The Role of Export Diversification of Agriculture Sector on Economic Growth (Case Study: Developed Countries)

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(Received Feb. 2015 & Published online April. 2015 issue)

Abstract

This paper investigates the role of export diversification of agriculture sector on economic growth in developed countries include France, Italy, Germany, Spain, Denmark, Hungary, Canada, USA, Japan and Australia using the Hummels and Klenow (2005) and Kehoe and Ruhl (2013) models and panel data for the period between 1991 and 2011.

The empirical findings showed that for developing countries, export diversity index of agricultural sector has a positive and significant effect on economic growth of studied countries, so that a one percent increase in export diversity of agricultural sector of developed countries leads to 0.91 percent increase in economic growth of studied countries. Also the results showed that human capital variable has a positive and significant effect on economic growth of developed countries in discussed period, so that one percent increase in human capital caused 1.10 percent increase in economic growth in selected developed countries. According to the results, it is observed that there is a positive relationship between economy openness degree and economic growth. Trade contribution coefficient of GDP is positive and significant as a criterion of commercial openness degree on economic growth pattern for studied countries. Experimental results showed that there is a positive and significant relationship between financial development and economic growth of developed countries in studied period, so that one percent increase in financial credit provided by banking sector as a percentage of GDP as a criterion for financial development index causes 0.09 percent increase in economic growth of developed countries in studied period. Also the study results showed that labour force variable has a positive and significant effect on economic growth of studied countries, so that one percent increase in labour force supply causes 0.24 percent increase in economic growth of developed countries. According to experimental results, physical capital supply variable has a positive and significant effect on economic growth of developed countries, so that one percent increase in physical capital supply causes 1.75 percent in economic growth of developed countries in studied period. Meanwhile the coefficient related to physical capital supply for developed countries is higher than two variables of human capital and labour force that implies capital-intensive production in developed countries.

Keywords*:* Export diversification, Agriculture sector, Economic growth, Developing countries.

1. INTRODUCTION

In recent decades the international flow of trade has grown to unprecedented levels. Since 1950, world trade has increased over 20-fold (by value), far exceeding the growth rate for population or GDP. For example, since 2005, world merchandise trade has grown by 3.7% annually, while GDP has risen by 2.3%.4 Parallel to the rise in exports, there is a growing recognition of importance of entry to new export markets, such as new destination countries and products. The world economy has witnessed the expansion of trade, especially in the number of exchanged varieties, the so-called *extensive margins*. For example, Hamano (2012) shows that from 1980 to 2000,

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

the average number of items exported into and imported from the U.S. increased by 38.1% and 13.4%, respectively.

One particular aspect of the rise in international trade is that the economic emergence of developing countries, such as China and India, has dramatically increased global trade flows overall; and exports are perceived to be crucial in having a sustainable and high growth in most of the developing countries. Consequently, the volume of world trade and share of developing countries in the world exports increased dramatically in the last decades.

In this paper, we analyze the importance of extensive margin, in other words, new export products and destinations, on Iran export performance between 1991 and 2011, in comparison with some other developing countries.

To put simply, export growth may happen due to the two margins: (i) extensive and (ii) intensive margins. In general, extensive margin refers to export growth due to new firms entering into the export market, new goods exported or new countries destined as export markets or a combination of these. On the other hand, export growth can come from increasing exports of existing firms, goods and markets, which is referred as the intensive margin. In recent years, there is a considerable literature on measuring the contributions of these margins and relating them to some economic variables.

Different trade theories have similar predictions that as countries become bigger and richer they export more. However, there is not a consensus on the sources of higher exports.

For example, the Armington model assumes that all countries produce and export a single variety (Armington, 1969). Hence, exports can grow only by exporting more of the single export good, i.e. the intensive margin. On the other hand, the Krugman model assumes endogenous number of export varieties which is proportional to per capita GDP of the countries (Krugman, 1981). In addition, all countries export the same quantity per variety. As a result, all export growth comes from the extensive margin. The Melitz model with heterogeneous firms and fixed cost of exporting finds that only productive firms will export (Melitz, 2003). As firms become more productive, more firms will enter the export market.

