Horácio C. Faustino[1], Nuno Carlos Leitão[2]

COUNTRY-SPECIFIC DETERMINANTS OF INTRA-INDUSTRY TRADE: EVIDENCE FROM PORTUGAL

This paper uses a static and dynamic panel data approach to test the country-specific determinants of Portuguese intra-industry trade (IIT). We include income variables together with supply-side variables in order to test the demand similarity and factor endowments difference hypotheses. The results suggest that the Linder hypothesis is confirmed and that differences in income levels have positive effect on vertical IIT and a negative effect on IIT and horizontal IIT. However, our findings only partially confirm Helpman's and Krugman's theoretical predictions of the negative relationship between differences in relative factor endowments and IIT.

Keywords: *intra-industry trade; Linder hypothesis; panel data; Portugal.*

JEL Classification: *F12, C2, C3, L1.*

Гораціо С. Фаустіно, Нуно Карлош Леітан

КРАЇННА СПЕЦИФІКА ВНУТРІШНЬОГАЛУЗЕВОЇ ТОРГІВЛІ (ЗА ДАНИМИ ПОРТУГАЛІЇ)

У статті застосовано статичний і динамічний аналіз панельних даних для дослідження крайної специфіки чинників, що визначають внутрішньогалузеву торгівлю в Португалії. Для перевірки гіпотез схожості попиту і різниці в сукупності чинників виробництва включено змінні доходу і пропозиції. За результатами аналізу підтверджено гіпотезу Ліндера і те, що різниця в доходах позитивно впливає на вертикальну внутрішньогалузеву торгівлю і негативно - на горизонтальну. Результати дослідження всього лише частково підтверджують теоретичні гіпотези Хелпмана і Кругмана про негативну залежність між відносною сукупністю чинників виробництва і внутрішньогалузевою торгівлею.

Ключові слова: *внутрішньогалузева торгівля; гіпотеза Ліндера; панельні дані; Португалія.*

Горацио С. Фаустино, Нуно Карлош Леитан

СТРАНОВАЯ СПЕЦИФИКА ВНУТРИОТРАСЛЕВОЙ ТОРГОВЛИ (ПО ДАННЫМ ПОРТУГАЛИИ)

В статье применен статический и динамический анализ панельных данных для исследования страновой специфики факторов, определяющих внутриотраслевую торговлю в Португалии. Для проверки гипотез схожести спроса и разницы в совокупности факторов производства включены переменные дохода и предложения. По результатам анализа подтверждена гипотеза Линдера и то, что разница в доходах позитивно влияет на вертикальную внутриотраслевую торговлю и негативно - на горизонтальную. Результаты исследования всего лишь частично подтверждают теоретические гипотезы Хелпмана и Кругмана о негативной зависимости между относительной совокупностью факторов производства и внутриотраслевой торговлей.

Ключевые слова: *внутриотраслевая торговля; гипотеза Линдера; панельные данные; Португалия.*

[1] ISEG, Technical University of Lisbon, Portugal
[2] ESGTS, Polytechnic Institute of Santarem, and CEFAGE, University of Evora, Portugal

1. Introduction. In this paper, we seek to test some hypotheses suggested by the theory of monopolistic competition and the Neo-Heckscher-Ohlin theory and to compare our results with those obtained by Greenaway et al. (1994) and Hummels and Levinsohn (1995).

It is a fact that most of the empirical studies on IIT found more empirical support for country-specific determinants (i.e., income levels, endowments, economic dimension, foreign direct investment) than for industry-specific determinants (market structure, scale economies, product differentiation). Geenaway et al. (1994, 1995) concluded that it was worthwhile separating out HIIT and VIIT because the theory suggests that they have different determinants. So, in this study, we apply the methodology of Abd-el-Rahaman (1991) and Greenaway et al. (1994) in order to separate HIIT from VIIT.

Following Hummels and Levinsohn (1995), we decided to include supply-side variables to distinguish income effects from factor endowments effects. We found a negative relationship between differences in per-capita income and IIT, which confirms the Linder (1961) hypothesis. We also tested the factor endowments hypotheses (differences in physical and human capital) and obtained statistically significant results. Helpman-Krugman's (1985) endowments hypotheses are confirmed in the VIIT and HIIT dynamic models, although in the IIT model, the estimated sign is positive, not as predicted.

The remainder of the paper is organized as follows. Section 2 presents the theoretical background and the revisited empirical work on IIT. Section 3 presents the empirical model. Section 4 analyzes the estimation results. The final section concludes.

