Trade Openness: An Effective tool for Poverty Alleviation or an Instrument for Increasing Poverty Severity?

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Abstract

Several studies focus on the effects of trade openness on poverty alleviation through studying the effect on headcount poverty. Few of them studied the effects on poverty severity and none of them studied the effects on multi-dimensional poverty. Even those who studied the effect on headcount poverty found that the ground argument that trade openness alleviates poverty in developing countries is fragile. Although theoretical models emphasize a positive relationship between openness and poverty alleviation through several channels, the proof of the relationship is practically proven in only a few cases. Many studies have attempted to explain the weak relationship, or in many cases the contrary is proven in most of developing countries. Most of studies stressed on the importance of mitigating the negative effects of trade openness in the short term. This paper has attempted to review the literature that supports and opposes the effects of trade openness on multi-dimensional poverty and its intensity. Additionally, a dynamic panel model is estimated to test this relationship relying on macroeconomic data set for countries in MENA region. The paper supports that trade openness restricts the efforts to alleviate both of multidimensional poverty and its intensity in MENA countries. This underscores the need for governments to provide complementary policies aimed at bringing the benefits of trade openness to those in extreme poverty.

Key Words: Severity of poverty, Endogenous growth theory, MENA countries, Multidimensional poverty, Poverty alleviation, Trade openness.

JEL Classifications: F13, F59, and I32

1. Introduction

Trade liberalization and openness are global trends and prerequisites for development. Additionally, poverty alleviation and achieving equitable income distribution are fundamental objectives of development. This increases the trend towards studying the possibility of mergers between trade openness and poverty reduction, more specifically, studying the ability of trade openness to reduce poverty.

The study of the relationship between trade liberalization and poverty alleviation was largely related to the opposed researchers' attitudes towards globalization between pros and cons. But even those who oppose globalization recognize that it is inevitable and irreversible. Therefore, the determinants of the extent of trade liberalization gains and how to minimize the negative effects on losers should be studied.

The review of literature has shown that the relationship between trade openness and poverty alleviation is not clear, as benefiting from trade openness especially for unskilled labor requires the application of a number of conditions. These conditions include intersectoral labor mobility, government policies to minimize the costs of adjustment in the short term, the flexibility of labor markets, the effect of the price shocks resulting from trade liberalization on the poor, the dependence of the poor on government services, the effectiveness of financial institutions, and the ability of absorbing new technologies imported because of trade openness. The above has been shown to researchers that resolving the relationship between trade openness and poverty are an issue of application. A review of literature for applied studies has shown that, despite the multiplicity of studies that have touched on the impact of trade openness on headcount poverty, rare of them have studied the impact of trade openness on poverty severity[1] and none of them studied poverty as a multidimensional phenomenon.

In this paper, the literature on the impact of trade openness on poverty severity is reviewed to identify the most important channels from which trade openness moves to affect the poor; followed by an estimation of a dynamic panel model to test the effect of trade openness on multidimensional poverty and its intensity in 23 MENA countries during the period 1995-2015.

The remainder of this paper is structured as follows: section 2 reviews the literature on the channels through which trade openness affects poverty, section 3 describes the estimation technique, Specification of the Model and data sources, section 4 includes the model estimation, empirical results and discussion of the results, and section 5 includes the Conclusion and policy implications.

2. Review of Literature

Trade openness has become a prerequisite for accelerating development in most of the reform programs adopted in developing countries. Alleviating poverty has become one of the main objectives targeted from accelerating development for any economy. Thus, it became common sense for economists to ask whether trade openness and poverty alleviation complemented or hindered each other (Cicowiez and Conconi, 2008). The relationship between trade openness and poverty is neither direct nor unambiguous as the ability of trade to be effective in alleviating poverty depends on a multidimensional set of economic and institutional factors (Alkire and Roche, 2011; Cicowiez and Conconi, 2008; McCulloch, Winters and Cirera, 2001).

In order to be able to study the effects of trade openness on poverty alleviation, identifying and characterizing both of trade openness and poverty must be taken place. Following it, a study of both the theoretical and practical background of the effects of trade openness on poverty and its dimensions will be done.

2.1 Conceptual framework

A review of related literature on trade shows that there is not a clear definition of trade openness (Harrison, 2006; Huchet-Bourdon, Mouel and Vijil, 2011). There are three categories of definitions that exist depending on the degree of comprehensiveness of the definition. The first includes the literature focus on the practice view of trade openness and defines it as reducing barriers to trade in goods and services in

[1] The severity of poverty goes beyond headcount poverty. It takes into account the breadth and intensity of poverty (Alkire and Roche, 2011).

addition to promoting trade (Dava, 2012; Harrison, 2006; Pradhan and Mahesh, 2014). The second category overlaps the concepts of trade openness with trade liberalization. This category considers trade openness as a complicated policy measure includes both of trade policies that target reducing trade barriers and a set of macroeconomic and institutional policies which makes the country more outward oriented (McCulloch *et al.*, 2001; Pattillo, Gupta, and Carey, 2005; Pradhan and Mahesh, 2014). The third goes beyond the policies to include non-policy factors such as the quality of infrastructure, more developed financial systems, and geographical factors that help increase the trend to be more outward oriented (Cain, Hasan, and Mitra, 2010; Pradhan and Mahesh, 2014).

The lack of agreement on the definition of trade openness has led to the absence of a universal acceptable measure for trade openness (Nursini, 2017; Tahir, Haji, and Ali, 2014). Studies use several measures to reflect both practices and policies dimensions of trade openness. These measures include trade intensity, growth rate of exports, tariff and non-tariff barriers[2], ratio of manufacturing output to GDP, black market premium[3], Heritage Foundation index[4], IMF index of trade restrictiveness[5], and The World Bank's outward orientation index (Dava, 2012; Harrison, 2006; McCulloch *et al.*, 2001; Nursini, 2017; Tahir *et al.*, 2014).

The same ambiguous is found between literatures in classifying and measuring poverty. Addae-Korankye (2014) and Bradshaw (2005) gave six categories of poverty according to the root causes of poverty. These categories are individual capability deficiencies; cultural belief systems; economic, political, and social distortions; geographical disparities; and cumulative; circumstantial interdependencies and contaminated or hazardous environment. McCulloch *et al.*, (2001) added another category which is living in a polluted environment.

The first category relates poverty to the lack of individual capabilities and motivations. Hence, treating poverty efficiently needs social and welfare anti-poverty programs (Addae-Korankye, 2014; Egye and Muhammad, 2015). The second links poverty to beliefs, traditions, and values that generate the culture of poverty. Accordingly, developing anti-poverty programs includes changing distortions in existing culture and working for young people[6] (Bradshaw, 2005; Jordan, 2004). The third connects poverty to economic, political, and social distortions that limit the capabilities of individuals. Here changing the system through working on grassroots, institutional and national levels are needed (Addae-Korankye, 2014; Bradshaw, 2005). The fourth category concerns poverty with conditions that are concentrated in a specific geographical area. Accordingly, poverty alleviation needs improving local industry competitiveness, enhancing infrastructure and motivating private investment in poor areas (Cain *et al.*, 2010; Egye and Muhammad, 2015). The fifth connects poverty to economic imbalances as a two way causality creating a cumulative set of problems that further complicate the cycle of poverty[7]. Fighting poverty in this case requires concerted efforts to break poverty cycles through enhancing supply-side capabilities in poor developing countries (Egye and Muhammad, 2015; Jordan, 2004). The last category relates poverty to living in a contaminated environment or working on poor-quality land. Anti-poverty programs, in this case, should include improving the working environment and tightening laws on the environment (McCulloch *et al.*, 2001).

The measurement of poverty was also not unambiguous. Measures vary from income poverty[8] using either the absolute standard based on quantitative measures such as food consumption or the relative standard that relates poor people with reference to the welfare of other households in the same society.

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[2] These measures include tariff averages, collected tariff ratios and coverage of quantitative restrictions.
[3] The black market premium refers to the overall degree of external sector distortions.
[4] It uses the Trade Freedom index. This index is a composite measure of tariffs and nontariff barriers to trade.
[5] It is constructed by the IMF using three components. These components are the Overall Trade Restrictiveness Index, the Tariff Restrictiveness Rating and the Nontariff Restrictiveness Rating.
[6] Focusing on educational programs is required according to this category of poverty.
[7] One of the sources of poverty cycles is the nature of specialization of developing countries after the new international division of labor which is reflected on the distribution of benefits of the integration in the world trade between poor developing countries and developed countries.
[8] Lopez (2010) demonstrated that the degree of poverty in any country depends on the average Per-capita income level in the country which reflects the headcount poverty and the extent of income inequality.

