Introducing income distribution to the Linder hypothesis

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Abstract

The Burenstam Linder hypothesis is a well established and empirically tested hypothesis. In this study we introduce a new method of measuring the Linder effect. Our approach focuses on the income distribution within a country. We identify the common market between trading partners by calculating the income overlap. The size of the common market is then related to the size of the home market to form the new Linder-variable. We also consider the scale effect of the common market. Results show a positive and significant effect of the Linder variable on export intensity. The scale effect of the Common Market is also positive.

JEL Classification codes: F10, D31

1. Introduction

The Burenstam Linder (abbreviated BL) hypothesis is a well established part of international trade theory. The basic conjecture of the hypothesis is that differences in preferences constitute a significant trade barrier between countries. Countries with similar demand structures will trade more with one another. Burenstam Linder (1961, p94) wrote

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

Burenstam Linder suggested that per capita income can be used as a proxy for preferences. The hypothesis can then be tested by comparing per capita income between trading partners.

The purpose of this paper is to introduce a new method of asserting the Burenstam Linder hypothesis. We will model the common market between two countries given the countries' structure of income distribution. We believe this is a better way to test the Linder hypothesis than just using each country's average income.

The idea of this paper can be expressed as follows. Given Engel's law, we assume that consumer preferences will be dependent on the level of income of the consumer. Consumers of a similar level of income will have similar tastes. In the context of international trade, we will expect countries to trade more intensively with one another the more similar their income structures are. We will try to capture this by modeling the extent to which their incomes overlaps. The Linder variable that we introduce here identifies the size of the common market between the exporting and receiving country and relates it to the size of the domestic market of the exporter. By the conjecture of the hypothesis, the Linder variable should be positively correlated with the export intensity between country pairs. Since we know the size of the common market we can also estimate the scale effect of the common market.

Through the years, studies have examined the BL hypothesis in several ways. One approach has been to identify BL goods and study the demand pattern for these goods. BL goods are defined as differentiated with high income elasticity. Francois and Kaplan (1996) find a demand shift towards BL goods as income increases. Arad and Hirsch (1981) reveal that import of BL goods, compared to Heckscher-Ohlin goods, originate from countries with a narrower range of per capita income. The most

common approach of examining the Linder Hypothesis has been to in a gravity model 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 they find that developing countries also present evidence of a Burenstam Linder effect.

These studies consider the income distribution *between* countries. The approach in this study is different since we elaborate on the distribution of income *within* a country. Dalgin et al (2004) also consider the allocation of income within a country in a gravity model. They find that income inequality has a positive effect on the demand for luxury products and a negative effect on the demand for necessities.

The outline of the paper is as follows. The following section outline the theoretical framework, which includes a discussion of the "Linder"-variable. Subsequently, the methodology of calculating the new variable 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. Theory

The Burenstam Linder (1961) hypothesis departs from the neoclassical theories of trade where supply conditions are the most important factors of trade. BL rather argues that the structure of preferences is the major determinant of trade flows between two countries. BL argued for a home market effect in the selection of which products to export. Countries should export the goods for which they have a large domestic market. This idea was further developed by Krugman (1980) 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 exported (Helpman and Krugman, 1985).

Trade between countries is decreasing with distance. Distance does not simply include the geographical remoteness or proximity, the structure of preferences, institutions and communication in terms of language understanding are also important impediments to trade. Thus it is better to talk about an "economic" distance rather than just geographical distance. One way for companies to lower the cost of exporting would then be to export to countries with a similar preference structure as the domestic market. This will reduce the transfer cost of accommodating products to local preferences. Countries create trade links in order to reduce transfer costs (Johansson and Westin, 1994).

The traditional way of testing the similarity of demand structure is by comparing the average income of each country. The smaller the difference is between the average incomes of the respective countries, the higher the expected trade. This approach has the obvious advantage of being easy to estimate, but one major criticism is that it ignores how income is distributed within the country. It may very well happen that in two countries with the same average income level, the preference structure of the market may be very different if the distribution of income is diverging between the countries. There is an increasing body of literature on how income distribution affects demand patterns in a country (see e.g. Shleifer, Murphy and Vishny, 1989; Foellmi and Zweimüller, 2005). As a consumer's income increases, there are at least three possible ways in which we could expect to see this translated into their consumption patterns. First, you may substitute goods for other types of goods; most typically the Engel effect. Engel's law states that as your income increases, the relative consumption of food decreases. Secondly, you can upgrade

your consumption and consumer more sophisticated goods. Third, you could simply consume more of the same, in which case there should be no effect of income distribution on the overall demand structure in the economy.

