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Bilateral Trade Flows and Income-Distribution Similarity

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Abstract

This paper accounts for non-homothetic preferences by specifically investigating the role of income per capita and income-distribution differences in the context of the gravity model of trade. A theoretically justified gravity model is estimated for disaggregated trade data using a sample of 104 exporters and 108 importers for 1980-2003 to achieve two main goals. First we are able to empirically test some of the theoretical predictions of Markusen (2010), namely that there is a positive dependence of trade on per capita income and that higher inequality increase trade of more sophisticated goods. Second, and in line with the Linder hypothesis, we hypothesized that a higher demands' overlap implies a more similar demand structure and therefore more trade. We test this hypothesis with new measures of income-distribution similarity. National income distributions are used to calculate income similarity indices that measure how much each country pair overlaps in terms of income distribution and population. We find that per capita income is positively related to bilateral trade and that on average, a 10 percent increase in income-distribution similarities increases exports by almost 4 percent being this effect stronger for more sophisticated goods in comparison with more homogenous ones.

JEL classification: F10, F14, D31

Keywords: exports; income distribution; gravity equation; density estimation; non-homothetic preferences.

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1. Introduction

The role of within country income distributions and between country income-distribution similarities has been a relatively neglected area in international trade. Most trade theories assumed that preferences are homothetic and identical across countries, giving a very small role to demand patterns as factors that can explain international trade. This assumption might have been useful to simplify the modeling framework, but it was based on no or only a weak empirical foundation. Tastes cannot be considered identical for all consumers in a country; studies clearly find consumer preferences to be non-homothetic (Hunter and Markusen, 1988; Hunter, 1991).

An early exception to the main strand of theoretical models is the well-known Linder hypothesis (Linder, 1961). He departs from traditional trade theory where supply side factors are the main determinants of trade. He argued that the traditional theories cannot explain why countries would engage in both exports and imports of the same type of products. He considers that demand for a product has to appear first in the producer country and that then this product can be exported to other countries that have similar demand structures.

Recently, Fajgelbaum et al. (2009), Fieler (2009) and Markusen (2010) incorporated the assumption of non-homothetic consumer preferences in general models of international trade. Markusen (2010) builds a generic model of identical but non-homothetic preferences and presents a unified and testable set of results. The attractiveness of the model lies on its simplicity without lack of generality and its predictions that also apply to imperfect competition and increasing returns to scale.

With respect to the related empirical literature, we find several studies that tried to test the Linder hypothesis obtaining mixed results. These are summarized in McPherson, Redfearn and Tieslau (2000, 2001). In most cases a gravity framework was used and differences in income per capita is the variable selected to measure income similarities between trading pairs (Arnon and Weinblatt, 1988; Arad and Hirsch, 1981; Choi, 2002; Martínez-Zarzoso and Nowak-Lehmann, 2004). Hallak (2010) focuses on product quality and shows that the failure to confirm the Linder hypothesis in past studies could be due to aggregation bias. He finds support for the Linder hypothesis by testing different type of products separately.

Most of the abovementioned studies consider per capita income differences between countries. Instead, a few recent studies considered the within country distribution of income as a determinant of bilateral trade flows. Hunter (1991), Francois and Kaplan (1996), Matsuyama (2000) and Mitra and Trindade (2005); Bohman and Nilsson (2007), Chul Choi et al. (2009) are some of them.

The purpose of this paper is twofold. First, we aim to test some of the theoretical predictions derived in Markusen (2010), specifically the role played by income per capita in gravity equations and the effect of within country income inequality on trade. Second we estimate the effect of between country income-distribution similarities on bilateral trade. To our knowledge this relationship has not been jet investigated and the theoretical foundations are also missing. Therefore we suggest an avenue for further theoretical research. We accomplish our second aim by providing a simple measure of similarity of demand structures between countries that uses information of within country distribution of income. To construct the index, we first estimate the distribution of income within each country of the world and then we measure to what extent the distributions of two given countries overlap. The underlying assumption is that the overlap between the respective density functions of income within each country can be considered as a good proxy for the overlapping demand structure between trading partners. Bertola, Foellmi and Zweimüller (2006) developed a framework for analyzing non-homothetic demand, which illustrates the assumptions behind our proposed method. The proposed measure is added as explanatory variable in a gravity model of trade.

The results from estimating the theoretically justified gravity model of trade show a positive effect of income per capita on bilateral trade, holding constant aggregate income and a significant and economically important effect of similarity of demand structures (measured by the overlap of income distributions) on bilateral disaggregated trade flows.

In the next Section we explain how to construct the measure for income distribution similarity. In Section 3 we conduct our empirical analysis and present the main results, before concluding in Section 4.

2. Income-distribution overlaps between countries

We propose three different measures of demand similarity for each pair of countries based on their income distributions. National income distributions are derived from two main data sources. Income data are drawn from the Penn World Tables 6.2 (Heston, Summers and Aten, 2006), which report the real GDP per capita in constant international dollars (chain series, base year 2000), available for most countries. However, for three particularly populous countries namely, Bangladesh, Russia and Ukraine we estimated the initial missing values[1]. Our second data source is the inequality dataset proposed by Grün and Klasen (2008) based on the WIDER database. Their adjusted Gini dataset is derived by using several estimation techniques and has substantial advantages in terms of comparability to the raw Ginis available in the WIDER database, which are not fully comparable over time and across countries[2].

[1] For Bangladesh we calculated the values for the two initial years 1970, 1971 using the average income per capita growth rate of the rest of the decade. For Russia and Ukraine we used the derived (Penn World Tables 5.6) USSR growth rates to estimate the average income for the years before 1990.

[2] As inequality does not change too dramatically over time, we assume the first real observation of the Gini in any given country to be equal to its initial level of inequality. Starting from this initial level we used a moving average to catch changes in trends of inequality. Unfortunately, there is no reliable inequality data for the populous Democratic Republic of Congo, hence we used the neighboring Central African Republics' Gini as a substitute.

