

Nuno Carlos Leitão<sup>1</sup>

## ECONOMIC GROWTH AND MARGINAL INTRA-INDUSTRY TRADE

*The purpose of this article is to investigate the impact of marginal intra-industry trade on economic growth. The results indicate that economic growth is a dynamic process. The change of intra-industry has positive impact on economic growth. This paper confirms the theoretical hypothesis that foreign direct investment and globalization promote economic growth.*

*Keywords:* endogenous models; panel data; the United States; economic growth; intra-industry trade.

*JEL classification:* C21, O57.

Нуно Карлош Леитан

## ЕКОНОМІЧНЕ ЗРОСТАННЯ І ГРАНИЧНА ВНУТРІШНЬОГАЛУЗЕВА ТОРГІВЛЯ

*У статті досліджено вплив граничної внутрішньогалузевої торгівлі на економічне зростання. Результати аналізу показали, що економічне зростання — це динамічний процес. Зміни у внутрішньогалузевій торгівлі позитивно впливають на економічне зростання. Підтверджено теоретичну гіпотезу про те, що прямі іноземні інвестиції і глобалізація стимулюють економічне зростання.*

*Ключові слова:* ендогенні моделі; панельні дані; США; економічне зростання; внутрішньогалузева торгівля.

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## ЭКОНОМИЧЕСКИЙ РОСТ И ГРАНИЧНАЯ ВНУТРИОТРАСЛЕВАЯ ТОРГОВЛЯ

*В статье исследовано влияние граничной внутриотраслевой торговли на экономический рост. Результаты анализа показали, что экономический рост — это динамический процесс. Изменения во внутриотраслевой торговле положительно влияют на экономический рост. Подтверждена теоретическая гипотеза о том, что прямые иностранные инвестиции и глобализация стимулируют экономический рост.*

*Ключевые слова:* эндогенные модели, панельные данные, США, экономический рост, внутреотраслевая торговля.

**1. Introduction.** The issue of convergence vs. 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, innovations could not be analyzed outside the economic system, as demonstrated by the exogenous growth models. The models of monopolistic competition (endogenous) show that international trade, foreign direct investment and technological factors promote economic growth. Thus, it appears that it is more important to assess the endogenous growth perspective rather than exogenous. That is, more than studying convergence vs. economic divergence between a group of economies, it is important to evaluate the economic growth in a dynamic perspective. With economic globalization all theoretical and empirical models are revisited.

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<sup>1</sup> Professor, ESGTS, Polytechnic Institute of Santarem; CEFAGE, University of Evora, Portugal.

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

**2. Literature Review.** Theoretical models of economic growth are based on two schools: the exogenous growth and the endogenous growth. The exogenous theory, as Solow (1956) stresses, helps to explain the convergence between economies. However, this model does not explain the technological progress. According to these assumptions the technology is obtained exogenously. The theory that emphasizes endogenousness (Romer, 1986; Lucas, 1988; Grossman and Helpman, 1991; Rebelo, 1991; Aghion and Howitt, 1992) introduced the assumptions of monopolistic competition to explain economic growth. These models are based on the theoretical construction of Schumpeter (1942). Technological progress, innovation is a part of an economic system. Innovation is explained by endogenous factors.

In the 1980s and 1990s some studies emerged introducing other theories of growth. These studies (Rodrik, 1998, Alesina et al., 1994, Dollar, 1992, and Frankel and Romer, 1996) introduced new determinants of economic growth as foreign direct investment (FDI), the degree of openness of economies, technology, globalization and immigration. A not frequently used indicator is marginal intra-industry trade (MIIT) in the estimation of models of economic growth.

The intra-industry trade (IIT) or two-way trade is defined as simultaneous exports and imports within a country or a particular industry. Recently Leita (2012) examined the MIIT and its components horizontally (MHIIT) and vertical intra-industry trade (MVIIT) applied to the United States. The author shows that MIIT occurs more among countries that have similar demand.

In fact, the MIIT has been used very frequently on the issues of adjustment and its implications at the labour market. This paper introduces the MIIT, to explain the economic growth. Moreover, the MIIT is a dynamic indicator. The growth is a dynamic phenomenon. It will be important to understand the relationship between marginal intra-industry trade and economic growth.

**3. Measuring Intra-Industry Trade and Marginal Intra-Industry Trade.**

*Traditional intra-industry trade index.* The empirical literature uses the index proposed by Grubel and Lloyd (1975):

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

where  $X_i$  and  $M_i$  are the exports and imports of a particular country 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 reflect the changes in trade partners. Their measure did not eliminate the scale effect. In other words, their index did not allow the comparison between industries of different size. This problem was resolved by Brulhart (1994) marginal IIT index (MIIT):

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

This index could be rewritten in the following manner:

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

The Brulhart 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.

**4. Panel Data Approach.** This research uses panel data. 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.

**5. Econometric Model.** The dependent variable is the real GDP per capita<sup>2</sup> for the period 1995 and 2008. The data are taken from the World Development Indicators by the World Bank.

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

*Hypothesis 1:* There is a negative correlation between the initial level of GDP per capita and economic growth.

