

# INEQUALITY, NONHOMOTHETIC PREFERENCES, AND TRADE: A GRAVITY APPROACH\*

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We construct the first *direct* classification of goods as luxuries or necessities that is compatible with international trade data. We then use it to test an idea that has not been tested directly in the literature: countries' income distributions are important determinants of their import demand, and in particular of the difference in their import demands of luxuries versus necessities. We interpret this result with the aid of a model in which preferences are nonhomothetic, thus relaxing a long-held and standard – but empirically dubious – assumption in the theory of international trade. Our model is strongly borne out by the results: imports of luxuries increase with importing country's inequality, and imports of necessities decrease with it. Our calculations imply that if income distribution in the United States became as equal as in Canada, the US would import about 9 – 13% less in luxury goods and 13 – 19% more in necessity goods.

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# 1 Introduction

One basic tenet of the standard theory of international trade is that tastes are homothetic. For a long time this was a convenient simplification because, along with the assumption that tastes are also identical across countries, it allowed trade theorists to concentrate on the *supply side* as an explanation for the causes of international trade. However, what started out as a convenient modeling technique propagated into virtually all empirical work in international trade, regardless of whether the assumption on homotheticity is empirically tenable or not. This is problematic because, as we review in more detail below, there is consistent and robust evidence that tastes cannot properly be considered to be homothetic. In particular, one conclusion from accepting the nonhomotheticity of tastes is that income distribution and income per capita become arguments for the aggregate demand function. Since one country's international trade is given by its aggregate supply minus its aggregate demand, we conclude that income distribution and income per capita are important determinants of international trade *from the demand side*.<sup>1</sup> This effect has been almost completely absent from the empirical trade literature.<sup>2</sup> In particular, as we shall argue, the standard gravity model, which has been used widely to explain trade flows among countries, can only be considered to be complete if it does include income distribution and income per capita as explanatory variables.

Specifically, we propose in this paper to demonstrate the role that income distribution plays in international trade, while also controlling for income per capita. To enhance the persuasiveness of our results it is crucial that we rely on the most standard and successful empirical model of trade, the gravity model mentioned above. Thus we are quite purposeful in excluding the possibility that our results stem in any way from an innovation in the methodology. The gravity model, which explains the volume of trade by the economic masses of the trading partners and the distance between them, has been remarkably successful. In practical applications, researchers sometimes call its use the "modified gravity methodology" because, depending on the question that the researcher intends to ask, she modifies the basic model with some variable or variables of interest.

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<sup>1</sup> Mitra and Trindade (2005) work out a theory of this effect. They also discuss intra-industry trade and international transmission of inequality, which are outside the scope of the present paper.

<sup>2</sup> We discuss below the few exceptions to this general statement, and their relation to our work.

For example, in the first paper (to our knowledge) to look at the impact of the internet on trade, Freund and Weinhold (2004) include variables on the number of web hosts in each country to show that they have a positive impact on trade. Dunlevy (2006) asks the question: what is the impact of the immigrant population in the United States on state-level trade with foreign nations? Naturally, he uses the stock of immigrants in each state as his main explanatory variable. Hutchinson (2005) wants to study the impact of language differences on trade, taking the interesting stance that what matters most is *how much* languages differ from one another. Therefore, he modifies the gravity model with a measure of linguistic distance (Japanese being more distant from English than Dutch from English, for example). As a final recent example of this methodology, Rose (2004) augments the gravity model with membership in the WTO/GATT to ask whether the WTO enhances trade. Surprisingly he is unable to find any significant effect of membership in the WTO/GATT on trade.

We begin our argument with the empirical fact that tastes cannot be considered to be homothetic. The evidence that all goods do not have unit income elasticity of demand abounds in the literature. In particular the papers by Hunter and Markusen (1988) and Hunter (1991) specifically test for nonhomotheticity of preferences by estimating linear income-expansion paths that have intercepts significantly different from zero. Their model is consistent with a minimum subsistence level for one good ( $N$ ), causing consumers at very low levels of income to consume good  $N$  only, purchasing the other good ( $L$ ) only at higher levels of income. Good  $N$  is a necessity and good  $L$  is a luxury, in the sense that their income elasticities of demand are below and above one, respectively. The strongest prediction of Hunter and Markusen's and Hunter's models is that income per capita is a determinant of aggregate demand. If income per capita increases in a perfectly equal country with a representative consumer, she increases her budget share of the luxury good in response. Note that, while the positive intercepts of the income-expansion paths make budget shares a function of per capita income, the linearity of the paths imply that income redistribution, holding per capita income constant, has no impact on the demand for each good, as long as everyone's income is sufficiently high to consume both goods.

Further empirical evidence is provided by Thursby and Thursby (1987). They

estimate a gravity model augmented with income per capita, finding that countries with more similar incomes per capita trade more. They ascribe this result to countries with similar GDP/capita having similar consumption patterns, which is an indication of nonhomothetic tastes, and stems directly from the Linder (1961) theory that they are trying to test. Note that this paper is closer to our framework than the aforementioned pieces by Hunter and Hunter and Markusen, since like us Thursby and Thursby also estimate a gravity model. However, their paper differs from our approach in that they also do not allow for a role for income distribution.

The empirical work mentioned in the paragraphs above shows that income per capita plays an important role in the determination of expenditure shares, thereby establishing the importance of nonhomotheticity in tastes. But only Francois and Kaplan (1996) look at the effect of income distribution, and in particular of inequality, on trade. However, note that they perform this in a non-gravity setting. More specifically, they look at inequality in developing countries as a determinant of the shares of imports of manufactured goods from developed countries. They find that these shares increase with the inequality of the developing country (and with its per capita income), and more so in product categories that are more differentiated, according to their classification of product differentiation.

Having established from previous work that tastes should properly be considered to be nonhomothetic, we consider in the next section the possibility that they are so in a way that makes income-expansion paths have some curvature. As already pointed out this is different from the work of Hunter (1991) and Hunter and Markusen (1988). See also the seminal contribution of Markusen (1986) who also considers income-expansion paths that are linear but with an intercept. When the income-expansion path is actually curved, income distribution becomes a determinant of aggregate demand and therefore of trade flows. The intuition is simple. Imagine that income is redistributed in a country, by taking one dollar from the poor and giving it to the rich. Given curved income-expansion paths, the same dollar will be used by the rich to buy proportionately more luxuries than before. Then, aggregate demand for luxuries increases, and aggregate demand for necessities decreases. All else equal (including the country's total income, its income per capita, and the income of all other countries), this country will import more luxuries. Therefore, a

country pair's GDPs and the distance between them, which constitute the backbone of the gravity model, cannot be considered to be a complete model in order to determine world trade flows. At a minimum the gravity model must be augmented with income per capita and a measure of income distribution.

We use these insights to set up our own modified gravity model. We then ask whether these measures perform according to the theoretical predictions. But in order to do that we need to identify which goods are necessities and which goods are luxuries. In our main approach, we use consumer data from the Bureau of Labor Statistics, along with a concordance that we created between BLS product categories and SITC codes, to categorize goods into luxuries and necessities at the four-digit SITC level. We then use our classification to re-aggregate trade flows into luxuries and necessities, and estimate the gravity model separately for imports of either type of good.

A summary of our results follows. First, we find that pooling all country pairs does not lead to any economically meaningful results. A moment's reflection reveals that this is not at all a surprising finding, since our necessity-luxury classification is based on US household data. Even with identical tastes (an assumption that we maintain throughout) many goods are likely to be luxuries for low incomes, and necessities at higher incomes. For example, used cars are likely necessities in the United States (as people become richer used cars become less attractive to them) but are certainly luxuries in some of the poorest countries. Some very common consumer goods are also likely to change from luxuries to necessities. For example, packaged cereal is considered a luxury in Jamaica,<sup>3</sup> but like any food items it would be hard to argue that it is a luxury in the developed world. Given these considerations, we restrict our sample to country pairs in which the importing country is developed, thus better aligning its income level with the US's. We find strong evidence that imports of luxuries are positively related to importing country inequality, and imports of necessities are negatively related to it, exactly as our theory would predict.

