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Muhammed Dalgin
Devashish Mitra
Vitor Trindade

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ABSTRACT

In this paper, we show that inequality is an important determinant of import demand, in that it augments the standard gravity model in a significant way. We interpret this result with the aid of a model in which tastes are nonhomothetic. Classification of products, based on the correlation between household budget shares in the US and income, into "luxuries" and "necessities," works very well in our analysis when we restrict the analysis to developed importing countries. While the imports of luxuries increase with the importing country's inequality, imports of necessities decrease with it. Furthermore, we find that an increase in the level of inequality in the importing country generally leads to an increase in imports from developed countries, and to a reduction in imports from low-income countries.

Muhammed Dalgin
Gebze Yuksek Teknoloji Enstitusu
Isletme Fakultesi
Cayirova/Gebze
41400 Kocaeli
Turkey
mdalgin@maxwell.syr.edu

Devashish Mitra
Department of Economics
The Maxwell School of Citizenship and
Public Affairs
133, Eggers Hall, Syracuse University
Syracuse, NY 13244
and NBER
dmitra@maxwell.syr.edu

Vitor Trindade
Department of Economics
The Maxwell School of Citizenship and
Public Affairs
Eggers Hall, Syracuse University
Syracuse, NY 13244
vmtrinda@maxwell.syr.edu

1 Introduction

It is traditional in trade theory to assume identical and homothetic preferences across all countries. This simplifies computations, especially in empirical work. For example, one implication of this assumption is that in a world with free trade, the shares of countries and individuals in overall world demand for each good are the same as their shares in world income. Since world demand must equal world supply, a country's consumption pattern can be explained by two things: its share of the world's GDP; and the world output of each good. Thus each country's demand is simply a proportion of world supply. While this approach to modeling has led to the convenient and elegant methodology of factor-content studies, it has at the same time effectively resulted in the complete elimination of the demand side from the picture, an embarrassing asymmetry in the international trade literature. While we acknowledge that such an approach has been quite successful in explaining trade flows based on differences in supply (and in particular, based on the differences in the supply of factors), we must emphasize that it cannot by construction explain the portion of trade that can only be understood with the inclusion of demand considerations. In this paper, we take up such considerations.

We begin with the empirical fact that tastes are not homothetic. If that is the case, then aggregate demand depends not solely on aggregate income, but also on the *distribution* of that income, and on the *per capita* income level. Therefore, these two variables matter for trade flows. To see this in more detail, suppose that tastes are nonhomothetic, in that there are some goods that are “luxuries” and some goods that are “necessities” (defined as goods whose income elasticity of demand is larger and smaller than one, respectively). Imagine that income is redistributed in a country, by taking a dollar from the poor and giving it to the rich. The same dollar in the hands of the rich will be used to buy proportionately more luxuries, than it used to when it belonged to the poor. Therefore, the demand for luxuries increases, and the demand for necessities decreases. All else equal (including the country’s GDP and the world output), this country will import more luxuries, or export fewer of them. Therefore, a country’s GDP and world output of a good, which constitute the backbone of the well-known gravity model, cannot be considered sufficient statistics to determine world trade flows.

There is indeed some evidence that all goods do not have unit income elasticity of demand. 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 that are significantly different from zero (see figure 1, where the income-expansion path, or Engel curve, is marked E). Their model is consistent with a minimum subsistence level for one good (good *Y*), causing consumers at very low levels of income to begin by consuming good *Y* only, purchasing the other good (*X*) only at higher levels of income. Therefore, the strongest prediction of the model 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 might go from consumption point C_1 to point C_2, thereby increasing her budget share of the luxury good (*X*). Note that, while the positive intercept of the Engel curve makes budget shares a function of per capita income, its linearity implies that income redistribution, holding per capita income constant, has no impact on the demand for a product, if everyone's income is sufficiently high that every consumer consumes both goods. Two consumers, both starting at consumption point C_0, one of which loses income and goes to consumption C_1, while the other gains the same income, and consumes at C_2, still have the same *aggregate* consumption: that is, $2C_0 = C_1 + C_2$.

Consider now the possibility that preferences are nonhomothetic in a way that results in some curvature for the Engel curve (see figure 2). Then income distribution becomes a determinant of demand and of trade flows. Thus in figure 2, a regressive income redistribution (from the poor to the rich) would result in an increase of the aggregate demand for good *X*, and a decrease of the aggregate demand for good *Y*.

Some further empirical evidence for nonhomothetic tastes is provided in the paper by Thursby and Thursby (1987). They estimate a model that controls for the usual gravity variables (distance, common border, membership in preferential trade areas, GNPs etc), and find that countries with more similar incomes per capita trade more. They ascribe this result to countries with similar GDP/capita having similar consumption patterns. Although that paper is closer to our framework, in that it estimates a gravity model, it also does not allow for a role for income distribution.

The empirical work mentioned above shows the role of per capita income 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, albeit in a non-gravity setting. More specifically, they look at inequality in developing countries as a determinant of the shares of their 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 measure of product differentiation.

In this paper, we use the well-known gravity model, which has been shown in numerous papers to be able to explain trade flows. We augment the standard gravity model by including measures for inequality and GDP per capita, and ask whether these measures add any explanatory power to the model. In our attempt at identifying the impact of inequality on trade, we use consumer data from the Bureau of Labor Statistics, along with a concordance we created between BLS product categories and three-digit SITC codes, to categorize goods into luxuries and necessities at the four-digit SITC level.[1] We then use our classification to re-aggregate trade flows into these two categories. We estimate our augmented gravity model for imports of these two types of goods. Since the classification is based on US household data, we find that pooling all country pairs does not lead to any economically meaningful results. Therefore, we restrict our sample to country pairs in which the importing (destination) country is developed (high income).[2] In other words, we look at trade flows from developed to developed countries and from developing to developed countries. Here we find that while the imports of "luxuries" are positively related to importing country inequality, the imports of "necessities" are negatively related to it. This is exactly what our theory would have predicted.

[1] We look at the correlation between budget shares of each consumer good in the household survey with income levels of different income quintiles. Goods that have a negative income correlation are classified as necessities, while those with positive correlations are classified as luxuries.

[2] We place no such restrictions on our set of exporting (source) countries.