According to the assumptions of growth models, the hypothesis 1 reflects economic convergence. Barro (1991) and Dreher (2006) showed that economic growth has been negatively correlated by the initial level of GDP per capita.

*Hypothesis 2:* Marginal intra-industry trade promotes economic growth.

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

*Hypothesis 3:* There is a positive (dominant paradigm) correlation between FDI and growth.

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

<sup>2</sup> We select the following trade partners: Australia, Belgium, Brazil, Canada, China, Denmark, France, Germany, the Netherlands, Spain, Portugal, Japan, Korea, Thailand, Italy, the United Kingdom, and Russia.

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 economic growth.

However, De Mello (1999) and Ayanwale (2007) stated the negative impact of FDI on growth.

*Hypothesis 4:* Globalization encourages economic growth.

The index of globalization proposed by Dreher (2006) represents 3 dimensions of globalization: economic; social and political (Dreher, 2006; Dreher, Gaston (2008); <http://globalization.kof.ethz.ch/>). There is a positive relationship between KOF and economic growth.

ECOKOF is economic globalization. The index is composed of 2 categories: actual flows and restrictions.

Actual flows involve the following components: trade in % to GDP; foreign direct investment in % to GDP; portfolio investments in % to GDP, and income payments to foreign nationals in % to 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 the quantity of embassies and membership in international organizations.

*5.2. Model Specification.*

$$Growth_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it}, \tag{4}$$

where  $Growth_{it}$  is real GDP per capita, 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 the 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:

$$Growth_{it} = Growth_{it-1} + \beta_0 + \beta_1 X_{it} - \rho \beta_1 X_{it-1} + \delta t + \eta_i + \varepsilon_{it}, \tag{5}$$

where  $Growth_{it}$  is the real GDP per capita, X is the set of explanatory variables. All variables are in the logarithm form.

**6. Empirical Results.** Table 1 presents summary statistics for each variable. LogECOKOF, LogCULTKOF, and LogPOLTKOF appear to have only little differences. However, this is not the case for the LogGrowth, LogGDP, LogMIIT and LoFDI.

*Table 1. Summary Statistics*

Variables	Mean	Std. dev.	Min	Max
LogGrowth	-1.20	0.27	-1.47	-0.32
LogGDP	7.01	0.08	6.87	7.15
LogMIIT	-0.35	0.37	-2.99	-0.01
LogECOKOF	1.82	0.01	1.79	1.84
LogCULTKOF	1.94	0.01	1.94	1.95
LogPOLTKOF	1.97	0.01	1.97	1.98
LogFDI	5.18	0.25	4.76	5.51

Before estimating the panel regression model, we have conducted a test for unit root of the variable. The most important variables such as the economic growth (LogGrowth), marginal intra-industry trade (LogMIIT), economic and cultural globalization (LogECOKOF, LogCULTKOF), and foreign direct investment (LogFDI) do not have unit roots, that is, are stationary with individual effects and individual specifications.

*Table 2. Panel unit root test results*

ADF-Fischer Chi square	Intercept and trend statistic	Probability
LogGrowth	70.08	0.00
LogMIIT	52.82	0.03
LogECOKOF	58.02	0.01
LogCULTKOF	105.29	0.00
LogPOLTKOF	46.92	0.10
LogFDI	75.43	0.00

In Table 3 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 there are no problems with the validity of the instruments used. The Windmeijer (2005) finite sample correction is used.

The model presents all the significant variables (LogGrowtht-1, LogGDP, LogMIIT, LogFDI, LogECOKOF, LogCULTKOF, and LogPOLKOF).

The lagged of per capita GDP growth (LogGrowtht-1) is statistically significance with a positive sign. This result shows that economic growth is a dynamic progress. Our results confirm the empirical studies of Barro (1991), Kai and Homori (2009), Dreher (2006), and Dreher and Gaston (2008).

The initial per capita GDP (LogGDP) is statistically significance with a positive sign. Our results confirm the empirical studies of Barro (1991), Kai and Homori (2009), Dreher (2006), Dreher and Gaston (2008), and Leita0 (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 and significant. So we can conclude that FDI promotes economic growth.

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 % level. Ar(2) is test 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  $\chi^2$  under the null of the instruments' validity (with the two-step estimator).

Table 3. GMM-System

Dependent variable: LogGrowth (real GDP per capita )		
Independent Variables	Coefficient	Expected Sign
LogGrowth <sub>t-1</sub>	0.30 (4.276)***	(+)
LogGDP	-1.29 (-6.85)***	(-)
LogMIT	0.01 (3.58)***	(+)
LogFDI	1.21 (10.01)***	(+)
LogECOKOF	18.30 (12.35)***	(+)
LogCULTKOF	11.64 (17.57)***	(+)
LogPOLKOF	5.11 (12.00)***	(+)
C	9.08 (8.38)***	
Arellano- Bond test for Ar(2) (P-value)	0.372	
Sargan test (P-value)	0.89	
N	207	

**7. Conclusions.** This paper analyses the link between economic growth and monopolistic competition. For this purpose we introduce new explanatory variables as marginal intra-industry trade, foreign direct investment and globalization. The last variable was analyzed considering 3 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 imperfect competition. Drawing from the relationship between economic growth and marginal intra-industry trade, we presented the GMM-system estimator.

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

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