Partly motivated by Francois and Kaplan's (1996) identification of luxuries as being differentiated goods, we then turn to a classification of product differentiation, constructed by Rauch (1999). We check whether inequality matters differently for trade

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<sup>3</sup> We are grateful to Neville Francis for this example.

in differentiated goods, as compared to trade in homogenous goods. We find only weak evidence of systematic differences in the inequality coefficient, thus not lending support to one of Francois and Kaplan's assumptions. We conclude that the assumed relationship between product differentiation and income elasticity of demand is not very strong.

In our third approach, we look at a classification of trade flows based on the income levels of the country of origin (while controlling for the country of destination). We find that, holding everything else constant, an increase in the inequality of the importing country leads to higher imports from rich countries and a reduction of imports from poor countries. This result clearly shows that on average high-income countries produce luxuries and low-income countries produce necessities, thus validating one key assumption in Markusen (1986), which is also used by Mitra and Trindade (2005): high income elasticity goods are on average capital intensive. Note that in our second and third approaches we use our full sample (allowing less developed countries to be importers) since we are no longer relying on consumer data from US sources.

We consider our paper complementary to Francois and Kaplan (1996), while departing from it in a number of dimensions. First, quite importantly, we purposefully choose the most successful and widely employed model of empirical trade, the gravity model. We will then be able to pinpoint precisely how much inequality matters for trade, as compared to the standard results. For example, our calculations show that if income distribution in the United States became as equal as Canada, the US would import about 9 – 13% less in luxury goods and 13 – 19% more in necessity goods. Second, and equally important, note that Francois and Kaplan in their first approach rely on two crucial assumptions to identify goods that are luxuries (we mention their second and third approaches below). First, they assume that luxuries are differentiated goods. Second, they assume that differentiated goods are those that have higher indices of intra-industry trade. While both links in this chain of assumptions are justified by Linder's story (which is ultimately what Francois and Kaplan are trying to test), it remains an empirical question to decide whether they are valid or not. We break open both links with the use of the first *direct* classification of luxuries and necessities that is compatible with international trade data. Therefore we can test directly the effect of income inequality on trade of luxuries and necessities.

Note that in our analysis each observation is a country pair at a point in time. Therefore, we make use of much more information than Francois and Kaplan, whose study aggregates imports to each developing country across different exporters and does not have a time component. The panel structure of our data allows us to control for country-specific effects, expunging the results from any such effects that might contaminate the impact of inequality. Note that while for the first part of our analysis, we are forced by the origin of the goods classification (the US) to look at the imports of developed countries only, for the rest of the analysis we pool all developed and developing country data. Using income distribution data from developing countries only, as Francois and Kaplan (1996) do, can be problematic, because of potential measurement problems in those countries.<sup>4</sup> Importantly we will be able to state what trade looks like for different pairs of countries (such as between two high income countries, between a high and a low income country, and so on), and will argue that the patterns of trade with respect to luxuries and necessities are different for different pair types, which to our knowledge is a new empirical effect (see the theories in Markusen 1986 and Mitra and Trindade 2005).

In sum, the paper makes three contributions to the literature. First, we examine the role of inequality (through nonhomotheticity of preferences) in determining the composition of trade. We emphasize that this effect occurs from the demand side, which has been an understudied aspect of international trade flows. Second, we document novel patterns of trade between different pairs of countries. Third, we hope that our classification of 4-digit industries into luxuries and necessities should be useful to researchers interested in the role of income elasticity in trade.

## **2 Theoretical Considerations**

If tastes are homothetic, the income expansion path is a straight line starting from the origin.<sup>5</sup> If tastes are nonhomothetic, then some goods are luxuries and others are necessities, meaning that they have income elasticities of demand higher and lower than

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<sup>4</sup> This would be the case, for example, if a large proportion of asset ownership and of economic transactions in developing countries is informal.

<sup>5</sup> The income expansion path is the locus of consumption bundles for varying income levels at constant prices.

one, respectively. The empirical investigations of Hunter and Markusen (1988) and Hunter (1991) find that, in contrast to the standard assumption in trade models, tastes are nonhomothetic in a statistically and economically significant way. According to Hunter, for example, restricting preferences to be homothetic causes an overestimation of the total volume of trade by approximately 25 percent.

In this paper, we take the stance that if tastes are nonhomothetic, there is a case for studying the effects of income distribution on trade flows. To our knowledge, ours is the first gravity-based paper to do so. Suppose that there are  $n$  individuals in an economy with two goods, which we call  $L$  and  $N$  (luxuries and necessities). It is well-known that if we assume preferences to be homothetic and identical, we can write the aggregate demand function for  $L$  as follows:

$$L = D(p, I), \tag{1}$$

in which  $p$  is the price ratio ( $= p_L/p_N$ ) between the two goods, and  $I = \sum_{j=1}^n I_j$  is total income in the economy,  $I_j$  being  $j$ th individual's income. There is an analogous demand function for  $N$ . Now let us relax the assumption of homothetic tastes, which we do in two steps. First, suppose that the income expansion path is a straight line that does not pass through the origin (see the line labeled E in figure 1). This is usually called quasi-homothetic tastes. This path is consistent, for example, with assuming that good  $N$  is food, which has a minimum subsistence level that every consumer tries to reach before she buys any good  $L$ .

Let us first note that with quasi-homothetic tastes aggregate demand no longer is simply a function of aggregate income. Even with a perfectly equal economy where all consumers have the same income (and consume say at point  $C_0$ ), we must now know where along line E each consumer is: the richer he gets, the more proportion of good  $L$  he consumes. Thus, income per capita matters. However note that income distribution still does not matter, as long as all consumers are rich enough to consume both goods. Suppose for example that the economy has two consumers, both consuming at  $C_0$ . Redistribute income from one consumer to the other, such that they end up consuming at points  $C_1$  and  $C_2$ , respectively. Because  $C_1 + C_2 = 2C_0$ , aggregate demand remains unchanged. In conclusion, with quasi-homothetic tastes, equation (1) is replaced by

$$L = D(p, I, I/n), \tag{2}$$



that is, we add income per capita  $I/n$  as an argument of aggregate demand.

Second, suppose that preferences are strictly nonhomothetic in such a way that the income expansion path is curved (see figure 2). Income per capita still matters here, of course. But now, performing the same income redistribution experiment as above, we see that aggregate demand changes. In particular, note that aggregate demand for good  $L$  increases ( $L_1 + L_2 > 2L_0$ ), while it decreases for good  $N$  ( $N_1 + N_2 < 2N_0$ ). Thus, aggregate demand now depends on the income of each consumer in the economy: as inequality in the country rises, aggregate demand for luxuries increases and aggregate demand for necessities decreases. Equations (1) and (2) are amended as follows:

$$L = D(p, I_1, I_2, \dots, I_n). \quad (3)$$

One problem with this specification is that we do not have data on every single consumer. What we do have are various summary measures of income distribution. More precisely we have several moments of the distribution. Consequently, we work with an approximation of equation (3) by including those moments:

$$L = D(p, I, I/n, \sigma),$$

where  $\sigma$  is the measure of income dispersion, that is of income inequality.

We make use of these insights to modify the gravity equation. Let the value of country  $i$ 's production of luxuries and necessities be denoted by  $X_L^i$  and  $X_N^i$ , respectively. Country  $i$ 's values of exports of luxuries and necessities to country  $j$  are then given by  $X_L^{ij} = s_L^j X_L^i$ ,  $X_N^{ij} = s_N^j X_N^i$ , respectively, where  $s_L^j$  and  $s_N^j$  represent country  $j$ 's shares of world expenditure on luxuries and necessities respectively. Further, letting  $\alpha_L^i$  and  $\alpha_N^i = (1 - \alpha_L^i)$  denote the shares of luxuries and necessities respectively in the overall GDP of country  $i$ , and taking logs, we have

$$\begin{aligned} \log X_L^{ij} &= \log s_L^j + \log \alpha_L^i + \log GDP^i, \\ \log X_N^{ij} &= \log s_N^j + \log \alpha_N^i + \log GDP^i. \end{aligned} \quad (4)$$

