Globalisation and Swedish Export Diversity

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Abstract

During the 1980s many economists started to use the term globalisation as a catchword for an increased interaction between countries in world trade. This phenomenon has been interpreted as the result of reduced friction for information, capital and commodity flows and hence reduced transaction costs. This paper is an inquiry into phenomena related to globalisation. We investigate Sweden's export to other countries and try to establish how globalisation of export flows can be observed. In this endeavour the study employs several measures of how Sweden's aggregate export flows are distributed across importing countries during the period 1980-2000. Several such measures of export diversity are compared as a means to examine to what extent globalisation can be verified and how important it is. The exercise results in a questioning of some hypotheses about the nature of globalisation, whereas other hypotheses cannot be rejected, given the criteria formulated.

Key words: Globalisation, Product Diversity, Country Diversity.
JEL: F01, F10

1. Introduction

What is economic globalisation? The literature does not offer a clear definition of the concept. Some key-concepts are however frequently used in attempts to pin down the concept. In these efforts one finds references to openness, integration and interdependence. Openness can in a simple way be illustrated by the size and share of exports from and imports to a country. Sweden has since 1960 increased its export share of GDP from 23 per cent to about 47 per cent in 2000 (World Bank). In 1995 Sweden joined the European Union, thereby having free access to a large market as a stimulus to increasing trade intensity. It has also been suggested that recent fluctuations in financial and commodity markets reflect that the friction has become smaller for relevant world market networks.

Economic globalisation is not a new phenomenon. Many would argue that it started already in second half of the 19^{th} century and then declined with the start of World War I (Kenwood and Lougheed, 1999). Two major sources are attributed to the fast integration of global markets during the initial period of globalisation: rapidly declining transportation cost and improved communication conditions. Further technological development in these areas has fostered the ongoing wave of globalisation that started in the 1950s. Scholars have argued that gradual reductions in transportation and other transaction costs as a share of commodity values continue to reduce the importance of distance (Andersson et.al., 1993; Welfens, 1999). However, many studies – like this study – indicate that distance still plays a significant role in the interaction between countries (cf. Bröcker and Rohweder, 1990). Sceptical authors state that the turn of the 20^{th} century merely represents a return to a world trade situation that was observed about a century ago (Baldwin and Martin, 1999; Krugman, 1995).

In the first period of globalisation a century back in time, capital flows were spreading in an extensive way. Especially Britain but also France had large capital outflows in that period. It was with the help of these capital flows that Sweden at that time managed to catch-up with the core countries of Europe (O'Rourke and Williamson, 1999). In current time only some countries have managed to reach the same level of financial integration as in the beginning of the 20^{th} century (Baldwin and Martin, 1999).

The development of aggregate trade has not displayed a clear trend during these past hundred years. However, some scholars argue that new features can be identified on the disaggregated level. Krugman (1995) mentions four new properties of contemporary international trade. The first is a rise of intra-industry trade, the second is an increase of the international production of goods, the third is the growing number of countries with very high openness (trade to GDP ratio), and the fourth is the emergence of low wage countries that have large exports of manufactures to high wage countries. An additional feature of international trade is a growing share of intra-firm trade (Balassa and Bauwens, 1987; He, 1998). To some extent these patterns are associated with trans-national companies, which presently generate about one-third of all world trade (UN, 2001).

The aim of this paper is to see whether Swedish exports are more globalised today than it used to be twenty years ago. Measures are formulated both on the aggregate level and on the disaggregate level. In this way one can detect if product groups differ in their globalisation. The analyses investigate in turn two properties, labelled country diversity and product diversity of export flows.

1.1 Globalisation and Diversity of Trade

This paper is focused on the development of export intensity and the diversity of export patterns during the last two decades. Why a focus on exports? Welfens (1999) presents a view that implies that both export coverage and import penetration should be considered as exponents of globalisation, although he limits his statements to the OECD countries.

Following Heckscher (1957), export flows are based on scale economies and comparative advantages. As such they can be expected to be much less diversified than import flows, which represent the variety of the entire world economy. In this view, import patterns represent both diversification and novelties, whereas export flows from any particular country will be more limited in scope and more invariant over time.

Accepting Heckscher's conclusion that imports are more diversified than exports, we still consider a study of export flows as an appropriate starting point in our endeavour to examine to what extent that the last 20 years represent a change towards more globalised trade. Exports is considered to become more globalised as export intensity increases and as export flows become more diversified. Export intensity is measured as the ratio of export value to GDP. Export diversity is measured in two dimensions – country diversity and product diversity. In the first case the focus is on how total export value is spread across countries, and in the second case the emphasis is on the spread of products for each importing country.

