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MARKET OVERLAP AND THE DIRECTION OF EXPORTS

- a new approach of assessing the Linder hypothesis

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Market overlap and the direction of exports: A new approach of assessing the Linder hypothesis*

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Abstract

The Linder hypothesis states that countries will trade more intensively with countries that have similar structures of demand. We suggest an alternative method of assessing the hypothesis, incorporating the distribution of income within a country. The variables that we develop capture the similarity in demand structures between two trading partners and the size of the market for which the market overlap is identified. These variables are included in a one-sided gravity model. Results show that similarity in structure of demand act as a catalyst of trade flows between countries and that similarities are more important for the differentiated goods than homogenous goods.

Keywods: Linder hypothesis, income distribution, overlapping demand
JEL Classification codes: F10, D31, B41

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1 Introduction

Research on international trade, whether theoretical or empirical, is often focused on supply side characteristics. The role of demand is perhaps less discussed, but it nevertheless has a long tradition in the academic discussion and it seems to be coming into fashion again, given the recent surge of publications within the area (see e.g. Mitra and Trindade 2005; Chul Choi, Hummels et al. 2006; Hallak 2006). One of the prominent advocators of the importance of the demand side was the Swedish professor Burenstam Linder (henceforth BL). In his doctoral thesis, BL wrote (p 94, 1961):

> *"The more similar the demand structure of the two countries the more intensive potentially is the trade between these two countries."*

BL's conjecture is generally known within international trade theory as the *Linder hypothesis*. The typical way of testing the Linder hypothesis is to let per capita income be a proxy of demand. However, consumer studies clearly indicate that consumer demand changes with the level of income; in fact, this has been one of the most stable empirical findings since the mid 19th century (Engel 1857; Engel 1881). This implies that aggregate demand is affected not only by the average level of income, but also of how income is distributed. This was also acknowledged by BL who claimed

> *"Uneven income distribution in a country widens the range of potential exports and imports and results, ceteris paribus, in there being a greater overlapping of demands between countries with different per capita incomes than would be the case if incomes were more evenly distributed"* (p 96, 1961)

The purpose of this paper is to introduce a new method of testing the Linder hypothesis; one that takes also the distribution of income into account. During the past decades, availability of income data has increased significantly, making it possible to model the distribution of income within a country. The basic idea of our proposed method is to calculate the overlapping demand between two trading partners. The method captures the market for which consumers with the same income levels can be identified in two countries given the distribution of income within the respective

country. Our method resembles the one used by (Chul Choi, Hummels et al. 2006) but our main focus is very different since they estimate import distribution and match it to income distribution.

Our method builds on the assumption that the income level of a consumer represents his or her demand. The influence of similar demand structures on trade flows is captured through the use of two different variables. The first variable is the overlapping demand, measured as the overlap of the respective density functions of income within each country. Secondly, we estimate the total size of the potential export market, which also relies on the market overlap idea but is expressed as number of people in the potential market. The dependent variable in our econometric models is export share to indicate the export intensity between markets. This also allows us to treat export as given and focus on the choice of export markets.

It is also probable that similarity of the demand structures may have different effects depending on the type of goods in focus. Differentiated goods are likely to be more sensitive to differences in demand structures than homogeneous goods (see e.g. Francois and Kaplan 1996). We will therefore divide products into different subgroups according to the definitions by (Rauch 1999). Homogeneous goods are goods that are traded on a formal exchange and while for differentiated goods, since they are more complex, affinity and familiarity between markets are more important for the exchange. Thus, we expect the Linder hypothesis to be more important in explaining trade of differentiated goods than for homogeneous goods.