With non-homothetic preferences, we can write

$$\begin{aligned} s_L^j &= \phi\left(\frac{GDP^j}{GDP^W}, (GDP/capita)^j, \sigma^j, \sigma^W\right), \\ s_N^j &= \psi\left(\frac{GDP^j}{GDP^W}, (GDP/capita)^j, \sigma^j, \sigma^W\right), \end{aligned}$$

where  $(GDP/capita)^j$  denotes GDP per capita of country  $j$ ,  $GDP^W$  is world GDP,  $\sigma^j$  is the

inequality measure of country  $j$  and  $\sigma^W$  is the inequality measure for the world. Here, all countries face a common world relative price of luxuries to necessities, and therefore this variable is absorbed into a year fixed effect in our regressions. A first-order Taylor expansion yields:

$$\begin{aligned}\log s^j_L &= \beta_0 + \beta_1 \log\left(\frac{GDP^j}{GDP^W}\right) + \beta_2 \log(GDP/capita)^j + \beta_3 \sigma^j + \beta_4 \sigma^W, \\ \log s^j_N &= \gamma_0 + \gamma_1 \log\left(\frac{GDP^j}{GDP^W}\right) + \gamma_2 \log(GDP/capita)^j + \gamma_3 \sigma^j + \gamma_4 \sigma^W.\end{aligned}$$

Here, the coefficients of per capita GDP and inequality are positive in the case of luxuries and negative in the case of necessities. Plugging into equation (4), we have:

$$\begin{aligned}\log X^{ij}_L &= \beta_0 + \beta_1 \log GDP^j - \beta_1 \log GDP^W + \beta_2 \log(GDP/capita)^j \\ &\quad + \beta_3 \sigma^j + \beta_4 \sigma^W + \log \alpha^i_L + \log GDP^i, \\ \log X^{ij}_N &= \gamma_0 + \gamma_1 \log GDP^j - \gamma_1 \log GDP^W + \gamma_2 \log(GDP/capita)^j \\ &\quad + \gamma_3 \sigma^j + \gamma_4 \sigma^W + \log \alpha^i_N + \log GDP^i.\end{aligned}\tag{5}$$

We estimate equations similar to equation (5). They are of course the well-known gravity equations, in that exports from country  $i$  to country  $j$  depend on the logarithms of the GDP of each country. However, the equations are modified by the inclusion of *GDP per capita* and inequality for the importing country. Note that according to the gravity literature, the *GDP per capita* plays a dual role in the estimation, in that the stage of development of the trading countries may capture trade barriers.<sup>6</sup> Therefore, its role through nonhomotheticity will be virtually impossible to identify. The effect of nonhomothetic preferences through the inequality measure is more clear-cut and less contaminated. As is traditional in the gravity literature, we also allow for natural barriers to trade, proxied by distance. One last modification is that we expect from the model that the coefficients on luxuries and necessities to be different, and therefore for our main model we will estimate two different equations, one for luxuries and one for necessities.

In deciding on how to classify goods as necessities and luxuries, we need to address the fact that nothing guarantees that a good is *only* a necessity *or* a luxury. In fact, the opposite is likely to occur often, for example a good may at low levels of income be a luxury, while at higher levels of income it becomes a necessity. We will use US

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<sup>6</sup> Frankel (1997) argues that per-capita GDP's capture formal and informal barriers to trade, and are therefore negatively correlated with trade barriers not directly measured by distance.

household data to classify goods into luxuries and necessities, as those are the most readily available household data, and also the most likely to be accurate. Note that we maintain the assumption of identical preferences throughout this paper. Therefore, our use of US data is a less severe problem when we use our classification to study other developed countries' demands, as the populations in developed countries will be in the same approximate region of the income expansion path as the US population. But it may be a problem when we use the classification for less developed countries. Being attuned to this difficulty will have the consequence that we shall have to drop observations in which a less developed country is the importer (but not when it is the exporter).

### **3 Empirical Strategy**

#### *A. Direct measure: luxuries versus necessities*

The standard gravity model estimates the volume of trade between two countries, as determined by the product of their GDPs, and some factors that may stimulate or impede trade. Among the latter factors, it is standard to include the distance between the two countries (a proxy for trade costs). As discussed in the previous section, we add per-capita GDP and a measure for the second moment of income distribution (income inequality), both of which also matter if preferences are nonhomothetic. We have already noted that GDP per capita will perform a dual role, and its interpretation should be treated with care. This is one further reason to include inequality, since its interpretation is more straightforward.

We expect that the impact of the different variables, especially GDP per capita and inequality, on the international trade of some good will depend on the nature of the good being transacted. If the good is considered a luxury, then the impact of importing country inequality should be positive, while the converse is true of necessities. We must therefore classify goods as luxuries or necessities in a manner that is compatible with the trade data, and aggregate trade flows according to these two categories. We describe in the next section and in the appendix how we constructed our classification. We then estimate the following model:

$$\ln X_{ijkt} = A_{ik} + A_{jk} + A_{kt} + \beta_{1Ek} \log(GDP_{it}) + \beta_{1Mk} \log(GDP_{jt}) + \beta_{2Ek} \log[(GDP/Capita)_{it}] + \beta_{2Mk} \log[(GDP/Capita)_{jt}] + \beta_{3k} \log(\text{Distance}_{ij}) + \beta_{4k} \text{Inequality}_{jt} + v_{ijkt}, \quad (6)$$

where the variables are defined as follows:

$X_{ijkt}$ : exports from country  $i$  to country  $j$  in category  $k$  (luxuries or necessities) in year  $t$ ;

$GDP_{it}$ : country  $i$ 's GDP in year  $t$ ;

$(GDP/Capita)_{it}$ : country  $i$ 's GDP per capita in year  $t$ ;

$Distance_{ij}$ : great circle distance between principal cities of countries  $i$  and  $j$ ;

$Inequality_{jt}$ : income inequality in (importing) country  $j$  in year  $t$ ;

$v_{ijkt}, u_{ijkt}$ : error terms, with assumed normal i.i.d. distributions.

We use country fixed effects ( $A_{ik}$  and  $A_{jk}$ ) throughout, which stand for country specific factors that may affect differently trade of luxuries and trade of necessities. These might include differences in tastes, comparative advantage in one of the two types of goods, country-specific trade barriers, or multilateral resistance effects.<sup>7</sup> Finally, we also use “fixed time effects,”  $A_{kt}$ , to account for such things as business cycles, systematic currency fluctuations, changes in price levels, worldwide rise or fall in protectionism and so on. Also, these time effects are added to control for variables that although they change with time, are common to all countries at a given point in time. Examples of such variables are world GDP and world inequality ( $GDP^W$  and  $\sigma^W$  in our previous section).

### *B. Homogeneous versus differentiated goods*

Next we use a classification devised by Rauch (1999), which separates goods at the 4-digit SITC level according to three different types: goods that are traded in organized

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<sup>7</sup> For a discussion of the latter, see Anderson and van Wincoop (2003). The case for using country fixed effects to capture multilateral resistance is made by Feenstra (2003). Gravity models with country fixed effects have been estimated by Feenstra (2002) and Dunlevy (2006), among others. Note that this paper is *not* about trade barriers, or about how they interact, which is Anderson and van Wincoop's true contribution to the literature. In other words, the effects that we test here would still be present, even if all trade barriers were zero. Any attempt to use Anderson and van Wincoop's full approach would suffer the difficulty that their model was deduced with the assumption of homothetic tastes, and therefore would not be immediately relevant for our purposes. Using fixed country-year effects also does not solve the problem, as the fixed effects would absorb our inequality variable.

exchanges; goods that are not traded in organized exchanges but for which there is a published reference price; and goods which fall under neither of the two previous categories. Rauch argues that the last type is more differentiated than the first two types. We estimate equation (6) for two categories of goods.  $k=w+r$  is the category that aggregates trade in all goods with organized exchanges ( $w$ ) plus goods with reference prices ( $r$ ). This is the category of homogeneous goods.  $k=n$  denotes trade in all other goods, that is, in differentiated goods. We are motivated to separate trade into these two categories motivated by the following two reasons: (a) Linder's (1961) book, which also motivated previous empirical work, and which argued that luxuries are manufactured, differentiated, goods; (b) Francois and Kaplan's (1996) evidence that works in the same direction. It is certainly plausible that differentiated goods such as automobiles and toys tend to be bought by consumers who have considerable disposable income after the bare necessities of life are met. Since, unlike Francois and Kaplan, we have at our disposal a direct measure of product differentiation, it seems worthwhile to compare our results with theirs.