1.2 *Outline of the Paper*

Section 2 has four sub sections. First, models of import demand and export behaviour are introduced. Second, diversity of export flows are related to theories of specialisation. The suggestion is that trade specialisation should reveal itself in the form of country diversity of export flows. Third, a set of criteria is established. These criteria are subsequently applied in the assessment of the globalisation process. Fourth, data and estimation method are presented.

Section 3 examines and assesses the hypotheses. In a sequence measures are applied to examine country and product diversity. In section 4 some preliminary conclusions are presented.

2. Theory of Trade Diversity

This section introduces, defines and examines variables and relations that will be empirically analysed in Section 3. The perspective is the same throughout the paper: we study one exporting country and its relation with customer countries. In the empirical analyses the exporting country is Sweden.

2.1 A Model of Import Demand and Exporters Behaviour

The flow from an exporting country is limited by the demand in each importing country. Consider that the GDP of country *r*, Y_r, represents the purchasing power or the import capacity of that country. Moreover, let X_r denote the flow in value terms from a selected exporting country to the importing country *r*. One could then formulate the following primitive model of how the export flow to every country *r* is determined by the size of demand for each importing country:

$$X_r = \hat{a} Y_r^b \tag{2.1}$$

where a is a positive share parameter and where b is a scale parameter reflecting a possible non-linearity of demand. Observe that if b deviates from unity, this implies that export flows will not be proportional to the size of GDP. Given this formulation we may also consider that market size – as such – is not the only thing that matters and that the "transaction distance" also influences the expected size of demand and hence the size of exports to country *r*. Let d_r denote the transaction distance to country *r*, measured in kilometres between capital cities. Then formula (2.1) could be changed to

$$X_r = \hat{a} Y_r^b \exp\{-j d_r\},\ \hat{a} > 0,\ j > 0,\ b \approx 1 \tag{2.2}$$

In formula (2.2) $Y_r^b \exp\{-j d_r\}$ can be interpreted as the market potential of country *r* (Johansson and Karlsson, 2001; Lakshmanan and Hansen, 1965). We may also think of the expression as a market accessibility measure. The assumption is then that the larger j, the larger the transaction costs, and hence the smaller is the market potential or the accessible market. With this interpretation diversity means that the trade flow X_r should be proportional to the size of the market potential of country *r*.

Consider now that we interpret $Y_r^b \exp\{-j d_r\}$ as the exporting country's accessibility to customer demand in country *r*. Given this we can consider to expand the expression to represent a demand function such that

$$X_r = \hat{a} Y_r^b \exp\{-j d_r - f p_r\} \tag{2.3}$$

where p_r denotes the aggregate/average price level for the flow X_r or the deviation of the price from the average export price, and where f transforms the price variable to the same scale as the transaction distance (transaction cost) variable d_r. For technical reasons, the econometric exercises of this paper will only apply the formulation in (2.2). One technical problem is that d_r and p_r are likely to display a strong co-variation.

Before ending this sub section, formulas (2.2) and (2.3) will be further discussed. In these formulas Y_r^b represents country *r*'s "demand budget", $\hat{a}$ is the budget share allocated to deliveries from the exporting country, and the factor $\exp\{-j d_r\}$ represents the influence of transaction distance on demand. With this interpretation, formulas (2.2) and (2.3) are demand equations.

In a complementary setting formulas (2.2) and (2.3) describe export supply behaviour. In this setting we assume that the behaviour of exporters can be described by a random-choice preference function of the following type

$$U_r = y_r - d_r + e_r, \text{ or } U_r = y_r - d_r - f p_r + e_r \tag{2.4}$$

where U_r denotes the preference value associated with export supply to country *r*, and where y_r is an attractiveness factor that may reflect the size of demand or number of customers in country *r*. Moreover, e_r is random term that we assume to be extreme value distributed. Given this specification the probability of selling to country *r*, q_r, can be described by the following share formula (Ben-Akiva and Lerman, 1985):

$$q_r = x_r = X_r / X = \exp\{V_r\} / \Sigma_r \exp\{V_r\} \tag{2.5}$$

where $V_r + e_r = U_r$. Next, assume that $y_r = \ln(s + b \ln Y_r)$. Taking the logarithm of formula (2.5) then yields $\ln X_r = y_r - d_r - f p_r + \ln X - \ln \Sigma_r \exp\{V_r\}$. Now $\ln X$ and $\ln \Sigma_r \exp\{V_r\}$ can both be treated as constants that can be added to s, yielding $a = s + \ln X + \ln \Sigma_r \exp\{V_r\}$. Putting $a = \ln \hat{a}$ we obtain formula (2.3). Formula (2.2) obtains when price variations are disregarded.