National income distributions are modeled as log-normal distributions[3]. Formally, the log-normal distribution LN(μ, σ) is defined as the distribution of the random variable Y = exp (X), where X ~ N(μ, σ) has a normal distribution with mean μ and standard deviation σ. It can be shown that the density of LN(μ, σ) is,

$$f(x;\mu,\sigma) = \frac{1}{x\sigma\sqrt{2\pi}} e^{-(\log(x)-\mu_i)^2 / 2\sigma^2}, \quad x > 0 \tag{1}$$

The Gini coefficient G of LN(μ, σ) is given by,

$$G = 2\Phi(\sigma/\sqrt{2}) - 1 \tag{2}$$

where Φ is the distribution function of the standard normal distribution. Therefore, the parameters μ and σ of LN(μ, σ) can be determined from the mean E(Y) and the Gini coefficient G as follows,

$$\sigma = \sqrt{2}\Phi^{-1}[(G+1)/2], \qquad \mu = \log(E(Y)) - \sigma^2/2 \tag{3}$$

Three measures for the similarity of demand structures that calculate the overlap of the income distribution density functions between each pair of countries are proposed. $DS1_{ij}$ measures the overall similarity of the two countries populations in terms of real per capita incomes. First, the minimum overlap of the share of each country population that falls into a particular interval of the income per capita distribution is calculated. $DS1_{ij}$ is obtained as the sum over all intervals. It is symmetric (i.e. $DS1_{ij} = DS1_{ji}$) and ranges from 0 to 1. However, not only the overall similarity of the demand structure is of importance for trade, but also the number of potential customers. Hence, two additional measures of demand similarity are

[3] Holzmann, Vollmer and Weisbrod (2007) provide a discussion of the log-normal distributions goodness of fit for income per capita data.

proposed. To calculate $DS2_{ij}$ each countries log-normal density is multiplied by the respective populations, so that the areas are no longer equal to one but equal to each country population (right graph in figures 1 and 2). It can be interpreted as the number of people which have a match in the other country in terms of income per capita[4]. $DS2_{ij}$ is also symmetric (i.e. $DS2_{ij}=DS2_{ji}$). Finally, $DS3_{ij}$ is calculated as $DS2_{ij}$ divided by country *i*'s population and can be interpreted as the percentage of country *i*'s population that has a match in country *j*'s in terms of income per capita. $DS3_{ij}$ ranges from 0 to 1 but it is not symmetric.

Figures 1 and 2 illustrate the different concepts for a given pair of countries and for the years 1970 and 2003. China and the U.S. have been selected for this example. Note that the figures focus on the part of the graph where the two densities overlap; we have cut out an important part of China's distribution for a better visibility of the overlap. Recall that each density function has an area of one regardless of the countries size, so the overlap of two density functions can therefore be interpreted as the overall similarity of the two distributions. The overlap is calculated by numeric integration.

Let us now briefly illustrate the measures using China and the United States. In 1970 both the overlap and the population weighted overlap of the two densities are virtually zero, for about 825,000 people one match is found in the other country's population. All the mass of the U.S. density is right of the Chinese density, this means that the top percentile in the Chinese income distribution in 1970 was approximately as well off as the bottom percentile in the United States. This picture changes over time as the simple overlap and the population-weighted overlap both increase drastically from 1985 to 1995 and again from 1995 to 2003. In 2003 the overlap of the two densities is 22 percent. This corresponds to 128,216,000 people that have a match in the other country. Only 10 percent of the Chinese population, but as much as 44 percent of the U.S. population have a match in the other country's population. This makes China an extremely important market for the United States today (c.f. Table 1).

[4] We assume that every individual in country *i* can only have one match in country *j*.

3. Empirical strategy

3.1 Testable hypotheses

We aim to test a number of predictions derived from the model developed by Markusen (2010). The author builds a model with identical but non homothetic preferences extended with economies of scale and imperfect competition. The main predictions are:

1. With homothetic preferences aggregate income is all that matters in explaining bilateral trade flows. However if preferences are non-homothetic, then the elasticity of exports with respect to income per capita should be different from zero. It is not obvious in what direction, but, if traded goods are income elastics, then this elasticity should be positive. Consequently, holding constant aggregate income, there is a positive dependence of trade on per capita income because a higher per capita income leads to a shift in consumption towards the capital intensive good and to an increase in intra-industry trade, inter-industry trade being zero.

2. Under certain conditions, redistribution of income within a country does affect aggregate demand. Perfect aggregation does not hold with a wide distribution of household income and for two countries with the same average income, aggregate demand for the luxury will be higher in the country with the more unequal distribution.

3. There are higher markups and higher price levels in higher per capita income countries (high productivity economies). The markups can differ between countries even with zero trade costs because per capita income differences lead to a difference in their prices elasticities of demand.

Empirical evidence showing higher mark-ups and higher price levels in higher per capita income countries is reported by Simonovska (2009), Hsieh and Klenow (2007) and Wong

(2003). In the next sub-section we especially focus on testing the second and last predictions by estimating a gravity model of trade for sectoral trade.

3.2 Model specification

One of the main devices used to analyse the determinants of international trade flows is the gravity model of trade. A simple gravity equation augmented with income distribution variables and with the proposed index is specified and estimated for aggregated and disaggregated data.

According to the generalized gravity model of trade, the volume of sectoral exports between pairs of countries X_{ijk} is a function of their incomes (GDPs), their incomes per capita, their geographical distance, a set of dummies and a measure of income-distribution similarity, as shown by the equation

$$X_{ijk} = \beta_0 \; Y_i^{\beta_1} Y_j^{\beta_2} YH_i^{\beta_3} YH_j^{\beta_4} DIST_{ij}^{\beta_5} F_{ij}^{\beta_6} IDI^{\beta_7} \; u_{ijk}, \qquad (4)$$

where Y_i (Y_j) indicates the GDPs of the exporter (importer), YH_i (YH_j) are exporter (importer) GDP per capita, $DIST_{ij}$ measures the distance between the two countries' capitals (or economic centers), and F_{ij} represents any other factors aiding or preventing trade between pairs of countries. u_{ijk} is the error term. IDI states for within country and between countries income distribution variables. First, each of the income-distribution indices derived in the previous section is considered ($DS1_{ijt}$, $DS2_{ijt}$ and $DS3_{ijt}$). Alternatively, to compare our results with previous studies, absolute differences in per capita incomes has also been used (yhdif). Furthermore, the Gini inequality coefficients for each country (gini_it, gini_jt) are also used as explanatory variables to account for within country income differences.

For estimation purposes, and with a time dimension added, we first specify an augmented version of Model 4 in log-linear form given by:

$$\ln X_{ijkt} = \alpha_1 + \phi_{t1} + \chi_{i1} + \varphi_{j1} + \beta_{11} \ln Y_{it} + \beta_{21} \ln Y_{jt} + \beta_{31} \ln YH_{it} + \beta_{41} \ln YH_{jt} + $$
$$+ \beta_{51} \ln DIST_{ij} + \beta_{61} lang_{ij} + \beta_{71} border_{ij} + \beta_{81} IDI_{ijt} + \upsilon_{ijkt} \qquad (5)$$

where *ln* denotes variables in natural logs, X_{ikjt} are product *k* exports from country *i* to country *j* in period *t* at current US$. Note that IDI variables only vary over i and j when they measure between country income differences, whereas the Gini indices are specific for each country and year.

Y_{it}, Y_{jt} indicate the GDP of countries *i* and *j* respectively, in period *t* at constant PPP US$. YH_i and YH_{jt} denote the income per capita of countries *i* and *j* respectively, in period *t* at constant PPP US$ per thousand inhabitants. $DIST_{ij}$ is the greater-circle distance between countries *i* and *j*.