### *C. Source country*

We next attempt to correlate the country of origin of a given good to whether that good is a necessity or a luxury. Here, the working hypothesis is that a country will either produce luxuries or necessities but not both. Because this is an obvious approximation of reality it is surprising how strong the results come out. Specifically, we re-estimate the models in equation (6) differently. The first difference is that we use *total* exports from country  $i$  to country  $j$ . Second, we include the variables  $HighIncome_i$  and  $MidIncome_i$ , which are dummies for whether the exporting country  $i$  is high or mid-income. Third, we also include  $HighIncome_j$  and  $MidIncome_j$ , which perform the analogous role for the importing country. These dummy variables are introduced both in levels and interacted with *Inequality* for the importing country.

We then estimate the average impact of inequality on bilateral trade, for the different combinations of income levels of the importing and the exporting countries. Since we allow three income levels (high-income, medium-income, or low-income), there will be nine combinations in all.

#### D. Robustness checks

Starting with the estimation that uses our direct classification of luxuries and necessities, note that the dependent variable  $X_{ijkt}$  is bounded below by zero, and the bound is observed for a large number of bilateral observations. Therefore, besides estimating models (6) with OLS, we also estimate a corresponding Tobit model. The equation is changed to:

$$\begin{aligned} \ln X_{ijkt} = & \text{Max}\{A_{ik} + A_{jk} + A_{kt} + \beta_{1Ek} \log(GDP_{it}) + \beta_{1Mk} \log(GDP_{jt}) \\ & + \beta_{2Ek} \log[(GDP/Capita)_{it}] + \beta_{2Mk} \log[(GDP/Capita)_{jt}] \\ & + \beta_{3k} \log(\text{Distance}_{ij}) + \beta_{4k} \text{Inequality}_{jt} + v_{ijkt}, 0\}, \end{aligned} \quad (7)$$

where the estimation is performed with maximum likelihood methods. Note that for all models we replaced the (logs of) missing trade flows with zeros. This is because typically missing trade flows happen between small countries that are far apart, and the most likely reason for no trade to be recorded is absent or negligible trade between them.

We also perform median regressions as robustness. This is a type of regression that attempts to estimate the median of the dependent variable (as opposed to the mean), conditional on the independent variables. Therefore, it is quite robust to outliers and bunching of zeros in the dependent variable.

We then try further ways to check the robustness of the results. First, since it is possible that the impact of inequality is non-linear, we experiment with the inclusion of the square of inequality. Second, apart from using the Gini coefficient, the most widely used summary measure of inequality, we also experiment with the ratio of the income of the top quintile in the income distribution to the income of the bottom quintile. In this way, we hope to capture various aspects of income inequality. This also has the advantage that it responds to a possible criticism of the Gini index, namely that it is a measure that is relatively insensitive to changes in the extremes of the distribution.

One further issue may be the possible endogeneity of the inequality variable. This may occur through a Stolper-Samuelson effect, in which a country's trade has a direct impact on its factor rewards, and thus an indirect impact on inequality.<sup>8</sup> We handle such concerns by restricting the sample in two ways: first, we exclude all observations in which the exporting country represents more than 1% of the importing country's trade;

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<sup>8</sup> A country with a leftist government that wishes to enhance equality may well use trade policy to do so.

second, we exclude all observations in which the exporting country has one of the 5 largest GDPs for that year. The goals of both restrictions are the same. By excluding each country's major trading partners, we are restricting ourselves to imports that will have no or at most a negligible impact on inequality, but on which inequality will according to theory most definitely have an impact.

## 4 Data

One contribution of this paper was the creation of a classification of goods as luxuries or necessities that is compatible with the most widely used trade classification in manufactures, namely the Standard International Trade Classification (SITC). In this section we briefly describe our procedure, leaving to the appendix a more complete documentation of our methodology to create this dataset and of some data issues that arose in the process. First, we obtained data from the Bureau of Labor Statistics on US households' expenditure layouts in 2001. The BLS separates US household population into five income quintiles and, for each quintile, lists the average expenditure share of about 100 consumption categories. These data are then used to extract information about which goods are luxuries and necessities. The next step was matching goods categories from the BLS with categories in international trade data in manufactures, which are coded in the SITC. We used this concordance between the two classifications to aggregate bilateral exports according to whether they are necessities or luxuries. At the end of this process, for any exporter  $i$ , importer  $j$ , and year  $t$ , we have two trade flows: exports by  $i$  to  $j$  in luxuries; and exports by  $i$  to  $j$  in necessities.

The trade data come from the World Trade Analyzer (WTA), which is a panel covering trade flows from 1970 to 1997 for most countries of the world, organized by the SITC, Revision 2, at the 4-digit aggregation level. The WTA was compiled by Statistics Canada, using bilateral trade data from the United Nations Statistical Office, and it has been made widely available by Robert Feenstra (2000). The usefulness of this dataset comes from its two main characteristics. First, Statistics Canada took special care to match import and export data between any two countries. Second, imports from one country to another are reported in quite a disaggregated manner. The latter feature is

important for our purposes, since we must aggregate trade data according to our luxury/necessity classification, and according to the Rauch commodity categories.

We also use Rauch's (1999) classification, which divides 4-digit SITC goods into three groups: goods that are traded on organized exchanges (denoted by  $w$ ); goods that have reference prices ( $r$ ); and finally those goods that fall into none of these categories, and therefore can be thought of as differentiated ( $n$ ). We aggregated  $w$  and  $r$  goods into  $w+r$ , and following Rauch take this aggregate to be homogeneous goods.

For the purpose of defining income level dummies, we separated countries into high, medium, and low-income countries according to the World Bank's cutoffs to designate high income, middle income and low income countries. Note that countries can change their income classifications over time.

Inequality data come from Dollar and Kraay (2002), according to whom theirs is the largest dataset on inequality available up to date. It is largely a recompilation of the UN-WIDER dataset that was also used by Deininger and Squire (1996) to construct what they call "a high quality dataset." These data contain a panel of 137 countries, spanning the years from 1955 to 1999. For the main part of the analysis we use the Gini coefficient as the summary measure of inequality.

Real GDP and real per-capita GDP (in 1995 constant US dollars) come from the World Bank's *World Development Indicators*. We obtained the logarithm of the great circle distance data from Rose (2004).

## 5 Estimation Results

### *A. Direct measure of luxuries and necessities*

We begin by aggregating bilateral exports into luxuries and necessities, and we then estimate equation (6) separately for each category. In light of the possibility that some goods switch from necessities to luxuries or from luxuries to necessities at different income levels and because we used US household data to classify goods, we restrict the sample to high-income importing countries only, keeping exporting countries unrestricted. The results of such a model are presented in the first two columns of table



1.<sup>9</sup> We also experimented with a model slightly different from equation (6), in that it restricts the importer and exporter GDP elasticities to be the same, as well as the importer and exporter GDP per capita elasticities to be the same. That model – which is sometimes taken to be the standard gravity model – is reported on columns 3 and 4 of the table for ease of comparison.

We first note from either set of estimations that the gravity model works well, as countless numbers of papers have shown before us. All gravity variables enter with the right sign and roughly with magnitudes comparable to other gravity papers (note that in columns 1 and 2, the parameters on Log mGDP and Log (mGDP/capita) need to be added to get the total effect of the importing country's GDP).

It is remarkable that only one variable changes sign between the two categories, and that is precisely the variable that the theory predicts. In particular, the main prediction of the model is strongly confirmed: imports of luxuries go up with importing country inequality, and imports of necessities go down. A percentage point increase in importing country inequality causes an increase of luxury imports by 0.9 percent and a reduction of necessity imports by 1.3 percent.<sup>10</sup> Thus for example if the US changed from its Gini index of 45 to Canada's Gini index of roughly between 30 and 35 (depending on year), the US would see a 9-13% reduction in luxury imports and a 13-18% increase in necessity imports. These are surely non trivial numbers. Inequality seems to have not only a statistical significant but also an economically significant impact on the structure of trade.<sup>11</sup>

### *B. Homogeneous versus differentiated goods*

The results that are most easily comparable to the work of Francois and Kaplan (1996) are shown on table 2. They are the estimation of equation (6) for the Rauch differentiated

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<sup>9</sup> The estimation with an unrestricted sample of all importing countries fails to get results that are economically meaningful and robust to inclusion and exclusion of country dummies, econometric techniques, and measures of inequality.