2. Theoretical Background and Empirical Work. Linder (1961) considered that consumers' tastes are conditioned by their income levels. These tastes yield demands for products and this demand structure generates a production response. Hence, countries with similar per-capita incomes will have similar demand structures and will export similar goods. The Linder theory of overlapping demands suggests that goods must first be produced for home markets and then exported to similar countries. According to Linder's (1961) hypothesis, a negative relationship between income differences and IIT is to be expected. Linder's (1961) theory can also explain VIIT. Less developed countries with low per-capita incomes specialize in, and export, low-quality products (varieties), whereas developed countries with high per-capita incomes specialize in, and export, high-quality products (varieties of the same product). So, Linder's theory suggests that the higher the difference in per-capita income, the greater the VIIT. In the theoretical models, the distinction between two types of IIT is very important. As stressed by Greenaway et al. (1994, 1995), there are theoretical reasons - different determinants - and empirical evidence that justify separating HIIT from VIIT.

The first theoretical models of IIT were made by Krugman (1979, 1980, 1981), Lancaster (1980) and Helpman (1981). This work was synthesized in Helpman and Krugman's (1985) model. This is a model that combines monopolistic competition with the Heckscher-Ohlin (HO) theory, incorporating factor endowments differences, horizontal product differentiation and increasing returns to scale. The model generates both intra- and inter-industry trade and formulates the following country-

specific hypothesis: the more different are the factor endowments, the smaller is IIT. As horizontal product differentiation considers that different varieties are of the same quality, but of different characteristics, they may be produced with similar factor intensity. The Helpman and Krugman (1985) model also puts forward the following country-specific hypothesis: the larger the difference in factor endowments, the smaller (larger) the extent of HIIT (VIIT).

Making the distinction between types of IIT, Linder's theory can also be used to explain HIIT and VIIT. As the similarity of the demand determines the similarity of the goods traded, Linder (1961) theory also suggests the following country-specific hypothesis: the more different are the factor endowments, the smaller (greater) is the extent of HIIT (VIIT).

The main references in VIIT models are Falvey (1981), Shaked and Sutton (1984), Falvey and Kierzkowski (1987) and Flam and Helpman (1987). The essentials of these models can be summarized as follows. Vertical product differentiation means that different varieties are of different qualities and, on the demand side, it is assumed that consumers rank alternative varieties according to product quality. On the supply side, it is assumed that high- (low-) quality varieties are relatively capital- (labor-) intensive. In the HO theory, as in the Neo-HO theory, there is a linkage between factor endowments of the countries and factor proportions. The relatively labor-abundant countries have comparative advantages in labor-intensive products (lower-quality varieties) and relatively capital-abundant countries have comparative advantage in capital-intensive products (higher-quality varieties).

To sum up, the Neo-HO theory shows that VIIT takes place between countries with different factor endowments (supply-side) and with differences in per-capita income (demand-side).

HO theory was generalized in two versions: the Jones (1956) commodity content version and the Vanek (1968) factor content version. After the Leontief paradox, the commodity version included a new factor, human capital, as a non-homogeneous factor, which became known as neo-factor proportions theory (see Baldwin, 1971). We therefore decided to include as an explanatory variable the difference in human capital endowments jointly with the differences in physical capital.

The empirical studies that we revisited in this paper may be synthesized as follows. Helpman (1987) tested 3 predictions based on the Helpman and Krugman (1985) model, using data from 14 OECD countries and his results confirm the theory. Hummels and Levinsohn (1995), using the panel data analysis, did the same on Helpman's tests and concluded that the theory is confirmed. However, when country-specific fixed effects (country-pair dummies) were used, they concluded that most of the variation in the share of IIT for all country pairs of OECD countries was explained by factors that were specific to the countries. This result contradicts the results of Helpman (1987). Hummels and Levinsohn (1995) concluded that their results were inconsistent with Helpman-Krugman's (1985) model and questioned the empirical success of the monopolistic competition models. Possibly, the solution would be to refine the theory, as Hummels and Levinsohn suggested. As we have discrepancies between the data and the predictions of the Helpman-Krugman model, we need to explore simple amendments of the model's assumptions.