The model includes dummy variables for trading partners sharing a common language ($lang_{ij}$) and for pairs of countries with a common border (adj_{ij}). ϕ_t are specific time effects that control for omitted variables that are common for all trade flows and vary over time. χ_i and φ_i are exporter and importer effects that proxy for multilateral resistance factors. υ_{ijkt} denotes the error term that is assumed to be well behaved.

A high level of income in the exporting country indicates a high level of production, which increases the availability of goods for export. Therefore, we expect β_1 to be positive. The coefficient of Y_j, β_{21}, is also expected to be positive since a high level of income in the importing country suggests higher imports. The coefficients of income per capita of the exporters and the importers, β_{31} and β_{41}, should not be statistically different from zero if the world is characterized by homothetic preferences (Markusen, 2010, page 14). However, if preferences are non-homothetic, β_{31} and β_{41} may be negatively or positively signed, depending on the mix of goods demanded, which is different for each country. We should find positive coefficients if traded goods are income elastic, whereas if traded goods are income inelastic we could find negative coefficients. (In second place, we take into account different ways to control for unobserved heterogeneity recently suggested in the related literature, to fully account for omitted variable bias. Instead of adding fixed effects for each exporter and importer we first introduced dyadic-sectoral fixed effects. That is for each exporter-importer-industry. I this way we are able to control for factors that are specific to each trading-pair and industry but are time invariant. Next, we consider country-and-time effects to account for time-variant multilateral price terms, as proposed by Baldwin and Taglioni (2006) and Baier and Bergstrand (2007). As stated by Baldwin and Taglioni (2006), including time-varying country dummies should completely eliminate the bias stemming from the "gold-medal error" (the incorrect specification or omission of the terms that Anderson and van Wincoop (2003) called *multilateral trade resistance*). There are two main shortcomings associated to this approach. First, it involves estimation of *XMT* (*X*=exporters, M= Importers, *T*=years) dummies for unidirectional trade, in our case, (104*108*6) dummies. Nevertheless, within the panel we have *XM(M-1)T* observations and with *X* relatively large (104) there are still many degrees of freedom. Second, we cannot estimate the coefficients of GDP per capita variables and Gini inequality indices, since they are country specific and vary over time but not bilaterally.

The specification that accounts for the multilateral price terms in a panel data framework is given by

$$\ln X_{ijkt} = \alpha_2 - \ln P_{it}^{1-\sigma} - \ln P_{jt}^{1-\sigma} + \gamma_1 IDI_{ijt} + \gamma_2 lang_{ijt} + \gamma_3 border + \varepsilon_{ijkt} \tag{6}$$

where $P_{it}^{1-\sigma}$ and $P_{jt}^{1-\sigma}$ are time-varying multilateral (price) resistance terms, that will be proxied with *2NT* country and time dummies and ε_{ijt} denotes the error term that is assumed to be well behaved. The other variables are the same as in Equation 5, above.

Finally, a third alternative specification is based on Helpman, Melitz and Rubinstein (2008). The authors developed a two-stage estimation procedure that uses a selection equation in the first stage and a trade-flow equation in the second. They showed that the traditional estimates are biased and that most of the bias is due to the omission of the extensive margin (number of exporters), rather than to selection into trade partners. As a robustness check, and in line with Helpman et al. (2008), we also estimate the proposed system of equations. The first equation specifies the log of bilateral exports from country *i* to country *j* as a function of standard variables (distance, common language, island), dyadic fixed effects, and a variable $\omega_{ij,}$ that is an increasing function of the fraction of country *i* firms that export to country *j*. The second equation specifies a latent variable that is positive only if country *i* exports to country *j*. The resulting equations are

$$\ln X_{ijkt} = \alpha_3 + \omega_{ij} + \phi_{t3} + \chi_{i3} + \varphi_{j3} + \beta_{13} \ln Y_{it} + \beta_{23} \ln Y_{jt} + \beta_{33} \ln YH_{it} + \beta_{43} \ln YH_{jt} + \\ + \beta_{53} \ln DIST_{ij} + \beta_{73} border_{ij} + \beta_{83} IDI_{ijt} + \mu_{ijkt} \tag{7}$$

and

$$z_{ijkt} = \theta_0 + \zeta_t + \varsigma_i + \xi_j + \theta_1 \ln Y_{it} + \theta_2 \ln Y_{jt} + \theta_3 \ln YH_{it} + \theta_4 \ln YH_{jt} + \\ + \theta_5 \ln DIST_{ij} + \theta_6 com\_lang_{ij} + \theta_7 border_{ij} + \theta_8 IDI_{ijt} + \eta_{ijkt} \tag{8}$$

where ς_i are fixed effects of the exporting country, ξ_j are fixed effects of the importing country, and ϕ_{t3} and ζ_t denote time-specific effects. The new variable, $\omega_{ij,}$ is an inverse function of firm productivity. The error terms in both equations are assumed to be normally distributed: $\mu_{ijkt} \sim N(0,\sigma^2_\mu)$, $\eta_{ijkt}= (\mu_{ijkt}+ \nu_{ijkt}) \sim N(0, \sigma_\mu + \sigma_\nu)$. Clearly, the error terms in both equations are correlated, therefore we will also correct for the sample selection introducing the inverse Mills ratio in equation (8). Helpman et al. (2008) construct estimates of the ω_{ij}s using predicted components of Equation 8. They proposed a second stage non-linear estimation that corrects for sample selection bias and for firm heterogeneity bias. They also decompose the bias and find that correcting only for firm heterogeneity addresses almost all the biases in the standard gravity equation. They implement a simple linear correction for unobserved heterogeneity by adding

$$\hat{z}^*_{ijk} = \phi^{-1}(\hat{\rho}_{ijk}) \tag{9}$$

where $z^{*}_{ijk} = \frac{z_{ijk}}{\sigma_{\eta}}$ and ϕ (.) is the cdf of the unit-normal distribution. $\hat{\rho}_{ijk}$ is the predicted probability of exports from country j to country i, using the estimates from the panel-probit Equation 8. We decomposed the bias and used the inverse Mills ratio as a proxy for sample selection and the linear prediction of exports as a proxy for firm heterogeneity, both obtained from Equation 8.

3.3 Estimations and results

Different versions of the models specified in the previous section are estimated for disaggregated exports (ISIC 3-digits) using a sample of 104 exporter and 108 importers for which income distribution data are available. The period under study is from 1980 to 2003 and we are considering data for 1980, 1985, 1990, 1995, 2000 and 2003. The descriptive statistics presented in tables 1 and 2 indicate that income overlap patterns that account for income distribution within countries incorporate valuable information that averages values (differences in income per capita) are not able to capture. Hence, the income-overlap indices are introduced in a gravity model to evaluate its effect on the flows of export between countries. According to the theory, a similar within-income-distribution between countries is expected to have a positive effect on bilateral exports. Similarity in income-distributions is also expected to be more important for differentiated goods than for homogenous goods.