Others measure poverty as a multidimensional phenomenon (Alkire and Roche, 2011; McCulloch *et al.*, 2001). Alkire and Roche (2011) go beyond measuring headcount poverty by taking into account the severity of poverty.

The breadth of poverty investigates poverty as an expanding concept which concerns the failure of having valuable capabilities. The later includes not only income and wealth, but also social conditions which can lead to a good form of life including the ability to live long in a good health, read, write and communicate with others (Clark and Hulme, 2005). The intensity of poverty is a technical term which refers to the depth of poverty. It can be measured by combining headcount poverty with income gap ratio[9] and the degree of inequality below the poverty line (Clark and Hulme, 2005; Hulme, Moore, and Shepherd, 2001). In order to capture the severity of poverty, the Alkire-Foster (AF) method combines several measures of living standard, health, and education dimensions of poverty.

Regardless of the classifications of poverty and their root causes, there is a general agreement that poverty alleviation should include a combination of policies, not only in the poor countries, but also through the assistance programs provided by the developed countries (Bradshaw, 2005; Stark, 2009).

2.2 The effects of trade openness on poverty and its dimensions

The relationship between trade openness and poverty alleviation has taken a great deal of analysis both theoretically and empirically. Harrison (2006) noticed that the way of measuring trade openness determines its effect on the poor[10]. Cicowiez, and Conconi (2008) and Winters and Martuscelli (2014) stated four main channels through which trade openness affects poverty. These channels are effects on economic growth, labor markets; households and markets; and government revenues.

A. The economic growth channel

The first channel relates trade openness to poverty alleviation through accelerating economic growth. Trade openness accelerates economic growth through benefiting from specialization, the efficiency of allocating resources, economies of scale and scope and technological progress. Then poverty responses to growth, based on the trickle-down effect, assuming more equal distribution of income (Busse and Königer, 2012; Harrison, 2006; Le Goff and Singh, 2013; Lopez, 2010; Winters and Martuscelli, 2014). However, in case the distribution of income and unemployment are affected negatively because of growth, growth may lead to increasing the breadth of poverty even if the income per capita has doubled (Clark and Hulme, 2005).

Theoretically, the effects of trade openness on economic growth can be found in three theoretical approaches such as the Neo-Classical theory, the endogenous growth and the institutional approach (Cicowiez and Conconi, 2008; McCulloch *et al.*, 2001). The Neo-Classical theory targets providing efficient allocation of scarce resources which can only be achieved by markets (Majeed, 2010). The theory focused on accumulating capital and eliminating barriers to trade as prerequisites for development (Saad-Filho, 2010)[11].

The endogenous growth theory tries to explain economic growth from within the system (Aghion, Caroli, and Garcia-Peñalosa, 1999; Cicowiez and Conconi, 2008). The main theme of the theory is that trade openness can accelerate growth in the long term only if it leads to attracting technology, enabling activities that may not have been possible before, reducing networking costs, and gaining from economies of scale (Berg and Krueger, 2003; Majeed, 2010; McCulloch *et al.*, 2001; Nursini, 2017).

[9] Income gap ratio is measured as the average deviation from the poverty line for those who live below the poverty line.

[10] Harrison (2006) noticed that while measuring trade openness as expanding trade reduces poverty, measuring it as a removal of protection increases poverty. This can be explained by the relative immobility of factors between import competing and export oriented sectors.

[11] Once capital is accumulated, it will flow from low productivity to higher productivity areas and lead to growth convergence of countries (Berg and Krueger, 2003). The implication of this is that liberalizing trade enhances the efficiency of allocating resources and accelerates growth (Berg and Krueger, 2003; Deardorff, 2001).

Within the 1990s, institutional factors emerged as a possible new interpretation of many economic outcomes. Hence economists claimed that the positive relationship between trade openness and poverty alleviation is conditional on the existence of supported institutions (Cicowiez and Conconi, 2008). Accordingly, Dava (2012) stated that institutional reforms are critical in fostering economic growth. Saad-Filho (2010) and Trabelsi and Liouane (2013) confirmed the positive relationship by stating that the poor did not benefit from globalization in most of developing countries because of wrong state intervention, corruption, inefficiency, and misleading economic incentives.

Empirically, few papers confirmed the positive relationship between trade openness, economic growth, and poverty for developing countries with conditions. Winters (2002) argued that focusing on liberalizing trade in agricultural and labor intensive industries can be an effective tool in poverty alleviation and reducing the intensity of poverty especially in developing countries. Harrison (2006) found, using several evidences from cases of India, Colombia, Zambia, Mexico, and Ethiopia, a strong relationship between globalization and poverty alleviation through growth in the country levels.

Most papers confirmed the positive relationship between trade openness and economic growth in all countries including developing countries. Busse and Königer (2012) and Hoekman, Michalopoulos, Schiff, and Tarr (2001) used dynamic panel estimation and found a positive highly significant impact of trade openness on economic growth, especially for developing countries. Pradhan and Mahesh (2014) emphasized the same findings and stated that inward-oriented trade policy prevents growth. Majeed (2010) used panel data set for 18 Asian countries to study the effects of trade openness on economic growth which confirmed the positive and significant relationship. Dava (2012) studied the relationship between trade liberalization and economic growth in Southern African Development Community (SADC). The results indicate that trade liberalization, on average and in aggregate, have had a significant positive impact on the change in the growth rate of SADC sample countries. Pattillo *et al.* (2005) confirmed the same results in studying the main determinants of growth in Sub-Saharan Africa. Nursini (2017) confirmed the importance of trade openness for economic growth in Indonesia. Le Goff and Singh (2013) proved that improvements in trade facilitation coupled with the reductions in tariffs and non-tariff barriers supported in accelerating economic growth in Africa.

Few papers opposed the relationship between trade openness and economic growth in developing countries in particular. Both Dava (2012) and Deardorff (2001) argued that trade restrictions may be associated with accelerating growth whenever restrictions promote technology transfer. Son and Kakwani (2008) analyzed the pro-poor growth using data from 80 countries. He found a significant inverse relationship between trade openness and growth as the low level of trade openness is associated with positive growth.

The majority of papers failed to prove the strong relationship between trade openness and poverty reduction through economic growth especially from the breadth perspective in poor developing countries. Deardorff (2001) mentioned that the way of specialization according to the Neo-Classical theory enhances rich countries to grow increasingly rich and deepening the intensity of poverty in poor countries. Trabelsi and Liouane (2013) studied the relationship between trade liberalization, growth and poverty using panel data for 106 developing countries. They found that while trade liberalization benefits accelerating growth, it does not help reducing breadth poverty. Kuznets (1955) stated in his study of the effects of economic growth on income that the direction of affecting the poor depends on stages of economic growth[12] (Lim and McNelis, 2014; Majeed, 2010). Huchet-Bourdon *et al.* (2011) used a monopolistic competition trade model. They found that while countries with higher quality products grew more rapidly because of trade openness, countries with low quality products suffered from hindering growth and increasing the intensity of poverty because of trade openness. Dava (2012) confirmed the same findings by stating that poor countries are deprived of the benefits of trade openness as they are producing goods less intensive in research and development. Meschi and Vivarelli (2007) pointed out that the positive effects of opening

[12] Kuznets argues that in first stages of economic growth, poverty increases as inequality of income increases because of population movements to shift from agriculture. Then as economic growth continues, poverty reduces as incomes converge because productivity increases in all sectors (Aghion *et al.*, 1999; Kuznets, 1955).

trade are limited only to middle-income countries with an exception of low-income countries[13]. Lopez (2010) used a macroeconomic data set to estimate dynamic panel models to study the short- and long run impacts of policies on growth, inequality, and poverty. The findings proved that pro-growth policies lead to lower poverty levels in the long run and some of these policies may lead to higher inequality and poverty levels in the short run. Le Goff and Singh (2013) found that even though there were significant improvements in trade openness in Africa, however it is still the poorest continent in the world.

