-causality tests results are summarized in Table 5

Table 5: Panel Causality Test Results.

| Dependent variable | Sources of causation (independent variables) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Short-run | | | | | | | |
| | D.pov | D.exdb | D.gdpc | D.gfc | D.edu | D.health | D.infr | D.tra |
| D.pov | - | .2060239(0.291) | -.0164995 (0.687) | -.2031442 (0.003) | .0066903 (0.873) | .0004805 (0.802) | -.0129252 (0.147) | .0519627 (0.832) |
| D.exdb | .109014 (0.000) | - | .027156 (0.470) | -.0494125 (0.004) | -.0346475 (0.225) | .0000626 (0.877) | .0021104 (0.641) | -.1990095 (0.313) |
| D.gdpc | -.0565089 (0.299) | -.2273347 (0.232) | - | .0253121 (0.656) | -.0278587 (0.407) | -.0049763 (0.018) | .0124632 (0.137) | .136124 (0.504) |
| D.gfc | .2096138(0.167) | .5705675 (0.059) | -.5430362 (0.000) | - | -.0109902 (0.869) | -.0014143 (0.696) | .022011 (0.642) | -1.936338 (0.017) |
| D.edu | .062452 ( 0.340) | .1292588 (0.505) | .0230934 (0.657) | .0024288 (0.970) | - | -.0027192 (0.324) | -.0115437 (0.448) | .2880656 (0.309) |
| D.health | 6.589459( 0.153) | -2.001954 (0.946) | 6.193238 (0.152) | 3.125886 (0.150) | 5.968122 (0.130) | - | .111953 (0.935) | -15.18423 (0.081) |
| D.infr | -.7496848( 0.467) | -3.064242 (0.477) | .8076986 (0.593) | -.4212642 (0.157) | .3272092 (0.245) | -.0315294 (0.001) | - | 6.89237 (0.186) |
| D.tra | -.0097194 ( 0.163) | -.0341318 (0.578) | .0213759 (0.455) | -.0204828 (0.567) | .0277283 (0.224) | .0051935 (0.001) | .0055768 (0.238) | - |
| Long Run ECT | .0299826 (0.001) | .0980921 (0.011) | -.1744619 (0.000) | -.0390078 (0.000) | -.0000718 (0.993) | -.001382 (0.000) | -.0015955 (0.535) | -.1904542 (0.000) |

With respect to equation (3), the short run causality shows that only external debt witch is affect the poverty in the short term since P-value is 0.000 lower than 1% significance level. In equation (5) only gross domestic fixed investment has a negative and statistically significant impact on GDP per capita in the short-run. In terms of equation (6), it appears that poverty and external debt have a negative and statistically significant impact on the gross domestic fixed investment. In equation (8), GDP per capita, infrastructure and openness have a negative and statistically significant impact on health condition. With regard to equation (10), gross domestic fixed investment and health condition have a negative and statistically significant impact on openness. Furthermore, the error correction terms of equation (3), (5), (6), (8) and (10) are statistically significant at the 1 and 5 percent level.However, equation (4), (7) and (9) have statistically insignificant results. In order to test both short-run and long-run relationships we apply the joint Wald F-test reported in Table 6 witch reject the null of zero coefficient and short-run and long-run causality have significant impact to poverty.

Table 6: Wald joint test

| Variables | | |
|---|---|---|
| D.pov | D.pov | - |
| D.gdpc | D.gdpc | - |
| D.gfc | D.gfc | - |
| D.edu | D.edu | - |
| D.health | D.health | - |
| D.infr | D.infr | - |
| D.tra | D.tra | - |
| D.ECT | - | D.ECT |
| chi2( 9)= 359.69 (0.0000) | chi2( 8)= 131.28 (0.0000) | chi2( 1)= 26.18 (0.0000) |

In summary,the short-run and long-run Granger-causality tests reveal a positive relation between external debt and poverty. We can conclude that external debt increase poverty in the short and the long run.

# 4 Conclusion

This paper explores the casual relationship between external debt and poverty using panel data for 25 developing countries over the period 2000-2015. The results for the heterogeneous panel cointegration test reveal a long-run equilibrium relationship between poverty, external debt, GDP per capita, gross domestic fixed investment,education level, infrastructure, health condition and openness. This long-run relationship indicates that a 1 percent in external debt increases poverty by 0.35 percent; a 1 percent increase in GDP per capita increases poverty by 1.76 percent; a 1 percent increase in real gross fixed capital formation increases poverty by 3.63 percent; a 1 percent increase in health condition decreases poverty by 1.68 percent; a 1 percent increase in infrastructure decreases poverty by 4.53 percent; and a 1 percent increase in trade openness decreases poverty by 1 percent.

