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# The impact of trade on economic growth

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**Abstract:** The purpose of this article is to investigate the impact of marginal intra-industry trade on economic growth. The manuscript questions the economic growth exogenous models. It introduces new proxies to explain the economic growth as in marginal intra-industry trade, foreign direct investment and globalization index. The results indicate that economic growth is a dynamic process. The change of intra-industry has a positive impact on economic growth. This paper confirms relevant theoretical hypothesis as foreign direct investment and globalization promote the economic growth. The good results obtained with GMM system estimator suggest that the building of dynamic theoretical models will be of interest to academic researchers the link between marginal intra-industry trade and economic growth.

**Keywords:** Endogenous models, Panel Data, and United States.

## 1. Introduction

The issue of convergence versus economic divergence has been a great debate in the literature over the past decades. In 1990s the endogenous growth models emerged. In fact, technological progress, innovation could not be analyzed outside the economic system, as demonstrated by exogenous growth models. The models of monopolistic competition (endogenous) showed that international trade, foreign direct investment and technological factors promoted the economic growth. Thus, it appears that it is more important to assess the growth perspective endogenous than exogenous. That is, more than studying the convergence versus the economic divergence between a group of economies, it is important to evaluate the economic growth in a dynamic perspective. With the economic globalization the theoretical and empirical models were revisited.

Theoretical models of economic growth are based on two schools: the exogenous growth and endogenous growth. The exogenous theory, which stresses Solow (1956) helps to explain the convergence between the economies, where a long-term. However, it remains to explain the technological progress. That is, the Solow assumptions allow us to infer that the technology obtained exogenously. The major limitation of the model relies on the growth is obtained outside the economic system.

The theory emphasizes endogenous where Romer (1986), Lucas (1988), Grossman and Helpman (1991), Rebelo (1991) and Aghion and Howitt (1992) introduce the assumptions of monopolistic competition to explain economic growth. These models are based on the theoretical construction of Schumpeter (1942). Technological progress, innovation is part of the economic system. Innovation is explained by endogenous factors.

In the 1980s and 1990s emerged some studies which have introduced other concerns to the theory of growth. These studies (Rodrik 1998, Alesina et al., 1994, Dollar 1992, and Frankel and Romer 1996) introduced new determinants of economic

growth and foreign direct investment (FDI), the degree of openness of economies, technology, globalization and immigration. It's not frequently to use the indicator of marginal intra-industry trade (MIIT) in the estimation of models of economic growth. In fact, the MIIT has been used very frequently on issues of adjustment and its implications on the labour market. This paper introduces the MIIT, to assess the extent to which changes in trade do or not have impact on economic growth. Moreover, the MIIT is a dynamic content. Growth being a dynamic phenomenon is important to understand the extent to which marginal intra-industry trade correlates with economic growth.

This paper presents two contributions. We demonstrate that as economic growth is a dynamic process, it is preferable to use dynamic estimators. Second, the changes in trade and globalization are the key to explaining economic growth.

## 2. Measuring Intra-Industry Trade and marginal Intra-Industry Trade

### *Traditional intra-industry trade index*

The empirical literature use the index proposed by Grubel and Lloyd (1975). The Grubel and Lloyd (1975) is given by:

$$IIT = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} \quad (1)$$

Where  $X_i$  and  $M_i$  are the exports and imports of a particular in industry  $i$ . The index is equal 1 if all trade is intra-industry trade (IIT). If IIT is equal 0 all trade is inter-industry trade. The Grubel and Lloyd index is a static measure and as Hamilton and Kniest (1991) demonstrated the changes of this index over time do not adequately reflects the changes in trade partners. Their measure did not eliminate the scale effect. For other words, their index did not allow the comparison between industries of different size. This problem was resolved by Brühlhart (1994) marginal IIT index (MIIT).

### *Marginal intra-industry trade index*

$$MIIT = 1 - \frac{|(X_t - X_{t-n}) - (M_t - M_{t-n})|}{|X_t - X_{t-n}| + |M_t - M_{t-n}|} \quad (2)$$

This index could be rewritten in the following manner:

$$MIIT = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|} \quad (3)$$

The Brühlhart index is a transformation of Grubel and Lloyd (1975) index. The MIIT index takes the values 0 and 1. The value 0 indicates that the marginal trade in the industry is exclusively of the inter-industry trade and the value 1 represents that the marginal trade is entirely of the intra-industry.