3. Empirical Model. The dependent variables used are the IIIT Grubel and Lloyd (1975) index and HIIT and VIIT indices. The explanatory variables are country-specific characteristics that have been used in others empirical studies (e.g., Greenaway et al., 1994; Hummels and Levinsohn, 1995). The data for explanatory variables is received from the World Bank, World Development Indicators (2005). The source of the dependent variables was the INE - Portuguese National Institute of Statistics.

3.1. Dependent Variables

The IIT index

Grubel and Lloyd (1975) define ITT as the difference between the trade balance of industry i and the total trade of this same industry.

In order to make the comparison easier between industries or countries, the index is presented as a ratio where the denominator is total trade:

$$IIT_i = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)}$$

The index is equal to 1 if all the trade is intra industry. If Bi is equal to 0, all trade is inter industry trade. In the empirical analysis, we consider all the products at the 5-digit level of the combined nomenclature (CN). In econometric analysis, the 5-digit product categories were aggregated to the 3-digit industry level, according to the Portuguese Classification of Economic Activities (CAE). At this level of disaggregation, CAE is similar to NACE. The conversion between CN and CAE is provided by the INE. Our sample comprises 15 member states of the European Union (EU15), prior to its enlargement in 2004 (trade data for Belgium and Luxembourg is aggregated).

The HIIT and VIIT indices

To separate horizontal from vertical intra-industry trade, the Grubel and Lloyd index and the methodology of Abd-el-Rahaman (1991) and Greenaway et al. (1994) are used.

Relative unit values of exports and imports of the good i between countries j and k (TTijk) are used to disentangle total IIT into total HIIT (RH) vs. total VIIT (RV). We use a unit value dispersion of 15 %.

If $TT_{ijk} \in [0,85; 1,15]$, we have RH; otherwise we have RV.

$$HIIT = \frac{RH}{(X_i + M_i)}$$

Xi, Mi are exports and imports of an industry i respectively.

$$VIIT = \frac{RV}{(X_i + M_i)}$$

If TTijk < 0,85 or TTijk > 1,15, we have VIIT. TTijk < 0,85, we have inferior VIIT (lower-quality varieties). TTijk > 1.15, we have superior VIIT (higher-quality varieties).

HIIT and VIIT are calculated with desegregation of 5 digits CAE from INE-trade statistics.

3.2. Explanatory variables and expected sign. In order to analyse the country-specific determinants of IIT, HIIT and VIIT we use the following explanatory variables:

- LogDGDP is the logarithm of the absolute difference in GDP per-capita (PPP, in current international dollars) between Portugal and each EU trading partner. Falvey and Kierzkowski (1987) suggest a positive sign for VIIT model and Loertscher and Wolter (1980) and Greenaway et al. (1994) provide empirical support for a negative relation between difference in per-capita income and HIIT. Linder (1961) considers that countries with similar demands will trade similar products. So, the Linder hypothesis suggests a negative sign for the IIT model (See, also, Falvey and Kierzkowski, 1987; Helpman,1987; and Hummels and Levinsohn, 1995);

- LogEP is a proxy for differences in physical capital endowments. It is the logarithm of the absolute difference in electric power consumption (Kw/h per-capita) between Portugal and its EU partners. Based on Helpman and Krugman (1985), we formulated the following hypothesis: the larger is the difference in factor endowments, the larger (smaller) is the VIIT (HIIT). Bergstrand (1983) found empirical support for a negative relationship between the differences in factor endowments and HIIT. Helpman and Krugman (1985), Helpman (1987), Hummels and Levinsohn (1995) and Cies'lik (2005) all considered a negative relation between IIT and differences in factor endowments;

- LogEC is the second proxy for difference in physical capital endowments. It is the logarithm of absolute difference in energy use (kg. of oil equivalent per capita) between Portugal and its EU trading partners;

- LogSEC is the proxy for the difference in human capital endowments. It is the logarithmic of the absolute difference in the school enrolment rate in secondary education between Portugal and European trading partners. According to the literature, the higher is the difference in factor endowments between Portugal and its trading partners, the higher (less) will be VIIT (HIIT). So, we expect a positive sign for VIIT, a negative sign for HIIT and an ambiguous sign for IIT;

- LogDIM is the logarithm of the average of GDP (PPP, in current international dollars) between Portugal and its EU trading partners. This is a proxy for economic dimension and a positive sign is expected (Loertscher and Wolter, 1980, Greenaway et al., 1994);