Next we turn to a very well-known classification, based on product differentiation, constructed by Rauch (1999). We check whether the coefficient of inequality in the gravity equation is different for trade in differentiated, as compared to homogenous goods.[3] We find only weak evidence of systematic differences in the inequality coefficient across the Rauch categories. A possible reason for this is that the assumed relationship between product differentiation and income elasticity of demand may be weak in practice.

We also 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 clearly see that, holding everything else equal, an increase in the inequality of the importing country leads to higher imports of goods produced in rich countries and a reduction of imports produced in poor countries. This result clearly shows that, at least on average, high-income countries are producers of luxuries while low-income countries produce necessities.

Our work differs significantly from Francois and Kaplan (1996) in a number of dimensions. First, note that in our analysis each observation is a country pair at a point in time. Therefore, we make use of a lot more information than Francois and Kaplan, who aggregate imports into each developing country across different exporters. We also experiment with alternative measures of inequality and their various combinations. While for the first part of our analysis, we look at the imports of developed countries from developing as well as developed countries, for the rest of the analysis using product classification based on Rauch categories and on the income levels of the exporting countries, we pool all developed and developing country data. Restricting the estimation to using only income distribution in the South, as in Francois and Kaplan (1996), can be problematic, because of potential measurement problems in the South.[4] As it turns out,

[3] Rauch's classification for differentiated goods is arguably better than the one available to Francois and Kaplan. Its use in our paper is motivated by: (a) Linder's (1961) book, which also motivated previous empirical work, and which argued that income elastic goods (the "luxuries" or Linder goods) tended to be manufactured, differentiated, goods; (b) the strong positive correlation between product differentiation and income elasticity across product categories found by Francois and Kaplan. As it turns out, our results are somewhat mixed across differentiation groups.

[4] This would be the case, for example, if a large proportion of asset ownership and of economic transactions in the South is informal.

there is an economically significant message of having four types of trade flows: developed country to developing country, developed country to developed country, and so on.

As explained earlier, we experiment with alternative ways of classifying goods into necessities and luxuries. We use three alternative types of classification, one based on the relationship between the household budget shares in each product, another based on the income levels of exporting countries, and thirdly, the Rauch classification, arguably a better measure of product differentiation than the one used by Francois and Kaplan. The first two classifications are absent from the work of Francois and Kaplan.

2 Theory

If tastes are homothetic, the income expansion path is a straight line starting from the origin.[5] If tastes are nonhomothetic (as shown in figures 1 and 2), then some goods are luxuries and others are necessities, meaning that they have income elasticities of demand higher and lower than 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 results in overestimating 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, X and Y. It is well-known that if we assume preferences to be homothetic and identical, we can write the aggregate demand function for X as follows:

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

in which p is the price ratio (= p_X/p_Y) of the two goods, and $I = \sum_{j=1}^{n} I_j$, I_j being the jth individual's income (measured in units of Y). There is an analogous demand function for Y. Now let us relax the assumption of homothetic tastes, which we do in two steps. First,

[5] The income expansion path is the locus of consumption bundles for varying income levels at constant prices.

suppose that the income expansion path is a straight line that does not pass through the origin (this is normally called quasi-homothetic tastes, as in figure 1). This path is consistent, for example, with assuming that good *Y* is food, which has a minimum subsistence level. Here, aggregate demand is no longer simply a function of aggregate income. In particular, it is now important to know additionally the per capita income (or the size of the population, *n*). Note however that, with quasi-homothetic tastes, 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. Let us redistribute the income from one consumer to the other, such that they end up consuming at points C_1 and C_2, respectively. Aggregate demand remains unchanged. In sum, with quasi-homothetic tastes, equation (1) is replaced by

$$X = D(p, I, I/n). \qquad \textbf{(2)}$$

Finally, suppose that the income expansion path is curved (figure 2). Performing the same income redistribution experiment as in the previous paragraph, one can easily see that aggregate demand changes. In particular, note that aggregate demand for good *X* increases ($X_1 + X_2 > 2X_0$), while it decreases for good *Y*. Thus, aggregate demand now depends potentially on the income of each consumer in the economy:

$$X = D(p, I_1, I_2, ..., I_n). \qquad \textbf{(3)}$$

In our data, we do not have information on the income of every single consumer in each economy. We do have various summary measures of income distribution, for the countries and years in our data set. Consequently, we approximate equation (3) by including all the determinants of demand in equation (2), and additionally a summary measure for the distribution of income:

$$X = D(p, I, I/n, \sigma), \qquad \textbf{(4)}$$

where σ is our measure of income distribution, or equivalently of income inequality.

We can now make use of these theoretical insights to modify the gravity equation. Let the value of country *i*'s production of luxuries and necessities be denoted by X^i_L and X^i_N, respectively. Country *i*'s exports of luxuries and necessities to country *j* are then given by $X^{ij}_L = s^j_L X^i_L$, $X^{ij}_N = s^j_N X^i_N$, respectively, where s^j_L and s^j_N represent country *j*'s shares of world expenditure on luxuries and necessities respectively.[6] Further, letting $\alpha^i{}_L$ and $\alpha^i{}_N = (1-\alpha^i{}_L)$ denote the shares of the value of the output of luxuries and necessities respectively in the overall GDP of country *i*, we have

$$X^{ij}{}_L = s^j{}_L \alpha^i{}_L GDP^i, X^{ij}{}_N = s^j{}_N \alpha^i{}_N GDP^i. \qquad \textbf{(5)}$$

Taking logs we have

$$\begin{aligned} \log X^{ij}{}_L &= \log s^j{}_L + \log \alpha^i{}_L + \log GDP^i, \\ \log X^{ij}{}_N &= \log s^j{}_N + \log \alpha^i{}_N + \log GDP^i. \end{aligned} \qquad \textbf{(6)}$$