### 3. Panel Data Approach

This research uses static and dynamic panels. In the static panel, we estimated by means of pooled OLS, fixed effects (FE) and random effects (RE), the F statistic tests and the null hypothesis of the same specific effects for all individuals. If we accept the null hypothesis, we could use the OLS estimator. The Hausman test can decide which model is better: random effects (RE) or fixed effects (FE). The static panel data have some problems in serial correlation, heteroskedasticity and endogeneity of some explanatory variables. The estimator GMM-system (GMM-SYS) permits the researchers to solve the problems of serial correlation, heteroskedasticity and endogeneity for some explanatory variables. These econometric problems were resolved by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998, 2000), who developed the first differenced GMM (GMM-DIF) estimator and the GMM system (GMM-SYS) estimator. The GMM-SYS estimator is a system containing both first differenced and levels equations. The GMM-SYS estimator is an alternative to the standard first differenced GMM estimator. To estimate the dynamic model, we applied the methodology of Blundell and Bond (1998, 2000), and Windmeijer (2005) to small sample correction to correct the standard errors of Blundell and Bond (1998, 2000). The GMM system estimator that we report was computed using STATA. The GMM-system estimator is consistent if there is no second order serial correlation in the residuals (m2 statistics). The dynamic panel data model is valid if the estimator is consistent and the instruments are valid.

### 4. Econometric Model

The dependent variable is the US income per capita<sup>1</sup> (GDP) for the period 1995 and 2008. The data are taken from World Development Indicators, the World Bank.

#### 4.1. Explanatory and testing of hypothesis

Based on endogenous economic models, we formulate the following hypotheses:

*Hypothesis 1:* Marginal intra-industry trade promotes the economic growth.

According to the literature the expected sign for MIIT is positive (Grossman and Helpman 1991, Rebelo 1991).

*Hypothesis 2:* There is a positive (dominant paradigm) correlation between FDI and growth.

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<sup>1</sup> We select the following trade partners: Australia, Belgium, Brazil, Canada, China, Denmark, France, Germany, Netherlands, Spain, Portugal, Japan, Korea, Thailand, Italy, United Kingdom, and Russia.

FDI - is the stocks inward foreign direct investment of each country. The data are collected from UNCTAD, FDI database.

The studies of Kai and Hamori (2009), Damijan and Rojec (2007), Campos and Kinoshita (2002), Badinger and Tondl (2002), Mileva (2008), and Onaran, (2007) show that foreign direct investment influences the economic growth. However De Mello (1999) and Ayanwale (2007) defend a negative impact of FDI on growth.

*Hypothesis 3:* Globalization encourages the economic growth.

The index of globalization (KOF) proposed by Dreher (2006) represents three dimension of globalization: economic; social and political (see Dreher, 2006; Dreher, Gaston (2008). <http://globalization.kof.ethz.ch/>. There is a positive relationship between KOF and economic growth.

ECOKOF- this is economic globalization. The index is composed by two categories: Actual flows and Restrictions.

The actual flows involve the following components: trade in percentage of GDP; foreign direct investment in percentage of GDP; portfolio investments in percentage of GDP, and income payments to foreign nationals in percentage of GDP. In restriction, the components consider are hidden import barriers, mean tariff rate, taxes on international trade and capital account restrictions.

CULTKOF- Cultural globalization is interpreted as the domination of American products (Dreher 2006: 1093). The data on cultural proximity are the number of McDonald's restaurants per capita.

POLTKOF- Political globalization is measured by embassies country and membership in international organizations.

### 4.3. Model Specification

$$GDP_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it} \quad (4)$$

Where  $GDP_{it}$  is per capita GDP at constant prices, X is a set of explanatory variables. All variables are in the logarithm form;  $\eta_i$  is the unobserved time-invariant specific effects;  $\delta t$  captures a common deterministic trend;  $\varepsilon_{it}$  is a random disturbance assumed to be normal, and identical distributed (IID) with  $E(\varepsilon_{it})=0$ ;  $Var(\varepsilon_{it})=\sigma^2 > 0$ .

