Review

Trade liberalization and poverty reduction in Africa: computable general equilibrium models approach. literature review

[1]Rafael de Arce, [2]Saúl de Vicente, [3]Ramón Mahía and [4]Eva Medina

[1]Applied Economics Department UAM, 28049, Madrid, Spain.
[2]Applied Economics Department UAM, 28049, Madrid, Spain. Corresponding author's email: saul.devicente@uam.es.
Telephone: 0034 914972852, Fax number: 0034 914973422.
[3]Applied Economics Department UAM, 28049, Madrid, Spain.
[4]Applied Economics Department UAM, 28049, Madrid, Spain.

The link between trade liberalization and poverty reduction has played a crucial role on economic policy in developing and least developed countries, particularly in sub-Saharan Africa. Academic research shows a remarkable lack of consensus and no clear effects in the direction of these linkages. This study presents an overview of the impact of trade liberalization on poverty in Sub-Saharan Africa within a general equilibrium framework. In order to do that, the links between trade liberalization and poverty are firstly summarized, reviewing the existent literature. After briefly describing the basic and extended structure of computable general equilibrium models, the advantages and drawbacks of using this methodology to analyze the relation between these two variables is shown, including the main findings from previous literature applied to the particular case of Sub-Saharan countries. Most of the studies conclude that, while trade liberalization has positive effects on poverty reduction in the long run, it should be accompanied by structural reforms, industrial and redistribution policies in order to minimize the expected negative effects in the short-term.

Keywords: Sub-Saharan Africa, Poverty Reduction, Trade Liberalization, General Equilibrium Models
JEL-Codes: F63, F47, O55, C68

INTRODUCTION

This paper presents an overview of the impact of trade liberalization on poverty in Sub-Saharan Africa within a general equilibrium framework. In this first section, we briefly introduce the links between trade liberalization and poverty reduction. Section 2 faces the use of General Equilibrium Models (CGE) to analyse the relation between these two variables. Section 3 shows the main findings from previous literature of CGE models applied to the particular case of Sub-Saharan countries (SSC). The paper concludes with some final remarks and policy implications.

The link between trade liberalization and poverty reduction has played a crucial role on economic policy in developing and least developed countries, particularly in

SSC. Academic research shows a remarkable lack of consensus and no clear effects in the direction of these linkages (Reimer, 2002). Openness advocates identify strong benefits from them in terms of both resource allocation and economic growth (Dollar and Kraay, 2004). While there remain some critics of such policies, there is widespread acceptance that in the long run open economies fare better in aggregate than do closed ones, and that relatively open policies contribute to long-run development. Many analysts argue, however, that being open exposes an economy to shocks that generate uncertainty, which imply to operate with higher levels of poverty than would a closed economy and undermines policy measures designed to alleviate poverty and redistribute income (Winters, 2002).

The empirical evidence on the links between trade liberalization and growth or productivity is vast and complex to summarize. Recent empirical evidence suggests a strong influence of trade liberalization on productivity, which in many cases leads to a reduction in poverty, especially in the long term (Winters et al, 2004). The literature also emphasizes that channel link between trade and poverty is specific to each case (Winters 2002). Therefore, the best approach is to examine separate episodes of trade liberalization by country and observe the effects on growth and poverty. Extensive and detailed reviews of this literature, taking into account the different channels of impact are provided by Winters (2002, 2004), Reimer (2002) or Bannister and Thugge (2001).

Regarding the technique, there are numerous approaches when analyzing the impact of external shocks (such as trade liberalization) on poverty in developing countries. Two main approaches should be mentioned: i) bottom-up, which emphasizes the heterogeneity of individuals and ii) top-down, which relies on the ability of a representative agent of a larger group. Furthermore, we can distinguish four basic methodologies (Reimer, 2002): i) cross-country regression analysis, ii) partial equilibrium or cost living, iii) general equilibrium and iv)macro-micro synthesis or general equilibrium simulation with post-simulation analysis. This study focuses on the utility of computable general equilibrium models (CGE) and the advantages over alternative approaches.