Some studies have linked trade openness to increased poverty in developing countries. Lee (2014) mentioned implicitly that trade openness raises the intensity of poverty through increasing inequality in developing countries. Harrison (2006) stated that while trade integration helps reducing poverty in developed countries, it increases them in developing countries. Meschi and Vivarelli (2007) confirmed the negative effects of trade openness on poverty alleviation in low income developing countries especially when trading with high income countries. This led Lee (2014) and Lim and McNelis (2014) to mention that the basis of the argument was that globalization alleviates poverty in developing countries is weakened even though the number of people under the absolute poverty continuously fell. Raihan (2008) used historical data for Bangladesh to study the relationship between trade liberalization and poverty and had the same conclusion.

B. Labor market channel

The second channel uses the effects on wages and employment to relate trade openness to poverty alleviation. Trade openness provides jobs and income for larger numbers of poor people in developing countries because exports are typically labor intensive (Cicowiez and Conconi, 2008; Lim and McNelis, 2014; Sikwez and Konkuni, 2008). Heckscher-Ohlin (HO) model is considered the first who mentioned the effects of trade openness on income[14] (Dava, 2012; McCulloch *et al.*, 2001). The model confirms that trade openness brings long-term gains, but involves short-term adjustment costs on the intensity of the poverty that needs to be carefully managed (Raihan, 2008). Hoekman *et al.* (2001) and Winters (2002) claimed that minimizing adjustment costs depends on the ability to enhance labor market flexibility. Cain *et al.* (2010) confirmed the same idea in studying the relationship between economic reforms including trade liberalization and poverty alleviation in India as the study noticed that this relationship is often stronger in countries with more flexible labor systems.

Several studies divided labor into skilled and unskilled then they applied HO model to study the effects of trade on both (Fukase, 2013; Lee, 2014; Thurlow, 2007). Even though some confirmed the effects of trade openness on poverty especially in unskilled labor abundant countries like Cain *et al.* (2010), however most of the findings disagreed with the model. Some mentioned that trade openness produces both winners and losers among the poor like Harrison (2006) and Thurlow (2007). Wood (1995) pointed out that the net effect of trade openness on the labor market depends on the factor content of traded goods and elasticities of substitution between domestic and imported products in production and consumption.

Studies gave several reasons why trade openness may not benefit the poor even in abundant unskilled labor countries. Winters and Martuscelli (2014) stated that the immobility of labor prevents the spread of gains to the poor on a larger scale. Moreover, trade openness may increase the intensity of poverty as competition increases which results from trade openness as well as reducing absolute wages of unskilled labor. Winters (2002) stated that in case the relative wages for unskilled labor increases, industries will switch to more skill-intensive production methods. Harrison (2006) noticed that trade openness coupled with increasing inequality reducing the benefits to the poor in most cases. However, the losses and costs of trade openness depend on to what extent the unskilled poor, whose salaries have fallen in the short term, depend on wages as a source of income (Winters, 2002). Meschi and Vivarelli (2007) concluded that most of new technology transfer because of trade openness is skill biased. Harrison (2006) proved using the neoclassical growth model that the differences in productivity between countries can result in a negative effect on poor countries, because of trade openness, that may exceed the positive effect of the abundance of

[13] The reason is the relatively higher ability of the middle-income countries to absorb technology that could be imported once trade is opened.

[14] The model states that international trade benefits the owners of abundant factors and worsens the owners of scarce factors.

factors. Accordingly, Harrison argued that relying on Stolper-Samuelson Theorem[15] to benefit the poor is "worse than wrong-it is dangerous".

Empirically, most of the studies failed to prove the positive effects of trade openness on unskilled labor. Thurlow (2007) studied the effects of trade liberalization on labor market in South Africa. He found that trade reforms contribute positively to economic growth, import competition and technological change. However it increased the intensity of poverty dramatically through affecting unemployment, headcount poverty and inequality especially from unskilled labor. Raihan (2008) estimated labor demand functions of the manufacturing industries in Bangladesh. He found that, in general, trade liberalization has created jobs in major export-oriented industries, while major import-substituting industries have suffered. However, for most of the industries, there are insignificant relationship between trade liberalization and employment generation.

C. Households and markets channel

The third channel connects trade openness to poverty alleviation through the effects on households and markets. The neoclassical theory and the models of imperfect competition illustrate that trade openness affects households and markets through increasing incomes, enhancing competition[16], enlarging the market size, causing price shocks[17], reducing tariffs, and changing real exchange rates. All of these channels transfer trade openness to offer varieties of products affordable for the poor households (Busse and Königer, 2012; Dava, 2012; Raihan, 2008; Winters, 2002).

Raihan (2008) argued that the responsiveness of household poverty reduction to price shocks resulted from trade openness which depends on the ability of households to adjust their consumption and production in the appropriate direction in response to the price change. Hoekman *et al.* (2001) stated that the effects of trade openness on poverty alleviation depend on the household sources of income. Winters (2002) mentioned that even if trade openness benefits households in aggregate, gains are unevenly distributed. Usually the intensity of poverty increases for women and children because of trade openness. Furthermore, Winters argued that price shocks are widespread and shocks are moving from one market to another. Even for locally traded products, the transmission may be narrow but deep.

Harrison (2006) and Hoekman *et al.* (2001) mentioned that the effective medium between trade openness and poverty alleviation should be money shocks. Hoekman *et al.*, (2001) added the exchange rate policy as an effective tool to affect prices. Accordingly, Harrison mentioned that trade reform benefits households through the increase in real incomes generated from the reduction in prices. Winters (2002) argued that the effect of price shocks on the poor households depends on their spent on traded goods as a share of total spending of the poor. Hoekman *et al.* (2001) confirmed the same idea saying that the impact of trade openness on poverty alleviation depends on the effects of price shocks on goods and services that the poor consume.

D. Government revenues channel

The fourth channel connects trade openness to poverty alleviation through the government revenues. Winters (2002) provided that in their early stages of trade liberalization, countries are turning from quantitative restrictions on trade to tariffs and then reducing high tariff rates. This in turn affects public expenditure directed to alleviate poverty. Mallick (2008) determined two broader components of public expenditure those who are affected because of trade openness such as revenue expenditure and capital expenditure. Raihan (2008) emphasized that if trade taxation is an important source of revenue; reduced public resources because of trade policy reform are most likely to affect the poor. Pattillo *et al.* (2005) identified another channel through which the decline in public revenues could affect poverty which is the impact of declining public revenues on economic growth.

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[15] Under certain conditions, an increase in the relative price of a good will raises the real income of the factor used intensively in that industry and a decrease in the price of the other factor (Le Goff and Singh, 2013; Raihan, 2008). The theory is applied also for unskilled relative to skilled labor (Winters, 2002). Fukase (2013) and Winters (2002) stated the critics of using Stolper-Samuelson Theorem in studying the relationship between trade and poverty.

[16] Competition supports the optimization of resource allocation and production processes.

[17] The price chocks result from changes towards world prices.

Empirically, studies proved that public revenues reduction can be avoided by adopting accompanying policies for tax reform and reducing the scope of tariff exceptions and exemptions. Raihan (2008) argued that the impact through affecting government revenues depends on to which extend do poor people depend on public services. Additionally, tax revenues can be increased as a result of the increase in trade volume and the increase in revenues resulted from the reduction of tariff rates which eliminates a number of ways used to avoid paying the tariff (Winters, 2002).

Hoekman *et al.* (2001) argued that Ghana, Kenya, Senegal, and Malawi applied trade reforms in the 1990s without significant reductions in their public revenue as a percent of GDP. They explained this by the reliance of developing countries more on quantitative restrictions. Accordingly, Hoekman *et al*. rejected the negative effects of trade openness on poverty alleviation through the effects on government revenues even in the short term. The reason is that protection often transfers income from consumers, including the poor, to the license holders and is considered a major source of inefficiency[18]. Hoekman *et al.* added that, in most cases the effects of inefficiency resulted from protectionism exceed the potential benefits that could be generated from spending tariff revenues on the poor. Mallick (2008) studied the effects of trade openness on economic growth through affecting aggregate public expenditure in India. He found that neither aggregate expenditure nor capital expenditure affect significantly the growth rate of India while revenue expenditure affects economic growth positively. Accordingly he stated that, trade openness has an effect on economic growth, to some extent, through affecting revenue expenditure.