Through the years, several studies have aimed at empirically verifying the Linder hypothesis, and the results have been mixed. One approach has been to identify Linder goods and study the demand pattern for these goods. Linder goods are often defined as goods that are differentiated and demonstrate high income elasticity. Francois and Kaplan (1996) find a demand shift towards Linder goods as income increases. Arad and Hirsch (1981) find that import of Linder goods, compared to Heckscher-Ohlin goods, originate from countries with a narrower range of per capita income. The most common approach to examine the Linder hypothesis has been to use a gravity framework and include a variable which accounts for the difference in per capita income between the supplier and demander of products. Arnon and Weinblatt (1998) confirm the Linder hypothesis and find that developing countries also provide evidence of a Burenstam Linder effect. In Hallak (2006) the focus is on product quality and he demonstrates that failure to confirming the *Linder* hypothesis is due to aggregation bias. By testing product goods separately, he finds support for the Linder hypothesis. The above studies, except for

Francois and Kaplan (1996), consider the income distribution *between* countries. There is also a small but growing body of literature that consider the within country distribution of income in trade models. Some examples are (Hunter 1991; Matsuyama 2000; Mitra and Trindade 2005; Chul Choi, Hummels et al. 2006). There are however, to our knowledge, no previous studies that use it to test the Linder hypothesis.

The outline of the paper is as follows. The following section outlines the theoretical framework. Subsequently, the methodology of calculating the new variables is delineated and an example from the data is provided. Section 4 provides the empirical results followed by conclusions and suggestions for further research.

2 Similarity of demand

This section discusses the Linder hypothesis and delineates the intuition behind the new method that we propose to assess the hypothesis.

2.1 The Linder hypothesis

The *Linder* hypothesis departs from traditional trade theory where endowments are the main cause and determinant of trade, like for example the Heckscher-Ohlin framework. BL argued against the Heckscher-Ohlin framework since, although it could be expected to provide a framework to study trade of raw material, it seems considerably less useful in explaining why countries would engage in both export and import of the same type of products. The explanation provided by BL was that, unless the country has a domestic demand for a product, they cannot be successful on the international market.[1] At early stages of development, proximity matters for raising new ideas and seeing the needs of consumers in terms of new products, and also to see eventual flaws of a product once starting to develop it. If the potential market only exists in countries other than that of the producer, it would be very costly to achieve this type of information and knowledge. Therefore, domestic demand will affect what is being produced

[1] This idea was further developed by Krugman, P. (1980). "Scale Economies, Product Differentiation, and the Pattern of Trade." American Economic Review **70**(5 (December)): 950-59., to include transport cost and increasing returns to scale as reinforcing aspects of the HME. In the presence of increasing returns to scale, specialization is promoted and excess production is export Helpman, E. and P. R. Krugman (1985). Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy. Cambridge, Mass., MIT Press.

within a country and changes in demand lead to changes in the composition of production (Burenstam Linder 1961). Once a production becomes established, it is possible to sell also to more distant markets. Countries should then, according to BL, more likely engage in trade with countries where demand patterns resemble their own ones.

The above reasoning of first requiring a domestic demand for a product before being able to export the product provides a basis for the most prevalent type trade that exist on the world market today - intra-industry trade (IIT). If a country has a domestic demand for a product it is likely to demand similar types of products from other countries. BL explained it as follows (p 102, 1961):

> *"When the entrepreneurs raise their trade horizons… they can extend their market expansion paths into each other's territory while competing only with substitute and not with identical goods"*

The degree of IIT between trading partners is generally higher for countries with a high average income level. Following consumption theory, consumers with a high income level commonly prefer to consume a larger variety of goods. In general product groups with a high share of IIT are found in the manufacturing industry, because of the virtually infinite possibility of differentiating products and the dependence on economies of scale. According to BL (1961) potential trade in differentiated goods are most intensive between countries where the structures of demand are similar. He does not make the same conjecture for trade in primary products.

Thus, in correspondence to the ideas of BL, we may expect that the similarity in structures of demand has a larger impact on differentiated products than it has on homogenous products. However, one reservation may be asserted; the importance of scale economies in production may have a considerable impact on the selection of export destinations. It is therefore possible that an overlapping demand is not a sufficient reason for countries to engage in trade. To the extent that there are fixed costs associated with exports, we should expect that there is a minimum size of the potential market in the importing countries in order to overcome those costs and make trade beneficial.