COMPUTABLE GENERAL EQUILIBRIUM BASICS

From the very beginnings of CGE models (Johansen, 1960) this theoretical approach has been demonstrated as a useful tool to simulate economic changes, especially in countries with a huge lack in economic information. Despite the increased complexity of these models compared to partial equilibrium models or cross-country regressions, CGE models have important strengths in analyzing the economic impacts on poverty and

inequality in developing countries. CGE models allow, on the one hand, satisfactory results at microeconomic level while maintaining consistency of macroeconomic fundamentals. On the other hand, unlike partial equilibrium models, CGE allow a complete analysis of an economy, taking into account both the income side and the expenditure, all production factors involved and interdependence between different sectors, better facing the information problems for developing countries (Hertel et al, 2001).

Adelman and Robinson (1978) first used such models to analyze poverty and income distribution in Korea and since then, there has been a vast literature on development economics using more or less sophisticated CGE models. Within this class of models there are many variations, such as using a representative household for each group (most studies) or work with actual households (Cockburn, 2001; Chitiga et al, 2005; Bourguignon et al, 2005) orgeneral equilibrium models with post-simulation analysis (two-step) (Stifel and Thorbecke, 2003; Friedman and Levinsohn, 2001; Hertel et al, 2001, among others).

As it is well known, CGE models are typically calibrated to a Social Accounting Matrix (SAM) (Pyatt and Thorbecke, 1976). A SAM is a square matrix in which columns represent the payments and rows record receipts of the different agents (accounts) within an economy and can be used to analyse intersectoral linkages, effects of external shocks on certain variables, regions or social groups, including income distribution and poverty (Decaluwé et al, 1998). In a basic SAM we can distinguish the following accounts:

- Factors of production accounts include capital and labor, receiving income via rent, wages and net factor income. These incomes are distributed to households and firms.
- Production activities accounts: produce goods and services from raw materials, intermediate goods and services. These goods and services are sold to households, the government and the rest of the world (exports). They also pay indirect taxes to the government.
- Institutional accounts are composed by households, firms and government. Households, receive most of their income from the factors of production (offering their endowments of capital and labor), as well as transfers from the government and the rest of the world. They pay taxes and consume goods and services. Firms receive profits and transfers from other institutions and spend on transfers and taxes. Government spends on goods and services, transfers and subsidies to other institutions and receives tax revenues and current transfers from abroad.
- Combined Capital Account records savings from the institutions and also foreign and other regions savings.

▪   Transactions between domestic residents and foreign residents, such as imported final goods, capital goods, row materials, exports and factor and non-factors incomes, are included in the Rest of the World account.

After displaying the source of the data needed to implement a general equilibrium model, we will make a brief review of the structure and functioning of these models. In its basic version we can distinguish three components:

▪   Households choose their consumption function in order to maximize their utility subject to their income constraint, which, as discussed above, stem from their endowments of labor and capital. The utility is a function of the amount of consumption of goods available in the market.

▪   Firms choose its demand of inputs and supply of outputs in order to maximize profits restricted to their production technology. Like households, firms pay taxes to the government.

▪   Hence, both households and companies reach, under given prices, their individual equilibrium (balance subjective). However, in general equilibrium models some restrictions, called market-clearing conditions, are imposed, so that demand and supply are equal in price and quantity. Thus, the third component, the Market, equilibrates supply and demand via price adjustment.

Typically, these basic models extend in order to better explain the reality of an economy and most consistent empirical analysis. To do this, the production of intermediate inputs, government and international trade are usually introduced. While the basic model assumes that firms use only labour and capital to produce final goods, intermediate inputs are often introduced together with value added in the production function to obtain total output. The government receives its income via taxes from other institutions (households, firms and rest of the world) and it spends it on commodities and transfers through redistribution policies. It is also usual and more realistic to assume that we work with open economies and, therefore, introduce international trade. Generally, models consider small-country assumption and not perfect substitutability between imports, exports and domestically supplied goods (Armington, 1969).

CGE AS A STRATEGY TO ANALYZE ECONOMIC GROWTH AS A WAY TO REDUCE POVERTY

Since the main goal of this work is to observe the changes that take place in an economy in terms of welfare, income distribution and poverty alleviation when a shock is introduced in a variable associated to international trade, CGE approach can be truly useful. In this sense, the tools that can be managed by the government within a CGE model are basically changes in tariffs, taxes and subsidies. However, we cannot forget

the government's ability to affect variables that may be indirectly related to trade openness or free trade areas (FTA) formation on the one hand and reduction of inequality and poverty and pro-poor growth on the other. Such is the case of investment in education, health, environment, infrastructure, general policies of capital increase, etc. with the aim of benefiting certain socioeconomic groups, promote certain sectors, or integrate a large part of the production process within the value chain of the domestic economy.