In conclusion, regardless of the channel used to help in poverty alleviation, trade openness can guarantee accelerating economic growth but may not be sufficient to alleviate poverty even in the long run without having supportive complementary policies (Cicowiez and Kankoni, 2008; Harrison, 2006; Thurlow, 2007). Studies suggest that the effective complementary pro-poor policies, especially in the short term, include supporting macroeconomic stability, having a competitive real exchange rate, investing in human capital and infrastructure, reducing impediments to labor mobility, supporting the poor's access to credit and technical know-how, reducing transaction costs, and offering social safety nets and food aids (Cicowiez, and Conconi, 2008; Harrison, 2006; Hoekman *et al.*, 2001; Lee, 2014; Lopez, 2010).

The previous review of literature illustrated that although many studies have measured the impact of trade openness on alleviating poverty, they all focused on income poverty and none exposed that poverty is a multidimensional phenomenon. The focus of this paper is on link trade openness to poverty alleviation in MENA countries taking into account that poverty is multidimensional.

3. Estimation Technique, Specification of the Model and data sources

3.1 Estimation Technique

This section empirically investigates the effects of trade openness on multidimensional poverty and poverty intensity in MENA countries[19]. In both models, data cover the period from 1995 to 2015, due to the data availability.

In estimating the model, the Ordinary Least Squares (OLS) has a problem of omitted variable bias. Fixed effect econometric techniques could avoid the problem of omitted variable bias. However, it gives biased parameter estimates in case of using lag independent variable (Majeed, 2010).

Accordingly, the models are specified using the dynamic panel data technique based upon the generalized method of moments (GMM) in order to capture the cyclical interdependencies between multidimensional poverty and its causes[20] and to avoid the biasness of results and the doubts on reliability (Agboghoroma *et al.*, 2009; Arellano and Bond, 1991).

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[18] Especially, putting into consideration that non-tariff barriers result in transferring the additional rent generated from the difference between domestic prices and world prices.

[19] The country sample consists of 23 countries that belong to the group of MENA. These countries are listed in the appendix 'A'.

[20] It should be noted that poverty is interrelated with unemployment, human capital development, improvements in physical infrastructure, inflation, GDPpcgr and investment in a complex way. Furthermore, poverty in itself may

Arellano and Bond (1991) used first differences instead of levels in order to eliminate the individual effects in estimating the dynamic GMM model and simultaneously used the differenced endogenous and predetermined explanatory variables with their lagged levels as instruments. This can produce efficient and consistent estimates, and at the same time take all the potential orthogonality conditions into account. Agboghoroma *et al.* (2009) reviewed the studies that mentioned the weaknesses of using the difference GMM estimator showing that lagged levels can be poor instruments for first-differenced variables, in particular if the variables are persistent. In a modification of the estimator, system GMM estimator for dynamic panel data model is used. This model combines lagged levels to be included as instruments for the difference equation and lagged differences as instruments in the level equation.

3.2 Specification of the Model

In choosing the dependent variable, three dimensions of poverty are considered such as multidimensional poverty, inequality, and poverty intensity. In constructing a multidimensional poverty index (MPI), we followed Alkire and Foster's method (for a complete formal explanation see: Alkire and Roche, 2011). The MPI is constructed to cover three dimensions of poverty such as the deprivation of decent living standards, longevity, and knowledge.

1. Deprivation of decent living standards (D_1). In measuring this dimension of poverty, an average of three measurements is used. The first is the proportion of people who suffer from hunger. The second is the percentage of population with no access to improved drinking water source. The third is the percentage of population with no access to electricity.
2. Deprivation of longevity (D_2). In measuring this dimension of poverty, an average of two measurements is used. The first is the percentage of people with life expectancy less than 65 years. The second is the percentage of children under five mortality rates.
3. Deprivation of knowledge (D_3). Due to data availability, only the Drop-out rates from secondary education derived from the percentage of enrollment of secondary school data is used.

Then we used the methodology adopted by the United Nations Development Program (UNDP) to generate the MPI by combining these three dimensions into one single measurement. The formula of calculating the MPI, where j refers to the dimension of poverty used, is:

$$MPI = \left(\sum_{j=1}^{3} D_j^3 \right)^{1/3} \quad \text{.... (1)}$$

The multidimensional headcount is a useful measure, but it does not increase if the poor become more deprived. Hence an augmented multidimensional poverty indication is used to measure the intensity of poverty[21]. In measuring the intensity of poverty (MPIdep), the average of the group of Middle East and North Africa after excluding high income countries is assumed to be the benchmark for measuring the intensity of deprivation. So if the country has the same rate as the average of the group or less might be identified as nondeprivation while more might be identified as deprivation. The intensity of deprivation is measured by the difference between the indicator of the country and the group. The same formula of calculating the MPI is used.

The proposed empirical specification will be as follow:

$$MPI_{it} = \alpha + \rho\ MPI_{i(t-1)} + \beta\ Trade_{it} + \sum_k \delta_k X_{ikt} + \lambda_i + \varepsilon_{it} \quad \text{.... (2)}$$

where i and t denote country and time period, respectively. *MPI* refers to the constructed multidimensional poverty index in models 1, 2, and 3. The same variable refers to the augmented multidimensional poverty that measures the intensity of poverty in models 4, 5, and 6. *Trade* is the trade openness variable; X_k refer to a set of control variables; λ_i is a set of individual and time-invariant country's fixed effect and ε_{it} stands for the error term. The trade openness variable is measured using exports plus imports of goods and services as

affect economic growth because of the possibility of poverty trap. Therefore, establishing a good specification for poverty is difficult because of endogeneity and reverse causality.

[21] The intensity of poverty can be measured through combining headcount poverty with income gap ratio.

a share of GDP then using both exports of goods and services and imports of goods and services as shares of GDP in order to study the effects of trade liberalization on each of them individually.

In choosing the control variables, the following independent variables are included:

- **Unemr** refers to unemployment rates as a percentage of total labor force referring to the dependency ratio which increases poverty.
- **Healthexp** describes the total health expenditure[22] as a percentage of GDP referring to improvements in health as one of the dimensions of human capital development.
- **Eduy** indicates the expected years of schooling referring to improvements in education as one of the dimensions of human capital development.
- **Infrs** refers to fixed telephone subscriptions per 100 people referring to improvements in physical infrastructure.
- **GDPpcgr** indicates the growth rate of GDP per capita referring to the changes in per capita income.
- **Inf** indicates the inflation measured as the annual growth rate of the GDP deflator referring to the rate of price change which affects the purchasing power in the economy.
- **Inv** describes the gross capital formation as a share of GDP referring to the level of investment.
- **NODA** indicates the net official development assistance referring to grants by official agencies of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries.

Using the control variables in equation (2), the specification of the model can be shown as follow:

$$MPI_{it} = \alpha_i + \beta_1 MPI_{i(t-1)} + \beta_2 Trade_{it} + \beta_3 Unemr_{it} + \beta_4 Health\exp_{it} + \beta_5 Eduy_{it} + \beta_6 Infrs_{it} + \beta_7 GDPpcgr_{it} + \beta_8 Inf_{it} + \beta_9 Inv_{it} + \beta_{10} NODA_{it} + \lambda_i + \varepsilon_{it} \quad \text{.... (3)}$$

All variables are expressed in natural logarithms except those who can have negative values. The potentially endogenous variables are *Eduy*, *Trade*, *GDPpcgr*, *NODA*, *Infrs*, *Unemr*, *Inv*, *Healthexp*, and *Inf*.

The trade openness is considered the main independent variable in this model. As mentioned above, although its theoretical effect on poverty is negative, the empirical evidence is mixed. The variables of historical records of poverty, unemployment rates, the inflation, and gross capital formation as a share of GDP are expected to be positively related to multidimensional poverty. On the other hand, the variables of total health expenditure, expected years of schooling, better infrastructure, and GDP per capita or its growth are expected to be negatively related to multidimensional poverty in the presence of trade openness.

3.3 Data sources

In order to test the implications of the model, data is collected from several sources depending on the availability of the data of the selected countries. Data of multidimensional poverty index (MPI) and its intensity are calculated depending on two sources. The first is the Millennium Development Goals Indicators for the deprivation of decent living standards data. The second is the World Development Indicators for the data on the deprivation of longevity. The data on GDP per capita growth rate, inflation, infrastructure, trade, health expenditure, net official development assistance, and unemployment are collected from World Development Indicators of the World Bank national accounts data. The United Nations Educational Scientific and Cultural Organization (UNESCO) data is used to collect the expected years of schooling.