According to the Linder hypothesis, the extent of international trade will depend on how similar the demand structures are. We assume consumers with similar income levels to have similar consumption bundles. Countries would therefore have a Linder reason to trade to the extent that their incomes overlap. This is different from the more commonly applied approach of using difference of average incomes as a proxy, since we will try to consider not only the average but also the distribution of income. We will refer to this by the *common market* between the two countries. This idea is illustrated in Figure 1. 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 distribution functions will then tell us how large the common market between the two countries is.

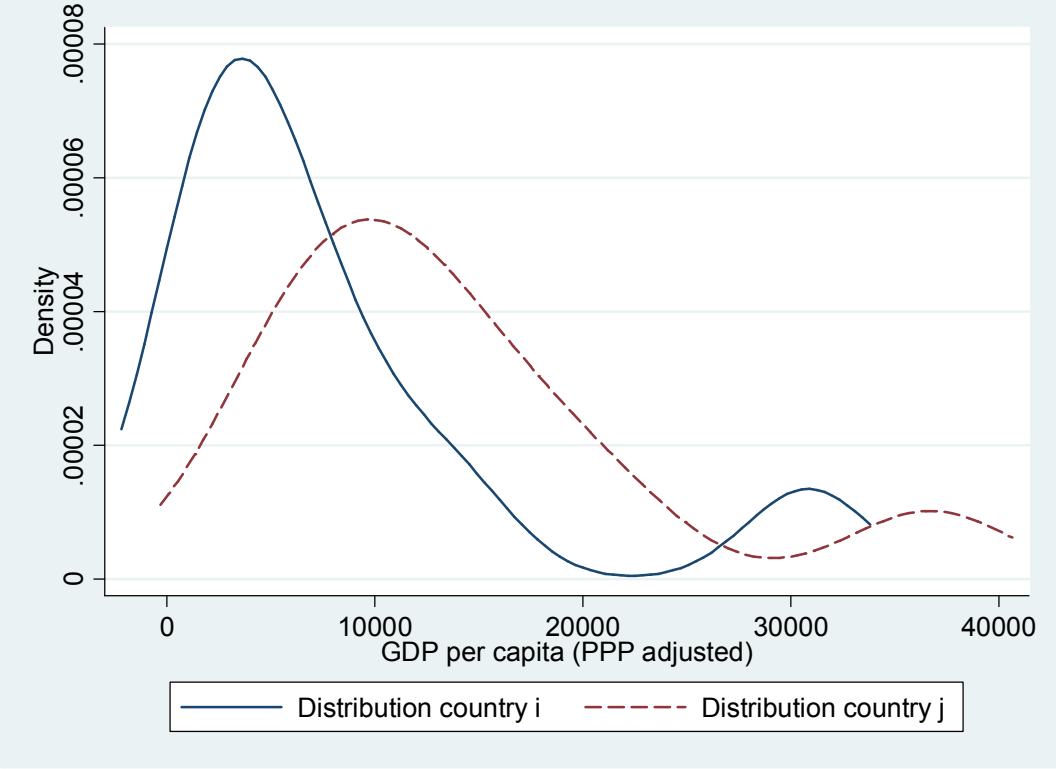


Figure 1. An illustration of the Common Market Approach

The common market is thus the area below the lowest of the distribution functions,

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

In other words, as long as there is a person with a corresponding income in the country in question, there should be a Linder rationale for trade between the countries.

This estimation method captures demand patterns that would not be present in any study using averages. For example, it is possible to imagine two countries with similar average incomes but who, given different distributions of income, show very different consumption patterns. On the other hand, countries with different average levels of income could still have groups of the populations who overlap in their income; the upper class in a poor country could have consumption patterns more similar to the average consumer in a rich country than to the average citizen of their own country.

3. Method: The common market approach

In order to estimate each country's distribution function, we use deciles of disposable income from World Income Inequality Database.(200x) Rather than assuming equality within deciles, we estimate these distributions using a Gaussian kernel smoothing procedure. Thereby we can generate observations at a much finer level. This is similar to the technique applied by Sala-i-Martin (2006). 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 function.[1]

Since we need to match income levels across countries we need to specify the incomes at which we want density estimates. We decided to estimate intervals of US$100 between 0 and 150.000 in order to capture the relevant spectra of incomes, so in other words we have 1500 observations for each country.