In order to see how different economic agents are affected is essential to consider two aspects. On one hand, the level of desired desegregation regarding basic SAM scheme we proposed previously (i.e. types of households or workers). In this way, we can figure out from where to where money flows move and ultimately, who are the "winners" and "losers" of each policy or simulated shock.

The other pillar is to determine how we measure welfare, inequality and poverty in our model and how to specify the indicators used for this purpose. There are many definitions of poverty and inequality (Sen, 1973, 1976, 1992; Dasgupta et al, 1973) according to different criteria such as absolute and relative poverty, objective and subjective, direct and indirect or capacities approaches for poverty (Sen, 1984). Although the combined use of them seems to be the best option, in this case, we focus on strictly monetary measures. Most CGE studies use absolute poverty measures, setting a poverty line that reflects the basic needs (Ravallion, 1994). The headcount index measures the proportion of people who are under the poverty line, representing the incidence or dominance of poverty. Poverty gap measures the depth of poverty and indicates the average distance of poor people to poverty line, weighted by the incidence of poverty. A group of measures that deserves special attention is the family of parametric indices proposed by Foster, Greer and Thorbecke (1984). These indices can be interpreted as a poverty gap that assigns greater weight on individuals the further they are from poverty line. In terms of income distribution, most common measures are Gini coefficient and Theil index. Atkinson (1970) introduced a welfare based measure of income inequality.

In this sense, economic growth and income inequality become the two key variables over which induce changes, direct or indirectly, in the simulations of CGE models. In fact, as pointed out by Bourguignon (2004), poverty is a function of this two variables and it is essential to know the links among them ("Poverty-Growth-Inequality Triangle"), which is far from simple.

The current consensus holds that solid growth is the best way to fight poverty, but without forgetting the fact that when growth leads to greater inequality also affects its ability to reduce poverty levels. In turn, inequality may limit the potential for growth, thus creating a spiral

contrary to the objectives of combating poverty. The relationship between growth, inequality and poverty depends largely on country-specific characteristics, which makes that there are no recipes for eliminating absolute poverty.

The ability of growth to reduce poverty appears to be lower the higher the income per capita and the initial level of income inequality (Alesina and Rodrik, 1994), so the elasticity of poverty with respect to growth varies across countries with different development levels and income distribution. Moreover, it also depends on the changes in inequality, that is to say, the way in which income generated by increased growth is distributed among the population. If growth generates inequality the total effect of growth on poverty will be lower than in the case of a constant distribution of income.

Furthermore, income inequality, as mentioned above, not only reduces the positive impact of growth on poverty, but it can also slow growth itself, usually for reasons of asymmetric information, access to credit for the poor, incentives for capital accumulation, political instability (Alesina and Perotti, 1996) and property rights. Despite the apparent consensus about the positive effect of growth on poverty reduction, the debate on this and the implementation of income redistribution policies remains unsolved. In fact, many authors believe that inequality is still excessive (Atkinson and Brandolini, 2010, or Basu, 2006) to care exclusively for economic growth. Thus, fostering growth exclusively seems reasonable when absolute poverty is relatively low. However, if it is high, as is the case in most of African countries, the policies of poverty reduction through economic growth should be accompanied by redistributive measures.

MAIN FINDINGS FROM PREVIOUS LITERATURE

Main findings in terms of overall economic performance, welfare and poverty reduction differ depending on households approach, type of workers, data, sectors, different scenarios and other characteristics of the models, as well as country specific features when applying CGE simulations. These variances in the studies we have reviewed, however, do not impede us to draw significant conclusions in terms of trade liberalization and poverty reduction.

In a recent study, Aredo et al. (2012) analyse the effect of trade liberalization on poverty and inequality in Ethiopia. They observe a decline in the overall output in the economy as well as an increase in poverty when applying trade liberalization, although farming agriculture sector benefits from openness. The study also shows an increase in volume of imports, while exports slightly increase. Several authors, such as Bhasin and Annim (2005) for Ghana or Chitinga et al. (2005), in the case of Zimbabwe, find also strong evidence of general increases in poverty and inequality.