4. Empirical Results and Discussions

Before running the models, the time series properties of the variable were checked to avoid the problem of spurious regression. The variables of *GDPpcgr*, *Inf*, *Unemr*, and *NODA* were found to be stationary in their levels while variables of *Eduy*, *FDI*, *Heaexp*, *Infrs*, *INV*, *MPI*, *MPIDep*, and *Trade* were found to be integrated in their levels and stationary with their first difference. It has been realized that the variables included in the two models are cointegrated.

[22] It is calculated as the sum of public and private health expenditure.

Following the description of the variables and the econometric method used, the equation (3) is estimated using a system GMM estimator for dynamic panel data model. Both levels and differences in the multidimensional poverty index and its intensity across countries and time are explained by the lagged value of multidimensional poverty "$MPI_{(t-1)}$ or $MPIDep_{(t-1)}$", the degree of trade openness "*Trade*", the unemployment rate "*Unemr*", the health expenditure as a percentage of GDP "*Healthexp*", the expected years of schooling "*Eduy*", the physical infrastructure "*Infrs*", the GDP per capita growth rate "*GDPpcgr*", the inflation rate "*Inf*", the level of investment "*Inv*", and net official development assistance "*NODA*".

The pooled ordinary least square (OLS) and panel fixed effect methods are employed as robustness tests. Moreover, the existence of the fixed effects is tested using redundant fixed effects – likelihood ratio. The results strongly reject that the cross-section effects are redundant. In a trial to eliminate the fixed effects, Arellano-Bond method of adding first difference to the system of regression equation is taken. The values of the Sargan test imply ignoring the over-identifying restrictions. The values of Q-statistics of System Residual Portmanteau for Autocorrelations test imply that problems of second order autocorrelation in differences can be rejected. The determinants of multidimensional poverty and its intensity, after dropping the insignificant variables from the models, are reported in table 1.

Table 1 Determinants of multidimensional poverty

	Dependant Variable: ln MPI_{it}					
Models	1	2	3	4	5	6
Independent Variables	MPI	MPI	MPI	MPIdep	MPIdep	MPIdep
$MPI_{(t-1)}$	0.997*** (292.96)	1.006*** (148.21)	0.939*** (123.93)			
$MPIdep_{(t-1)}$				0.994*** (82.86)	1.011*** (89.67)	1.039*** (203.88)
Trade	0.049*** (10.91)			0.041 (0.93)		
Exports		0.059*** (12.52)			0.131** (3.04)	
Imports			0.023*** (3.933)			0.036* (1.927)
Unemr	0.005*** (3.66)	0.009*** (4.03)	0.0195*** (12.14)	0.148** (2.25)	0.126** (2.51)	0. 0.056** (2.252)
Healthexp				0.704*** (2.81)	0.544*** (2.59)	-0.159* (-1.710)
Eduy	0.101*** (8.24)	0.119*** (3.75)	-0.368*** (-16.01)	1.317* (1.75)	2.516** (2.54)	2.894*** (5.114)
Infrs	-0.027*** (-10.54)	-0.022*** (-6.48)	0.0128** (2.58)	-0.229* (-1.83)	-0.285** (-2.51)	-0.207*** (-3.066)
GDPpcgr	0.246*** (50.68)	0.249*** (28.44)	0.152*** (13.07)	0.906** (1.97)	-0.494* (-1.91)	0.425** (2.279)
Inf	-0.001*** (-3.37)	0.002*** (4.05)	-0.004*** (-6.95)	-0.045*** (-5.17)	-0.027*** (-4.43)	-0.033*** (-8.791)
Inv	-0.023*** (-12.42)	0.008* (1.81)	0.013** (2.08)	-0.42* (-1.652)	-0.753*** (-3.98)	0.171** (2.007)
R-squared	0.995	0.995	0.993	0.797	0.770	0.754
Observations	329	318	318	363	362	338
Sargan Test (p-value)[1]	0.10	0.14	0.36	0.43	0.48	0.41
Q-statistics for Autocorrelations (p-value)[2]	0.43	0.51	0.18	0.56	0.31	0.31
Red. FE Test (Chi-square)[3]	65.22	68.74	68.17	140.58	139.26	140.056

Note: Significance at the 10, 5, and 1 percent level is denoted by *, **, and ***, respectively.
Constant terms are always included but not reported.
t-statistics are reported in parentheses.
1Sargan test of over-identifying restrictions
2 System Residual Portmanteau for Autocorrelations test of second-order autocorrelation in residuals; first-order autocorrelation is not reported.
3 Redundant Fixed Effects likelihood Ratio of testing fixed effects.

The results confirmed the theoretical basis that trade openness is statistically significant and positively related to multidimensional poverty. This confirms that trade openness harms the poor in MENA countries during the period of the study. This has been assured by the effects of each of exports and imports severally on multidimensional poverty. Therefore, the study can be integrated into other studies that have shown the negative impact of trade openness on poverty. By contrast, the trade openness is insignificant in affecting the intensity of multidimensional poverty. This is despite the negative impact of trade openness on the intensity of poverty using exports and imports severally. This proves that being in extreme multidimensional poverty may disable this segment of the poor of benefiting from trade openness. Hence, governments are required to reach this segment and provide the benefits without waiting for its attempts to take advantage of the potential returns from opening up trade.

The rest of the variables included in the two models have the expected potential sign as follow:

1) The multidimensional poverty and intensity in the previous period is statistically significant and positively related to poverty and its intensity in all models. This confirms that high initial multidimensional poverty and its intensity are considered barriers for poverty reduction even under trade openness.
2) The unemployment rate is statistically significant and positively related to multidimensional poverty and its intensity in all models. Hence, being unemployed hinder any effort to get out of poverty or reduce its intensity.
3) The growth rate of GDP per capita is statistically significant and positively related to multidimensional poverty and its intensity in all models except the intensity of multidimensional poverty using imports referring to openness. This indicates that the gains of economic growth do not reach the poor and those living in extreme poverty. One reason may be that the role of governments in reallocating benefits from growth among community segments is inefficient. This suggests that governments, in their efforts to promote economic growth, favor capitalists at the expense of the poor.
4) The physical infrastructure is statistically significant and negatively related to multidimensional poverty and its intensity in all models except the multidimensional poverty using imports referring to openness. This confirms that investments in physical infrastructure directly help in combating poverty and its intensity.
5) The investment is statistically significant and negatively related to multidimensional poverty when using the trade openness variable although having positive relationships in some cases when using exports and imports severally referring to openness. This confirms that the investments in MENA countries are directed effectively to alleviate multidimensional poverty and its intensity.
6) Improvements in education are statistically significant and positively related to multidimensional poverty and its intensity in all models except the model of multidimensional poverty using imports referring to openness. This can be explained, especially in poor countries, by the fact that the increase in the expected years of schooling reduces the ability to exploit children at work. This makes the impact of increasing the years of education on poverty negative in the short term.
7) Inflation is statistically significant and negatively related to multidimensional poverty and its intensity in all models except the model of multidimensional poverty using exports referring to openness. This indicates that the employment effect of inflation (creating more jobs because of lower labor costs) can outweigh the real-wage effect (lower income) on poverty.
8) The net official development assistance is statistically insignificant in affecting multidimensional poverty and its intensity in all models. This can be explained by the fact that some types of foreign aid serve the interests of developed donor countries rather than improving the conditions of recipient developing countries. Furthermore, in turn they may harm developing countries.
9) Total health expenditure as a percentage of GDP is statistically insignificant in affecting multidimensional poverty. This is consistent with the study of (Farahani *et al.*, 2010) which reviewed the literature that studied the impact of public expenditure on health on its outcomes. The study found that usually there is a little effect of public health spending on health outcomes. Moreover, this effect may disappear in cross-country studies. This is due to two main reasons. First, the different levels of need and the ability to replace private spending with public expenditure from one country to another. Second, the heterogeneity in the provision of health care across countries, which makes pooling these disparate countries in a single analysis problematic. However, total health expenditure as a percentage of GDP is statistically significant and positively related to

multidimensional poverty intensity in all models except the model uses imports referring to openness. This confirms the previous conclusion that benefits given by the governments to the poor do not reach those in extreme poverty.