2.1 A new approach of assessing the Linder hypothesis

The traditional way of testing the similarity of demand structure is by comparing the average income of each country (Burenstam Linder 1961; Arnon and Weinblatt 1998; Hallak 2006). The smaller the difference is between the average incomes of the respective countries, the higher the expected trade. Hence, there is a negative relation between income differences and the intensity of trade. This approach has the obvious advantage of being easy to estimate, since average income levels for many countries are easily accessible. However, it pays no attention to how income is distributed within the country which, according to consumer studies, there is good reason to expect affects aggregate demand.

There is an increasing body of literature on how income distribution affects demand patterns in a country (see e.g. Shleifer, Murphy et al. 1989; Foellmi and Zweimüller 2005). In line with the findings of their research, let us assume that consumers with similar income levels also have similar demand patterns. When demand overlaps, there is a potential to trade, and we estimate this overlap using information on within country income distribution, which we believe contain more information than using only average data.

The general idea of the method can be explained as follows. Assume a country *i* with a distribution function of disposable income of θ_i. Consider next the possibility of trading with country *j*, which has a distribution function of θ_j. The overlap of demand structures corresponds to the area below the lowest of the distribution functions, i.e. the minimum integral of the two distribution functions:

$$MO_{ij} = \int_0^{\Omega} \min\{\theta_i(y), \theta_j(y)\} dy \qquad (1)$$

where Ω denotes the span of individual incomes. An illustration of equation 1 is shown in Figure 1.

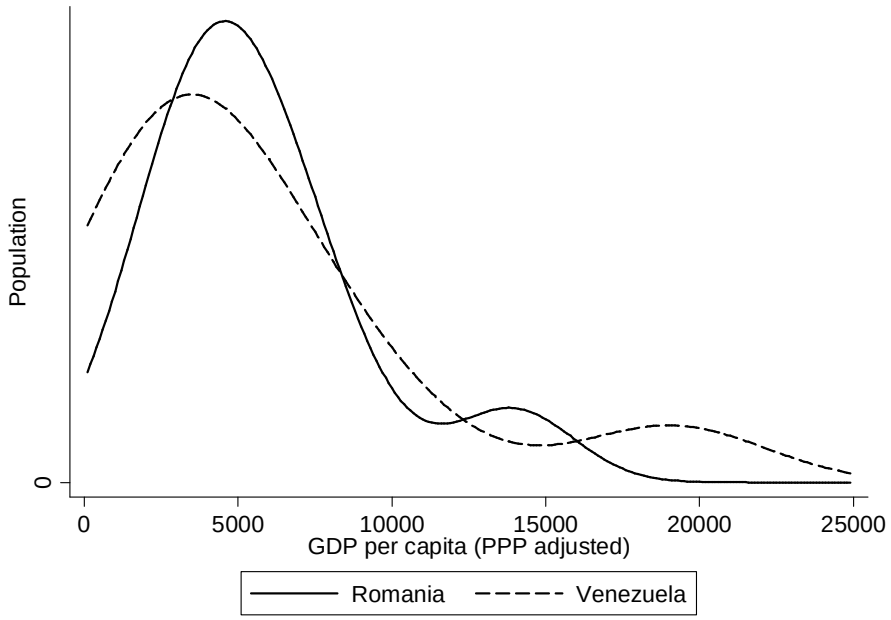

Figure 1. An illustration of the market overlap

The two countries in Figure 1 (Romania and Venezuela) present, according to national accounts, approximately the same average income levels and if the average income were used to estimate demand similarities, the two countries would appear as very similar markets. In this approach however, a relatively large share of the population are expected to have demand structures that differ from the other country. In the same way, countries with different average levels of income could still have groups of the populations where their incomes overlap. One example of this is that the upper class in a poor country may display demand patterns that resemble more those of the average consumer in a rich country rather than the average consumer of their own country.