It is then possible to match the subgroups of populations within a country to that of other countries, and then to calculate the common market.

[1] In order to see if we could find any function that would realistically fit the data, we used the method by Stuart and Ord (1994) on determining functions pertaining to the Pearson family of distribution. Our calculations suggested that our data fit none of theses functions and we therefore want to avoid forcing the data into an overall function.

3.1 What do the common markets look like?

Before estimating the effects in standard regression analysis, we will have a closer look at the calculated Linder variables.

One of our interests is to see how different our findings are from the standard approach of average income. We do not argue that the common market approach has to be very different from the standard approach; there is a possibility that the income effect outweighs the distribution effect. That is, the average income could be a good proxy to estimate the Linder hypothesis. However, if the distribution is strong enough, it would imply that the average income is not a good enough proxy in order to capture the Linder effect. We could illustrate data with an example from the data. Figure 2 shows the example of Venezuela and Romania, two countries with similar levels of per capita income.[2] However, whereas Romania have a relatively homogenous group of consumers (as depicted by the concentration of incomes to a relatively narrow range of incomes), Venezuela seems to have a much more heterogeneous consumer group. As a result, the common market as we have defined it is very small despite their similarity in terms of per capita income.

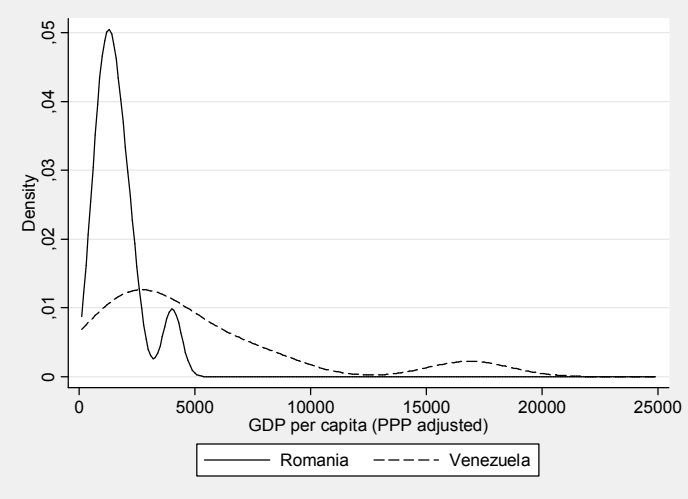


Figure 2. The common market for Hungary and Panama

Our estimations lead us to two types of Linder variables. First of all, we are interested in how large the common market is in relation to the home market. Secondly, standard trade models include some sort of size measure, often the total population or GDP, as

[2] In our data, Romania has a PPP adjusted GDP per capita of $US 5632 whereas the corresponding figure for Venezuela is $US 5715.