5. Conclusion and policy implications

In this paper the effects of trade openness on both multidimensional poverty and its intensity have been tested. Findings support the view that trade openness restricts alleviating multidimensional poverty in MENA countries. This has been proved through the statistically significant and positive effects of trade openness on multidimensional poverty. However, its effect on the intensity of multidimensional poverty for those living in extreme poverty has not been proven in spite of the negative impact of trade openness on the intensity of poverty using exports and imports severally. This can be explained by the fact that those living in extreme poverty do not have the ability to benefit from the benefits granted by governments, including the benefits of opening up trade. Hence, assistance policies are required to integrate this segment of the poor to benefit from anti-poverty programs and not to wait for their attempts to take advantage of these gains.

The high initial multidimensional poverty, the high initial poverty intensity, unemployment rate, GDP per capita growth rate, and education expenditure are considered barriers to reduce both of multidimensional poverty and its intensity. Moreover, health expenditure increases the intensity of multidimensional poverty. The inflation, investment, and infrastructure spending can support in reducing both of multidimensional poverty and its intensity.

To reduce multidimensional poverty and its intensity in MENA countries, it must be borne in mind that opening trade can have negative effects on the poor and may increase multidimensional poverty and its intensity. This requires further efforts by governments to introduce supportive policies to reduce both of multidimensional poverty and its intensity. These efforts can include policies to:

1) Improve the integration of the poor into the labor market. Here policy options can include supporting the investment in labor intensive sectors such as infrastructure investment. Moreover, promoting public social investment in creating sustainable employment opportunities and giving more attention to small and medium-size enterprise and crafts can be effective.
2) Shift from job to worker protection. A policy option can be moving from policies to support employment protection to policies that provide support to workers. Income and nonincome support can be effective, especially to those who are laid off or unemployed.
3) Support effectively the social security programs to mitigate the effects of short-term growth on the poor. Policies to boost the investment in offering basic rights especially childcare and care for other dependents such as unemployment insurance; give more attention to services, learning, in particular, can be effective.
4) Improve the integration of children into education and increase the opportunity cost of dropping them out from education. Effective programmes here can include scholarships, conditional cash support, school feeding, improved student health, access to credit for education, and adult education programmes for parents.
5) Reduce the cost of labor to enhance the demand for labor rather than trigger inflation. Here, a culture of quality can be promoted to reduce waste and restore, enhance Lean Production culture, avoid overscheduling of operations, promote standardization to benefit from economies of scale and automation, and promote the use of technology. In these ways, the benefits of reducing labor costs can be taken advantage of without the need for inflation in order to reduce multi-dimensional poverty.
6) Emphasize greater focus on development assistance programs that promote reducing multidimensional poverty and its intensity in member states. Donor governments need to focus on directing development assistance programs to institution-building that supports high quality health care and education access to the poor. Moreover, development assistance programs need to focus more on eliminating administrative corruption in governments, eliminating its effects on the poor, and providing infrastructure services such as clean water, sanitation, roads, clinics, and other services that help improve the living standards of the poor.
7) Integrate those in extreme poverty to benefit from foreign aid programs. Improving the effectiveness of these programs should focus on better aid instead of increasing aid. Better aid can be reached through combatting the causes of extreme poverty, rather than just its symptoms.

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APPENDIX 'A'

List of MENA countries included

Lower middle income		Upper middle income		High income	
1	Djibouti	1	Algeria	1	Bahrain
2	Egypt, Arab Rep.	2	Iran, Islamic Rep.	2	Israel
3	Mauritania	3	Iraq	3	Kuwait
4	Morocco	4	Jordan	4	Oman
5	Sudan	5	Lebanon	5	Qatar
6	Syrian Arab Republic	6	Libya	6	Saudi Arabia
7	Tunisia	7	Turkey	7	United Arab Emirates
8	West Bank and Gaza				
9	Yemen, Rep.				

The classification followed the United Nations - The World Economic Situation and Prospects (WESP).

APPENDIX 'B'

The estimation of MPI equation using exports plus imports of goods and services as a share of GDP (Model 1 in table 1)

System: SYSMPI
Estimation Method: Generalized Method of Moments
Date: 10/28/17 Time: 19:54
Sample: 2001 2015
Included observations: 274
Total system (unbalanced) observations 329
Estimation settings: tol=0.00010, derivs=analytic (linear)
Initial Values: C(1)=0.41551, C(2)=0.00398, C(3)=0.04903, C(4)=-1.46374, C(6)=-0.05773, C(7)=-0.00078, C(8)=-0.00820, C(9)=-0.00151, C(10)= -0.02284
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 101 weight matrices, 102 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.332480	0.040180	-8.274718	0.0000
C(2)	0.997170	0.003401	293.1861	0.0000
C(3)	0.048999	0.004512	10.86081	0.0000
C(4)	0.005212	0.001420	3.669705	0.0003
C(6)	0.101425	0.012306	8.241820	0.0000
C(7)	-0.027612	0.002623	-10.52598	0.0000
C(8)	0.246277	0.004866	50.61152	0.0000
C(9)	-0.001514	0.000448	-3.377966	0.0008
C(10)	-0.022842	0.001843	-12.39669	0.0000

Determinant residual covariance	0.293031
J-statistic	0.240780

Equation: LOG(MPI)=C(1)+C(2)*LOG(MPI(-1))+C(3)*LOG(TRADE)+C(4) *LOG(UNEMR)+C(6)*LOG(EDUY)+ C(7)*LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: D(MPIDEP) D(UNEMR) D(UNEMR,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,3) D(TRADE,5) D(INFRS,2) D(INFRS,3) D(INFRS,4) D(INFRS,5) D(GDPPCGR) D(GDPPCGR,2) D(MPI,7) D(MPI,8) D(MPI,9) D(MPI,10) D(MPI,11) D(MPI,12) D(MPI,13) D(MPI,14) D(MPI,15) D(MPI,16) D(MPI,18) LOG(MPI(-2)) D(INV,2) D(INV,3)D(HEAEXP,4) D(GDPPC) D(GDPPC,2) D(GDPPC,3) D(GDPPC,4) D(GDPPC,5) D(INV) D(EDUY) D(EDUY,2) D(EDUY,4) D(HEAEXP,5) D(EDUY,3) D(INFRS) D(MPI) D(MPI,3) D(TRADE,2) D(TRADE,3) C
Observations: 57

R-squared	0.995537	Mean dependent var	2.635973
Adjusted R-squared	0.994793	S.D. dependent var	0.791591
S.E. of regression	0.057121	Sum squared resid	0.156616
Durbin-Watson stat	1.459935		

Equation: D(MPI)=C(2)*D(MPI(-1))+C(3)*D(TRADE)+C(4)*D(UNEMR)+C(6)*D(EDUY)+C(7)*D(INFRS)+ C(8)*D(GDPPCGR)+C(9)*D(INF)+C(10)*D(INV)
Instruments: C EDUY INFRS LOG(MPI) D(HEAEXP,3) D(GDPPC) LOG(MPI(-1)) LOG(MPI(-2)) TRADE INV INFRS(-1) D(GDPPC,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,4) INF INF(-1) INF(-2) INF(-3) INF(-4) INF(-5) INF(-6) D(MPI) GDPPCGR
Observations: 272

R-squared	-1.879764	Mean dependent var	-0.565020
Adjusted R-squared	-1.956121	S.D. dependent var	6.096786
S.E. of regression	10.48243	Sum squared resid	29008.69
Durbin-Watson stat	3.558635		

The estimation of MPI equation using exports of goods and services as a share of GDP (Model 2 in table 1)

System: SYSMPIEXP
Estimation Method: Generalized Method of Moments
Date: 10/27/17 Time: 17:17
Sample: 2001 2015
Included observations: 266
Total system (unbalanced) observations 318
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 117 weight matrices, 118 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.545575	0.110311	-4.945784	0.0000
C(2)	1.006183	0.006789	148.2123	0.0000
C(3)	0.059859	0.004780	12.52176	0.0000
C(4)	0.009097	0.002257	4.031385	0.0001
C(6)	0.119981	0.031999	3.749568	0.0002
C(7)	-0.022798	0.003517	-6.483034	0.0000
C(8)	0.249585	0.008773	28.44882	0.0000
C(9)	0.002245	0.000555	4.047439	0.0001
C(10)	0.008498	0.004692	1.811052	0.0711