<sup>10</sup> Note that the Gini coefficient in our dataset is measured on a scale of 0 to 100 (not 0 to 1).

<sup>11</sup> Table 1 also suggests that as we increase the per capita incomes of both trading partners, the composition of their trade shifts in favor of luxuries (even though trade increases both in luxuries and in necessities).

and homogeneous categories, presented in odd and even columns, respectively. We obtain at best only modest support for Francois and Kaplan's approach. In two of their three approaches, the identifying assumption is that luxuries are differentiated goods.<sup>12</sup> Here we use a more recent, and arguably better, classification of product differentiation than the one they used.<sup>13</sup> When using the full sample we do not find that imports of homogeneous goods (identified as necessities) decrease with inequality. When we restrict the sample as we did in the previous subsection to high-income importing countries only, we do find that imports of homogeneous goods decrease with importing country's inequality, but the coefficient for the differentiated goods (identified as luxuries) loses significance and enters with the wrong sign. These results are perhaps not on the whole surprising, because we are after all positing that the definition of differentiated goods (ultimately a combination of technological and taste characteristics, as defined by Rauch) somehow maps to the definition of luxuries (purely a taste characteristic).

Overall, no specification shows a statistically significant pattern that agrees with the theoretical prediction. This stands in contrast with the results of the previous subsection, in which by using a direct classification of luxuries and necessities, and thus avoiding any identifying assumptions, we do find such a statistically and economically significant pattern. Note that the contrast in table 2 between the two samples (the full sample and the restricted sample) alerts once more to the importance of considering demand, and nonhomothetic tastes in particular, for the empirical study of international trade. If tastes were homothetic, and each country's demand were simply proportional to world supply, then restricting the sample of importing countries should not matter, as long as we do not restrict the sample of *exporting* countries.

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<sup>12</sup> These are their first and third approach. Their second approach assumes that luxuries are goods that industrial countries trade more. We shall have something of this flavor in the next sub-section, in which we divide trade according to the income per capita of the trading partners.

<sup>13</sup> In their first approach they use the *further* assumption that differentiated goods have high indices of intra-industry trade. In their third approach, they simply count the number of sub-industries that the industrial classification provides for each industry. Rauch's measure is arguably an improvement on both of these approaches, since it relies on market responses to each good (for example: are there reference prices widely available for the good?), not on the decisions of the officials that create industrial classifications.

### C. Source country

We now turn our attention to whether luxuries and necessities differ according to the income level or the stage of development of the source (exporting) country. Once again we find economically and statistically significant results. The main message we find is: developing countries export necessities, and developed countries export luxuries. We conjecture that this may be due to systematic technological differences between luxuries and necessities, which cause necessities to be labor-intensive goods. But it may also be due to differences in technological advancement of less developed versus more developed countries.<sup>14</sup> The result here is also consistent with the Markusen (1986) conjecture implying that the share of luxury production is higher in countries with higher per-capita income. This is also posited in Mitra and Trindade (2005). Then, if the exporting country  $i$  is high income, it will have a higher  $\alpha_L$  in equation (4), which in turn leads to a higher predicted  $X^{ij}_L$ , than if the exporting country were low or middle income.

In order to thoroughly investigate this issue (and to see the roles of the country of origin versus that of the destination country), we created four additional dummy variables: *HighIncome<sub>i</sub>* and *MidIncome<sub>i</sub>* take value one if the exporting country  $i$  is high or mid-income, respectively, with two analogous variables for the importing country. Table 3 presents the regression results. All gravity variables enter with the right sign and most are significant at the 1% level.

Note that since we interact the dummy variables with our measure of inequality for the importing country, we need to calculate the partial effect of inequality on imports. Since there are three types of countries (high, medium, and low income), there are nine types of country pairs for one-way trade. Table 4 presents the partial effects of inequality on imports, arranged in a matrix with all nine possibilities.<sup>15</sup> Again, these partial effects can be fairly large in magnitude. One can discern a fair amount of structure. Note that since the different rows let the income level of the *exporting country* vary, this is the

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<sup>14</sup> In other words, the reason for more developed countries to have comparative advantage in luxuries may be Heckscher-Ohlin: luxuries such as automobiles (but also leather bags and fashion clothing) systematically use capital more intensively than necessities. But the reason may also be Ricardian: simply because luxuries are consumed more as the world is getting richer, it is likely that luxuries are newer goods, with whose technology less developed countries have not yet caught up.

<sup>15</sup> We calculate the partial derivative of bilateral one-way trade flow with respect to inequality.

variation of greatest interest. The results provide a fairly strong confirmation of the presumption that whether a good is a luxury or a necessity is mostly determined by country of origin, not country of destination. To see this, consider each row one by one. For the first and the third rows whenever the results are statistically significant, the row determines the sign of the partial effect of inequality on trade. In particular, by moving through the first row (barring the import demand from middle income countries which has a positive sign but is statistically insignificant), one can see that import demand from all income levels behaves as if the exports of low income countries are necessities. Analogously from the last row, exports from high-income countries behave as luxuries, irrespective of the income level of the importing country.

Only for middle income exporters does the rule break down. Here, we have a result similar to something that we have already encountered: what is a luxury for someone may be a necessity for someone else at a different income level. In particular the pattern of signs in the middle row is reasonable: as the importer grows richer, it sees middle income countries more and more as *low* income, and therefore it sees middle income exports more and more as necessities: the sign of the coefficient starts out positive and ends as negative. Note that a sign pattern that would be the reverse of this would be unexpected.

In sum, we provide strong support for the following stylized fact, to our knowledge not known to the empirical economics literature: *poor countries export necessities, and rich countries export luxuries.*

#### *D. Robustness checks*

We have performed several robustness checks, a selection of which is reported in table 5. First, we checked for non-linearities with respect to inequality, with results reported in columns 1 and 2. Introduction of an additional squared inequality term does not qualitatively (or even quantitatively) change the results. The partial derivatives of imports with respect to inequality remain preserved in terms of sign and magnitude. Furthermore they remain preserved in significance if one accepts an 11% significance level.<sup>16</sup>

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<sup>16</sup> Even though inequality and inequality squared are individually insignificant in column 2 for necessities, they are jointly significant leading to the low p-value for the partial effect of inequality.

One may argue that the Gini index, which we have used throughout, is relatively insensitive to the extremes of the income distribution. As a further robustness check, we use the ratio of the income share of the fifth quintile to that of the first quintile (Q51) as an alternative measure of inequality (columns 3, 4). Q51 has the right signs – negative in the case of necessities and positive in the case of luxuries. While it is insignificant in the case of necessities, it is highly significant (at the 1% level) in the case of luxuries.

Columns (5) – (8) report Tobit and median regressions. This is done since, as mentioned before, the dependent variable is bounded below by zero, and the bound is observed for a large number of bilateral observations. The results are very robust for the median regressions, and for necessities with Tobit, while the coefficient of interest loses significance for the Tobit regression in luxuries. Note that the interpretation of the Tobit results is affected by the likely existence of heteroscedasticity in our panel data, for which to our knowledge there is no adequate econometric treatment in Tobit.

Columns (9) and (10) report the results when we exclude from the sample each country’s main trading partners. In particular, we exclude observations in which the exporting country represents more than 1% of the importer’s import flows. As explained in section 3, this is done to allay the worry that the *Inequality* is endogenous. For the remaining (smaller) exporters, most likely the chain of causality runs unambiguously from inequality to imports, not the other way round. An inspection of columns (9) and (10) reveals the essential robustness of the main results in table 1. Columns (11) and (12) perform the analogous analysis when we exclude the largest five economies each year from the exporting side.<sup>17</sup>

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<sup>17</sup> Some additional robustness tests were performed. We tried adding the inequality of the exporting country, which for the bilateral trade sample we are focusing on, enters insignificantly, in all cases with a t-ratio less than one. This is understandable since in deriving the gravity model, we find that the country that produces a tradable good will consume a negligible share of the output of that good in a world with many countries. Bilateral imports should then be a function of, in addition to the other gravity variables, the importing country’s inequality and the inequality of the rest of the world, which in turn can be expressed as a function of importing country inequality and overall world inequality. Our year dummies capture variations in world inequality from one year to another. In one set of regressions we include a variable for “remoteness” of the country pair, which is sometimes used in the gravity literature, without affecting the main conclusion. We also tried to combine some of the tests, for example, including the square of the inequality measure in a Tobit regression. Finally, for the Rauch categories, we tried to separate regressions for the  $w$  and for the  $r$  goods, in all cases getting no qualitative changes.