The estimation of a panel vector error correction model indicates the presence of both short-run and long-run bidirectional causality between external debt and poverty.This result shows that a higher external debt increases poverty. Thus, a high debt service impacts negatively the social spending by reducing government resources allocated to poor such as education and health. Moreover,in the long run, high indebtedness decline capital inflows, reduce investment in social sectors and affect poverty through income. In addition, country with high external debt are perceived as risky for investment by financial markets and donors. Thus, reduce growth and economic infrastructure expenditures. However, resources misallocation, political instability and corruption, increase social inequalities and poverty.

This paper have some relevant policy implications. Developing countries should continuous to support infrastructure, health conditions and trade openness since they reduced significantly the level of poverty. However, they should pay attention on the other factors such as external debt, domestic investment and the revenue distribution. Theoretically, these determinants should have a significant impact in reducing poverty. In contrary, they have the opposite effect. Government and policymakers are invited to more control the process of domestic investment, precisely the public investment. Also, developing countries should reveal a strong will to fight corruption. This corruption limits FDI, growth and increases poverty. With regard to external debt, it should be contracted with a reasonable level and canalized in productive activities like investment.

# References


Arellano, M. and Bover, O. (1995), 'Another look at the instrumental variable estimation of error-components models', *Journal of econometrics* **68**(1), 29–51.

Awan, M. S., Malik, N., Sarwar, H. and Waqas, M. (2011), 'Impact of education on poverty reduction', *International Jouranl of Academic Research* **3**(1), 659–664.

Benzeval, M. and Judge, K. (2001), 'Income and health: the time dimension', *Social science & medicine* **52**(9), 1371–1390.

Berensmann, K. (2004), 'New ways of achieving debt sustainability beyond the enhanced hipc initiative', *Intereconomics* **39**(6), 321–330.

Blundell, R. and Bond, S. (1998), 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of econometrics* **87**(1), 115–143.

Boamah, D. and Moore, W. (2009), 'External debt and growth in the caribbean', *Money Affairs* **22**(2), 139–157.

Borensztein, E. (1990), 'Debt overhang, debt reduction and investment: The case of the philippines'.

Calvo, G. A. and Díaz-Alejandro, C. (1989), *Debt, stabilization and development: essays in memory of Carlos Díaz-Alejandro*, B. Blackwell; World Institute for Development Economics Research of the United Nations University.

Engle, R. F. and Granger, C. W. (1987), 'Co-integration and error correction: representation, estimation, and testing', *Econometrica: journal of the Econometric Society* pp. 251–276.

Fosu, A. K. (1999), 'The external debt burden and economic growth in the 1980s: evidence from sub-saharan africa', *Canadian Journal of Development Studies/Revue canadienne d'études du développement* **20**(2), 307–318.

Hameed, A., Ashraf, H. and Chaudhary, M. A. (2008), 'External debt and its impact on economic and business growth in pakistan', *International Research Journal of Finance and Economics* **20**, 132–140.

Im, K. S., Pesaran, M. H. and Shin, Y. (2003), 'Testing for unit roots in heterogeneous panels', *Journal of econometrics* **115**(1), 53–74.

Imai, K. S., Gaiha, R. and Thapa, G. (2010), 'Is the millennium development goal on poverty still achievable? the role of institutions, finance and openness', *Oxford Development Studies* **38**(3), 309–337.

Iyoha, M. A. (2000), 'The impact of external debt reduction on economic growth in nigeria: Some simulation results', *The Nigerian Journal of Economic and Social Studies* **42**(2), 235–262.

Janjua, P. Z. and Kamal, U. A. (2011), 'The role of education and income in poverty alleviation: A cross-country analysis', *The Lahore Journal of Economics* **16**(1), 143.

Jayaraman, T. K. and Lau, E. (2009), 'Does external debt lead to economic growth in pacific island countries', *Journal of Policy Modeling* **31**(2), 272–288.

Kalonji, M. K. D., Loko, M. B., Nallari, R. and Mlachila, M. M. (2003), *The Impact of External Indebtednesson Poverty in Low-Income Countries*, number 3–61, International Monetary Fund.

Kao, C. (1999), 'Spurious regression and residual-based tests for cointegration in panel data', *Journal of econometrics* **90**(1), 1–44.

Kemal, A. R. (2001), 'Debt accumulation and its implications for growth and poverty', *The Pakistan Development Review* **40**(4), 263–281.

Kessides, I. N. (2004), *Reforming infrastructure: Privatization, regulation, and competition*, World Bank Publications.

Khan, M. S. and Kumar, M. S. (1997), 'Public and private investment and the growth process in developing countries', *Oxford bulletin of economics and statistics* **59**(1), 69–88.

Khan, M. S. and Reinhart, C. M. (1990), 'Private investment and economic growth in developing countries', *World development* **18**(1), 19–27.