Some authors divided products into different subgroups according to the definitions by Rauch (1999). This classification has been widely used in empirical studies using sectoral trade data such as Feenstra, Markusen and Rose (2001) and Tang (2006). Rauch (1999) divides internationally traded goods into three groups: Goods traded on organised exchanges, goods not traded on organised exchanges but possessing what he refers to as reference prices and finally all other goods. Goods in the two first categories could be considered as homogeneous goods whereas those in the third one could be considered as differentiated goods. According to Dalgin, Trindade and Mitra (2008) a classification that distinguishes among necessities and luxuries would be desirable to study the relationship between income inequality and trade. They construct such a classification based on US household data for 2001. The classification is more appropriate for developed countries with similar income levels to the US. Since we use a sample of more than a hundred countries, this classification is not used. Instead, we decided to take advantage of the 3-digit level classification and do a separate analysis for 9 different 2-digit categories.

The estimates are calculated at the ISIC 3-digit level since that involves fewer observations taking the value of zero. In estimating the gravity models we apply the different estimation techniques outlined above to explore the robustness of our results. Panel-fixed-effect estimations and Heckman estimations are applied. Several previous studies used Tobit estimates as a means to include trade links where there is no trade (Hallak, 2006 and McPherson et al., 2000). However, Tobit estimates are very sensitive to non-normal distributions of the dependent variable and are not accounting for selection bias. Instead, we use the procedure proposed by Heckman and also the one proposed more recently by Helpman et al (2008). This is important because accounting for links where export specific products are not observed (that is the case using disaggregated exports) result in considerable amounts of zero observations. In addition we also estimate a generalized linear model using the Poisson and the gamma distributions, as an alternative way of including the zero trade flows in our estimations.

Table 2 presents summary statistics of the main variables used in the analysis. Our main focus in on income per capita, within country income inequality and between country income-similarity variables (Indices DS1, DS2 and DS3 described above).

Table 3 presents the results for all categories of goods with the three indices proposed and also with additional variables measuring income differences and inequality that have been used before in the literature namely, absolute differences in per capita income and Gini coefficients. The model is estimated using country, industry and year fixed effects and with robust standard errors clustered across industries. Income per capita variables show very stable coefficients that are always positive and statistically significant at the one percent significance level. The coefficient of the exporter is higher than one indicating a more-than-proportional effect of income per capita on exports, whereas the coefficient of the importer is around 0.90 indicating that a ten percent increase in income per capita raises exports by 9 percent. Consequently, this provides evidence supporting the first hypothesis: holding constant aggregate income, there is a positive dependence of trade on per capita income.

In addition, the effect of the income-similarity indices on trade is always positive and significant. With respect to index 1, an increase in 1 percentage point increases exports by 0.85%, whereas with respect to DS2 an increase in 1 percent of the population with similar income in both countries raises exports by 0.41 percent. Finally, with respect to DS3 a 1 % increase in similarity of income as the share of the population of country *i* increases exports by 0.64 percent. It is also worth noting that the effect of the indices on exports is also varying over time.

The last two columns of Table 3 show the results of adding income per capita differences and Gini inequality indices instead of the between-countries income-similarity variables as regressors. As already found in previous studies, the absolute difference in per capita income is negatively related to exports, indicating that a 10 percent increase in income per capita differences reduces exports by 3.6 percent. Results in column 6 show that the coefficient of the Gini inequality index is positive for both the exporter and the importer country, but only statistically significant for the importer. Hence, a decrease in inequality of the importer country (higher Gini index) of 10 percentage points increases exports by approximately 4.9 percent. Since the average Gini coefficient is 0.44 and the maximum is 0.79, reducing the Gini coefficient by 35 percentage points will raise exports by around 17 percent.

Secondly, Table 4 presents estimates for different categories of goods and considering DS1 (similar results were obtained with DS2 and DS3). Our main interest here is the sign and significance of the income per capita, the income-distribution similarity and the Gini variables. With respect to income per capita variables, the estimated coefficients are positive and significant for all sectors, but the magnitude differs. Whereas for Food Products, Beberages and Tobacco the elasticities are below unity for exporter and importer, the magnitude increase with the degree of sophistication for other products, specially the one corresponding to the exporter country. For example, for Chemical products the elasticity of exports with respect to GPD per capita of the exporter is 1.5 and for Transport Equipment is 2.1.

A similar pattern is observed concerning the relationship between exports and demand overlap, the coefficient of DS1 also increase with the degree of sophistication (e.g. Chemical products, Transport equipment and Machinery also show larger coefficients, above one, compared to the results from regressions made on more homogeneous goods Textiles and Footwear, Wood and Paper, Iron and Steel). This difference is statistically significant for all specifications. For example, for Transport equipment and Machinery, as well as for Machinery and other Manufactures the estimated coefficient for DS1 is higher than one, whereas for Food Products and Textiles and Footwear it is around 0.62. Similar differences are obtained using the other two indices considered.

The Gini indices show that concerning inequality of the exporter country, the estimates are only significant for two sectors: Beberages & Tobacco and Transport Equipment. The negative coefficient indicates that a more equal distribution of income (higer Gini index) decreases exports. Hence exporting countries with higher inequality levels tend to export more. Conversely, with respect to the level of inequality of the importer, for most sectors a more equal distribution of income is associated with higher exports, specially for sectors 311, 313, 32, 35 and 384, for which the coefficient is statistically significant at conventional levels. Hence, we are not able to show evidence indicating that aggregate demand for any of the sectors is higher in countries with more unequal distribution. Indeed, we are not able to distinguish luxury goods from the rest and this could be the reason why we are not able to find evidence supporting the *second hypothesis*.

Thirdly, we estimate the gravity model using export unit values instead of export values as dependent variable. Assuming that those are a proxy for export prices, we aim to find some evidence with respect to the *third hypothesis* stating that there are higher markups and higher price levels in higher per capita income countries (high productivity economies). First we estimate the model for all sectors and then also for each of the nine sectors considered. The main results are shown in Table 5. When the model is estimated for all sectors the effect of income per capita of the importer and the exporter on bilateral export prices is not statistically different from zero. Thus, countries with higher standard of living do not seem to charge higher prices in exports markets. However the effect of within country inequality on export unit values is positive and significant for the exporter indicating that for a given income and income per capita, countries with a more unequal income distribution export higher priced goods, whereas it is negative and significant for the importer showing that higher income inequality in the destination market is associated with lower export prices. Finally our between-country similarity index shows a negative average coefficient, indicating that countries with a more similar income distribution export at lower prices than countries with less similar income distributions.