With non-homothetic preferences, we can write

$$\begin{aligned} s^j{}_L &= \phi(\frac{GDP^j}{GDP^W}, (GDP/capita)^j, \sigma^j, \sigma^W), \\ s^j{}_N &= \psi(\frac{GDP^j}{GDP^W}, (GDP/capita)^j, \sigma^j, \sigma^W), \end{aligned} \qquad \textbf{(7)}$$

where $(GDP/capita)^j$ is the per capita GDP of country *j*, GDP^W stands for world GDP, σ^j for the inequality of country *j* and σ^W for world inequality.[7] Specializing the above to a form where the logs of the expenditure shares are linear in the log of the share of GDP in world GDP, in the log of per capita GDP and in inequality, we have:[8]

$$\begin{aligned} \log s^j{}_L &= \beta_0 + \beta_1 \log(\frac{GDP^j}{GDP^W}) + \beta_2 \log(GDP/capita)^j + \beta_3 \sigma^j + \beta_4 \sigma^W, \\ \log s^j{}_N &= \gamma_0 + \gamma_1 \log(\frac{GDP^j}{GDP^W}) + \gamma_2 \log(GDP/capita)^j + \gamma_3 \sigma^j + \gamma_4 \sigma^W. \end{aligned} \qquad \textbf{(8)}$$

In (8), we have the coefficients of per capita GDP and inequality positive in the case of luxuries and negative in the case of necessities. Plugging (8) into (6), we have:

[6] Note that an importing country's share in world expenditure on a product category is being assumed to be the same across all source (exporting) countries for the same category, where a category represents whether the good is a necessity or luxury. Of course, as shown above, these shares are being hypothesized to be functions of the characteristics of the importing country. While this type of a gravity specification is usually based on the assumption of perfect specialization, Evenett and Keller (2002) show that a somewhat less restricted version of the gravity model is consistent with increasing returns to scale and product differentiation as well as with incomplete specialization in a unicone 2x2x2 Heckscher-Ohlin model. For an in-depth treatment of the relationship between the empirical gravity model and alternative theoretical models of international trade, see Feenstra, Markusen and Rose (2001). Finally, for an excellent, exhaustive textbook treatment of the entire gravity literature, see chapter 5 of Feenstra (2003).

[7] In equation (4), 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. Thus, to avoid unnecessary clutter, we suppress this argument in the share function presented in equation (4).

[8] Alternatively, one can think of this expression as a first-order Taylor expansion in the logarithms.

$$\log X^{ij}{}_{L} = \beta_0 + \beta_1 \log GDP^j - \beta_1 \log GDP^W + \beta_2 \log(GDP/capita)^j + \beta_3 \sigma^j + \beta_4 \sigma^W + \log \alpha^i{}_{L} + \log GDP^i,$$

$$\log X^{ij}{}_{N} = \gamma_0 + \gamma_1 \log GDP^j - \gamma_1 \log GDP^W + \gamma_2 \log(GDP/capita)^j + \gamma_3 \sigma^j + \gamma_4 \sigma^W + \log \alpha^i{}_N + \log GDP^i. \quad \textbf{(9)}$$

We estimate equations similar to these. They are essentially 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/capita* and inequality for the importing country. *GDP/capita*, of course, has a dual role in that it also represents the stage of development of the trading country and therefore, can capture the size of trade barriers (both formal and informal). Therefore, its role through nonhomotheticity will be virtually impossible to identify. The effect of nonhomothetic preferences through inequality is more clear-cut and less contaminated. One further modification is that we expect from the theory that the coefficients on luxuries and necessities to be different, and therefore we will estimate two different equations, one for luxuries and one for necessities. Finally, note that we will include terms for natural barriers to trade, such as distance and remoteness.

3 Empirical Strategy

A. Direct measure: luxuries versus necessities

We will thus investigate the effects of inequality on trade with the use of a standard gravity model of international trade, augmented in specific ways. 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, we include the distance between the two countries (which can be considered to be a proxy for trade costs), and remoteness of the country pair from the rest of the world (the more remote the two countries are from other countries, the more they are expected to trade with each other). As discussed in the theory section, we add per-capita GDP and various measures of income distribution (more properly, of income inequality), which also matter if preferences are nonhomothetic. Note that, as argued by Frankel (1997), per-capita GDP's also capture formal and informal trade barriers.[9] Therefore, this variable 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 direct and less ambiguous.

A further departure from the gravity model, as indicated by the theory, is that we first perform all regressions by including the GDPs and the GDPs/capita of the importing country and the exporting country separately (four variables total). To facilitate a direct comparison with the standard gravity model, for most regressions we also report the results in which we just use the logarithm of the product of the GDPs and the logarithm of the product of the GDPs/capita, which restricts the coefficients on the GDPs and on the GDPs/capita to be the same. Note that F-tests reject this restriction in all cases.

We expect that the impact of the different variables, especially GDP per capita and inequality, on the international commerce of some good to depend on the nature of the good being transacted. If the good is considered a luxury, then the impact of inequality in the importing country should be positive, while if the good is a necessity, the impact of inequality would enter negatively. We must therefore separate tradable goods according to whether they are luxuries or necessities, and aggregate trade flows according to these two categories.

We use a direct measure of luxuries and necessities to test the main hypothesis of this paper: the flows of international trade can only be fully understood with the inclusion of demand considerations. Because demand (and specifically, its non-homotheticity) plays such a significant role, the challenge will be to use consumer behavior for that purpose, but such that what we call a luxury or a necessity is independent of international trade.

For this purpose, we obtained data from the Bureau of Labor Statistics detailing consumer behavior for a wide range of consumption categories. For each of the consumption categories defined by the BLS, the first step was to designate it as a luxury (*L*) or a necessity (*N*). The second step of the procedure was to match 4-digit SITC categories, for which we have trade data, to the BLS categories. Details of this procedure

[9] Per-capita GDP captures the level of development, which is usually negatively correlated with formal and informal trade barriers that are not directly measured by distance or remoteness.

are given in the Data Appendix. For each exporter-importer-year combination, we were therefore able to aggregate trade into two different flows: exports in luxuries; and exports in necessities.