Inspecting formula (2.4) one can observe that the variable p_r represents an average price across all products exported to country *r*. The basic information contained in this variable is a measure of the share of products with a high value per weight unit. Moreover, the variation of d_r should reflect variations in p_r and this speaks in favour of formula (2.2). In view of this we may remark that a theoretical extension is at hand:

Remark 1: Formula (2.4) may be re-specified to a preference value, U_{ir} for each combination of product and country, which yields probabilities q_{ir} that can refer to share values $x_{ir} = X_{ir}/X_i$, $z_{ir} = X_{ir}/X_t$, as well as X_{ir}/X. In all these three cases the same random-choice model applies. In this case there is also a product-specific price variable p_{ir}.

2.2 Diversity and Specialisation

As explained in the previous section exports can be diversified in several ways. A country's export flows can be diversified in the sense that many different products are exported on each trade link, which may be thought of as product diversity. Another form of diversification is country diversity of export flows. In this case the exporting country has many export destinations. This latter form of country diversity in trade could also include a criterion for how well the export flows are spread across destination countries. In this sub section we will investigate the country diversity of export flows and consider the reasons for such diversity.

In accordance with the notations that have been introduced earlier, let X_{ir} denote the export value of product *i* to country *r*, and let the total export value to country *r* be represented by $X_r = \sum_i X_{ir}$. Then we can also specify total amount of exports of product *i* as $X_i = \sum_r X_{ir}$. Total export is then $X = \sum_r X_r = \sum_i X_i$. Given these definitions, we can also specify the corresponding share variables:

$x_r = X_r / X$, share of total exports going to country *r* (2.6a)

$x_{ir} = X_{ir} / X_r$, export of product *i* to *r* as a share of total export to *r* (2.6b)

$x_i = X_i / X$, export of product *i* as a share of total exports (2.6c)

Let us now turn to the role of specialisation in a country's exports. In this context specialisation means that a large share of a country's total export value is based on the export of a small number of products. Such specialisation is predicted by the theory of comparative advantage. It can also be explained as the outcome from internal economies of scale in production. In both these cases – and especially in the latter case – large markets favour the export specialisation. This in turn means that specialisation should generate country diversity of export flows.

How will the distribution of a country's export look like when it is completely diversified? Suppose that export transaction costs (including transport costs) are independent of the geography, i.e., the same for exports to every country. Then we should expect the export share to satisfy the condition $x_r = y_r$, where $y_r = Y_r / Y$ and Y_r denotes the GDP of country *r*, whereas $Y = \sum_r Y_r$. This means that the share of exports to a given market is proportional to the size of the market.

We may also use formula (2.1) with $X_r = \hat{a} Y_r^b$ to examine the proportionality criterion. Given this formulation we may also consider that market size is not the only thing that matters, and that the transaction distance also influences the expected size of the export to country *r*. Then formula (2.1) is changed to $X_r = \hat{a} Y_r^b \exp\{-j d_r\}$. However, this formulation addresses another issue by specifying transaction distance. Increased globalisation should reveal itself in gradually reduced values of the j parameter.

One way to consider the issue of product diversity is with the help of proportionality. If we think about the number of exported products as being constant for a certain time interval, product diversity will prevail on all links if flows are proportional in the following sense: $x_{ir} = x_i$ for all countries. Proportionality here means that every product has the same share of export flow to every destination country. We may examine formula (2.6) across countries for each product group i to get a measure of which products that tend to be exported to every country. In contrast we may investigate across product groups for which groups of countries that proportionality is approximated and for which it is not. Countries may for example be arranged in accordance to their transaction distance.

2.3 Measures of Diversity and Globalisation Criteria

The fundamental question posed in this paper is whether we can find indications of globalisation in the export flows from Sweden. In the preceding sub section we have argued that globalisation should reveal itself in two basic dimensions: country diversity and product diversity. This means that diversity may have increased in either of these two dimension, in both or in none. Now, the diversity increase may also be local in the sense that it is present for a subgroup of countries or for a subgroup of products.

Country diversity can be examined for each individual product group for each disaggregation level. Given this our prime concern is to investigate the diversity for aggregate export flows. Full diversity would obtain if export flows are directed to each import market in proportion to the size of that market, and distance should not have any influence. In such a case the world market would be completely global. We start with defining two criteria for country diversity followed by three criteria for product diversity.