Hence, Melitz model has a room for extensive margin in export growth. Building on Melitz's

(2003) model with heterogeneous firms, Helpman et al. (2008) and Chaney (2008), among others, developed trade models that explicitly consider the decision to export and therefore explicitly model the extensive margin of trade.

Sources of export growth might also be interesting for policymakers as governments in developing countries usually concern about the vulnerability arising from export concentration (Cadot et al., 2012). Concentration of exports in a small group of products might increase volatility in terms of trade, which indeed may cause volatility in income (Jansen, 2004). Hence, policymakers might prefer export growth coming from the extensive margin in order to avoid possible risks on growth path from export prices or change in the composition of world import demand.

Given the importance of the issue, there is an expanding literature, which focuses on the correlation of extensive and intensive margins with economic variables. Felbermayr and Kohler (2006) find that GATT- or WTO-membership increases world trade via extensive margin. Helpman et al. (2008) propose a methodology to decompose the effects of trade barriers on extensive and intensive margin. Markusen (2013) extends the gains from trade literature by including the gains via extensive margin explicitly. Cadot et al. (2011) decompose Theil index of export concentration into extensive and intensive margins and analyze the relationship between export concentration and per capita income. They find that export concentration increases with per capita income up to a threshold where specialization starts to increase. Cadot et al. (2011) also argue that it is the extensive margin that causes inverse U shaped distribution of Theil index with respect to per capita income.

The analysis of extensive and intensive margins has been conducted in alternative dimensions in different studies. For example, Felbermayr and Kohler (2006) and Helpman et al. (2008) define extensive margin on country basis. On the other hand, Hummels and Klenow (2005) and Kehoe and Ruhl (2013) define the extensive margin on

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

product basis. Hence, exports classified as extensive margin in one approach can be considered to be intensive margin in another other one. Evenett and Venables (2002) and Besedes and Prusa (2011) use the broadest definition of extensive margin by using product-country export lines as unit of analysis. In this definition, exports of traditional products to new markets or new products to traditional export markets are considered to be extensive margin.

There are several ways to measure extensive and intensive margins. One method is directly decomposing export growth due to existing, new and disappearing goods, where the contribution of existing goods are defined as intensive margin and the contribution of others are defined as extensive margin. Using this method, Amiti and Freund (2010) decompose Chinese export growth and Berthelon (2011) decompose Chilean export growth into intensive and extensive margins. Brenton and Newfarmer (2007) use a similar methodology for a list of developing countries but they extend the analysis to product-country space. Studies based on firm level data also use similar decomposition, such as Eaton et al. (2007) for Colombian firms.

Another methodology to measure extensive and intensive margins is based on the literature on the variety of goods in trade, starting with Feenstra (1994). Feenstra and Kee (2004) define a country's export variety to US, as the share of total US imports that are exported by the country. Hummels and Klenow (2005) adjust Feenstra and Kee's export variety definition in order to get extensive and intensive margin definitions. They define extensive margin as the ratio of total worldwide exports of a country's export basket to the total worldwide exports and intensive margin as the share of a country's exports to the worldwide exports in the country's export basket. Using this definition, they analyze a cross section of countries in 1995 and conclude that differences in exports between larger and smaller economies mainly come from the extensive margin. In this framework, export growth comes from the extensive margin if the share of country's basket of export goods in world's exports is increasing.

Kehoe and Ruhl (2013) criticize the definition of new good as the goods that were not exported at all in the beginning of the analysis period. Instead, they argue that goods that were exported with very small amounts should not be considered as export goods. Hence, they introduce the evolution of the exports of initially least traded goods as an indicator of extensive margin. They argue that such an indicator might capture the effect of structural changes or trade agreements on the evolution of the extensive margin. They analyze several countries and argue that extensive margin is the leading factor in export growth of developing countries while there is no such observation for developed countries. Furthermore, they find that structural reforms and trade agreements have significant effects on the extensive margins whereas business cycles do not have such an effect.