## 6 Conclusion

In this paper, we are mostly concerned with the question of how a change in income distribution affects the volume and pattern of trade. In the framework of established trade theory, the assumption of homothetic and identical tastes rules out that the distribution of income has any effect on trade. In our framework, we drop the assumption of homothetic preferences, which allows us to pursue empirically an investigation on the effect of inequality on trade with the use of a gravity model.

Overall, our findings show that inequality affects the structure and the origin of trade flows. In almost every regression, inequality variables are both economically and statistically significant. When we separate goods according to whether they are luxuries or necessities, based on consumer surveys, we see that a product's characteristic is a major predictor of the impact of inequality on trade. This provides a tighter link with the theory. Furthermore, we document another pattern in the relationship between inequality and trade: as inequality increases in the importing countries, we observe that imports from rich countries increase while imports from poor countries decrease. We note that most standard variables of the gravity model remain qualitatively the same, in the presence of inequality, as in the existing gravity literature.

## APPENDIX

This appendix describes how we classified 4-digit SITC goods as necessities or luxuries.<sup>18</sup> First, we obtained data from the Bureau of Labor Statistics on household expenditure shares in the US in 2001. The BLS separates household population into five income quintiles and, for each quintile, lists the average expenditure share of about 100 expenditure categories. For example, the BLS category labeled “APM1” is “apparel and services, men, 16 and over.” For this category, expenditure shares of the different quintiles, from the bottom quintile to the top quintile, are 0.8, 0.8, 0.8, 0.9 and 1.0%, respectively. We defined any category whose expenditure share is weakly rising (as in this example) as a luxury. Conversely, any category whose expenditure share weakly decreases is classified as a necessity. We did not classify either as luxuries or necessities those BLS categories whose shares vary in a non-monotonic way, or whose shares do not vary at all.

The second part of our procedure was to match the BLS categories to SITC codes. To do so, we went through the description of each 4-digit SITC, and matched it with a BLS description. Some judgment calls were needed, as we now detail. To use the example above, we matched the BLS category APM1, “apparel and services, men, 16 and over,” to the following SITC codes:

- 8421: overcoats and other coats, men’s
- 8422: suits, men’s, of textile fabrics
- 8423: trousers, breeches etc., of textile fabrics<sup>19</sup>
- 8424: jackets, blazers, of textile fabrics
- 8429: other outer garments of textile fabrics
- 842A: outer garments, men’s, of textile fabrics
- 842X: outer garments, men’s, of textile fabrics
- 8441: shirts, men’s, of textile fabrics

These eight SITCs were therefore assigned as luxuries, and many other SITC codes were in this way assigned as either luxuries or necessities. We also assigned as luxuries less

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<sup>18</sup> A file with our classification is posted online: <http://faculty.maxwell.syr.edu/vmtrindade/research.htm>.

<sup>19</sup> Even though “men’s” is not explicitly mentioned in this category 8423 or in 8424 and 8429, it can be inferred from the “X” and “A” categories, as explained later.

than ten SITC categories, for which there was no direct BLS correspondence, but that clearly are luxuries: for example, SITC 8973, “jewelry of gold, silver or platinum.” Of course, many SITC remained unclassified either as luxuries or necessities, because there was no clear BLS correspondence.

Some of the judgment calls had to do with the fact that the wording describing the BLS codes and the SITC did not correspond to each other in a clean way. Furthermore, generally speaking, the BLS categories are at a fairly more aggregated level than the SITC. To illustrate these problems, take SITC categories 0573 “bananas, fresh or dried,” and 0579 “fruit, fresh or dried, not elsewhere specified.” We matched both to the BLS category FHF1 “fresh fruits,” on the following two assumptions: consumer tastes for most fruits are similar, therefore consumer behavior for a more disaggregated fruit (bananas) should closely match the consumer behavior for aggregate fruit; furthermore, most trade is likely to be in fresh fruit, the part in which the BLS and SITC descriptions coincide.

The SITC, as revised by Statistics Canada, includes some codes ending in X or XX, which for our purposes can be interpreted as aggregate, or “unallocated,” trade (for more details, see Feenstra 2000, page 5). The criterion to match these codes to the BLS codes was a modified majority rule. Generally, if the BLS supplied a closely corresponding aggregate code (those codes end in 0 or 00), we simply matched the corresponding aggregates; otherwise, if over half the disaggregated SITC codes were assigned to a single BLS code, we also assigned the aggregate SITC code to the same BLS code.<sup>20</sup>

Another issue was posed by the so-called rolled-up codes, also created by Statistics Canada, many of which end with the letter A. These codes were the result of combining two or more SITC codes (for details the reader is referred again to the Feenstra paper). We checked all rolled-up codes for consistency. Generally, we forced consistency by letting the rolled-up code dictate its assigned BLS code to all the original SITCs that were rolled up into it. In some cases, we used judgment to make exceptions to

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<sup>20</sup> An exception to this general rule was SITC 1XXX, “beverages and tobacco,” which we assigned to BLS AB00 “alcoholic beverages,” rather than TB00 “tobacco products and smoking supplies.” Note that for our purposes this choice does not matter, since both AB00 and TB00 are necessities according to expenditure shares.



this rule. For example, Statistics Canada rolled up code 7631 “gramophones & record players, electric,” into 7649 “parts of apparatus of division 76.” We left 7649 unassigned to any BLS code.<sup>21</sup> However, we decided to still assign 7631 to the BLS category that clearly corresponds to it: ENT0 “televisions, radios, audio equipment.”

To summarize, at the end of this procedure, we had three types of SITC: luxuries, necessities, and unassigned. We dropped all unassigned trade, and separately aggregated the luxuries and the necessities. Thus, for exporter  $i$ , importer  $j$ , and year  $t$ , we had two trade flows: exports in luxuries; and exports in necessities.

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<sup>21</sup> This was also the result of a general criterion. Since the BLS expenditure categories refer to final consumer expenditures, there is no information regarding parts or components. Therefore, all SITCs that refer specifically to parts were left unassigned, and therefore were dropped out of all estimations. Also unassigned were all machinery, except when these are household appliances. Finally, we left unassigned codes that mix machinery with both industrial and household applications (e.g. SITC 7412 “furnace burners for liquid fuel and parts”).

## References

Anderson, James E. and Eric van Wincoop, 2003. "Gravity with Gravitas: A Solution to the Border Puzzle." *American Economic Review*, 93, 1 (March), 170-192.

Deininger, Klaus and Lyn Squire, 1996. "A New Data set Measuring Income Inequality." *World Bank Economic Review*, 10, 3, 565-591.

Dollar, David and Aart Kraay, 2002. "Growth is Good for the Poor." *Journal of Economic Growth*, 7, 3 (September), 195-225.

Dunlevy, James A., 2006. "The Influence of Corruption and Language on the Protrade Effect of Immigrants: Evidence from the American States." *Review of Economics and Statistics*, 88 (1), 182-186.

Feenstra, Robert C., 2000. "World Trade Flows, 1980-1997." University of California, Davis manuscript.

Feenstra, Robert C., 2002. "Border Effects and the Gravity Equation: Consistent Methods for Estimating the Gravity Equation." *Scottish Journal of Political Economy* 49, 491-506.

Feenstra, Robert C., 2003. *Advanced International Trade: Theory and Practice*. Princeton University Press, Princeton, NJ.

Feenstra, Robert C., James A. Markusen and Andrew K. Rose, 2001. "Using the Gravity Equation to Differentiate Among Alternative Theories of Trade." *Canadian Journal of Economics*, 34(2), 430-447.

Francois, Joseph F. and Seth Kaplan, 1996. "Aggregate Demand Shifts, Income Distribution, and the Linder Hypothesis." *Review of Economics and Statistics*, 78, 2 (May), 244-250.

Frankel, Jeffrey A., 1997. "Regional Trading Blocs in the World Trading System." Washington, D.C.: Institute for International Economics.