- LogFDI is the logarithm of the foreign direct investment, net inflows, that originate from a trading partner (% of GDP). Markusen (1984) and Helpman (1984, 1985) provide an explanation for a positive relation between FDI and IIT, both vertical and horizontal. Greenaway et al. (1995) consider a positive sign for IIT. The product life cycle theory of Vernon (1966) also asserts that FDI is positively associated with VIIT;

- LogMinGDP is the logarithm of the lower value of GDP (PPP, in current international dollars) between Portugal and its EU partners. This variable is included to control for relative size effects. According to Helpman (1987) and Hummels and Levinsohn (1995), a positive sign for IIT, HIIT and VIIT is expected;

 - LogMaxGDP is the logarithm of the higher value of GDP (PPP, in current international dollars) between Portugal and its EU partners. This variable is also included to control for relative size effects. A negative sign is expected (Helpman, 1987; Hummels and Levinsohn, 1995, and Leitao, 2011c).

We also considered other explanatory variables, such as "Distance", "Differences in school enrolment rate in tertiary education" and "Trade imbalance" (to control for bias in estimations), but the introduction of these variables did not improve the results.

3.3. Model Specification

$$IIT_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it} ,$$

where stands for either IIT, HIIT, or VIIT, meaning total, vertical or horizontal Portuguese IIT index, X is a set of country-specific explanatory variables in logs; η_i is the unobserved time-invariant country-specific effects; δ_t captures a common deterministic trend; ε_{it} is a random disturbance assumed to be normal, independent and identically distributed (IID) with E (ε_{it}) =0 and Var (ε_{it}) = $\sigma2 > 0$.

The model can be rewritten in the following dynamic representation:

$$IIT_{it} = \rho IIT_{it-1} + \beta_1 X_{it} - \rho\beta_1 X_{it-1} + \delta t + \eta_i + \varepsilon_{it} .$$

Because IIT is an index varying between zero and one, we apply a logistic transformation to IIT, HIIT and VIIT (see Hummels and Levinsohn, 1995).

$$IIT = \ln [IIT/(1-IIT)] .$$

The same is carried out for HIIT and VIIT.

4. Estimation Results. In order to compare the results, we estimate the models using static and dynamic panel data. Although the theoretical models of IIT do not suggest a dynamic specification, we decided to introduce a dynamic variant of the static model, because in this model we may have serial correlation, heteroskedasticity and endogeneity of some explanatory variables. The results of the empirical studies that use only a static panel data approach are questionable due to the difficulty in finding exogenous variables than can be regarded apriori as being uncorrelated with individual effects. These econometric problems were resolved by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bound (1988, 2000), who developed the first-differenced GMM and the GMM system estimators. The GMM system estimator, used in this paper, is a system containing both first-differenced and levels equations. In addition to using instruments in levels for equations in first differences, it uses instruments in first differences for equations in levels.

The idea of a dynamic variant in the empirical studies without a theoretical support was previously introduced by Baier and Bergstand (2001) and Badinger and Breuss (2004). The dynamic approach has been frequently used in studies of firms' growth, growth of trade and productivity spillovers from foreign direct investment. The dynamic analysis for intra-industry trade was introduced by Faustino and Leitao (2005, 2006, 2007). This dynamic analysis was also used by the authors in the empirical studies testing the fragmentation theory of production (Leitao and Faustino, 2009; Faustino and Leitao, 2011) and other empirical studies (see, for example, Leitao 2011a,b; Dima et al., 2011).

4. 1. Results for the Static Models. We only present the fixed effects estimates, although the random-effects regression results are similar to the fixed-effects results. The main results of the estimated regressions for IIT, HIIT and VIIT, displayed in Table 1, can be summarized as follow. The variable LogDGDP (difference in per-

capita income) is not statistically significant in all the models. Both proxy variables for differences in factor endowments are statistically significant in the IIT model. The variable LogEP (difference in electric power consumption) has a negative effect on IIT, as was predicted by the Helpman and Krugman (1985) model. However, the second proxy for differences in factor endowments, the variable LogEC (difference in energy use), has a positive sign. These two variables are not statistically significant in the HIIT and VIIT models.