Determinant residual covariance	0.273214
J-statistic	0.241991

Equation: LOG(MPI)=C(1)+C(2)*LOG(MPI(-1))+C(3)*LOG(EXPORTS)+C(4)*LOG(UNEMR)+C(6)* LOG(EDUY)+C(7)*LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: D(MPIDEP) D(UNEMR) D(UNEMR,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,3) D(TRADE,5) D(INFRS,2) D(INFRS,3) D(INFRS,4) D(INFRS,5) D(GDPPCGR) D(GDPPCGR,2) D(MPI,7) D(MPI,8) D(MPI,9) D(MPI,10) D(MPI,11) D(MPI,12) D(MPI,13) D(MPI,14) D(MPI,15) D(MPI,16) D(MPI,18) LOG(MPI(-2)) D(HEAEXP,4) D(GDPPC) D(GDPPC,2) D(GDPPC,3) D(GDPPC,4) D(GDPPC,5) D(INV) D(EDUY) D(EDUY,2) D(EDUY,4) D(HEAEXP,5) D(EDUY,3) D(INFRS) D(MPI) D(MPI,3) D(TRADE,2) D(TRADE,4) D(EXPORTS, 3) D(INV,3) C
Observations: 54

R-squared	0.995798	Mean dependent var	2.577930
Adjusted R-squared	0.995050	S.D. dependent var	0.772563
S.E. of regression	0.054352	Sum squared resid	0.132935
Durbin-Watson stat	1.610693		

Equation: D(MPI)=C(2)*D(MPI(-1))+C(3)*D(EXPORTS)+C(4)*D(UNEMR) +C(6)*D(EDUY)+C(7)*D(INFRS)+ C(8)*D(GDPPCGR)+C(9)*D(INF) +C(10)*D(INV)
Instruments: C EDUY INFRS LOG(MPI) D(HEAEXP,3) D(GDPPC) LOG(MPI(-1)) LOG(MPI(-2)) TRADE EXPORTS INV INFRS(-1) D(GDPPC,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,4) INF INF(-1) INF(-2) INF(-3) INF(-4) INF(-5) INF(-6) D(MPI)
Observations: 264

R-squared	-1.913765	Mean dependent var	-0.528049
Adjusted R-squared	-1.993438	S.D. dependent var	6.183413
S.E. of regression	10.69827	Sum squared resid	29299.94
Durbin-Watson stat	3.566827		

The estimation of MPI equation using imports of goods and services as a share of GDP (Model 3 in table 1)

System: SYSMPIIMP
Estimation Method: Generalized Method of Moments
Date: 10/27/17 Time: 17:35
Sample: 2001 2015
Included observations: 266
Total system (unbalanced) observations 318
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence not achieved after: 499 weight matrices, 500 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.908403	0.064269	14.13442	0.0000
C(2)	0.938773	0.007575	123.9298	0.0000
C(3)	0.023202	0.005899	3.933456	0.0001
C(4)	0.019543	0.001610	12.14096	0.0000
C(6)	-0.368310	0.023009	-16.00719	0.0000
C(7)	0.012814	0.004962	2.582528	0.0103
C(8)	0.151683	0.011606	13.06985	0.0000
C(9)	-0.004179	0.000601	-6.954175	0.0000
C(10)	0.013200	0.006317	2.089641	0.0375
Determinant residual covariance		0.420828		
J-statistic		0.217867		

Equation: LOG(MPI)=C(1)+C(2)*LOG(MPI(-1))+C(3)*LOG(IMPORTS)+C(4) *LOG(UNEMR)+C(6)* LOG(EDUY)+C(7)*LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: D(MPIDEP) D(UNEMR) D(UNEMR,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,3) D(TRADE,5) D(INFRS,2) D(INFRS,3) D(INFRS,4) D(INFRS,5) D(GDPPCGR) D(GDPPCGR,2) D(MPI,7) D(MPI,8) D(MPI,9) D(MPI,10) D(MPI,11) D(MPI,12) D(MPI,13) D(MPI,14) D(MPI,15) D(MPI,16) D(MPI,18) LOG(MPI(-2)) D(HEAEXP,4) D(GDPPC) D(GDPPC,2) D(GDPPC,3) D(GDPPC,4) D(GDPPC,5) D(INV) D(EDUY) D(EDUY,2) D(EDUY,4) D(HEAEXP,5) D(EDUY,3) D(INFRS) D(MPI) D(MPI,3) D(TRADE,2) D(INV,4) D(IMPORTS) C
Observations: 54

R-squared	0.993013	Mean dependent var	2.577930
Adjusted R-squared	0.991771	S.D. dependent var	0.772563
S.E. of regression	0.070084	Sum squared resid	0.221030
Durbin-Watson stat	1.081097		

Equation: D(MPI)=C(2)*D(MPI(-1))+C(3)*D(IMPORTS)+C(4)*D(UNEMR) +C(6)*D(EDUY)+C(7)* D(INFRS)+ C(8)*D(GDPPCGR)+C(9)*D(INF)+C(10)*D(INV)
Instruments: C EDUY INFRS LOG(MPI) D(HEAEXP,3) D(GDPPC) LOG(MPI(-1)) LOG(MPI(-2)) TRADE IMPORTS INV INFRS(-1) D(GDPPC,2) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,4) INF INF(-1) INF(-2) INF(-3) INF(-4) INF(-5) INF(-6) D(MPI)
Observations: 264

R-squared	-1.699235	Mean dependent var	-0.528049
Adjusted R-squared	-1.773042	S.D. dependent var	6.183413
S.E. of regression	10.29690	Sum squared resid	27142.69
Durbin-Watson stat	3.569614		

The estimation of MPIDep equation exports plus imports of goods and services as a share of GDP (Model 4 in table 1)

System: SYSMPIDEP
Estimation Method: Generalized Method of Moments
Date: 10/29/17 Time: 20:08
Sample: 1997 2015
Included observations: 287
Total system (unbalanced) observations 363
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 46 weight matrices, 47 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2.848119	2.098899	-1.356959	0.1757
C(2)	0.994164	0.011997	82.86567	0.0000
C(3)	0.040888	0.044034	0.928559	0.3538
C(4)	0.148204	0.065760	2.253704	0.0248
C(5)	0.703932	0.250644	2.808491	0.0053
C(6)	1.315989	0.751275	1.751674	0.0807
C(7)	-0.229339	0.125580	-1.826247	0.0687
C(8)	0.906296	0.460213	1.969297	0.0497
C(9)	-0.044732	0.008645	-5.174507	0.0000
C(10)	-0.420214	0.254388	-1.651860	0.0995
Determinant residual covariance		7305.684		
J-statistic		0.160285		

Equation: MPIDEP=C(1)+C(2)*MPIDEP(-1)+C(3)*LOG(TRADE)+C(4)*LOG(UNEMR)+C(5)*LOG(HEAEXP)
+C(6)*LOG(EDUY)+C(7)*LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: D(MPIDEP) D(HEAEXP) D(HEAEXP,2) D(HEAEXP,3) D(TRADE,5) D(INFRS,2) D(INFRS,3) D(INFRS,4) D(INFRS,5) D(GDPPCGR) D(MPIDEP,7) D(MPIDEP,8) D(MPIDEP,9) D(MPIDEP,10) D(MPIDEP,11) D(MPIDEP,12) D(MPIDEP,13) D(MPIDEP,14) D(MPIDEP,15) D(MPIDEP,16) D(INV,3) D(HEAEXP,4) D(GDPPCGR,3) D(GDPPCGR,4) D(GDPPCGR,5) D(MPI) D(MPI,2) D(MPI,3) D(MPI,4) D(MPI,5) D(MPI,7) D(INF) D(INF,2) D(INF,3) D(INF,4) D(INF,5) D(UNEMR,7) D(UNEMR,3) D(UNEMR,4) D(UNEMR,6) D(INFRS) D(EDUY) D(EDUY,2) D(INV,2) C
Observations: 93

R-squared	0.797485	Mean dependent var	2.115055
Adjusted R-squared	0.775525	S.D. dependent var	17.23801
S.E. of regression	8.167156	Sum squared resid	5536.302
Durbin-Watson stat	1.721483		