3 Method and model formulation

In this section we first present how we construct the variables that will be used to capture the Linder effect. Subsection 3.2 delineates the model in which our new variables are used. BL (1961) recognized that there will be a difference between potential trade and actual trade. He referred the difference between the two to "trade-breaking forces" between countries that will distort trade flows so that the potential market is not exploited. This model also includes friction factors that either aid or hinder the intensity of trade between countries. The last subsection clarifies the product categories used in the estimations.

3.1 Estimation of the overlap in structures of demand between trading partners - methodology

First, we calculate the overlap in demand structures for each bilateral link. Given that the true density function is unknown, we will use a discrete method of kernel estimates in order to find good proxies for equation 1. In addition, we will also consider the size of the export destination, the part of the population which represents the same structure of demand as in the export country.

In order to estimate each country's distribution function, we use deciles of disposable income from World Income Inequality Database (UNU-WIDER 2005). A nice feature of this process is that we do not need to make any assumptions of the overall distribution and force it in to a specific function.[2] Following (Sala-i-Martin 2006), we estimate these distributions using a Gaussian kernel smoothing procedure, which means that we do not use the same income for the entire deciles but generate income estimates through the smoothing technique. We partition the data into income subgroups (eq.2) which correspondingly can be expressed as distances. The partition of Ω can be expressed as

$$P \equiv \{[0, y_1), [y_1, y_2), ..., [y_{n-1}, y_n]\} = \{p_1, p_2, ..., p_n\}, \qquad p \to \Re \tag{2}$$

[2] In order to see if we could find any function that would realistically fit the data, we used the method by Stuart, A. and K. Ord (1994). Kendall's advanced theory of statistics. Vol. 1, Distribution theory London, Arnold Publishers.on determining functions pertaining to the Pearson family of distribution. Preliminary calculations reveal that our data fit none of these types of distributions.

And thus we can estimate a country's density function θ_i by the following expression

$$\theta_i(p) = \int_{y \in p} f(y)dy \tag{3}$$

Kernel estimates require the specification of bandwidth, and we choose to follow the standard approach (Sala-i-Martin 2006), so that $w=0.9*sd*(n^{-1/5})$. Each income interval represents US$100. In order to capture the relevant spectra of incomes, the range of incomes applied is between 0 and 150.000, which results in 1500 observations for each country.

For each bilateral trading relation, the estimated density functions are related to one another and the minimum integral is calculated as expressed in equation 4:

$$MO_{ij} = \int_{p \in P} \min\{\theta_i(p), \theta_j(p)\}, \qquad 0 \leq MO_{ij} \leq 1 \tag{4}$$

The measure is symmetric, in the sense that $MO_{ij} = MO_{ji}$. Furthermore, given the previous discussion, we also consider the overlapping markets to be the relevant markets when considering the contribution of scale economies. We capture this, in equation 5, by calculating the part of the population in the receiving country, *j*, which represents the same structure of demand as in the export country, *i*:

$$Linderpop_{ij} = MO_{ij} * Population_j \tag{5}$$

Contrary to the market overlap variable, the size of the *Linderpop* variable will be different for each bilateral relation. The above two measures will, in the following subsection, be incorporated into a one-sided gravity model.

3.2 Model formulation

Given that the focus of this study is primarily on the demand side, the variables defined in equation (5) and (6) are included in a one-sided gravity model. The model estimated[3] is:

$$\ln(x_{ij,p}) = \alpha + \beta_1 \ln(Linderpop_{ij}) + \beta_2 MO_{ij} + \beta_3 Dist_{ij} + \beta_4 Contig_{ij} + \beta_5 Comlang_{ij} + \beta_6 Colony_{ij} + \beta_z \mathbf{Z} + \varepsilon_{ij} \quad (7)$$

where the dependent variable is the log of export expressed as a share of the total export for each product group. Recall that the Linder hypothesis is expressed in terms of trade intensity, and it seems more appropriate to use the shares rather than the absolute values of trade flows. Denoting the dependent variable in shares also allows us to treat supply as given and focus on demand factors. Furthermore, expressing the shares by product group avoids inter-sectoral heterogeneity bias (Hallak 2006). Definitions and statistical sources for the independent variables are presented in Table 1.