Besedes and Prusa (2011) criticize the decomposition methodologies that use a static framework and compare two points in time. Static approaches, as in Amiti and Freund or in Kehoe and Ruhl, define the goods that are exported at the end of the sample period but not exported at the beginning, as new goods. This way of defining ignores the dynamics between these two points. Indeed, some of the new goods would be considered as traditional export goods or some traditional export goods would be considered as new goods if sample period changes slightly. They propose an alternative way of decomposing export growth which takes the survival rate of export relationship into account. We, basically, follow the method suggested by Hummels and Klenow (2005). In doing so, we extend the method in several ways.

This paper we investigate the role of export diversification of agriculture sector on economic growth in developed countries using the Hummels and Klenow (2005) and Kehoe and Ruhl (2013) models and panel data for the period between 1991 and 2011.

2. Materials and Methods

This paper investigates the role of export diversification of agriculture sector on economic growth in developing using the Hummels and Klenow (2005) and Kehoe and Ruhl (2013) models.

Our functional form, applying logarithms, is:

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

$$LnY_{ij} = \beta_1 + \beta_2 Ln(div_{ij}) + \beta_3 Ln(humanY_{ij}) + \beta_4 Ln(open_{ij}) + \beta_5 Ln(L_{ij}) + \beta_6 Ln(K_{ij}) + \varepsilon_t \quad (1)$$

Where the LnY_{it} represents the growth of the gross domestic production, $Lndiv_{it}$ the export diversification, $Lnhuman$ the human capital index, LnL the labour force, LnK the physical capital and $Lnopen$ the economy openness degree.

In the Hummels-Klenow framework, the share of a country's exports in world's total export is the product of extensive margins. The extensive margin is the share of country's basket of export goods in world's export basket. Formally, extensive (*EM*) of a country can be formulated as;

$$EM = \frac{\sum i \in I^c x_i^w}{\sum i \in I^w x_i^w} \quad (2)$$

Where the value of country *c*'s and world's exports are denoted by x_i^w and x_i^c, respectively. I^c is the set of goods exported by country *c* while the set I^w contains all goods that are exported in the world. Therefore, I^c is a subset of I^w.

All variables used in this study were macro and have been collected from national and international statistical centers. Enrollment rate index in secondary school as a criterion for human capital variable, trade contribution (exports plus imports) of GDP as a criterion of economy openness degree, financial credit provided by banking sector as a percentage of GDP as financial development index, total labour force to measure labour force variable and physical capital supply calculated by permanent inventory method (PIM) as capital variable are used in stipulated models. Data related to export diversity index were collected from UNCTAD and UNCOMTRADE sites and other variables data of World Development Indices (WDI).

The present study also examines the time variations within the observation units. The use of panel data increases the efficiency of the estimators and significantly reduces the potential problems caused by the omission of variables (Hiaso, 1986). From this perspective, three types of data panel estimation are proposed: the first is the estimation of ordinary least squares (OLS) with the grouped panel; the second and third take into account the time variation, by the inclusion in the model of random effects and fixed effects, respectively.

In order to determine which of the three estimators is most efficient, the LM Breusch-Pagan test for random effects was employed; this permitted us to choose between OLS estimation of the grouped panel and estimation with random effects. Following the application of the Breusch-Pagan tes, it was concluded that random effects are significant, and it is therefore preferable to use the estimation which includes them rather than the grouped panel estimation.

3. Results and Discussion

We constructed export flows by volume for agricultural and food products, following the system of the Standard International Trade Classification (SITC, Revision 3 for the period 1991-2011, in year t (div_{ij}). For trade in agricultural products and food (agricultural products included in the SITC group's 00-09). These data were taken from the figures for bilateral exports (FOB - free on board) supplied by the United Nations Statistics Division in the UN-COMTRADE (2003) database. The sample includes trade among 10 developing countries include Iran, India, Malaysia, Pakistan, Thailand, Turkey, Brazil, Kenya, Venezuela and Mexico.

This paper First, stationary of the variables series are tested by "Im, Pesaran, Shin W-stat", "ADF- Fisher Chi-square", "PP- Fisher Chi-square" and "Hadri Z-stat" Test.

The result of unit root test showed in table one.