Next, we estimate equations 2 and 3 for high income OECD (HOECD) countries and for the rest separately. The first part of Table 6 (columns 1 to 5) shows the results for HOECD countries from estimating Equation 2, with country, year and sectoral dummies, whereas the second part of the table (columns 6-10) shows the results when exporter-and-time and importer-and-time dummies are added as explanatory variables as specified in Equation 3. The hypothesis of higher income per capita associated to higher exports is confirmed only for per capita income in the destination market, which shows a coefficient higher than one significant at one percent level. However the coefficient of income per capita in the exporter country is not statistically significant. The second part of Table 7 shows only the estimates for the variables that have bilateral variation, which means that the effects of income and income per capita variables are subsumed into the country-and-time fixed effects. The coefficients estimated for the similarity indices are positive and significant showing that for the sample restricted to high-income OECD countries (19 countries) income similarities foster exports as well as for the whole sample.

Finally, we estimated similar equations for the rest of countries, obtaining different results for the income per capita variables that are now also significant for the exporter country and smaller in magnitude but also significant for the destination market. Table 7 shows the results of estimating equation 2. The main differences with respect to HOECD countries are that now higher income per capita differences are significantly associated with lower bilateral trade, whereas higher levels of inequality are associated with higher volumes of bilateral exports (*hypothesis 2*).

4. Robustness

In order to test for the robustness of our results, several additional estimations are considered. First, we take the zero flow observations into account. Results from four different estimation techniques are presented in Tables 8 and 9. Columns 1 and 2 (Tables 8 and 9) report the first and second step results from estimated a Heckman selection model. Columns 3 and 4 (Tables 8 and 9) report the first and second step results from estimated a Helpman et al. (2008) model. We find significant and positive selection bias[5], which is in accordance with previous research (e.g. Helpman et al, 2008; Hallak, 2006). In addition the estimates that account for firm heterogeneity (zhat1 and zhat2) are also positive and statistically significant, indicating that there is also a positive bias steaming from the differences in productivity across firms. The main results concerning the effect of income distribution similarities on

[5] The test for selection bias is the t-statistic of the inverse Mills ratio in the first step (behavioral) equation, which is highly significant and positively signed.

trade remain almost unchanged with respect to the log-linear model (Table 2). For example, results in Table 9 using the log of DS2 indicate that the effect of a 10 % increase in income-distribution similarities increases exports by 3.9 % according to the log-linear model (excluding zero trade) and by 4% according to the Heckman and Helpman et al. models and by 3.6% according to the gamma specification. The results concerning DS1 (Table 8) and DS2 are also very similar. With respect to the behavioural equation (step 1), most variables that impact the amount exported also affect the probability that country i exports to country j (the country level extensive margin). Specifically, increases in DS1, DS2 and income per capita increase the probability of exporting. Since in terms of root mean squared error and according to both information criteria, the results obtained with DS2 are better, we use only this index for the two following robustness checks.

Second, we estimated a dynamic model adding lagged exports as an additional regressor and estimating the equation using Arellano and Bond difference GMM estimator. The results for all countries are shown in Table 10. Once more, with respect to the variables of interest DS2, the long-run estimated coefficient is 0.23 (=0.137/(1-0.368-0.05)) that is in line with previous results.

Finally, we try also with different sets of fixed effects. We add dyadic fixed effects in addition to year and sectoral effects. The results are shown in Table 11.

5. Conclusions

In this paper we present empirical evidence supporting the hypothesis of non-homothetic preferences stated by Markusen (2010). We also propose three alternative measures of income distribution similarity between countries. These measures are used to proxy for demand similarities between pairs of countries across trading partners and over time. Trade theory in conjunction with some stylized empirical facts indicates that preferences are non-homothetic; not only the average income but also the distribution of income should influence aggregate demand. Ideally, the full distribution of income should be considered when demand similarities between countries are measured.

Using the three distribution-based measures as a proxy for demand similarities in gravity models, we find consistent and robust support for the hypothesis stating that countries with more similar income-distributions trade more with each other. The hypothesis is also confirmed at disaggregated level, both for homogenous and for differentiated product categories. The larger the overlap in income distribution between two countries the higher will be the extent of trade between the two. In line with the theoretical predictions we also find that income per capita has a stronger effect for more sophisticated goods in comparison with more homogenous ones.

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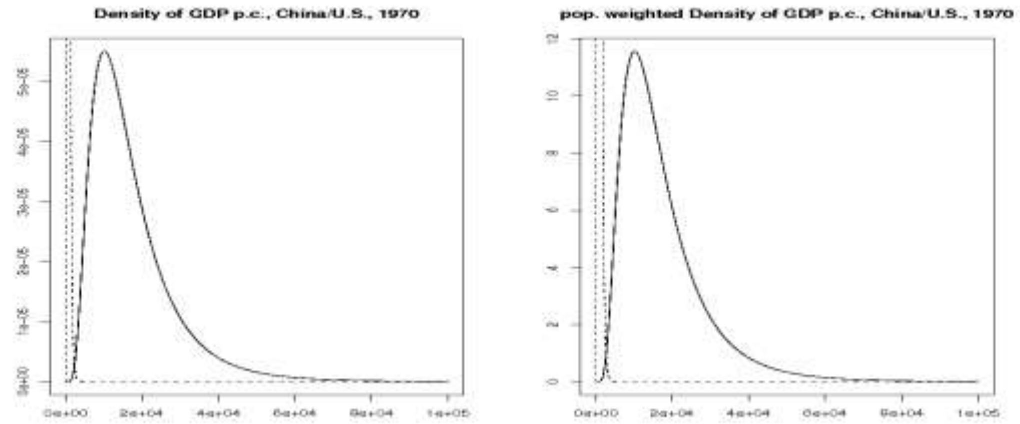
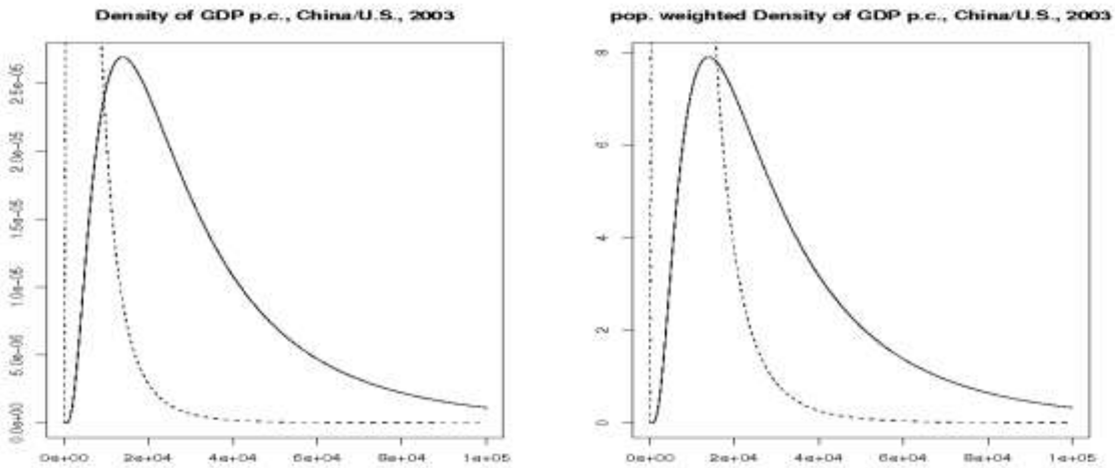
Figure 1 Illustration of Overlaps for China and the U.S., 1970



Left figure: Density of GDP p.c. for China (dashed line) and the U.S. (solid line). Right figure: Density of GDP p.c. For China (dashed line) and the U.S. (solid line) multiplied by population size.