More specifically, we ran OLS estimates of the following two models:

$$\ln X_{ijkt} = A_{ik} + A_{jk} + A_{kt} + \beta_{1Ek} \log(GDP_{it}) + \beta_{1Mk} \log(GDP_{jt}) +$$

$$\beta_{2Ek} \log\left[(GDP/Capita)_{it}\right] + \beta_{2Mk} \log\left[(GDP/Capita)_{jt}\right] + \qquad \textbf{(10)}$$

$$\beta_{3k} \log(\text{Distance}_{ij}) + \beta_{4k} \log(\text{Remote}_{ijt}) + \beta_{5k} \text{ Inequality}_{jt} + v_{ijkt} \ ,$$

$$\ln X_{ijkt} = A_{ik} + A_{jk} + A_{kt} + \beta_{1k} \log(GDP_{it} GDP_{jt}) +$$

$$\beta_{2k} \log\left[(GDP/Capita)_{it} (GDP/Capita)_{jt}\right] + \beta_{3k} \log(\text{Distance}_{ij})$$

$$+ \beta_{4k} \log(\text{Remote}_{ijt}) + \beta_{5k} \text{ Inequality}_{jt} + u_{ijkt} \ , \qquad \textbf{(11)}$$

$$k = L, N,$$

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*;

$Remote_{ijt}$: product of the average distances of country *i* and country *j* from all other countries, weighed by GDPs;

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

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

Note that (10) is directly derived from our theory, while (11) is a restricted version of (10) in that the coefficients of the GDPs (aggregate as well as per capita) of the importing and exporting countries are constrained to be the same. The imposition of this restriction gives us the traditional gravity model (where it is the product of GDPs that determines bilateral trade flows), augmented by the inclusion of the inequality variable.

Note that we use country fixed effects (A_{ik} and A_{jk}), which are important, as they stand for the multilateral resistance terms in Anderson and van Wincoop (2003).[10] These country fixed effects are also expected to capture a significant part of the output composition of countries in terms of luxuries and necessities as well as country-specific taste parameters.[11] 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 capture world GDP and world inequality (GDP^W and σ^W in our theory section).

The variable $Remote_{ijt}$ is calculated as follows:

$$Remote_{ijt} = \left(\frac{\sum_{m \neq i} Distance_{mi} GDP_{mt}}{\sum_{m \neq i} GDP_{mt}} \right) \left(\frac{\sum_{m \neq j} Distance_{mj} GDP_{mt}}{\sum_{m \neq j} GDP_{mt}} \right).$$

Since, in our main results, we perform the estimation of models (10) and (11) for the two different product categories separately, we allow all our parameters to vary across them.

B. Homogeneous versus differentiated goods

We next use the well-known index devised by Rauch (1999), which separates goods at the 4-digit SITC level according to three different types: goods that are traded in organized exchanges; goods that are not traded in organized exchanges but for which a published reference price can be found; 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. This is because differentiated goods have characteristics that can differ along many dimensions; therefore, it is not easy to trade them "long distance," as the trade that

[10] This identification relies crucially on the assumption that the multilateral resistance term does not vary with time. Rigorously speaking, that assumption is not exact, since the multilateral resistance depends on the trade barriers of all countries, which do change over time. Since our paper does not attempt to identify trade barriers or "border effects," but instead attempts to explain trade flows as determined by inequality, which are not modeled as a barrier to trade, it seems most economic to avoid the considerable cost of using multilateral resistance terms. The case for using country fixed effects to capture the multilateral resistance has been made quite clearly and strongly in chapter 5 of Feenstra (2003). Gravity models with country fixed effects have been estimated by Harrigan (1996), Redding and Venables (2000), Rose and Van Wincoop (2001) and Feenstra (2002).

[11] Note that the parameter α in our theory section is specific to both the type of good (luxury or necessity) and to the source country.

occurs in an organized exchange or through the aid of a reference price would be. We estimate equations (10) and (11) for two categories of goods. $k=w+r$ is the category that aggregates trade in all goods with organized exchanges (denoted by w) and goods with reference prices (r). Thus, this is the category of homogeneous goods. $k=n$ denotes trade in all other goods, that is, in differentiated goods.

The reason to use this index is two-fold. First, we follow Francois and Kaplan (1996) in arguing that, intuitively, differentiated goods should behave more like luxuries. 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. Second, unlike Francois and Kaplan we have at our disposal what is arguably a better measure of product differentiation than they had.[12] Therefore, as another attempt at identifying an effect of inequality on trade, we ran separate gravity regressions (equations 10 and 11) for homogeneous and differentiated goods, as indexed by Rauch.

C. Source country

We next try to correlate the country of origin of a given good to whether that good is a necessity or a luxury. Here, we re-estimate the models in equations (10) and (11) somewhat differently. First, we use total exports from country i to country j, $X_{ijt} = \sum_{k=L,N} X_{ijkt}$ + unclassified trade.[13] Second, we include additionally the variables $HighIncome_i$ and $MidIncome_i$. These 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.

[12] Francois and Kaplan's work predates, and therefore could not have used, Rauch's index. For a measure of differentiation, they simply use the proportion of the trade in each good that is *intra*-industry trade. This measure, from our point of view, has two disadvantages. First, it requires *two* links, instead of just one: first, it requires identifying luxuries with differentiated goods; second, identifying differentiated goods with goods that have high volumes of intra-industry trade. By using a direct measure of differentiated goods, we avoid the need for the second link (we have also avoided the first link in our direct measure). The second disadvantage of conflating luxuries with intra-industry trade, is that it disallows an investigation of the relationship between inequality and inter- versus intra-industry trade, itself a non-trivial topic that we intend to take up in future work.

[13] "Unclassified trade" refers to trade flows which could neither be classified as luxuries, nor as necessities.

We will then estimate the average impact of inequality on imports, 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 into 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 (10) and (11) with OLS, we also estimate a corresponding Tobit model. The equations then change to:

$$\begin{aligned}\ln X_{ijkt} &= Max\{A_{ik} + A_{jk} + A_{kt} + \beta_{1Ek}\log(GDP_{it}) + \beta_{1Mk}\log(GDP_{jt}) \\ &+ \beta_{2Ek}\log\left[(GDP/Capita)_{it}\right] \\ &+ \beta_{2Mk}\log\left[(GDP/Capita)_{jt}\right] + \beta_{3k}\log(\text{Distance}_{ij}) \\ &+ \beta_{4k}\log(\text{Remote}_{ijt}) + \beta_{5k}\, Inequality_{jt} + v_{ijkt}\ , 0\},\end{aligned} \quad \textbf{(12)}$$

$$\begin{aligned}\ln X_{ijkt} &= Max\{A_{ik} + A_{jk} + A_{kt} + \beta_{1k}\log(GDP_{it}GDP_{jt}) \\ &+ \beta_{2k}\log\left[(GDP/Capita)_{it}(GDP/Capita)_{jt}\right] \\ &+ \beta_{3k}\log(\text{Distance}_{ij}) + \beta_{4k}\log(\text{Remote}_{ijt}) + \beta_{5k}\, Inequality_{jt} + u_{ijk}\ , 0\},\end{aligned} \quad \textbf{(13)}$$

where the estimation is performed with maximum likelihood methods. Note that for all models [(10) , (11), (12) and (13)] 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 (Q51). 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.[14] We handle such endogeneity 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; 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. Note that a country's aggregate trade with the rest of the world can have an impact on its inequality. 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.