On the other hand, there are some studies that show ambiguous impact of trade liberalization on poverty and income distribution, or even clearly positive. This is the case of Aka (2006), Decaluwé et al (2008) or Blake et al (2002), for Ivory Coast, Benin and Uganda respectively.

Although most of studies use static models, there are several authors that have implemented dynamic CGE models for sub-Saharan Africa. For Nigeria, Manson et al (2005), find that national poverty increases, both in the short and the long run (stronger), while distribution worsens in both scenarios. However, using a dynamic model as well, small increases in poverty and inequality is observed in the short run in Senegal (Annabi et al, 2005). In the long run, trade liberalization enhances capital accumulation, leading to significant increases in welfare and decreases in poverty, particularly for urban and non-poor households.

Diagne et al (2013) find, however, positive effects when applying the Common External Tariff in this country. Although rural households show a good performance, reducing poverty, these effects are clearly stronger in urban areas. Mabugu and Chitiga (2007) found, in the case of South Africa, very low impact of trade liberalization alone in the short run and slight positive macroeconomic effects in the long run, particularly when introducing increases in total factor productivity. Thurlow (2008) tries to observe the different impact on poverty between the current situation in Mozambique, characterized by a slowdown in overall economic growth, and a more balance and diversified agricultural growth and more rapid land expansion (CAADP).Poverty declines in both scenarios but much stronger in the second one. Siddig and Babiker (2011), focusing in Sudan agricultural sector, conclude that agricultural efficiency gains can help to reduce poverty and better face the challenge of trade liberalization. Benin et al (2008) reach similar conclusions but pointing out that results differ depending on agricultural composition, stressing the importance of broad-based agricultural growth.

In 2005, the World Bank Development Prospects Group (DECPG) developed a tool for country-level analysis of medium-long-run development policies, including strategies for reducing poverty and achieving the MDGs. This tool (Maquette for MDG Simulations) is a dynamic CGE model that has been extended to cover the generation of outcomes in terms of growth, welfare, poverty alleviation, MDGs, and the educational make-up of the labor force[1].

[1] See http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21403964~menuPK:4800417~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html

Using this kit-tool, several studies about poverty fight in African countries have been developed. For the Republic of Senegal, Diagne et al. (2013), for Burkina-Faso, Gottschalk et al. (2009), Nielsen and Lofgren (2011)for the Republic of Congo or Lofgren and Kumar (2008) for Kenya, among others. In all of these studies, CGE is the better solution to solve the lack of quality information for these countries and, in the absence of better instruments, these simulations have shown important insights in terms of policy oriented recommendations.

Unfortunately, these experiences do not allow us to draw unequivocal conclusions or general recipes for the geographic area under consideration. Conversely, it seems much more reasonable to take into account not only the characteristics of each model and period of analysis (short/long run) but also the idiosyncrasies of each country when drawing conclusions and policy recommendations.

FINAL REMARKS

After this extensive review of CGE models applied to the study of poverty and trade liberalization in SSC, we can draw some relevant conclusions:
1. CGE models and/or micro simulation theories that can be linked with these models have been demonstrated as a useful tool to analyze simulations related to alternative economic policies to fight against poverty.
2. In this sense, obviously, facing a poverty analysis from a strictly monetary income point of view (particularly, taking into account household income) leaves out other key aspects which should be incorporated in a multidimensional poverty measurement.
3. While this type of model went through a stage of less use in the 90s, nowadays, driven by the World Bank, the International Monetary Fund and regional development banks, they have regained relevance in this field.
4. Probably the biggest advantage of CGE models is that they minimize the problem of lack of information in least developed countries without losing a model which remains consistent with the economic theory and available statistical information.
5. This type of analysis, together with information from micro-surveys is a powerful tool to analyze the effects of the more widespread economic policies aimed at poverty reduction, improvement of income distribution, welfare...
6. Unfortunately, this type of models require a calibration step for the determination of the coefficients, undoubtedly its principal weakness, due to the strong linkages to a static situation as the represented by the SAM.
7. The improved processing capacity of IT has enabled rapid development of mathematical algorithms in this type of models, making them more credible.