Figure 2 Illustration of Overlaps for China and the U.S., 2003



Left figure: Density of GDP p.c. for China (dashed line) and the U.S. (solid line). Right figure: Density of GDP p.c. For China (dashed line) and the U.S. (solid line) multiplied bypopulation size.

Table 1 Development of the different measures over time (example China and the U.S.)

Year	DS1	DS2	DS3 CHN	DS3 USA
1970	.002	825	.001	.004
1975	.004	1462	.002	.007
1980	.008	3574	.004	.015
1985	.023	9599	.009	.039
1990	.054	26079	.023	.102
1995	.114	58117	.048	.216
2000	.165	88347	.070	.311
2003	.221	128216	.100	.438

DS 1 and 3 are index values (range 0 to 1). DS 2 is measured in thousands of people.

Table 2. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lx	481766	5.852	3.176	-0.691	18.014
lxuv	450810	5.340	1.990	20.504	11.775
DS1	645960	0.448	0.292	0.000	0.998
DS2	645960	8.310	1.373	1.569	17.963
DS3	645960	0.403	0.359	0.000	1.000
lyc	645960	30.121	3.026	20.405	36.394
lyd	645960	30.107	2.983	20.405	36.394
lyhc	645960	9.014	1.035	6.186	10.460
lyhd	645960	8.806	1.110	5.884	10.460
ldist	645960	8.675	0.838	1.792	9.899
lgini	645960	-1.692	0.303	-2.768	-0.510
gini_i	645960	0.433	0.091	0.238	0.792
gini_j	645960	0.444	0.097	0.238	0.792

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1, DS2 and DS3 are described in Section 2 and are different measures of income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index.

Table 3. Income similarity and exports (Equation 2)

	Baseline	Index 1	DS2	DS3	yh diff	gini coeff
	m0	**m1**	**m2**	**m3**	**m4**	**m5**
DS1		0.855				
		12.747				
DS2			0.41			
			17.317			
DS3				0.644		
				11.041		
lyhdif					-0.363	
					-13.241	
gini_i						0.229
						1.133
gini_j						0.495
						3.094
lyhc	1.272	1.253	1.279	1.282	1.269	1.268
	11.465	11.106	11.17	11.392	11.068	11.385
lyhd	0.955	0.874	0.818	0.884	0.786	0.952
	21.712	19.942	18.238	20.52	17.37	21.53
lyc	0.01	0.01	0.009	0.01	0.008	0.01
	2.976	2.897	2.876	3.00	2.523	3.045
lyd	0.003	0.002	0000	0.001	0.001	0.002
	1.447	1.144	0.135	0.627	0.592	1.34
ldist	-1.303	-1.235	-1.212	-1.265	-1.225	-1.304
	-32.532	-32.192	-32.467	-31.846	-32.451	-32.605
border	0.829	0.699	0.691	0.764	0.665	0.83
	20.75	17.636	17.198	19.934	16.539	20.689
com_lang	0.869	0.828	0.873	0.85	0.846	0.867
	12.909	12.728	13.031	12.85	12.886	12.837
R^2	0.54	0.544	0.547	0.542	0.546	0.54
N	481766	481766	481766	481766	481766	481766
ll	1053004	1050938	1049194	1052170	1049955	1052987
rmse	2.153	2.144	2.136	2.149	2.139	2.153
aic	2106061	2101930	2098442	2104394	2099965	2106028
bic	2106361	2102229	2098741	2104693	2100264	2106328
Country and Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
ISIC 3D dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: l indicates natural logarithms..DS1, DS2 and DS3 are described in Section 2 and are different measures of income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Border and com_lang are dummy variables that take the value of one when a pair of countries share a common border or a common language. Yhdif denotes the absolute value of income per capita differences.

Table 4. Sectoral results (INDEX 1)

Food Products	**Beverages &Tobacco**	**Textiles and Footwear**	**Wood, paper**	**Chemicals, Rubber, Plastic**	**Pottery, Glass, ceramic products**	**Iron, steel. Other metals**	**Transport equipment**	**Machinery and other manufactures**
	m311	**m313**	**m32**	**m33**	**m35**	**m36**	**m371**	**m384**
DS1	0.635	0.703	0.623	0.791	0.995	1.016	0.719	1.164
	8.265	6.233	10.646	13.452	18.024	16.863	8.932	14.23
gini_i	-0.168	-1.15	0.333	-0.142	0.371	0.318	-0.284	-0.901
	-0.372	-1.975	1.038	-0.417	1.259	0.764	-0.588	-1.584
gini_j	1.591	0.945	1.442	0.329	0.544	0.187	-0.232	1.351
	3.799	1.901	5.38	1.188	2.347	0.657	-0.573	3.031
lyc	0.007	0.000	0.016	0.017	0.007	0.02	-0.002	0.001
	1.11	-0.013	4.034	3.991	1.712	4.037	-0.335	0.123
lyd	-0.004	0.017	0.001	-0.001	0.006	-0.006	0.009	0.002
	-0.681	2.264	0.228	-0.406	2.038	-1.372	1.454	0.268
lyhc	0.596	0.52	1.11	1.122	1.5	1.119	0.969	2.109
	5.256	3.397	14.883	14.791	22.921	12.499	8.778	15.442
lyhd	0.762	0.592	0.941	0.978	0.632	0.827	1.018	0.986
	8.559	5.578	15.763	16.288	13.099	13.235	12.296	9.633
ldist	-1.287	-1.072	-1.091	-1.349	-1.223	-1.305	-1.478	-1.259
	-39.002	-27.38	-45.837	-58.407	-53.649	-54.271	-48.415	-33.957
border	0.817	0.708	0.761	0.589	0.595	0.778	0.241	0.929
	5.939	4.787	8.921	7.074	7.093	8.216	2.155	6.645
com_lang	0.823	0.536	0.792	0.966	0.627	0.742	0.683	0.98
	11.652	5.927	15.165	18.443	12.74	13.69	9.3	12.967
cons	6.133	1.668	-6.169	-4.664	-4.763	-4.228	0.73	-12.31
	4.649	0.985	-6.633	-5.146	-6.18	-4.165	0.571	-7.786
R-squared	0.603	0.446	0.49	0.524	0.448	0.548	0.551	0.677
N	23435	20108	69078	66683	97443	44734	31454	20158
ll	-47785.36	-44020.52	-152578.6	-144029.4	-219316.9	-91381.14	-67694.78	-41935.77
rmse	1.868	2.172	2.206	2.1015	2.3001	1.871	2.089	1.948
aic	96020.72	88487.03	305605.1	288508.8	439083.9	183204.3	135839.6	84319.54
bic	97834.67	90250.71	307653.2	290558	441218.5	185128.9	137719.7	86091.69
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
X, M dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sectoral dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1 is described in Section 2 and measures income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. The ISIC trade classification has been used. Border and com_lang are dummy variables that take the value of one when a pair of countries shares a common border or a common language.