4 Data

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 Standard International Trade Classification (SITC), Revision 2, at the 4-digit aggregation level. The WTA was compiled by Statistics Canada, using the bilateral trade data available from the United Nations Statistical Office, and it has been made available by Robert Feenstra (2000). The usefulness of this data set 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, at the four-digit SITC level. This feature is important for us,

[14] A country with a leftist government that wishes to enhance equality may well use trade policy to do so.

because we want to aggregate the trade data according to our classification for luxuries and necessities, and also according to the Rauch commodity categories.

We needed to define traded goods according to whether they are luxuries or necessities. To do this, we obtained data from the Bureau of Labor Statistics for 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. We relegate to the Data Appendix a detailed explanation of how we used this information to construct our definition of luxuries and necessities, and how we matched it to SITC data. Here, it suffices to say that for an exporter *i*, and importer *j*, and a year *t*, we had at the end of this procedure two trade flows: exports by *i* to *j* in luxuries; and exports by *i* to *j* in necessities.

We use Rauch's (1999) classification, which separates 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*). In our regressions, we further 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.

Our inequality data come from Dollar and Kraay (2002), according to whom theirs is the largest data set on inequality available up to date. It is largely a recompilation of the UN-WIDER data set that was also used by Deininger and Squire (1996) to construct a "high quality data set." This data set is a panel of 137 countries, spanning the years from 1955 to 1999.

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

5 Empirical Results

A. Direct measure of luxuries and necessities

We began by looking at our direct classification of trade flows into luxuries and necessities. We ran separate regressions for exports in luxuries and exports in necessities. Results are presented in table 1, with two alternative model specifications. Since the classification of goods into luxuries and necessities is based on household survey data from the US, we restrict the sample to have only high-income importing countries, while keeping exporting countries unrestricted.[15] The main prediction of the model is strongly confirmed: not only do most gravity variables enter as predicted,[16] but the only parameter that changes sign in a significant way between the two regressions is the coefficient on inequality. Thus, imports of necessities as defined by US household behavior go down with inequality, and imports of luxuries go up with inequality (since the GDP / capita plays a dual role of capturing institutions and informal trade barriers as well as non-homotheticity of preferences, it is perhaps too much to expect it to also have the same sign pattern). A percentage point increase in the Gini coefficient of the importing country (the recipient of the trade flow) results in an increase in its imports of luxuries by roughly 1.2 percent and a reduction in its imports of necessities by roughly 1.3 percent. In other words, holding everything constant, if the US moved from its Gini coefficient of 45 to Canada's Gini coefficient of say roughly between 30 and 35, we would get a 12 -18 percent reduction in luxury imports and a 13 - 18 percent increase in imports of necessities. Thus, inequality seems to have a non-trivial impact on the structure of trade flows.[17]

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[15] We tried this estimation with an unrestricted sample of all importing countries. As suspected (given that the classification is based on household data from a high-income country, namely the US), we fail to get any results that are economically meaningful and robust to inclusion and exclusion of country dummies, econometric techniques, and measures of inequality.

[16] The exception is *Remote*, which enters negatively and significant for luxuries. We do not have an explanation for this result.

[17] We also perform a large number of robustness checks as explained in detail in subsection D.

B. Homogeneous versus differentiated goods

The results for the OLS regressions (10) and (11) for the Rauch categories are shown on table 2. Odd-numbered columns show results when the dependent variable is differentiated goods (n), while the even-numbered columns are results for homogeneous goods (w+r).

Looking first at columns (1), (2), (5) and (6), which are regressions when we use the full set of trading partners available in the sample, we first note that most gravity variables behave as expected: countries that are larger and closer trade more (note that the impact of the log GDP is given by adding the coefficient on, say, log mGDP to log mGDP/capita, which is always positive). Turning now to the parameter of interest, we see that the impact of inequality on trade is not noticeably different between the differentiated and the homogeneous goods. This is perhaps not on the whole surprising, because we were after all simply 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).

However, we also re-ran the regressions with a restricted sample, such that the importing country is high income (that is, the variable $HighIncome_i$=1). The regression results with the restricted sample are represented in columns (3), (4), (7) and (8) of table 2. Here, homogeneous goods behave as necessities, in a complete reversal from the results with the full sample. However, the results on the differentiated goods are mixed: there is some weak support that they behave as luxuries from the coefficient on GDP / capita,[18] but the coefficient on the inequality measure loses significance. If anything, the comparison between the two samples alerts 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.[19] Also, as in the case of our direct measure of

[18] As explained before, however, a positive sign on the coefficient of per capita GDP might not mean much.

[19] The results in table 2 for the full sample with products of GDPs and GDPs/capita (columns 5, 6) are not sensitive to inclusion of the square of inequality, changing the estimation to Tobit, using Q51 as the measure of inequality, or to separately regressing w and r goods, considered as homogeneous goods. The same is true for the restricted sample (columns 7, 8), with the following exceptions: Q51 for homogeneous

luxuries and necessities, a percentage point change in the Gini coefficient can be associated with up to a 1.3 percent change in each kind of trade flow.