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

Table 1. Unit root tests results

variables	test series	**Levels**	**First-differences**
LnY	Im, Pesaran, Shin W-stat	3.88(0.99)	-4.96*** (0.00)
	ADF- Fisher Chi-square	4.71(0.99)	60.07*** (0.00)
	PP- Fisher Chi-square	2.60 (0.98)	32.36*** (0.00)
	Hadri Z-stat	8.99 (0.00)	0.06*** (0.47)
$Lndiv_{it}$	Im, Pesaran, Shin W-stat	2.49 (0.99)	-5.58*** (0.00)
	ADF- Fisher Chi-square	6.38 (0.98)	64.00*** (0.00)
	PP- Fisher Chi-square	3.13 (0.97)	32.08*** (0.00)
	Hadri Z-stat	8.37*** (0.00)	0.16 (0.43)
Lnhuman	Im, Pesaran, Shin W-stat	4.05 (0.99)	-6.76*** (0.00)
	ADF- Fisher Chi-square	4.46 (0.99)	44.26*** (0.00)
	PP- Fisher Chi-square	3.77 (0.99)	54.61*** (0.00)
	Hadri Z-stat	8.79*** (0.00)	1.95 (0.25)
LnL	Im, Pesaran, Shin W-stat	6.67 (0.99)	-4.58*** (0.00)
	ADF- Fisher Chi-square	4.50 (0.98)	70.93*** (0.00)
	PP- Fisher Chi-square	2.20 (0.99)	79.09*** (0.00)
	Hadri Z-stat	3.38*** (0.00)	0.72(0.47)
LnK	Im, Pesaran, Shin W-stat	4.33 (0.99)	-12.91*** (0.00)
	ADF- Fisher Chi-square	2.20 (0.99)	53.60*** (0.00)
	PP- Fisher Chi-square	2.13 (0.99)	74.19*** (0.00)
	Hadri Z-stat	14.42*** (0.00)	-16.32 (0.94)
Lnopen	Im, Pesaran, Shin W-stat	13.83 (0.99)	-14.26*** (0.00)
	ADF- Fisher Chi-square	10.00(0.98)	148.25*** (0.00)
	PP- Fisher Chi-square	37.24 (0.99)	129.20*** (0.00)
	Hadri Z-stat	15.70*** (0.00)	0.49 (0.99)
Lnfd	Im, Pesaran, Shin W-stat	16.62 (0.99)	-14.69*** (0.00)

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

	ADF- Fisher Chi-square	6.60(0.99)	165.89*** (0.00)
	PP- Fisher Chi-square	4.50(0.99)	69.23*** (0.00)
	Hadri Z-stat	17.17*** (0.00)	-1.76 (0.96)

Note: *** indicate significance at the 1% level

Findings of these tests rejected the stationary hypothesis and the unit root hypothesis is confirmed completely.The tests confirmed the existence of a unit root in the variables series under consideration and the entire variables series are integrated in order one I (1).

To continue with the description of the model's variables the LnY_{it} represents the growth of the gross domestic production, $Lndiv_{it}$ the export diversification, $Lnhuman$ the human capital index, LnL the labour force, LnK the physical capital and $Lnopen$ the economy openness degree.

With regard to the estimation technique, our aim is to overcome the limitations of previous research which has only taken into account the variations among the units of observation (cross-section analysis).

The present study also examines the time variations within the observation units. The use of panel data increases the efficiency of the estimators and significantly reduces the potential problems caused by the omission of variables (Hiaso, 1986). From this perspective, three types of data panel estimation are proposed: the first is the estimation of ordinary least squares (OLS) with the grouped panel; the second and third take into account the time variation, by the inclusion in the model of random effects and fixed effects, respectively.

In order to determine which of the three estimators is most efficient, the LM Breusch-Pagan test for random effects was employed; this permitted us to choose between OLS estimation of the grouped panel and estimation with random effects. Following the application of the Breusch-Pagan tes, it was concluded that random effects are significant, and it is therefore preferable to use the estimation which includes them rather than the grouped panel estimation. Its results are given in table 1. At first sight, the economic growth equation presents satisfactory results.