Freund, Caroline L. and Diana Weinhold, 2004. "The Effect of the Internet on International Trade." *Journal of International Economics*, 62 (1), 171-189.

Hunter, Linda C., 1991. "The Contribution of Nonhomothetic Preferences to Trade." *Journal of International Economics*, 30, 345-358.

Hunter, Linda C. and James R. Markusen, 1988. "Per-Capita Income as a Determinant of Trade," in Robert C. Feenstra, Ed., *Empirical Methods for International Trade*. MIT Press, Cambridge, MA.

Hutchinson, William K., 2005. “‘Linguistic Distance’ as a Determinant of Bilateral Trade.” *Southern Economic Journal*, 72 (1), 1-15.

Linder, Staffan, 1961. *An Essay on Trade and Transformation*. Almqvist and Wicksell, Stockholm.

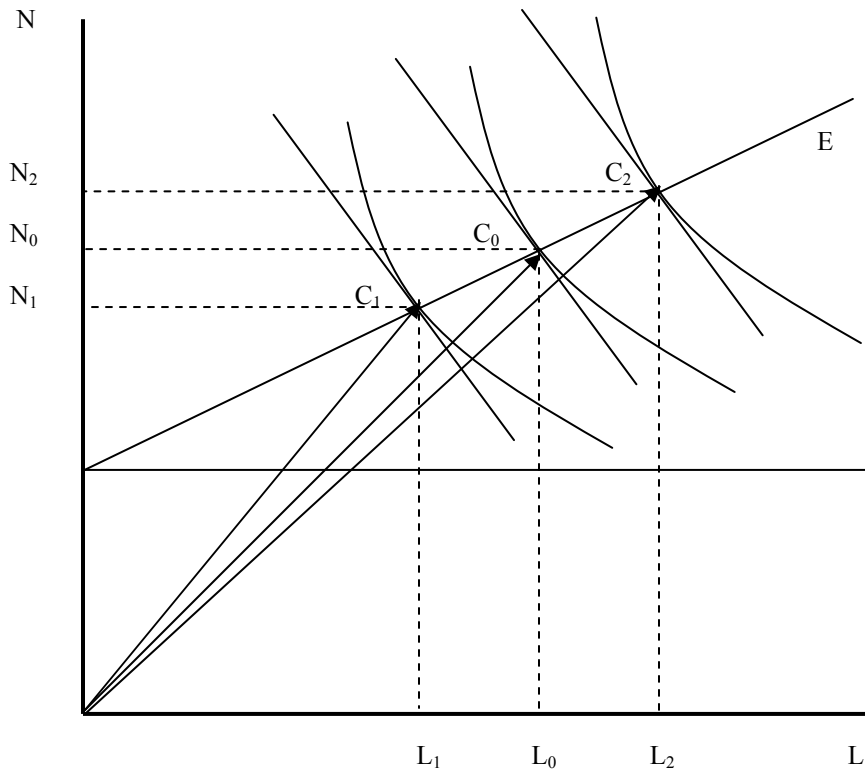
Markusen, James R., 1986. “Explaining the Volume of Trade: An Eclectic Approach,” *American Economic Review* 76, 1002-1011.

Mitra, Devashish and Vitor Trindade, 2005. “Inequality and Trade.” *Canadian Journal of Economics*, 38, (4), 1253-1271.

Rauch, James E., 1999. “Networks Versus Markets in International Trade.” *Journal of International Economics*, 48, 1 (June), 7-35.

Rose, Andrew K., 2004. “Do We Really Know That the WTO Increases Trade?” *American Economic Review*, 94, 1 (March).

Thursby, Jerry G. and Marie C. Thursby, 1987. “Bilateral Trade Flows, the Linder Hypothesis, and Exchange Risk.” *Review of Economics and Statistics*, 69, 3 (August), 488-495.

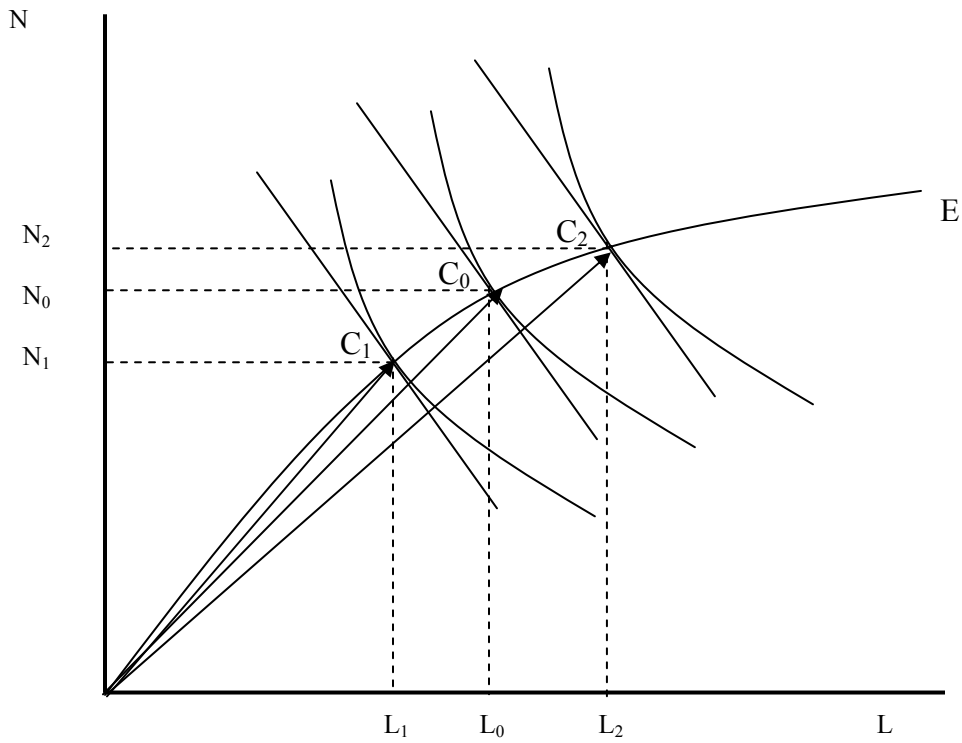


**Figure 1**

**Quasi-Homothetic Preferences**

Income per capita matters: vector  $C_2$  is not parallel to vector  $C_1$ .

Income Distribution does not matter:  $2C_0 = C_1 + C_2$ .



**Figure 2- Strictly Nonhomothetic Preferences**

Income per capita matters: vector  $C_2$  is not parallel to vector  $C_1$ .

Income distribution matters:  $2C_0 \neq C_1 + C_2$ .

**Table 1: OLS regressions with direct measure of Necessities and luxuries.**

<b>Regressand</b>	<b>Luxuries</b>	<b>Necessities</b>	<b>Luxuries</b>	<b>Necessities</b>
<b>Regressors</b>				
Inequality	0.009** (0.005)	-0.013*** (0.005)	0.008* (0.005)	-0.013*** (0.005)
Log xGDP	1.319*** (0.287)	1.045*** (0.357)		
Log mGDP	-2.162*** (0.521)	-0.216 (0.586)		
Log xGDP/Capita	0.405 (0.280)	0.224 (0.360)		
Log mGDP/Capita	3.815*** (0.572)	1.705*** (0.660)		
Log distance	-1.449*** (0.059)	-1.487*** (0.070)	-1.448*** (0.059)	-1.487*** (0.069)
Log (xGDP mGDP)			0.669*** (0.258)	0.821*** (0.303)
Log (xGDP/Capita mGDP/Capita)			0.977*** (0.255)	0.447 (0.309)
Observations	26644	26644	26644	26644
Adj. R-squared	0.84	0.75	0.84	0.75

Regressand: log of bilateral exports, in luxuries or in necessities.

The column title shows the commodity category. *x* is the exporting country, *m* is the importing country.

Robust standard errors in parentheses. Standard errors clustered for country pairs.

\* denotes significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Year, exporting and importing country dummies not shown.