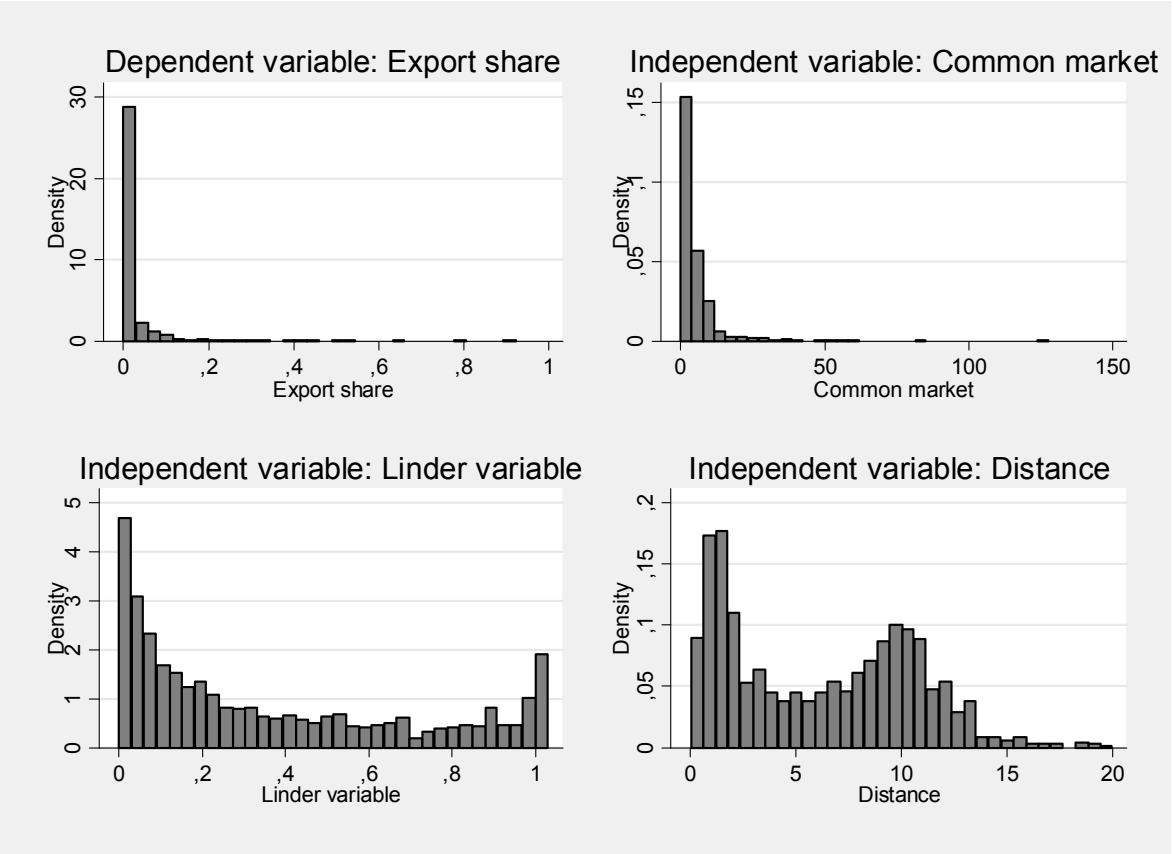
proxies for scale economies. We will try to model scale economies here as well, but since our interest is to test the Linder hypothesis, we will use the size of the common market as an explanatory variable. The Linder hypothesis is thus included by using the following variables:

$$Linder_{ij} = \left(\frac{CM_{ij}}{M_i} \right) \tag{2}$$

$$CM_{ij} = 2 * \int_0^{\infty} \min\{\theta_i(y), \theta_j(y)\} dy \tag{3}$$

Furthermore, we suggest that the Linder hypothesis allows for two different types of scale economies. First, if we suppose that it is the common market that is the relevant market for determining exports, this should also be the relevant market in terms of scale economies (defined in equation 3). Secondly if we relax the Linder hypothesis and say that the rest of the market may also be important, we should include also this effect in the model. We do not claim that equal preferences is the only reason for countries to trade; rather we believe it could be one reason in addition to resource-based explanations. Because of this, we will also add the absolute size of the rest of the market and thereby control for scale effects outside those caught in the Linder market approximation. The model will therefore include two proxies for scale economies; one Linder market or common market (*CM*) variable, and one variable for the rest of the market (*RoM*). Equation 5 includes the additional variable (RoM_{ij}) that captures the rest of the market.

Description of variable characteristics



The dependent variable in our model is the share of export from country *i* to country *j*. This variable displays a lognormal distribution. The same applies to the common market variable. The similarity in distribution motivates the same transformation of the variable. By logaritmizing the dependent variable we can use OLS to estimate the model.

The main variable of interest is the Linder variable. It seems to display a bipolar distribution. The two ends of the distribution show the extremes where the one close to zero contains observation where the common market (cm) constitutes a very small part of the domestic market. At the opposite end we encounter observations where the size of the common market is the same as the domestic one. The finding that a lot of countries have values of 1 in their trade is not surprising; rather it is a natural result of small countries trading with larger economies. Take the example of Sweden trading with the US. Given that Sweden has a very small population we would expect to find a "perfect match" of Sweden inside the US economy. Looking from the US perspective, the match with Sweden would be very low simply because the economy is so much larger. The distance variable displays a similar pattern to the

Linder variable. The similarity between the two variables motivates a similar treatment in the model.