Table 1. **Static estimates**

Variable	IIT	HIIT	VIIT	EXPECTED SIGN		
				IIT	HIIT	VIIT
LogDGDP	-0.089 (-0.367)	-0.038 (-0.054)	-0.256 (-1.131)	(-)	(-)	(+)
LogEP	-0.814 (-2.359)**	-1.474 (-0.752)	-1.078 (-1.379)	(+/-)	(-)	(+)
LogEC	0.125 (1.678)*	0.478 (2.057)**	0.043 (0.444)	(+/-)	(-)	(+)
LogSEC	0.052 (0.523)	-0.405 (-0.594)	0.014 (0.077)	(+/-)	(-)	(+)
LogDIM	1.542 (1.707)*	-4.615 (-1.287)	2.062 (1.574)	(+)	(+)	(+)
LogFDI	0.085 (2.013)**	-0.016 (-0.54)	0.059 (0.673)	(+)	(+)	(+)
LogMinGDP	-1.900 (-2.443)**	4.108 (1.227)	-2-234 (-1.654)*	(+)	(+)	(+)
LogMaxGDP	-0.686 (-2.542)**	1.484 (1.304)	-0.771 (-1.769)*	(-)	(-)	(+)
Adj.R^2	0.967	0.639	0.794			
N	88	88	88			

Notes: t-statistics (heteroskedasticity corrected) are in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels respectively.

Thus, these empirical results are ambiguous in relation to Helpman-Krugman theoretical predictions. The variable LogSEC (difference in school enrolment rate in secondary education), used as proxy for difference in human capital endowments, is not statistically significant in all the models. The variable LogDIM (average of GDP), used also by Greenaway et al. (1994) has a significant and predicted positive effect on IIT, but it is insignificant in both models. The variable LogFDI (foreign direct investment) enters significantly in the IIT model and has a predicted positive sign, but it is insignificant in both the HIIT and VIIT models. The variables LogMinGDP and LogMaxGDP, included as size effect controls, are statistically significant in the IIT and VIIT models, although LogMinGDP has a wrong sign. The results for the HIIT and VIIT regressions are very poor. In the HIIT equation, only LogEC is significant, whereas in the VIIT regression, only the variables that control for bias are significant. This could be due to a possible misspecification and/or the potential endogeneity of the explanatory variables. These results suggest a dynamic specification.

The explanatory power of the IIT regression is very high (R^2 = 0.967). So, we can conclude that in Hummels and Levinsohn's (1995) paper, the fixed effects are picking up the effects of the missing explanatory variables. The R^2 of their fixed effects regression jumps from 0.524 (without country-pair dummies) to 0.96 when country

dummies are included in regression. Instead of country-pair dummies, we use country-specific variables.

4.2. Results of Dynamic Models. The regression results presented in Table 2 can be summarized as follows. Lagged IIT, HIIT and VIIT variables have an expected positive sign and are significant in IIT and HIIT models. Similarly to Greenaway et al.'s (1994) cross-section study, we find evidence in support of Linder's hypothesis in the IIT, HIIT, VIIT panel data dynamic models. However, Greenaway et al. (1994) found an unexpected positive sign for income per-capita differences in the IIT model. In our study, the variable LogDGDP (difference in per-capita income) has a negative and significant sign in the IIT, HIIT and VIIT equations. However, if we consider the joint-effect of LogdGDP and LogDGDPt-1 the sign in the VIIT equation is positive (the long-run effect is positive, i.e., -0.983+2.405 >0). The signs of the physical capital endowments difference proxies (LogEP and LogEC) are as we had expected in all 3 models, but LogEP (difference in electric power consumption) is significant only in the HIIT model and LogEC (difference in energy use) is significant only in the VIIT model. Helpman-Krugman predictions are confirmed (not confirmed) relatively to the HIIT and VIIT (IIT) models.

The human capital endowments difference proxy (LogSEC) is significant in the HIIT and VIIT equations. However, the negative sign in the VIIT equation is contrary to expectations. The variables LogDIM (dimension) LogFDI and LogMinGDP are not statistically significant in all the models. The variable LogMaxGDP is significant in all the models and has the expected negative sign.

Comparing the GMM estimates with the fixed-effects estimates, we note an improvement in the results for HIIT and VIIT models. However, there are variables that are insignificant and/or with the wrong sign. Since we used the same specification for all the models, the solution to the problem could be to use different equations for the HIIT and VIIT models. As in our sample VIIT accounts on average for 64 % of the total IIT, it is acceptable that in the future we use the same regression for IIT and VIIT and a different equation regression for HIIT. Another remarkable difference is that the income per-capita differences variable (LogDGDP) is now significant and with the predicted sign in the IIT, HIIT and VIIT models.