8. The reviewed studies highlight the very different effects that may occur on poverty with the same kind of economic policy and the importance of taking into account the income distribution in the country for which the simulation is performed. The extension of the content of the SAM's with household surveys makes it possible to analyze the impact of each shock, taking into account the specific effects on different types of households (in terms of income and geographic location, mainly).
9. Additionally, in the context of economic simulation and, particularly, in poverty issues, it would be very useful to capture social aspects, governance and corruption, among others, that are impossible to introduce in such models.

Furthermore, the usefulness and advantages of these models should be fitted in the specific area under consideration. Thus, with regard to the general relationship between poverty and international trade, several conclusions can be drawn from the studies mentioned above.

International trade has increased exponentially in recent years, which seems to be a great opportunity to achieve sustained growth and poverty alleviation in less developed countries, particularly in SSC. However, as we have seen in both theoretically and empirical studies, one must be very cautious, especially when linking international trade to income distribution and poverty reduction, taking into account which socioeconomic groups are winners and which lose on a particular openness policy. Furthermore, it appears that those countries that have opened their borders more slowly have been more successful in reducing poverty (Southeast Asia) than those who started from a worse initial situation and have opened their economies to trade abruptly, as is the case with many sub-Saharan countries (UNCTAD, 2004).

Thus, although trade liberalization seems to have strong impact on overall economic performance, welfare and poverty reduction, the direction of these effects is not clear and vary depending on the data, model approach and country specific features. In fact, in the studies reviewed in this paper we have found notable differences and conflicting results regarding these effects in SSC. There is no clear effect of trade liberalization on poverty at national level, while generally speaking, poverty falls more in urban than in rural areas, where, in many cases, even rises. There seems to be some evidence of negative effects among rural and poorest population in the short term while it seems to revert in the long term. Inequality remains the same or slightly increases in most of cases. Additionally, income distribution worsens more when reductions on export tariffs are applied.

There are also indirect effects in other variables that ultimately affect poverty such as growth (usually increases with openness), factors and commodities prices, international trade or household's welfare. Sectors

with higher initial level of protection tend to lose after liberalization, leading to a reallocation of resources towards more competitive and export-oriented sectors. Manufacturing and industrial (particularly modern) often shrink. Unskilled workers appear to beneficiate from liberalization, while capital owners and skilled workers are, in general, adversely affected.

Thus, trade liberalization should be accompanied by structural reforms, industrial and redistribution policies in order to minimize the expected negative effects in the short-term and ensure that openness reverses into a better performance of overall economy, enhancement of value chain and welfare increase, especially among the poorest households.

ACKNOWLEDGMENT

REFERENCES

Aredo D, Samson and Fekadu, Belay and Kebede, Sindu W (2012). Trade Liberalization and Poverty: A Macro-Micro Analysis in Ethiopia (May 1, 2012). MPIA Working Paper No. 2012-04

Adelman and Robinson (1978). Income Distribution Policy: A Computable General Equilibrium Model of South Korea. Stanford University Press.

Blake A, McKay A, Morrissey O (2002). "The Impact on Uganda of Agricultural Trade Liberalisation." Journal of Agricultural Economics 53 (2): 365-81

Cockburn J (2001), "Trade Liberalisation and Poverty in Nepal: A Computable General Equilibrium Micro Simulation Analysis", Discussion paper 01-18, Centre de Recherche en Économie et Finance Appliquées (Universite Laval), October

Diagne A, Cabral F, Robilliard A, Cissé F (2013). "Senegal" in Sanchez, Marco V., and Rob Vos. Financing Human Development in Africa, Asia and the Middle East. The United Nations Series on Development. London: Bloomsbury Academic.

Alesina A, Perotti R (1996). Income Distribution, Political Instability, and Investment. European Economic Review, 40(6): 1203-1228.

Alesina A Rodrik D (1994). Distributive Politics and Economic Growth. Quarterly Journal of Economics, 109(2): 465-490.

Annabi N, Cisse F, Cockburn J, Decaluwe B (2005). Trade Liberalisation, Growth and Poverty in Senegal: a Dynamic Microsimulation CGE Model Analysis.