Table 5. Export unit values and income variables

		Food Products	Beverages& Tobacco	Textiles and Footwear	Wood, paper	Chemicals, Rubber, Plastic	Pottery, Glass , ceramic	Iron, steel. Other metals	Transport equipment	Machinery and other manufactures
	All Sectors	**m311**	**m313**	**m32**	**m33**	**m35**	**m36**	**m371**	**m384**	**m38**
DS1	-0.11	0.14	0.14	0.07	-0.10	-0.10	-0.15	-0.21	0.10	-0.28
	-2.67	4.06	2.08	2.45	-2.42	-2.48	-3.14	-4.08	1.55	-6.89
gini_i	1.23	0.00	2.43	1.98	0.47	0.73	1.09	0.18	0.87	1.58
	4.66	0.00	4.08	9.85	1.92	3.32	3.47	0.69	1.37	6.44
gini_j	-0.25	-0.35	-0.52	0.20	-0.13	-0.27	-0.23	-0.58	-0.06	-0.39
	-3.62	-1.81	-0.98	1.38	-0.71	-1.76	-1.02	-2.41	-0.15	-2.25
lyc	0.01	0.01	0.02	0.00	0.01	0.01	0.03	0.01	0.02	0.02
	3.52	1.92	1.99	1.13	1.85	3.56	6.10	1.05	1.59	4.93
lyd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.46	0.76	-0.19	-0.50	1.49	0.29	1.10	0.27	-0.34	-0.34
lyhc	-0.13	0.14	0.56	-0.19	0.05	-0.09	0.09	0.11	-0.47	-0.58
	-1.34	2.52	3.45	-4.52	0.94	-1.90	1.14	1.67	-3.15	-9.91
lyhd	0.00	0.01	0.06	0.16	-0.07	-0.04	0.07	-0.05	0.06	-0.10
	0.13	0.14	0.49	4.93	-1.62	-1.26	1.33	-1.02	0.57	-2.38
ldist	0.23	0.21	0.18	0.05	0.23	0.33	0.44	0.29	0.22	0.25
	9.85	15.85	7.98	4.82	13.74	22.17	20.87	14.94	8.33	15.16
border	-0.15	-0.14	-0.30	-0.12	-0.13	-0.15	-0.18	0.01	-0.05	-0.14
	-5.69	-2.77	-3.59	-3.03	-2.31	-2.94	-2.46	0.18	-0.54	-2.47
com_lang	-0.03	0.05	-0.04	0.01	0.01	0.01	-0.02	0.05	-0.05	-0.19
	-1.05	1.70	-0.72	0.23	0.17	0.23	-0.34	1.12	-0.87	-5.33
cons	-8.57	-10.71	-16.33	-5.70	-8.32	-8.21	-13.55	-9.69	-4.37	-1.04
	-9.03	-17.20	-8.78	-11.19	-13.13	-15.47	-15.26	-13.36	-2.57	-1.54
R^2	0.40	0.29	0.21	0.32	0.14	0.14	0.27	0.19	0.52	0.25
N	450810	22691	19306	65161	61353	92020	40969	30443	18891	82193
ll	-835692.00	-30878.75	-38506	-104472	-110765	-174557.4	-76190.3	-51226.6	-38992.1	-162657.7
rmse	1.55	0.95	1.79	1.20	1.47	1.61	1.56	1.31	1.92	1.75
aic	1671438.00	62205.49	77456.77	209390.60	221977.90	349562.80	152820.70	102901.40	78428.17	325763.40
bic	1671735.00	64004.15	79203.50	211416.50	223999.40	351675.10	154717.30	104765.80	80170.08	327850.40
Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

dummies										
X,M dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1is described in Section 2 and measures income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. The ISIC trade classification has been used.

Table 6. Trade and income similarity in OECD countries. Estimation of equations 2 and 3

HOECD							**HOECD with X-t and M-t dummies**					
	m0	**m1**	**m2**	**m3**	**m4**	**m5**		**m1**	**m2**	**m3**	**m4**	**m5**
DS1		0.191					**DS1**	0.149				
		1.535						1.374				
DS2			0.274				**lDS2**		0.275			
			8.627						8.437			
DS3				0.332			**DS3**			0.341		
				5.597						5.604		
lyhdif					-0.072		**yhdif**				-0.038	
					-1.022						-0.446	
gini_i						-1.99	**ginidif**					1.241
						-4.168						3.841
gini_j						1.378						
						4.634						
lyhc	0.037	-0.006	0.001	0	0.012	0.066						
	0.186	-0.027	0.007	0	0.06	0.33						
lyhd	1.435	1.39	1.394	1.408	1.409	1.412						
	17.53	15.097	16.884	17.119	15.909	17.132						
R-squared	0.703	0.703	0.704	0.703	0.703	0.703	**R-squared**	0.708	0.709	0.708	0.708	0.708
N	54245	54245	54245	54245	54245	54245	**N**	54245	54245	54245	54245	54245
ll	-103359.5	-103357.4	-103245.1	-103338.3	-103358.6	-103331.5	**ll**	-102824.6	-102708.5	-102803.1	-102825.5	-10281
ISIC 3D dummies	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
Country and year Dummies	Yes	Yes	Yes	Yes	Yes	Yes						

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1, DS2 and DS3 are described in Section 2 and are different measures of income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Yhdif denotes the absolute value of income per capita differences.

Table 7. Trade and income similarity in Non OECD countries.