Table 2. **Dynamic estimates**

Variable	IIT	HIIT	VIIT	EXPECTED SIGN IIT	HIIT	VIIT
Constant	26.295 (2. 03)	160.03 (1.58)	112.76 (2.62)			
(IIT; HIIT; VIIT)t-1	0.645 (4.29)***	0.473 (4.62)***	0.134 (0.715)	+	+	+
LogDGDP	-0.323 (-1.77)*	-1.262 (-1.96)**	-0.983 (-2.33)**	(-)	(-)	(+)
LogDGDPt-1	0.362 (0.898)	0.627 (0.831)	2.405 (2.12)**			
LogEP	0.270 (0.372)	-4.769 (-1.89)*	1.496 (0.904)	(+/-)	(-)	(+)
LogEPt-1	-0.119 (-0.14)	5.397 (2.12)**	-1.868 (-1.05)			

The End of *Table 2*

LogEC	0.306 (1.43)	-1.003 (-1.49)	0.914 (1.99)**	(+/-)	(-)	(+)
LogECt-1	-0.404 (-1.94)*	0.457 (0.586)	-1.150 (-2.48)**			
LogLSEC	-0.196 (-1.28)	-0.968 (-1.81)*	-0.934 (-1.84)**	(+/-)	(-)	(+)
LogLSECt-1	0.159 (0.886)	0.039 (0.06)	-0.192 (-0.444)			
LogDIM	-1.184 (-0.255)	-2.77 (-0.25)	-8.184 (-0.986)	(+)	(+)	(+)
LogDIMt-1	-3.033 (-0.778)	-9.65 (-0.76)	4.115 (0.531)	(+)		
LogFDI	-0.031 (-0.195)	0.496 (1.01)	-0.226 (-0.891)	(+)	(+)	(+)
LogFDIt-1	-0.148 (-1.18)	-1.087 (-1.77)*	-0.025 (-0.07)			
LogMinGDP	1.843 (0.313)	-19.95 (-1.18)	-8.391 (-0.967)	(+)	(+)	(+)
LogMinGDPt-1	1.535 (0.285)	29.81 (1.56)	12.12 (1.61)			
LogMaxGDP	-10.02 (-2.14)**	-50.75 (-2.04)**	-50.30 (-3.15)***	(-)	(-)	(-)
LogMaxGDPt-1	8.187 (2.19)**	37.26 (2.28)**	38.26 (3.13)***			
M1	-1.181 [0.238]	-1.113 [0.266]	-0.647 [0.517]			
M2	0.137 [0.891]	0.916 [0.360]	0.454 [0.650]			
W_{JS}	4999 [0.000]	5954 [0.000]	6449 [0.000]			
Sargan	-1.9e-15 [1.000] df=55	3.3e-015 [1.000] df=73	1.645e-15 [1.000] df=45			
N	74	74	74			

Notes: ***, **, * indicate significance at the 1%, 5% and 10% levels respectively. In round brackets are t-statistics (heteroskedasticity corrected). P-values are in square brackets. M1 and M2 are tests for first-order and second-order serial correlation in the first-differenced residuals. W_{JS} is the Wald statistics of joint-significance of independent variables (two-step estimation). Sargan is the test of the over-identifying restrictions, under the null of instruments validity (two-step estimation).

5. Conclusions. Following Hummels and Levinsohn (1995), and according to Linder, we consider that demand structure is proxied by the difference in per-capita income and that the supply-side structure is proxied by the factor endowments difference. Our findings reveal that Linder's hypothesis (the demand similarity hypothesis) is confirmed when we include the supply-side variables. The results present a negative (positive) relationship between income per-capita difference and IIT, HIIT (VIIT), when we use a dynamic panel data analysis. Our results also suggest that country-pair dummies used by Hummels and Levinsohn (1995) should be replaced by differences in relative factor endowments (physical and human capital) and other country-specific variables such as economic dimension and foreign direct investment. Comparing our static panel data regression (without country-pair dummies) with

Hummels and Levinsohn's panel data regression (with country-pair dummies), we conclude that the explanatory power of both regressions is identical (R 2=0.96). Comparing our results with those of Greenaway et al. (1994), we note that both found a negative relationship between per-capita income differences and both types of IIT. However, our dynamic analysis allows us to conclude that the effect on VIIT is positive if we consider the long-run effect. Contrary to Helpman and Krugman's (1985) theoretical framework that predicts a negative relationship between IIT and differences in factor endowments, our results suggest that the sign of the coefficient is ambiguous (it is a matter of empirical evidence) because IIT encompasses both HIIT and VIIT, which have different determinants.

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