Given the discussion in section 2.1, we expect $\beta_1 > 0$ and $\beta_2 > 0$ and furthermore, we expect them to be more important for differentiated goods than for the other categories of goods. The effect of overlapping income, MO_{ij}, is modeled as a positive friction variable, which means that it is assumed to increase the intensity of trade between countries. The more similar countries are in their structure of demand, the larger is the likelihood of them trading with one another.

The additional friction variables, $Dist_{ij}, Contig_{ij}, Comlang_{ij}$ and $Colony_{ij}$, are standard variables in the gravity setting, but of special interest when put in a BL context. It is possible to make a broader interpretation of consumer similarity and look at factors other than income. Common cultural and social factors such as language and a history may also contribute in shaping the demand of people. We expect these factors to be most important for differentiated goods (Burenstam Linder 1961; Rauch 1999). The first variable included is the distance ($Dist_{ij}$) between country *i* and *j* and we expect $\beta_3 < 0$. We use distance as measured between the capital cities of countries or the economically most important city, in cases where the two differ.

[3] The model expressed in its original form

$$x_{ij,p} = Linderpop_{ij}^{\beta_1} \exp\{\alpha + \beta_2 MO_{ij} + \beta_3 Dist_{ij} + \beta_4 Contig_{ij} + \beta_5 Comlang_{ij} + \beta_6 Colony_{ij} + \beta_z \mathbf{Z} + \varepsilon_{ij}\}$$

$Comlang_{ij}$ assumes the value of one if countries share an official language, $Contig_{ij}$ reveals whether they share a common border, and $Colony_{ij}$ tells whether the countries have ever had a colonial link. For these variables, we all expect positive signs on the coefficients.

Z is a matrix that accounts for the multilateral resistance in trade flows. The most common approach of dealing with this has been through fixed effects (Anderson and van Wincoop 2003). However applying fixed effect in the cross-sectional analysis of this study would give rise to co-linearity problems with the other explanatory variables. Instead we apply the methodology of Mundlak (1978) which argue that the fixed effects are functions of the explanatory variables.

Table 1. Definition of variables and statistical sources

Variable	*Definition*
$x_{ij,p} = \frac{X_{ij,p}}{X_{i,p}}$	Exports from country *i* to country *j* as a proportion of total exports from country *i*. Calculated for each product group p Source: Comtrade
MO_{ij}	Overlapping market between countries *i* and *j* as defined by equation 2. Source: WIID and WDI
$Linderpop_{ij}$	Market overlap between countries *i* and *j* as defined by equation 3. Source: WIID and WDI
$Dist_{ij}$	Distance between the most important cities in countries *i* and *j*. Expressed in terms of 1000 kilometers. Source: Cepii
$Contig_{ij}$	1 if countries *i* and *j* share a border, 0 otherwise. Source: Cepii
$Commlang_{ij}$	1 if countries *i* and *j* have a common official language, 0 otherwise. Source: Cepii
$Colony_{ij}$	1 if the countries *i* and *j* ever had a colonial link, 0 otherwise. Source: Cepii
Z	Is a matrix of variables, constructed from the bilateral variables, to account for the multilateral resistance. The average values of the bilateral variables are calculated from both the exporter and import perspective.