> *Criterion 1* (Distance-dependent diversity): This criterion refers to equation (2.2), which is transformed to $\ln X_r = a + b \ln Y_r - j d_r$, implying that distance effects can be assessed. This criterion requires that $a > 0$ and significant, that $b \approx 1$ and significant. Moreover, growing export intensity is reflected by growing values of a and b, as well as of falling j - values.

The criterion above assumes a form of proportionality of export flows. The same basic hypothesis may also be examined by means of another approach. To see this, recall that $x_r = X_r / X$ denotes a share value which can be interpreted as a probability, since $\sum_r x_r = 1$. The distribution of the share values can be described by the function $-\sum_r x_r \ln x_r$, which is a concave function that attains its maximum, $\ln M$, as $x_r = 1/M$ for all *r*, where *M* denotes the number of countries (e.g. Theil, 1963). Referring to the introduced distribution function one may go one step further and formulate the function $C = -\sum_r x_r \ln(x_r / y_r)$, which is convex and attains its minimum, $C = 0$, as $x_r = y_r$ for all r (Theil, 1963; Snickars and Weibull, 1977). On the basis of this, a second hypothesis obtains.

Criterion 2 (Pure diversity): In this case country diversity is measured by C = - $\sum_r x_r \ln(x_r / y_r)$. First, we examine which groups of countries that contribute most to the observed C-value. The hypothesis is that globalisation has increased between 1980 and 2000, and we expect this to reveal itself in gradually reduced C-values during the time period.

Suppose now that a certain degree of country diversity can be observed. Following the theoretical discussion in the preceding sub section, one may then also examine to what extent the aggregate export flow to each country is composed by the same products. A lack of product diversity is present if the export flow has a specialised pattern for each country. The first hypothesis to be examined requires that each product group should have the same export share to country r as the product group export share of total export, $x_{ir} = X_{ir} / X_r$, across all importing countries.

Criterion 3 (Product proportionality): Product diversity is first defined as $\frac{x_{ir}}{x_i} = x_{ir/i}$. The hypothesis of diversity is accepted if $x_{ir/i} \approx 1$, then product group i is proportionally distributed according to its share of total exports. If $x_{ir/i}$ is larger or less than one then there exists a specialised export pattern to country r.

A second version of product diversity is represented by the equation $X_{ir} = a_i Y_r^b$. In this case the export of product group i is assumed to be proportional to the demand factor Y_r^b. The critical requirement is that the share parameter a_i is the same for all destination countries.

Criterion 4 (Scale-dependent product diversity): Product diversity is examined with the equation $X_{ir} = \hat{a}_i Y_r^b$. Expanding this equation to include the transaction distance we get the following formulation $X_{ir} = \hat{a}_i Y_r^b \exp\{-j\, d_r\}$. This hypothesis is rejected if the parameter $a_i = \ln \hat{a}_i$ has a low t-value. The parameter b measures the degree of bias.

The equations that are specified in criteria 3 and 4 can be estimated for different points in time. One may then examine to which extent the goodness of fit increases over time.

We also consider another way to count the number of products, while at the same time measuring the distribution among products. In this effort we employ the measure, $H_r = \sum_i x_{ir} \ln x_{ir}$, for each country and sum over r, where $x_{ir} = X_{ir} / X_r$.

Criterion 5: (Number and spread of products): First the value of $H_r = -\sum_i x_{ir} \ln x_{ir}$ is calculated. We then observe that $H_r^{\max} = \sum_r \ln N_r$. Finally, the measure $H(t) = \sum_t H_r(t)$ is calculated for different points in time, t. We examine the change of the H-value for the entire set of countries and for groups of countries.

2.4 Presentation of the data set and method

In the empirical analyses we have used trade statistics from five years 1980, 1985, 1990, 1995 and 2000. The data source is Statistics Sweden. The data are used in cross-sectional data analyses. GDP statistics for countries have been collected from The World Bank and The United Nations.

The classification of products used in this study is SITC rev 3 (Standard International Trade Classification) on both one- and two-digit level, resulting in 10 and 65 product groups to work with. We would have preferred to use a more disaggregated classification but data on the three-digit level in this classification are not comparable over the whole time period 1980-2000.

In criteria 1 and 2 total exports to each country was used and for the product diversity criteria 3 and 5 exports on the two-digit level were applied and then aggregated to nine geographical areas. The second criteria investigating product diversity, criterion 4, uses exports on the one-digit level. Schwarz information criteria together with model specification tests, is used to determine the proper model.

3. Examining Export Destination Diversity

Section 3 examines in sequence country diversity and product diversity. In this effort we follow the criteria formulated in the preceding section.