Krugman, P. (1988), 'Financing vs. forgiving a debt overhang', *Journal of development Economics* **29**(3), 253–268.

Levin, A., Lin, C.-F. and Chu, C.-S. J. (2002), 'Unit root tests in panel data: asymptotic and finite-sample properties', *Journal of econometrics* **108**(1), 1–24.

Loko, M. B., Kalonji, M. K. D., Nallari, R. and Mlachila, M. M. (2003), *The Impact of External Indebtednesson Poverty in Low-Income Countries*, number 3–61, International Monetary Fund.

Lopes, P. S. (2002), *A comparative analysis of government social spending indicators and their correlation with social outcomes in Sub-Saharan Africa*, number 2002–2176, International Monetary Fund.

Maddala, G. S. and Wu, S. (1999), 'A comparative study of unit root tests with panel data and a new simple test', *Oxford Bulletin of Economics and statistics* **61**(S1), 631–652.

Maghyereh, A. I. and Omet, G. S. (2002), 'External debt and economic growth in jordan: the threshold effect', *Available at SSRN 317541* .

McKernan, S.-M. and Ratcliffe, C. (2010), 'Childhood poverty persistence: Facts and consequences'.

Nguyen, T. Q., Clements, M. B. J. and Bhattacharya, M. R. (2003), *External debt, public investment, and growth in low-income countries*, number 3–249, International Monetary Fund.

Novignon, J., Nonvignon, J., Mussa, R. and Chiwaula, L. S. (2012), 'Health and vulnerability to poverty in ghana: evidence from the ghana living standards survey round 5', *Health economics review* **2**(1), 11.

OECD (1976), 'Public expenditure on income maintenance programmes'.

Parikh, P., Fu, K., Parikh, H., McRobie, A. and George, G. (2015), 'Infrastructure provision, gender, and poverty in indian slums', *World Development* **66**, 468–486.

Parikh, P. and McRobie, A. (2009), 'Engineering as a tool for improving human habitat', *International Journal of Management and Decision Making* **10**(3-4), 270–281.

Pattillo, C. A., Poirson, H. and Ricci, L. A. (2002), *External debt and growth*, number 2002–2069, International Monetary Fund.

Pervez, S. (2014), 'Impact of education on poverty reduction: A co-integration analysis for pakistan', *Journal of Research in Economics and International Finance* **3**(4), 83–89.

Pradhan, B. K. and Mahesh, M. (2014), 'Impact of trade openness on poverty: a panel data analysis of a set of developing countries', *Economics Bulletin* **34**(4), 2208–2219.

Pradhan, B. K. and Mahesh, M. (2016), 'Impact of remittances on poverty: an analysis of data from a set of developing countries', *Economics Bulletin* **36**(1), 108–117.

Raja, N. (2005), 'Humanization of education in pakistan through freires concept of literacy', *Asia Pacific Education Review* **6**(1), 1–6.

Ricci, L. A., Pattillo, C. A. et al. (2004), What are the channels through which external debt affects growth?, Technical report, International Monetary Fund.

Sheikh, M. R. and Alam, T. (2013), 'Does external indebtness enhance the incidence of poverty in pakistan? an empirical evidence', *International Research Journal of Finance and Economics* (106), 17–23.

Siddique, A., Selvanathan, E. and Selvanathan, S. (2016), 'The impact of external debt on growth: Evidence from highly indebted poor countries', *Journal of Policy Modeling* .

Siddique, M. (1994), 'The government poverty alleviation: Selected micro-economic and selected issues', *Department of Economics, The University of Western Australia, Perth* .

Siddique, M. et al. (1994), *The External Debt Problem of Sub-Saharan Africa: 1971-90*, University of Western Australia, Department of Economics.

Somi, M. F., Butler, J. R., Vahid, F., Njau, J. D. and Abdulla, S. (2009), 'Household responses to health risks and shocks: a study from rural tanzania raises some methodological issues', *Journal of International Development* **21**(2), 200–211.

Straub, S. (2008), *Infrastructure and growth in developing countries*, Vol. 4460, World Bank Publications.

Tanzi, V. and Davoodi, H. (1998), *Roads to nowhere: how corruption in public investment hurts growth*, Vol. 12, International Monetary Fund.

United Nation (1995), 'The copenhagen declaration and programme of action: world summit for social development 6–12 march 1995', *New York: United Nations* **1995**.

UNPD (2013), 'Supporting global progress'.

Vogelsang, T. J. and Wagner, M. (2014), 'Integrated modified ols estimation and fixed-b inference for cointegrating regressions', *Journal of Econometrics* **178**(2), 741–760.

Were, M. (2001), 'The impact of external debt on economic growth in kenya', *UNU-WIDER Research Paper, DP* **116**.

World Bank (1997), *Health, nutrition, and population sector strategy*, World Bank.