3.3 Differentiated and homogenous products

In order to distinguish between differentiated and homogenous goods, we use the approach by (Rauch 1999). Goods are divided into three categories depending on their characteristics. The rationale for this distinction is that homogenous goods are the only goods traded on organized exchanges. Differentiated goods are, according to Rauch, more appropriately described as traded through networks in which already existing links play a central role. Given that the goods are

differentiated, the buyer cannot as easily evaluate the product and the search costs make buyers stick to producers they are familiar with. There is also a third category that takes a middle position, goods for which there exist price lists published but the brand names bear no importance for the exchange. These goods are not traded on organized exchanges and are therefore treated as a separate group of goods.

4 Empirical results

This section presents some descriptive statistic of the two variables that we have introduced in the previous sections. The second subsection displays the results from the one-sided gravity model where the new variables have been used to explain export intensity between trading partners.

4.1 Market overlap and average income for the "Linder" population

One of the variables that we introduce in this section is the market overlap, MO_{ij}. The essence of the concept is to find the area below the income distributions of two trading partners (see equation 4 and Figure 1). Table 2a and 2b, display the most extensive as well as the least extent of market overlap between trading partners in our study. Considering the Linder population, the tables also present the average income level for the population in the two countries for which we can identify the same demand structures. The trade links are presented in ascending order of market overlap.

The largest degrees of overlap of demand structures are found among the Northern European countries, with the exception of the link connecting Austria and Canada. The market overlap variable takes the highest value for Finland and Sweden, where 96 per cent of the population in each country display the same demand structure (according to our calculations).

Table 2a. Largest market overlaps and average income within the overlaps, year 2000

Trade Links		*Average income within market overlap*	MO_{ij}
Netherlands	Austria	28018	0.91
Germany	Netherlands	27777	0.91
Germany	Sweden	25339	0.92
Austria	Canada	28661	0.92
Germany	Austria	27397	0.92
Finland	Germany	25895	0.92
France	Germany	25866	0.94
Finland	France	25466	0.94
France	Sweden	25113	0.95
Finland	Sweden	25030	0.96

Table 2b. Smallest market overlaps and average income within the overlaps, year 2000

Trade Links		*Average income within market overlap*	MO_{ij}
Rep. of Moldova	Luxembourg	2977	0.02
Netherlands	Rep. of Moldova	3165	0.03
Uzbekistan	Luxembourg	4183	0.03
Luxembourg	Kyrgyzstan	4985	0.04
Rep. of Moldova	Finland	3104	0.04
Uzbekistan	Norway	4339	0.04
Austria	Rep. of Moldova	3011	0.04
Sweden	Rep. of Moldova	3090	0.04
Cameroon	Luxembourg	5592	0.04
France	Rep. of Moldova	3065	0.04
Rep. of Moldova	Germany	3011	0.05

Not surprisingly, the lowest degrees of overlap are for cases where one country belongs to the industrialized countries and the other is a developing country. The market overlap illustrates that part of the population in a developing country; even it is ever so little, has the same demand structure as part of the population in an industrialized country. Our calculations tell us e.g. that 5 per cent of the population in the Republic of Moldova has the same demand structure as 5 per cent of the population in Germany.

4.2 Estimation results

Table 3 presents the results of equation 7, for the three types of product categories, Homogenous, Reference Priced and Differentiated goods. Differentiated goods constitute the largest group of products in the data and Homogenous the smallest one. All estimates are from 2000.

Table 3. The effect of market overlaps on export intensity of Homogenous, Reference Priced and Differentiated goods. (pooled data, dependent variable: Share of total products by product group)

	Homogenous Goods	***Reference Priced Goods***	***Differentiated Goods***
MO_{ij}	-0.360	0.674	0.468
	(4.84)***	(17.62)***	(20.58)***
$\ln Linderpop_{ij}$	0.614	0.663	0.753
	(53.11)***	(109.02)***	(208.84)***
$Dist_{ij}$	-0.191	-0.234	-0.264
	(27.43)***	(66.94)***	(125.06)***
$Contig_{ij}$	1.882	1.583	1.394
	(46.12)***	(71.03)***	(98.34)***
$Comlang_{ij}$	0.116	0.083	0.124
	(2.18)**	(2.97)***	(6.99)***
$Colony_{ij}$	0.129	0.502	0.809
	(2.21)**	(16.61)***	(44.56)***
Constant	-14.458	-16.319	-17.768
	(85.00)***	(180.51)***	(332.79)***
Observations	32236	96292	257782
R-squared	0.29	0.37	0.40

Robust t statistics in parentheses, *** significant at 1%, ** significant at 5. Fixed effects and multilateral resistance parameters not reported to save space.