C. Source country

After the mixed but suggestive results obtained by distinguishing between differentiated and homogeneous goods, we turn our attention to whether luxuries and necessities differ according to the income level or the stage of development of source (exporting) country. The economically and statistically significant message we find here is: developing countries tend to export necessities, and developed countries tend to export luxuries. Note 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.[20]

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, as described above: $HighIncome_i$ and $MidIncome_i$ take value one if the exporting country i is high or mid-income, respectively, with two analogous variables for the importing country. Since we interact them with our measure of inequality for the importing country, we need to calculate the partial effect of inequality on imports. And since there are three types of countries (high, medium, and low income), we have nine combinations.

Table 3 presents the regression results when the measure of inequality is the Gini index. Most gravity variables enter with the right sign and are significant at the 1% level (except *Remote*, which enters with the wrong sign, but insignificantly). Table 4 presents the partial effects of inequality on imports, arranged in two matrices with all nine

goods becomes insignificant; the coefficient on Gini becomes insignificant for w goods (but not for r goods).

[20] In other words, the reason for the comparative advantage may follow Hecksher-Ohlin: it may be that luxury goods, such as automobiles, but also leather bags and fashion clothing, systematically use more capital than necessities, at the same factor prices. But the reason may also be Ricardian: simply because they are the goods that 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. The conclusion of either story is that comparative advantage of richer countries is likely to fall on luxuries.

possibilities in each (one matrix being for the unrestricted model and the other for the restricted one, which is the traditional gravity model augmented with inequality). Again, these partial effects can be fairly large in magnitude.

One can discern a fair amount of structure from these matrices. Note that the vertical dimension lets the income level of the *exporting country* vary, and thus it is the dimension 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 in each of the two matrices. On the whole, for the first and the third rows in each of the two matrices (barring one exception), the row determines the sign of the partial effect of inequality on trade. In particular, by moving through the first row of both tables 4A and 4B (barring the import demand from middle income countries in table 4A which has a positive sign but is statistically insignificant), one can easily see that import demand from all three income levels behaves as if the exports of low income countries are necessities.[21] Analogously from the last row for each of the two matrices, 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 the analysis with differentiated versus homogeneous goods: 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. Note that the reverse sign pattern on the middle row would be unexpected.

In sum, this sub-section provides fairly strong support for the following stylized fact, to our knowledge not known to the economics literature: *poor countries export necessities, and rich countries export luxuries*.

Furthermore, at the margin of this major determinant, an additional determinant of what constitutes luxury or necessity is the income level of the importer. This lends support for an Engle curve that not only is curved, but it is so in a complicated way, such

[21] Note that the first entry in the matrix 4A is negative but insignificant at the 10% level. However, it just misses the 10% mark, in that it is significant at the 12% level.

that goods that are luxuries initially, tend to become necessities at higher income levels. With these facts in hand, it becomes more and more inescapable that a correct specification of the gravity model must make an allowance for demand.

D. Robustness checks

Finally, we performed several robustness checks, a selection of which is reported in table 5. First, we checked for non-linearities with respect to inequality. Introduction of an additional squared inequality term (columns 1, 2) does not qualitatively or even quantitatively change the results in any way. The partial derivatives of imports with respect to inequality remain preserved in terms of sign, magnitude and significance (as compared to the linear case).

As a further robustness check, we also use the ratio of the income share of the fifth quintile to that of the first quintile (Q51) as an alternative measure of inequality that we use on the right-hand side (columns 3, 4). Q51 has the right signs – negative in the case of necessities and positive in the case of luxuries. While it is only marginally significant 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. The results are very robust with 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 likely to be affected by the likely existence of heteroscedasticity in our panel data.

Columns (9) and (10) report the results when we take out each country's main trading partners. In particular, they 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.[22]

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 the distribution of income as a determinant of trade. In our theoretical framework, we drop the assumption of homothetic preferences and we empirically pursue our 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. These results are robust across measures of inequality and across specifications, and estimation methodology. Secondly, another pattern of the relationship between inequality and trade is as follows: as inequality increases in the importing countries, we observe that imports from rich countries increase while imports from poor countries decrease. Besides, most standard variables of the gravity model remain qualitatively the same, in the presence of inequality, as in the existing gravity literature.

[22] Some additional robustness tests were performed. We tried adding the inequality of the exporting country. For the bilateral trade sample we are focusing on, exporting country inequality remains insignificant and in fact its t-ratio is less than one in all cases. 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. We also tried to combine some of the tests, for example, including the square of the inequality measure in a Tobit regression. Finally, as explained in subsection B, for the Rauch categories, we tried to separate regressions for the *w* and for the *r* goods.

DATA APPENDIX

This appendix describes how we classified 4-digit SITC goods as necessities or luxuries.[23] 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[24]
- 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

[23] A file with our classification is posted online: http://faculty.maxwell.syr.edu/vmtrindade/research.htm.

[24] 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.[25]

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

[25] 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.[26] 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.

[26] 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").

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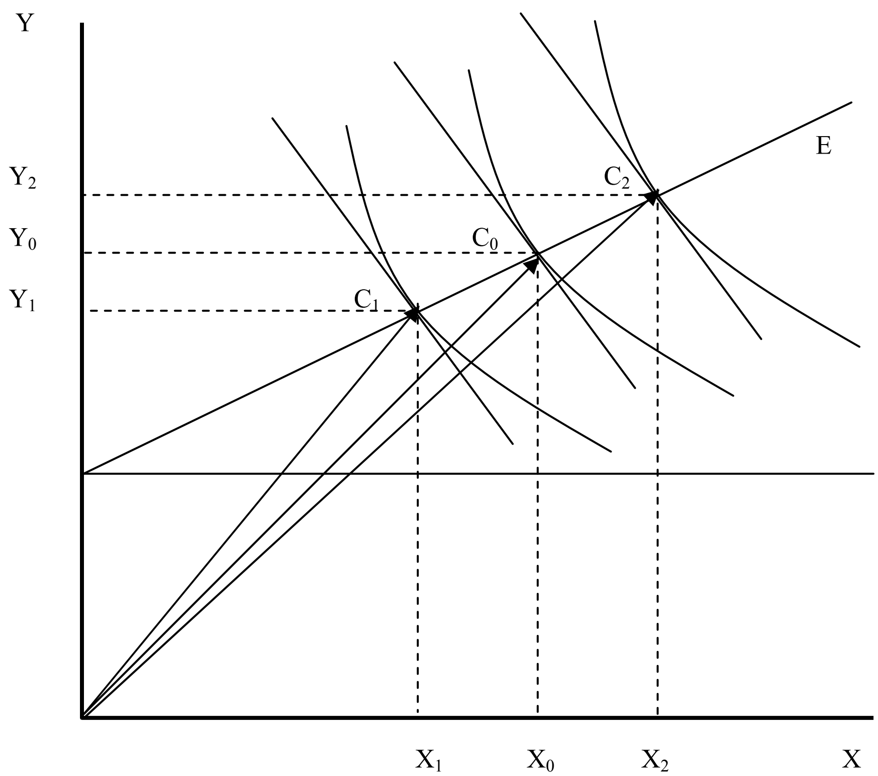