3.2 Model formulation

The previously defined variables, $Linder_{ij}$ and CM_{ij} are included in a gravity model. In addition to these new variables we complement the model with a few control variables. Equation 4 presents the simplest model

$$\ln(x_{ij}) = \alpha + \beta_1 Linder_{ij} + \beta_2 \ln(CM_i CM_j) + \beta_4 Dist_{ij} \quad (4)$$

where the dependent variable, x_{ij}, signifies the export intensity between country *i* and *j*, $Linder_{ij}$ is the size of the common market in relation to the size of the domestic market. CM_{ij} measures the market size as interpreted from the Linder hypothesis. The Linder common market is based upon consumers having the same income. The only control variable included is the distance ($Dist_{ij}$) between countries *i* and *j*. We use distance as measured between the capitals or, in the cases where there is another city which is more important than the capital, we use the most important city in the country. Equation 4, where $\alpha = \frac{1}{i}\sum_i \alpha_i$, is also estimated by accounting for the different propensities to trade for each of the exporting countries in a fixed effect model.

$$\ln(x_{ij}) = \alpha + \beta_1 Linder_{ij} + \beta_2 \ln(CM_{ij} CM_{ji}) + \beta_3 \ln(RoM_{ij} RoM_{ji}) + \beta_4 Dist_{ij} \quad (5)$$

Also equation 5 is estimated with a fixed effect. Table 1 provides the definitions of variables in equation 4 and 5 and the statistical sources.

Table 1. Definition of variables and statistical sources

Variable	Definition
$x_{ij} = \frac{X_{ij}}{X_i}$	Exports from country *i* to country *j* as a proportion of total exports from country *i*. Source: Comtrade
$Linder_{ij}$	Common market between countries *i* and *j* as defined by 1.1, divided by the total population in country i. Source: WIID and WDI
CM_{ij}	Common market between countries i and j as defined by 1.1, Expressed in terms of millions of people. Source: WIID and WDI
RoM_{ij}	Population outside of the common market of the two countries; Total Population - CM_i
$Distance_{ij}$	Distance between most important cities in countries i and j. Expressed in terms of 1000 kilometers.

4. Estimating trade models

This study has introduced two new variables that aim to capture the Linder hypothesis. First, the *Linder variable*, which measures the size of the common market between two trade partners in relation to the exporting country domestic market, put in relation to the export intensity between the same country pair seek to capture the conjecture of the Linder hypothesis. We expect a positive coefficient for the Linder variable. The extent of sharing the same preference structure should have a positive effect on the export intensity between two trading partners. The second variable introduced measures the size of the common variable, in order to capture the scale economies of the common market. As was previously mentioned, the Linder reason of trading is not the only motive for trade flows. Scale economies are a highly contributing factor of the exchange between countries. Table 2 presents the results of equation 4 and 5, where specification (ii) and (iv) represents the fixed effect models.

Table 2 Pooled and fixed effect (Dependent variable: lnExportShare)

	Equation 4		Equation 5	
	(i)	(ii) Fixed	(iii)	(iv)fixed
Ln(CM)	0.260	0.258	-0.009	0.152
	(16.24)***	(9.31)***	(0.42)	(5.19)***
Ln(RoM)			0.587	0.752
			(20.39)***	(21.58)***
Linder	1.492	1.960	2.407	0.749
	(9.63)***	(8.17)***	(16.56)***	(3.26)***
Distance	-0.281	-0.321	-0.319	-0.375
	(22.88)***	(27.68)***	(27.53)***	(34.83)***
Constant	-5.541	-5.477	-24.539	-29.354
	(62.19)***	(55.67)***	(26.29)***	(26.41)***
Observations	1872	1872	1872	1872
R-squared	0.38	0.48	0.49	0.58

Robust t statistics in parentheses
*** significant at 1%

The estimated coefficient of our new Linder variable turns out as expected in all of the regression models. The positive and significant coefficient indicates that the degree of common preference structure has a positive impact on the export intensity. This is entirely in line with the Burenstam Linder conjecture. The size of the scale effect for the common market is also positive and significant. Distance has a negative effect on export flows in all specifications.

Introducing the rest of the market as an additional independent variable changes the results to some extent. In specification (iii) the estimated parameter for the RoM_{ij} turns out significant and positive, which is according to expectations. However, the coefficient for the common market is now insignificant. In the fixed effect specification of equation 5, all coefficients return to being significant and with the expected sign. The coefficient for the Linder variable is in the fixed effect model considerably lower than in previous findings.