The estimated market overlap parameter is, as expected, largest for differentiated goods, and it even has a negative sign for the homogeneous group. A possible explanation for the negative sign leans on the Heckscher-Ohlin framework, for which countries trade more intensively with countries that are different from themselves. For trade of these types of goods to occur, endowments may be more important as an explanatory factor than the similarity in demand. The coefficient of the size variable, $Linderpop_{ij}$, is also larger for the differentiated group. The reference priced category of goods display a larger effect of the market overlap than it does for the differentiated goods. However, the effect of size is larger for the differentiated goods than for the reference priced category. This sector has a middle position making it somewhat more difficult to interpret, but the larger sign of the market overlap coefficient is nevertheless a bit of a puzzle.

The remaining friction variables demonstrate, with the exception of the common border variable, a stronger effect for the differentiated group. This means that it is more important to share common language and historical experiences for exchange of differentiated goods than it is for the other two categories. The dampening effect of distance is also larger in the case of

differentiated goods. The R-square is also higher for the last group of goods which suggests that the fit is better for these goods. The fact that it is still relatively low can be ascribed to the fact that there are several observations for each trade link, and the reason for presenting them is primarily to make a comparison between groups.

Table 4 displays the results of running equation 7 for each of the product groups separately. We present only an overview of the results given the large number of regressions. Furthermore, only results for the two new variables, MO_{ij} and $Linderpop_{ij}$, are presented since those are our main interest.

Table 4. Number of regressions for which positive coefficients are obtained at a significance level of 5%.

	Homogenous goods	***% of total***	***Reference Priced Goods***	***% of total***	***Differentiated goods***	***% of total***
MO_{ij}	37	0.32	123	0.63	234	0.60
$Linderpop_{ij}$	91	0.80	182	0.93	382	0.98
Total number of regressions	114		195		389	

Here, the results are clearly stronger for differentiated goods for both variables. When the model is run by product group, the market overlap turns out significantly positive for 60% of all differentiated goods, and as many as 98% of the $Linderpop_{ij}$ show the same results.

5 Conclusions

In this paper, we have suggested a new approach to assess the Linder hypothesis. Rather than just using the difference in average income between trading countries, we model the overlapping structures of demand using a method that includes the distribution of income in the countries.

We suggest the use of two different variables in order to test the Linder hypothesis, both of which are based on our concept of what constitutes a market overlap. The first variable measures the market overlap captured by density functions of income, whereas the second one measures the absolute size of that overlap. We test these variables against shares of total export and find a positive and significant effect of the Linder variables. Using shares rather than total numbers as a dependent variable is, in our opinion, a more correct assessment of the Linder hypothesis for two reasons. First of all, it gives us an expression of trade *intensity* between countries, rather than a size effect. Secondly, it also allows us to focus on the demand side forces in our data since we can treat supply as given and simply analyze what determines which countries the exporter chooses to export to. The results support the Linder hypothesis, and as expected we find the strongest results for differentiated products. Trade with homogenous goods can perhaps better be explained with a model that takes endowments into account, but we still find some validity of the Linder hypothesis also for this group.

Although the body of literature concerning income distribution as an explanatory factor to trade and trade structure is steadily increasing, the topic is still very much in its infancy. We expect to see much more within this area of research in the future.

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Appendix A.