Figure 1

Quasi-Homothetic Preferences

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

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

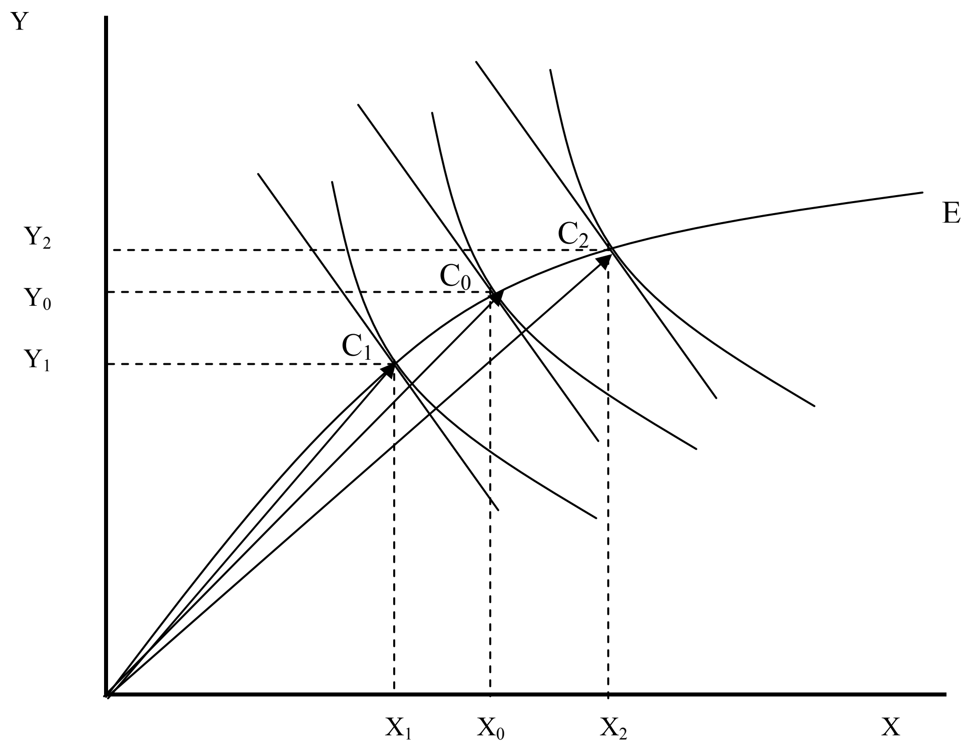

Figure 2- Nonhomothetic Preferences

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

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

Regressand / Regressors	Imports in Necessities	Imports in Luxuries	Imports in Necessities	Imports in Luxuries
Inequality (Gini)	-0.013*** (0.004)	0.013*** (0.004)	-0.013*** (0.004)	0.012*** (0.004)
Log xGDP	1.040*** (0.206)	0.745*** (0.167)		
Log mGDP	-0.233 (0.486)	-2.683*** (0.394)		
Log xGDP/Capita	0.227 (0.202)	1.094*** (0.156)		
Log mGDP/Capita	1.714*** (0.552)	4.078*** (0.468)		
Log distance	-1.487*** (0.025)	-1.527*** (0.023)	-1.487*** (0.025)	-1.525*** (0.023)
Log Remote	-0.643 (3.578)	-6.542** (2.996)	0.467 (3.540)	-2.019 (2.965)
Log (xGDP mGDP)			0.827*** (0.197)	0.143 (0.156)
Log (xGDP/Capita mGDP/Capita)			0.444** (0.191)	1.602*** (0.148)
Observations	26644	26644	26644	26644
R-squared	0.75	0.84	0.75	0.84

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
column title shows commodity categories
year, exporting and importing country dummies not shown

Table 2: OLS results for separate Rauch categories.

Regressand / Regressors	(1) n full	(2) w+r full	(3) n restr.	(4) w+r restr.	(5) n full	(6) w+r full	(7) n restr.	(8) w+r restr.
Inequality (Gini)	0.011*** (0.002)	0.008*** (0.003)	–0.003 (0.003)	–0.013*** (0.004)	0.012*** (0.002)	0.008*** (0.003)	–0.003 (0.003)	–0.013*** (0.004)
Log xGDP	0.314*** (0.112)	0.485*** (0.137)	0.437*** (0.165)	0.966*** (0.208)				
Log mGDP	–1.168*** (0.141)	0.555*** (0.175)	–0.768* (0.403)	1.511*** (0.499)				
Log (xGDP mGDP)					–0.269*** (0.091)	0.539*** (0.113)	0.236 (0.156)	1.082*** (0.198)
Log xGDP/Capita	1.392*** (0.105)	0.968*** (0.131)	1.179*** (0.159)	0.301 (0.204)				
Log mGDP/Capita	2.584*** (0.147)	1.230*** (0.182)	2.516*** (0.463)	0.641 (0.557)				
Log (xGDP/Capita mGDP/Capita)					1.843*** (0.085)	1.037*** (0.105)	1.378*** (0.149)	0.283 (0.191)
Log Distance	–1.488*** (0.015)	–1.617*** (0.016)	–1.339*** (0.021)	–1.509*** (0.026)	–1.488*** (0.015)	–1.618*** (0.016)	–1.338*** (0.021)	–1.511*** (0.026)
Log Remote	–3.680 (2.453)	2.843 (3.002)	–4.892 (3.244)	9.060** (3.993)	–1.065 (2.451)	2.076 (2.996)	–3.715 (3.205)	7.138* (3.941)
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 import volume, 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 parenthesis. *, **, *** denote results significant at the 10%, 5%, and 1% level, respectively.