The model can be rewritten in the following dynamic representation :

$$GDP_{it} = GDP_{it-1} + \beta_0 + \beta_1 X_{it} - \rho \beta_1 X_{it-1} + \delta t + \eta_i + \varepsilon_{it} \quad (5)$$

Where  $GDP_{it}$  is per capita GDP, X is a set of explanatory variables. All variables are in the logarithm form

## 5. Empirical Results

In Table 1 we can observe the determinants of growth using fixed effects estimator. The growth model presents four significant variables (LogFDI, LogECOKOF, and LogCULTKOF, and LogPOLTKOF at 1% level). The coefficients of KOF (index of globalization) are statistically significant with previous studies (Dreher, 2006; Dreher, Gaston 2008). Our model of growth also shows that foreign direct investment (LogFDI) is according to Kai and Hamori (2009). The variable LogMIIT is not statistically significant.

**Table 1:** Fixed effects estimates

<b>Dependent variable : LogGDP( per capita GDP)</b>		
<b>Independent Variables</b>	<b>Coefficient</b>	<b>Expect Signs</b>
LogMIIT	0.09 (0.94)	(+)
LogFDI	0.53 (6.60)***	(+)
LogECOKOF	6.033 (4.86)***	(+)
LogCULTKOF	4.89 (12.69)***	(+)
LogPOLTKOF	13.68 (6.04)***	(+)
C	-52.80 (-6.40)***	
N	237	
$\overline{R^2}$	0.68	

T- Statistics (heteroskedasticity corrected) are in brackets; \*\*\*-indicates statistically significance, respectively at 1%level.

In Table 2 we can observe the determinants of growth using GMM-system estimator. The model presents consistent estimates, with no serial correlation (the Arellano and Bond test for Ar(2)). The specification Sargan test shows that there are no problems with the validity of instruments used. The Windmeijer (2005) finite sample correction is used.

The model presents all significant variables (LogGDP<sub>t-1</sub>, LogMIIT, LogFDI, LogECOKOF, LogCULTKOF, and LogPOLKOF).

The lagged of per capita GDP (LogGDP<sub>t-1</sub>) is statistically significance with a positive sign. This result shows that economic growth is a dynamic progress. Our results confirm the empirical studies of as in Barro (1991), Kai and Homori (2009), Dreher (2006), and Dreher and Gaston (2008), and Leitão (2011).

A positive effect of marginal intra-industry trade (LogMIIT) on economic growth was expected and the results confirm this, showing that changes of trade encourage growth. This result is according to Grossman and Helpman (1991) and Rebelo (1991).

Our results show that the economic growth is positively correlated with all components of the index of globalization (LogKOF). This result is according to previous studies (Dreher 2006, Dreher and Gaston, 2008, Kai and Hamori, 2009). The

coefficient of foreign direct investment flows (LogFDI) is positive with significance. So we can conclude that FDI promotes the economic growth.

**Table 2 : GMM-System**

<b>Dependent variable : LogGDP( per capita GDP)</b>		
<b>Independent Variables</b>	<b>Coefficient</b>	<b>Expect Signs</b>
LogGDP <sub>t-1</sub>	0.97 (7.90)***	(+)
LogMIIT	0.17 (2.16)**	(+)
LogFDI	0.42 (40.10)***	(+)
LogECOKOF	0.49 (33.71)***	(+)
LogCULTKOF	2.65 (49.00)***	(+)
LogPOLKOF	3.54 (30.65)***	(+)
C	11.68 (52.41)***	
Arellano-Bond test for Ar(2) (P-value)	0.372	
Sargan test (P-value)	1.00	
N	207	

The null hypothesis that each coefficient is equal to zero is tested using one-step robust standard error. T-statistics (heteroskedasticity corrected) are in round brackets. P-values are in square brackets; \*\*\* - statistically significant at the 1 per cent level. Ar(2) is tests for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation (based on the efficient two-step GMM estimator). The Sargan test addresses the over-identifying restrictions, asymptotically distributed  $X^2$  under the null of the instruments' validity (with the two-step estimator).

## 6. Conclusions

This paper has questioned the exogenous models to explain the economic growth. To this purpose it introduced new explanatory variables as in marginal intra-industry trade, foreign direct investment and globalization. The last variable analyzed consider three dimensions: economic, social and political. The results indicate that the endogenous models have a greater potential to explain economic growth. In particular, the assumptions of monopolistic competition. Drawing from the relation between economic growth and marginal intra-industry trade, we presented the fixed effects and GMM-system estimator.

Our findings suggest that the economic growth is a dynamic process. The study confirms that the exchange of MIIT promotes the growth. The globalization process also contributes very well to explaining the growth. Finally we can refer that foreign direct investment promotes the growth.

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