Table1. Economic growth estimate Results for developing countries

Variables	Fixed effects	Standard error
$Lndiv_{it}$	0.91***	0.01
Lnhuman	1.10***	0.37
LnL	0.29***	0.02
LnK	1.75***	0.14
Lnopen	0.93***	0.17
Lnfd	-.06***	0.01

All variables are in logarithms and *** denote statistical significance at the 1%

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

Experimental results showed that for developing countries, export diversity index of agricultural sector has a positive and significant effect on economic growth of studied countries, so that a one percent increase in export diversity of agricultural sector of developing countries leads to 0.65 percent increase in economic growth of studied countries.

So if a country purpose is economic growth, according to empirical results of this study it can be said that pursuing policies of diversification of agricultural sector export can reach countries purposes. Therefore it is recommended that discussed countries such as Iran should consider policy of diversification of agricultural sector export, along with other factors affecting economic growth in order to make sustainable economic growth and development.

Also the results showed that human capital variable has a positive and significant effect on economic growth of developing countries in discussed period, so that one percent increase in human capital caused 0.09 percent increase in economic growth in selected developing countries. The obtained result was consistent with experimental theories and results and can explain the movement of these countries towards knowledge-based economies. In fact enrollment rate in secondary school and thus education are considered a kind of investment in human force and investment in human resources by raising skills and specialties of labour force and increase their abilities can raise physical assets efficiency and improve production quality and quantity. Thus, human capital can be examined as an important policy tool in studied countries and more investments should be done to develop human capital. In fact, for more labour force efficiency, it is necessary to take measures for public training and education and improving quality of training level and matching it to labour market needs. However, the coefficient related to human capital in economic growth model is lower than other two factors coefficient, i.e. physical capital and labour force that it can result from proper and specialized non-use of educated human force. Thus one of important and essential factors of inefficiency, non-use of production capacity and also lack of evolution of technology should be sought in important human capital factor.

According to the results, it is observed that there is a positive relationship between economy openness degree and economic growth. Trade contribution coefficient of GDP is positive and significant as a criterion of commercial openness degree on economic growth pattern for studied countries. Accordingly, it is recommended to consider the importance of education of human force to increase the effect of human capital on economic growth, develop the culture of in-service training to make skilled human capital and consider the experience and skill of the human force and composition change of the labour force toward skilled labour force.

Experimental results showed that there is a negative and significant relationship between financial development and economic growth of developing countries in studied period, so that one percent increase in financial credit provided by banking sector as a percentage of GDP as a criterion for financial development index causes 0.06 percent decrease in economic growth in studied countries in studied period. It seems that the reason of the negative effect of financial development on economic growth can be found in nature and way of financial liberalization, financial system management weakness and non-formation of integrated financial market and benefited from the provisions that in studied years led to reduced efficiency of investment through non-optimal allocation of resources in studied countries. In other words, like Latin American experience when financial development and financial liberalization is formed without required rule and consistency despite it can provide needed requirements for increased investment volume, but due to lack of financial deepening it reduces the efficiency of investment and in this way provides economic growth decrease ground. In other words, the main channel of positive effects transfer from financial development on economic growth is through increasing investment efficiency instead of investment volume. So if it is not considered in setting policies related to financial liberalization, despite the increased volume of investment, a decrease in economic growth can be observed. So what should be regarded by economic policy makers is financial deepening that provides needed ground to allocate resources more efficiently, thereby increasing the efficiency of investment. On the other hand it is

(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)

recommended that banking sectors of studied countries attempt to lead the credit mostly to private sector productive investment projects by optimizing their activities.

Also the study results showed that labour force variable has a positive and significant effect on economic growth of studied countries, so that one percent increase in labour force supply causes 1.49 percent increase in economic growth of developing countries. Meanwhile, the coefficient related to labor force in developing countries is higher than the coefficient of two other factors, namely human capital and physical capital that implies user production in developing countries.

According to experimental results, physical capital supply variable has a positive and significant effect on economic growth of developing countries, so that one percent increase in physical capital supply causes 0.10 percent in economic growth of developing countries in studied period, respectively.

Obviously, human force equipment with more capital is a very important factor in creating a proper ground to increase domestic production power and fulfils further production growth.

Therefore, it is recommended that to improve and enhance the role of human force in production, more investment in physical machinery and equipment is done that this can be achieved through joint investment and using gains due to scale.

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(DOI: dx.doi.org/14.9831/1444-8939.2015/3-4/MAGNT.18)