Armington PS (1969). A Theory of Demand for Products Distinguished by Place of Production. International Monetary Fund Staff Papers, 16(1): 159-178.

Atkinson AB (1970). On the Measurement of Inequality. Journal of Economic Theory, 2(3), pp. 244-263.

Atkinson AB, BRANDOLINI A (2010). On Analyzing the World Distribution of Income. World Bank Economic Review, 24(1): 1-37.

Bannister GJ, THUGGE K (2001). International trade and poverty alleviation. Washington, DC: IMF.

Basu K (2006). Globalization, Poverty, and Inequality: What Is the Relationship? What Can Be Done? World Development, 34(8):1361-1373.

Benin SE, Thurlow J, Diao X, Kalinda H, Kalinda T (2008). Agricultural growth and investment options for poverty reduction in Zambia. International Food Policy Research Institute (IFPRI).

Bhasin V, Annim SC (2005). Impact of Elimination of Trade Taxes on Poverty and Income Distribution in Ghana, Revised Final Report Submitted to Global Development Network.

Bourguignon F, Robilliard A, Robinson S (2005). Representative versus Real Households in the Macroeconomic Modeling of Inequality.

Bourguignon F (2004). The Poverty-growth-inequality triangle. Indian Council for Research on International Economic Relations, New Delhi, India.

Chitiga M, Kandiero T, Mabugu R (2005). Computable General Equilibrium Micro-Simulation Analysis of the Impact of Trade Policies on Poverty in Zimbabwe.

Dasgupta P, Sen AK, Starrett D (1973). Notes on the Measurement of Inequality. Journal of Economic Theory, 6(2):180-187.

Decaluwé B, Adjovi E, Robichaud V (2008). Trade Policy and Poverty in Benin: a General Equilibrium Analysis.

Decaluwé B, Patry A, Savard L (1998). Income Distribution, Poverty Measures and Trade Shocks: A Computable General Equilibrium Model of a Archetype Developing Country.

Dollar D, Kraay A (2004). Trade, growth, and poverty.

Friedman J, Levinsohn J (2001). The Distributional Impacts of Indonesia's Financial Crisis on Household Welfare: "A Rapid Response Methodology".

Gottschalk J, Manh V, Lofgren H, Kofi H (2009). Analyzing Fiscal Space Using the MAMS Model: An Application to Burkina Faso. IMF Working Paper 09/227.

Pyatt G, Thorbecke E (1976) Planning Techniques for a Better Future, ILO, Geneva

Hertel TW, Preckel P, Cranfield J, Ivanic M (2001). Poverty Impacts of Multilateral Trade Liberalization

JOHANSEN L (1960). A Multi-Sectoral Study of Economic Growth, Amsterdam, North-Holland.

Lofgren H, Kumar P (2008). Kenya: Accelerating and Sustaining Inclusive Growth (8.95 MB). Policy Note. Report no. 42844-KE. Poverty Reduction and Economic Management Unit 2. Country Department for Kenya. Africa Region.

Mabugu R, Chitiga M (2007). Poverty and Inequality

Impacts of Trade Policy Reforms in South Africa.

Nielsen H, Lofgren H (2011). Republic of Congo. Employment and Growth Study: From jobless to inclusive growth. Poverty Reduction and Economic Management 3. Africa Region.

Ravallion M (1994). Measuring Social Welfare with and without Poverty Lines. American Economic Review, 84(2): 359-364.

Reimer JJ (2002). Estimating the Poverty Impacts of Trade Liberalization.

Sen A (1992). Inequality reexamined. New York: Russell Sage Foundation; Cambridge: Harvard University Press.

Sen A (1984). Rights and Capabilities.

Sen AK (1976). Poverty: An Ordinal Approach to Measurement. Econometrica, 44(2): 219-231.

Stifel DC, Thorbecke E (2003). A Dual-Dual CGE Model of an Archetype African Economy: Trade Reform, Migration and Poverty. Journal of Policy Modeling, 25(3): 207-235.

Winters LA, Mcculloch N, Mckay A (2004). Trade Liberalization and Poverty: The Evidence so Far. Journal of Economic Literature, 42(1): 72-115.

Winters LA (2002). Trade Liberalisation and Poverty: What are the Links? The World Economy, 25(9):1339-1367.