Table 3: Regressions with interactions of source country income level

Inequality measure / Regressors	mGini (1)	mGini (2)
Inequality	–0.009 (0.006)	–0.017*** (0.006)
Log xGDP	0.472*** (0.129)	
Log mGDP	–0.113 (0.166)	
Log (xGDP mGDP)		0.323*** (0.108)
Log xGDP/Capita	1.220*** (0.125)	
Log mGDP/Capita	2.019*** (0.172)	
Log (xGDP/Capita mGDP/Capita)		1.421*** (0.102)
Log Distance	–1.597*** (0.016)	–1.577*** (0.016)
Log Remote	–2.294 (2.787)	–1.952 (2.792)
mHighIncome	1.569*** (0.304)	1.440*** (0.300)
mMidIncome	–0.474 (0.289)	–0.361 (0.286)
xHighIncome	–2.676*** (0.154)	–2.965*** (0.152)
xMidIncome	–0.650*** (0.126)	–0.875*** (0.127)
mIneq x mHighIncome	–0.036*** (0.007)	–0.029*** (0.007)
mIneq x mMidIncome	0.015** (0.007)	0.016** (0.007)
mIneq x xHighIncome	0.077*** (0.002)	0.084*** (0.002)
mIneq x xMidIncome	0.022*** (0.002)	0.027*** (0.002)
Observations	67956	67956
R-squared	0.77	0.77

Regressand: log total bilateral imports. ‘x’ refers to exporting country variables. ‘m’ refers to importing country variables.
Robust standard errors in parenthesis.
*, **, *** 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 income level of importer and exporter.

A. From table 3, column (1).

Importer / Exporter	Low Income	Medium Income	High Income
Low Income	–0.0087 (0.118)	0.0068 (0.163)	–0.0442*** (1.38e–24)
Medium Income	0.0137** (0.014)	0.0292*** (2.36e–09)	–0.0218*** (2.22e–07)
High Income	0.0684*** (3.10e–35)	0.0839*** (0)	0.0329*** (9.30e–15)

B. From table 3, column (2).

Importer / Exporter	Low Income	Medium Income	High Income
Low Income	–0.0166*** (0.003)	–0.0003 (0.945)	–0.0456*** (2.26e–26)
Medium Income	0.0104* (0.064)	0.0267*** (5.11e–08)	–0.0185*** (8.73e–06)
High Income	0.0672*** (3.2e–33)	0.0834*** (0.00)	0.0381*** (1.31e–19)

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) Nec.	(2) Lux.	(3) Nec.	(4) Lux.	(5) Nec. Tobit	(6) Lux. Tobit
Inequality (Gini)	-0.029 (0.031)	-0.089*** (0.026)			-0.017*** (0.005)	0.001 (0.006)
Square Inequality (Gini)	0.000 (0.000)	0.002*** (0.000)				
Inequality (Q51)			-0.021 (0.015)	0.051*** (0.013)		
Log xGDP	1.042*** (0.207)	0.760*** (0.167)	1.178*** (0.244)	1.329*** (0.197)	1.679*** (0.253)	3.102*** (0.268)
Log mGDP	-0.258 (0.493)	-2.841*** (0.398)	-0.330 (0.575)	-3.226*** (0.464)	0.315 (0.560)	-3.435*** (0.605)
Log xGDP/Capita	0.226 (0.202)	1.086*** (0.156)	0.055 (0.239)	0.438** (0.187)	-0.421* (0.244)	-1.179*** (0.264)
Log mGDP/Capita	1.734*** (0.557)	4.199*** (0.471)	1.420** (0.628)	4.761*** (0.530)	1.231* (0.641)	6.320*** (0.697)
Log Distance	-1.487*** (0.025)	-1.527*** (0.023)	-1.477*** (0.027)	-1.553*** (0.025)	-1.591*** (0.031)	-1.911*** (0.031)
Log Remote	-0.349 (3.597)	-4.700 (3.025)	0.544 (4.086)	-10.712*** (3.387)	1.397 (4.627)	-2.447 (4.777)
Observations	26644	26644	21757	21757	26644	26644
R-squared	0.75	0.84	0.75	0.84	0.24	0.35
Partial effect of Inequality (p-values)	-.0132*** (.002)	.011*** (.003)				

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
column title shows commodity categories
year, exporting and importing country dummies not shown
R-squared for median regressions are pseudo R-squareds.

Table 5 (continued)

Regressand / Regressor	(7) Nec. Median	(8) Lux. Median	(9) Nec.	(10) Lux.	(11) Nec.	(12) Lux.
Inequality (Gini)	-0.012***	0.016***	-0.021***	0.003***	-0.014***	0.014***
	(0.003)	(0.002)	(0.006)	(0.001)	(0.004)	(0.004)
Log xGDP	0.255	-0.557***	2.416***	0.014	1.329***	0.605***
	(0.163)	(0.118)	(0.340)	(0.032)	(0.224)	(0.182)
Log mGDP	0.256	-1.919***	-2.844***	0.132***	-0.152	-2.621
	(0.344)	(0.248)	(0.638)	(0.047)	(0.507)	(0.409)
Log xGDP/Capita	0.995***	2.096***	-2.050***	-0.046	-0.033	1.233***
	(0.157)	(0.113)	(0.337)	(0.032)	(0.219)	(0.172)
Log mGDP/Capita	0.786**	2.912***	5.142***	-0.094**	1.579***	3.975***
	(0.386)	(0.279)	(0.697)	(0.047)	(0.574)	(0.483)
Log Distance	-1.369***	-1.305***	-1.044***	-0.016**	-1.585***	-1.584***
	(0.020)	(0.015)	(0.067)	(0.008)	(0.027)	(0.026)
Log Remote	1.334	-3.419	-1.113	0.621	-2.413	-8.068**
	(2.984)	(2.150)	(7.627)	(0.418)	(3.926)	(3.305)
Observations	26644	26644	12782	9308	25339	25339
R-squared	0.56	0.66	0.65	0.11	0.74	0.82

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
column title shows commodity categories
year, exporting and importing country dummies not shown
R-squared for median regressions is pseudo R-squared.