NON-OECD						
	m0	**m1**	**m2**	**m3**	**m4**	**m5**
DS1		0.156				
		1.625				
DS2			0.323			
			8.24			
DS3				-0.07		
				-0.849		
lyhdif					-0.118	
					-2.996	
gini_i						1.482
						3.878
gini_j						0.100
						0.325
lyhc	1.324	1.337	1.422	1.322	1.356	1.301
	12.37	12.172	12.626	12.326	12.13	12.158
lyhd	0.597	0.581	0.578	0.598	0.552	0.591
	8.531	8.143	8.136	8.563	7.607	8.463
lyd	-0.001	-0.002	-0.001	-0.001	-0.002	-0.002
	-0.428	-0.464	-0.35	-0.415	-0.582	-0.54
lyc	-0.002	-0.002	-0.001	-0.002	-0.002	-0.004
	-0.298	-0.305	-0.187	-0.293	-0.324	-0.534
ldist	-1.118	-1.113	-1.079	-1.119	-1.111	-1.12
	-20.875	-21.381	-21.23	-21.001	-21.302	-20.889
border	0.827	0.818	0.83	0.83	0.805	0.829
	21.662	22.386	21.558	22.108	22.021	21.849
com_lang	0.629	0.631	0.609	0.631	0.633	0.622
_cons	-1.17	-1.275	-5.327	-1.126	-1.004	-1.527
	-0.896	-0.976	-3.916	-0.869	-0.764	-1.18
R-squared	0.395	0.395	0.398	0.395	0.396	0.396
N	133582	133582	133582	133582	133582	133582
ll	-294501.2	-294493.3	-294178.7	-294499.5	-294460.2	-294472.8
rmse	2.196	2.195	2.190	2.195	2.195	2.1955

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1, DS2 and DS3 are described in Section 2 and are different measures of income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Yhdif denotes the absolute value of income per capita differences.

Table 8. Considering also zero trade (DS1)

	Heckman 1	Heckman2	Probit	Helpman et al.
DS1	0.268	0.921	0.47	0.928
	27.778	61.05	26.951	60.46
lyc	0.002	0.008	0.004	0.008
	1.943	3.926	1.893	3.76
lyd	-0.004	0.001	-0.006	0.001
	-3.076	0.487	-2.837	0.29
lyhc	0.07	1.234	0.179	1.235
	4.062	40.815	5.688	39.47
lyhd	0.377	0.812	0.662	0.813
	27.301	36.323	26.386	35.21
ldist	-0.486	-1.225	-0.864	-1.232
	-126.157	-171.292	-124.59	-167.1
border	0.279	0.717	0.492	0.734
	18.587	34.994	18.35	34.91
com_lang	0.401		0.692	
	51.362		50.067	
zhat1				0.014
				3.744
invmills2				0.461
				7.808
lambda		0.279		
		8.925		
cons	0.777	-3.586	0.805	-3.847
	3.754	-10.382	2.154	-10.478
R-squared				0.422
N	645960	481443	645296	481443
ll			-219347.4	-1107311
rmse				2.41398
aic			439138.9	2215068
bic			441664.7	2217540

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS1is described in Section 2 and measures income similarity between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Border and com_lang are dummy variables that take the value of one when a pair of countries share a common border or a common language.

Table 9. Considering also zero trade (DS2)

	exp_tv Heckman 1	lx Heckman2	exp_tv Probit	lx Helpman et al.	exp_tv Poisson	exp_tv Gamma
DS2	0.16	0.405	0.099	0.407	0.079	0.362
	26.797	74.974	31.476	74.088	2.299	29.407
lyc	0.004	0.008	0.002	0.008	0.015	0.011
	1.891	3.846	1.972	3.689	1.653	1.886
lyd	-0.007	-0.001	-0.004	-0.001	0.005	0.007
	-3.016	-0.477	-3.306	-0.672	0.745	1.721
lyhc	0.197	1.258	0.08	1.259	1.246	1.333
	6.268	41.652	4.653	40.388	9.058	17.39
lyhd	0.669	0.777	0.378	0.778	0.979	0.64
	26.656	34.755	27.41	33.766	8.631	13.001
ldist	-0.855	-1.232	-0.48	-1.239	-0.677	-1.031
	-122.341	-174.022	-123.791	-169.226	-47.441	-80.667
border	0.503	0.736	0.281	0.752	1.143	0.743
	18.821	36.057	18.808	36.001	20.643	19.883
com_lang	0.714		0.414		-0.04	0.675
	51.768		53.155		-0.808	24.971
zhat2				0.013		
				3.399		
invmills		0.413		0.58		
		13.248		9.776		
cons	-0.738	-6.771	-0.176	-7.016	-8.373	-5.317
	-1.944	-19.451	-0.838	-18.963	-5.692	-6.596
R-squared				0.424		
N	645296	481443	645960	481443	645960	645960
ll	-219326			-1106366	-1.73E+10	-5431013
rmse				2.409249		
aic	439096			2213179	3.46E+10	1.68E+01
bic	441621.8			2215651	3.46E+10	-6.23E+06

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS2 is described in Section 2 and measures income similarity between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Border and com_lang are dummy variables that take the value of one when a pair of countries share a common border or a common language.

Table 10: Difference GMM

	m1
	b/t
lx(-1)	0.368
	49.386
lx(-2)	0.05
	13.402
DS2	0.137
	3.504
gini_i	0.412
	2.007
gini_j	0.76
	5.209
lyc	-0.002
	-1.209
lyd	0.003
	1.917
lyhc	-0.082
	-1.984
lyhd	1.344
	30.49
t4	0.027
	2.724
t5	-0.282
	-18.996
t6	-0.245
	-14.772
cons	-8.361
Ar(1) p	0.00
Ar(2) p	0.10
N	223244

Note: l indicates natural logarithms. x indicate bilateral exports, luv is the unit value of exports, DS2 is described in Section 2 and measures income similarity between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Gini denotes the Gini inequality index.

Table 11. With exporter-importer-sectoral and time fixed effects

	fe0	fe2	fe4	fe5
	b/t	b/t	b/t	b/t
DS2		0.211		
		13.224		
gini_i		-0.944		-0.618
		-8.344		-5.633
gini_j		1.039		1.21
		11.972		14.03
lyhdif			-0.224	
			-10.284	
lyhc	1.439	1.461	1.442	1.454
	53.457	53.567	53.595	53.207
lyhd	1.495	1.367	1.329	1.486
	77.284	63.677	51.839	76.831
lyc	0.013	0.011	0.012	0.012
	8.717	7.855	8.419	8.053
lyd	0.004	0.003	0.004	0.004
	3.222	2.05	2.907	3.052
t2	-0.226	-0.229	-0.211	-0.228
	-26.484	-26.549	-24.436	-26.373
t3	0.18	0.167	0.219	0.171
	16.701	15.479	19.266	15.851
t4	0.515	0.493	0.569	0.504
	40.561	38.69	41.653	39.553
t5	0.318	0.3	0.395	0.307
	20.054	18.964	22.694	19.377
t6	0.404	0.383	0.485	0.394
	23.766	22.576	26.089	23.174
cons	-21.3	-22.145	-19.623	-21.603
	-73.227	-75.235	-58.886	-74.088
R-squared	0.214	0.216	0.215	0.215
N	481766	481766	481766	481766
ll	-759940.4	-759487.3	-759785.8	-759697.8
rmse	1.1717	1.1706	1.1713	1.1711

Note: l indicates natural logarithms. DS2 is described in Section 2 and measures income similarities between pairs of countries, lyc, lyd and lyhc, lyhd are GDPs and GDPs per capita of exporter (c) and importer (d) countries. Ldist is distance between trading partners and gini denotes the Gini inequality index. Yhdif denotes the absolute value of income per capita differences.