**Table 2: OLS results for separate Rauch categories.**

<b>Regressand</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>	<b>(7)</b>	<b>(8)</b>
<b>Regressors</b>	<b>n full</b>	<b>w+r full</b>	<b>n restr.</b>	<b>w+r restr.</b>	<b>n full</b>	<b>w+r full</b>	<b>n restr.</b>	<b>w+r restr.</b>
Inequality	0.011*** (0.002)	0.008*** (0.003)	-0.003 (0.004)	-0.013*** (0.005)	0.012*** (0.002)	0.008*** (0.003)	-0.003 (0.004)	-0.013*** (0.005)
Log xGDP	0.349** (0.168)	0.458** (0.214)	0.488* (0.268)	0.872** (0.356)				
Log mGDP	-1.105*** (0.169)	0.506** (0.211)	-0.636 (0.483)	1.266** (0.590)				
Log xGDP/Capita	1.375*** (0.164)	0.981*** (0.213)	1.152*** (0.269)	0.350 (0.362)				
Log mGDP/Capita	2.551*** (0.175)	1.256*** (0.219)	2.446*** (0.548)	0.771 (0.646)				
Log distance	-1.488*** (0.036)	-1.617*** (0.039)	-1.338*** (0.057)	-1.510*** (0.071)	-1.488*** (0.035)	-1.618*** (0.039)	-1.338*** (0.057)	-1.511*** (0.071)
Log (xGDP mGDP)					-0.256** (0.118)	0.512*** (0.149)	0.287 (0.234)	0.983*** (0.301)
Log (xGDP/Capita mGDP/Capita <sub>j</sub> )					1.836*** (0.115)	1.050*** (0.148)	1.349*** (0.238)	0.338 (0.309)
Observations	67956	67956	26644	26644	67956	67956	26644	26644
R-squared	0.82	0.72	0.85	0.74	0.82	0.72	0.85	0.74

Regressand: log of bilateral exports, in differentiated goods ('n'), and in homogeneous goods ('w+r'). Columns (1), (2), (5) and (6) are the results with the full sample. Columns (3), (4), (7) and (8) restrict to observations in which the importing country is high income.

Robust standard errors in parentheses. Standard errors clustered for country pairs.

\* denotes significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Year, exporting and importing country dummies not shown.

**Table 3: Regressions with interactions of source country income level**

<b>Regressand</b>	<b>Total exports (1)</b>	<b>Total exports (2)</b>
<b>Regressors</b>		
Inequality	-0.009 (0.006)	-0.007 (0.007)
Log xGDP	0.493** (0.194)	
Log mGDP	-0.073 (0.198)	
Log xGDP/Capita	1.210*** (0.196)	
Log mGDP/Capita	1.999*** (0.208)	
Log Distance	-1.597*** (0.038)	-1.598*** (0.038)
Log (xGDP mGDP)		0.287** (0.137)
Log (xGDP/Capita mGDP/Capita)		1.485*** (0.137)
mHighIncome	1.555*** (0.302)	1.704*** (0.320)
mMidIncome	-0.483* (0.275)	-0.377 (0.301)
xHighIncome	-2.673*** (0.251)	-2.750*** (0.246)
xMidIncome	-0.651*** (0.225)	-0.685*** (0.224)
mInequality x mHighIncome	-0.035*** (0.007)	-0.037*** (0.007)
mInequality x mMidIncome	0.016** (0.007)	0.014* (0.008)
mInequality x xHighIncome	0.077*** (0.005)	0.077*** (0.005)
mInequality x xMidIncome	0.022*** (0.005)	0.022*** (0.005)
Observations	67956	67956
R-squared	0.77	0.77

‘x’ refers to exporting country variables. ‘m’ refers to importing country variables. Robust standard errors in parenthesis. Standard errors clustered for country pairs. \*, \*\*, \*\*\* denote results significant at the 10%, 5%, and 1% level, respectively. mHighIncome, mMidIncome: dummies for the importing country being high or mid-income. xHighIncome, xMidIncome: analogous dummies for the exporting country.



**Table 4: Partial effects of inequality on imports, by the income levels of importers and exporters.**

<b>Importer \ Exporter</b>	<b>Low Income</b>	<b>Medium Income</b>	<b>High Income</b>
<b>Low Income</b>	-0.0089 (0.154)	0.0069 (0.188)	-0.0441*** (1.14e-16)
<b>Medium Income</b>	0.0135** (0.031)	0.0293*** (3.31e-08)	-0.0217*** (1.25e-05)
<b>High Income</b>	0.0682*** (1.28e-26)	0.0839*** (0)	0.0330*** (4.26e-10)

Partial effects of importer's inequality on total imports, calculated from table 3, column (1).

p-values in parenthesis.

\*, \*\*, \*\*\* denote results significant at the 10%, 5%, and 1% level, respectively.

**Table 5: Robustness checks for the direct measure of luxuries and necessities**

Regressors \ Regressand	(1)	(2)	(3)	(4)	(5)	(6)
	Lux.	Nec.	Lux.	Nec.	Lux. Tobit	Nec. Tobit
Inequality (Gini)	-0.099*** (0.032)	-0.030 (0.033)			-0.002 (0.005)	-0.017*** (0.005)
Square Inequality (Gini)	0.002*** (0.001)	0.000 (0.001)				
Inequality (Q51)			0.046*** (0.016)	-0.021 (0.017)		
Log xGDP	1.319*** (0.285)	1.045*** (0.357)	1.984*** (0.335)	1.174*** (0.405)	2.963*** (0.246)	1.667*** (0.250)
Log mGDP	-2.384*** (0.497)	-0.250 (0.575)	-2.668*** (0.622)	-0.341 (0.697)	-2.402*** (0.544)	0.273 (0.542)
Log xGDP/Capita	0.405 (0.278)	0.224 (0.360)	-0.386 (0.328)	0.057 (0.408)	-1.023*** (0.242)	-0.414* (0.243)
Log mGDP/Capita	3.971*** (0.555)	1.729*** (0.654)	4.466*** (0.614)	1.426** (0.710)	4.860*** (0.642)	1.256** (0.636)
Log Distance	-1.450*** (0.059)	-1.487*** (0.070)	-1.479*** (0.061)	-1.477*** (0.073)	-1.754*** (0.030)	-1.591*** (0.031)
Log Remote						
Observations	26644	26644	21757	21757	26644	26644
R-squared	0.84	0.75	0.84	0.75		
Partial effect of Inequality (p-values)	0.007 (0.11)	-0.013*** (0.004)				

Robust standard errors in parentheses.

\* denotes significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Column title shows commodity categories.

Year, exporting and importing country dummies not shown.

**Table 5 (continued)**

Regressand Regressor	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Lux. Median	Nec. Median	Lux.	Nec.	Lux.	Nec.	Lux.	Nec.
Inequality (Gini)	0.015*** (0.003)	-0.013*** (0.003)	0.019*** (0.006)	-0.021*** (0.007)	0.010** (0.005)	-0.013*** (0.005)	0.008* (0.005)	-0.013*** (0.005)
Log xGDP	0.523*** (0.146)	0.237 (0.155)	1.112*** (0.376)	2.417*** (0.598)	1.274*** (0.306)	1.139*** (0.380)	1.217*** (0.290)	1.083*** (0.366)
Log mGDP	-3.015*** (0.303)	0.166 (0.322)	-1.778*** (0.491)	-2.815*** (0.839)	-2.147*** (0.543)	-0.222 (0.613)	-2.428*** (0.526)	-0.117 (0.590)
Log xGDP/Capita	0.986*** (0.142)	1.005*** (0.151)	-0.649* (0.373)	-2.050*** (0.573)	0.453 (0.301)	0.157 (0.383)	0.458 (0.281)	0.205 (0.363)
Log mGDP/Capita	4.568*** (0.348)	0.861** (0.370)	3.030*** (0.513)	5.129*** (0.883)	3.764*** (0.594)	1.717** (0.688)	3.955*** (0.571)	1.653** (0.659)
Log Distance	-1.295*** (0.018)	-1.372*** (0.020)	-0.789*** (0.084)	-1.045*** (0.153)	-1.499*** (0.062)	-1.558*** (0.075)	-1.450*** (0.059)	-1.487*** (0.070)
Log Remote							-9.810** (4.201)	3.645 (4.091)
Observations	26644	26644	15320	12782	25339	25339	26644	26644
R-squared			0.54	0.65	0.81	0.74	0.84	0.75

Robust standard errors in parentheses.

\* denotes significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Column title shows commodity categories.

Year, exporting and importing country dummies not shown.