Equation: D(MPIDEP)=C(2)*D(MPIDEP(-1))+C(3)*D(TRADE)+C(4)*D(UNEMR)+C(5)*D(HEAEXP)+
C(7)*D(INFRS)+C(8)*D(GDPPCGR)+C(9)*D(INF)+C(10)*D(LOG(INV))
Instruments: INF FDI HEAEXP MPIDEP EDUY NODA GDPPCGR INFRS INV TRADE INF(-1) INF(-2) C UNEMR UNEMR(-1) UNEMR(-2) NODA(-1) GDPPCGR(-1) INV(-1)
Observations: 270

R-squared	-1.523508	Mean dependent var	-0.061882
Adjusted R-squared	-1.590930	S.D. dependent var	7.692677
S.E. of regression	12.38242	Sum squared resid	40170.95
Durbin-Watson stat	2.395674		

The estimation of MPIDep equation exports of goods and services as a share of GDP (Model 5 in table 1)

System: SYSMPIDEPEXP
Estimation Method: Generalized Method of Moments
Date: 10/30/17 Time: 22:17
Sample: 1999 2015
Included observations: 280
Total system (unbalanced) observations 362
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 75 weight matrices, 76 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-4.810647	2.401646	-2.003063	0.0459
C(2)	1.010884	0.011273	89.67462	0.0000
C(3)	0.131181	0.043216	3.035448	0.0026
C(4)	0.125899	0.050089	2.513515	0.0124
C(5)	0.543706	0.209777	2.591829	0.0099
C(6)	2.516312	0.990938	2.539324	0.0115
C(7)	-0.285051	0.113694	-2.507178	0.0126
C(8)	-0.494352	0.258403	-1.913103	0.0565
C(9)	-0.027305	0.006165	-4.429167	0.0000
C(10)	-0.752901	0.189337	-3.976519	0.0001

Determinant residual covariance	7282.952
J-statistic	0.179988

Equation: MPIDEP=C(1)+C(2)*MPIDEP(-1)+C(3)*LOG(EXPORTS)+C(4)*LOG(UNEMR)+C(5)*LOG(HEAEXP) +C(6)*LOG(EDUY)+C(7) *LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: D(MPIDEP) D(HEAEXP,2) D(HEAEXP,3) D(GDPPCGR) D(MPIDEP,7) D(MPIDEP,8) D(MPIDEP,9) D(MPIDEP,10) D(GDPPCGR,3) D(GDPPCGR,4) D(GDPPCGR,5) D(INF) D(INF,2) D(INF,3) D(INF,4) D(UNEMR,3) D(UNEMR,4) D(INFRS) D(EDUY) D(EDUY,2) D(INV,2) D(UNEMR,6) D(UNEMR,7) D(UNEMR,8) C D(HEAEXP) D(INFRS,2) D(INFRS,3) D(HEAEXP,4) D(HEAEXP,5) D(HEAEXP,6) D(HEAEXP,7) D(HEAEXP,8) D(TRADE,5) D(MPI) D(MPI,2) D(MPI,3) D(MPI,4) D(MPI,5) D(MPI,7) D(INV,3) D(INV,4) D(MPIDEP,11) D(MPIDEP,12) D(MPIDEP,13) D(MPIDEP,14)D(INFRS,4) D(INFRS,5) D(MPIDEP,16)
Observations: 89

R-squared	0.769320	Mean dependent var	0.875774
Adjusted R-squared	0.743040	S.D. dependent var	16.73981
S.E. of regression	8.485609	Sum squared resid	5688.440
Durbin-Watson stat	1.720641		

Equation: D(MPIDEP)=C(2)*D(MPIDEP(-1))+C(3)*D(EXPORTS)+C(4)*D(UNEMR)+C(5)*D(HEAEXP)+ C(7)*D(INFRS)+C(8)*D(GDPPCGR)+C(9)*D(INF)+C(10)*D(LOG(INV))
Instruments: INF FDI HEAEXP MPIDEP C EXPORTS UNEMR(-1) NODA GDPPCGR UNEMR UNEMR(-2) IMPORTS IMPORTS(-1) IMPORTS(-2) MPI INFRS GDPPCGR(-1) INV(-1) INFRS(-4) INFRS(-3) INFRS(-2)
Observations: 273

R-squared	-1.778985	Mean dependent var	-0.256281
Adjusted R-squared	-1.852392	S.D. dependent var	7.086985
S.E. of regression	11.96923	Sum squared resid	37964.54
Durbin-Watson stat	1.829884		

The estimation of MPIDep equation exports of goods and services as a share of GDP (Model 6 in table 1)

System: SYSMPIDEPIMP
Estimation Method: Generalized Method of Moments
Date: 11/03/17 Time: 18:07
Sample: 1998 2015
Included observations: 268
Total system (unbalanced) observations 338
White Covariance
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 489 weight matrices, 490 total coef iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-7.185695	1.406015	-5.110683	0.0000
C(2)	1.038822	0.005095	203.8770	0.0000
C(3)	0.036063	0.018719	1.926563	0.0549
C(4)	0.056080	0.024901	2.252084	0.0250
C(5)	-0.159638	0.093334	-1.710392	0.0881
C(6)	2.893827	0.565860	5.114035	0.0000
C(7)	-0.206570	0.067364	-3.066470	0.0023
C(8)	0.425200	0.186609	2.278557	0.0233
C(9)	-0.032797	0.003731	-8.791406	0.0000
C(10)	0.171485	0.085449	2.006858	0.0456

Determinant residual covariance	9183.097
J-statistic	0.259875

Equation: MPIDEP=C(1)+C(2)*MPIDEP(-1)+C(3)*LOG(IMPORTS)+C(4)*LOG(UNEMR)+C(5)*LOG(HEAEXP) +C(6)*LOG(EDUY)+C(7)*LOG(INFRS)+C(8)*GDPPCGR+C(9)*INF+C(10)*LOG(INV)
Instruments: C D(MPIDEP) D(MPIDEP,7) D(MPIDEP,8) D(MPIDEP,9) D(MPIDEP,10) D(MPIDEP,11) D(IMPORTS) D(IMPORTS,2) D(IMPORTS,3) D(IMPORTS,4) D(IMPORTS,5) D(IMPORTS,6) D(INF) D(INF,3) D(INF,4) D(UNEMR,4) D(UNEMR,6) D(UNEMR,7) D(HEAEXP) D(HEAEXP,4) D(HEAEXP,5) D(HEAEXP,6) D(HEAEXP,7) D(HEAEXP,8) TRADE D(TRADE,2) D(TRADE,3) D(TRADE,4) D(TRADE,5) D(MPI) D(MPI,2) D(MPI,3) D(MPI,5) D(MPI,6) D(MPI,7) D(MPI,8) D(EDUY) D(EDUY,2) D(EDUY,3) D(INV,3) D(INV,4) D(INV,5) D(INFRS,4) D(INFRS,5) D(INFRS,2) D(HEAEXP,2) D(HEAEXP,3) D(GDPPCGR,2) D(GDPPCGR,3) D(GDPPCGR,4) D(GDPPCGR,5) D(GDPPCGR) D(GDPPCGR,6) D(GDPPCGR,7) D(GDPPCGR,8) D(GDPPC)
Observations: 87

R-squared	0.754086	Mean dependent var	0.630725
Adjusted R-squared	0.725343	S.D. dependent var	16.85333
S.E. of regression	8.832452	Sum squared resid	6006.940
Durbin-Watson stat	1.707632		

Equation: D(MPIDEP)=C(2)*D(MPIDEP(-1))+C(3)*D(IMPORTS)+C(4*D(UNEMR)+C(5)*D(HEAEXP)+ C(7)*D(INFRS)+C(8)*D(GDPPCGR)+C(9)*D(INF)+C(10)*D(LOG(INV))
Instruments: C UNEMR UNEMR(-1) UNEMR(-2) IMPORTS(-1) IMPORTS(-2) IMPORTS(-3) INV(-1) INV(-2) NODA NODA(-1) D(EXPORTS) FDI GDPPC GDPPCGR HEAEXP(-2) EDUY IMPORTS INF INFRS MPI MPI(-1) MPIDEP MPIDEP(-2) MPIDEP(-3)
Observations: 251

R-squared	-1.568032	Mean dependent var	-0.064174
Adjusted R-squared	-1.642008	S.D. dependent var	7.967202
S.E. of regression	12.95009	Sum squared resid	40752.29
Durbin-Watson stat	2.356939		