4.1 Applying the model to individual countries

The number of observations allows us to run separate regressions on each country and we can thereby try to find patterns among the countries. We divide the sample according to exporting country, and we can thus study the effects on export for each country in the sample. Table 3 presents the results from the individual OLS estimates from which we could obtain significant results. When running the formulated model separately for each exporting country we find that 19 of the 45 countries included in the study display a significant coefficient.

Table 3. Regression results for individual countries

Countries with significant effect of the *Linder* variable
Argentina, Belarus, Belgium, Croatia, Czech Republic, Greece, Hungary, Ireland, Israel, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovak Republic, Slovenia

Include estimates for the common markets

As the table above shows, it seems that the Linder hypothesis is primarily dominant in developing and transition economies. Belgium, the Netherlands and Norway are the most notable exceptions to this finding. It is however beyond the scope of this study to examine this relationship in depth.

5. Conclusions

In this paper, we have suggested a new way to test and measure the Linder hypothesis. Rather than just using the difference in average income between trading countries, we model the relevant markets using a method that includes the distribution of income in the countries.

We included two different variables in order to take the Linder hypothesis into account, both of which are based on our concept of what constitutes a common market. The first variable measures the common market in relation to the total home market, whereas the second one measures the absolute size of the market. In order to contrast this to traditional gravity model estimations, we also include a variable for the rest of the market. We find a positive and significant effect of the Linder variables. In the case of the relative market variable (*Linder*), the findings are positive and significant for all estimates. The absolute size variable is positive and significant in all but one estimate, for which it turns out insignificant. Our findings also find a significant result of the rest of the market. We interpret our results as a support of the Linder hypothesis and suggest this is a complementary result to other explanatory factors.

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. Our study was based on total trade, but it seems very plausible that the Linder effect should be more prominent for certain types of goods. One such example is the case of differentiated goods, for which variety is very central to the consumer. Another natural extension of this paper is to focus on different country characteristics. Our study indicates that the effect is more prominent among developing countries, but more research is needed before any final conclusion should be made.

References

Arnon A and Weinblatt J, (1998), "Linder's hypothesis revisited: income similarity effects for low income countries", *Applied Economic Letters*, vol. 5, 607-611

Arad R W and Hirsch, S (1981), "Determination of trade flows and choice of trade partners: Reconciling the Heckscher-Ohlin and the Burenstam Linder Models of international trade", *Weltwirtschaftliches Archiv*, 117(2), 276-97

Burenstam Linder S, (1961), *An Essay on Trade and Transformation*, Almqvist & Wiksell, Stockholm

Cepii, Centre d'Etudes Prospectives et d'Information International, Bilateral Distance Measures.

Comtrade, United Nations

Dalgin, D Mitra and V Trindade (2004), 'Inequality, non-homothetic preferences, and Trade: a gravity approach', *NBER working paper,* No. 10800.

Foellmi, Reto & Zweimüller, Josef, 2005. "Income distribution and demand induced innovations", *CEPR Discussion Papers*, 4985

Francois and Kaplan (1996), "Aggregate demand shifts, income distribution, and the Linder hypothesis", *Review of Economics and Statistics* 78, 244-250

Johansson B and Westin L, (1994), "Affinities and frictions of trade networks", *The Annals of Regional Science*, No 28, pp243-261

McPherson, M (2001), International Trade and Developing Countries: An Empirical Investigation of the Linder Hypothesis," with Michael R. Redfearn and Margie A. Tieslau, Applied Economics, vol. 33, no. 5 (April), pp. 649-657.

McPherson, M (2000) "A Re-Examination of the Linder Hypothesis: A Random Effects Tobit Approach," with Michael R. Redfearn and Margie A. Tieslau, The International Economic Journal, vol. 14, no. 3 (Autumn).

Sala-i-Martin, X (2006), The World Distribution of Income: Falling Poverty and … Convergence, Period., Quarterly Journal of Economics, Vol. 121, No.2 351-397

Shleifer, A, K Murphy and R Vishny (1989), Income Distribution, Market Size and Industrialization, Quarterly Journal of Economics, Aug.

Stuart, Alan and Keith Ord (1994), Kendall's Advanced Theory of Statistics, Vol.1 Distribution Theory, 6th Edition

World Development Indicators, (2005)

World Income Inequality Database V 2.0a June 2005