Table A1. List of countries

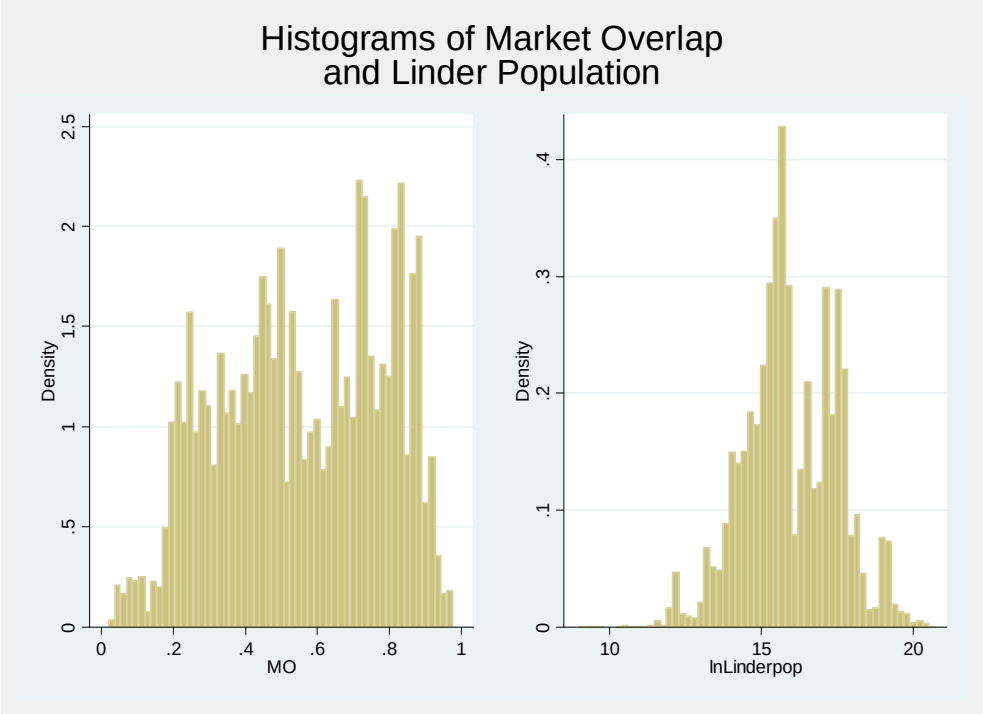
Argentina	France	Panama
Armenia	Georgia	Paraguay
Australia	Germany	Peru
Austria	Greece	Poland
Belarus	Guatemala	Portugal
Belgium	Honduras	Rep. of Korea
Bolivia	Hungary	Rep. of Moldova
Bulgaria	Ireland	Romania
Cameroon	Israel	Russian Federation
Canada	Italy	Slovakia
Chile	Kyrgyzstan	Slovenia
China	Latvia	Spain
Croatia	Lithuania	Sweden
Czech Rep.	Luxembourg	TFYR of Macedonia
Denmark	Mexico	Tajikistan
Ecuador	Netherlands	USA
El Salvador	New Zealand	Ukraine
Estonia	Nicaragua	United Kingdom
Finland	Norway	Venezuela

Appendix B.

Table B1. Correlation Matrix

	$Linderpop_{ij}$	MO_{ij}	$Distance_{ij}$	$Contig_{ij}$	$Colony_{ij}$	$Comlang_{ij}$
$Linderpop_{ij}$	1					
MO_{ij}	0.11***	1				
$Distance_{ij}$	0.14***	-0.19***	1			
$Contig_{ij}$	0.03	0.18***	-0.26***	1		
$Colony_{ij}$	0.00	0.04*	-0.04**	0.19***	1	
$Comlang_{ij}$	-0.04*	0.14***	-0.08***	0.17***	0.26	1

Appendix C


Histograms of Market Overlap
and Linder Population
Density
0
.5
1
1.5
2
2.5
0
.2
.4
.6
.8
1
MO
Density
0
.1
.2
.3
.4
10
15
20
lnLinderpop