3.1 Long-term Evolution of Diversity

Does the export intensity increase over time? A positive answer to this question implies that there is at least one clear indicator of globalisation. Figure 3.1 provides a picture of globalisation for a number of small European countries during a time interval of four decades. Swedish openness, here displayed as the ratio of exports to GDP, is put into comparison with the other Nordic countries and The Netherlands and Belgium. The degree of openness fluctuates fairly much between 1960 and 2000. However, for the majority of these countries there is a clear tendency of increased globalisation, only Norway appears to have a steady rate of around 40 per cent for the entire period. Much of the recent discussion about globalisation may be influenced by observations from these four decades.

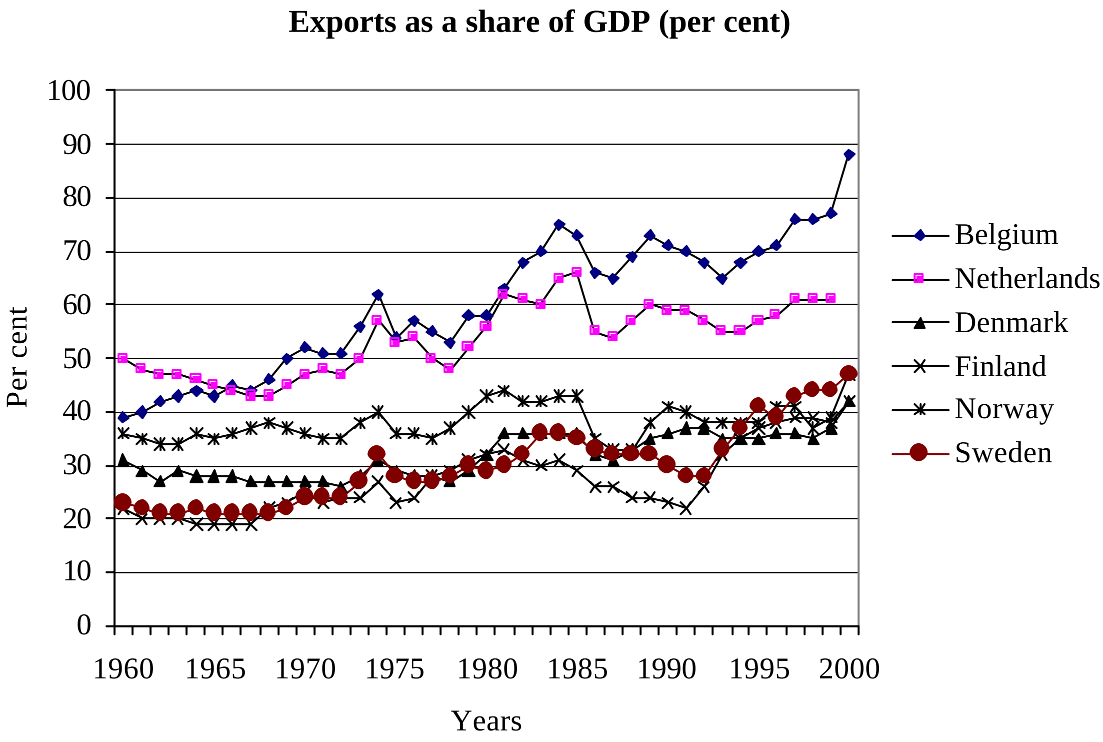

Figure 3.1: Degree of openness in small European countries.

Sweden has increased its exports intensity from 23 per cent in 1960 to 47 per cent in 2000. Though, the level of openness in Sweden has been extensively less than for both The Netherlands and Belgium during the ho le period in focus.

As an alternative one may investigate the Swedish export to each country as the ratio x_r to y_r. The findings of this investigation are presented for geographic areas in Table 3.1. The main observation is that export is not distributed in complete proportion to the size of GDP in importing countries. The observations rather indicate a distance effect.

Table 3.1: The ratio between export and GDP share in per cent.

	1980	1985	1990	1995	2000
Nordic area	12.47	14.75	11.11	11.20	11.79
Northern Europe	2.30	3.13	2.60	2.65	2.49
Southern Europe	1.48	1.41	1.36	1.16	1.87
Eastern Europe	1.11	0.85	1.21	3.08	4.35
North America	5.97	3.97	3.95	0.81	0.41
Centr/South America	0.61	0.65	0.67	0.40	0.50
Africa	1.72	1.08	1.01	0.74	0.58
Asia	0.98	1.18	0.79	0.70	0.68
Pacific	1.05	0.75	0.84	4.08	0.76

Another observation is that the share is lower in 2000 than in 1980 for the more distant geographical areas and for the Nordic countries. Swedish exports to the Nordic area become more proportionally distributed, while exports the other areas go in the opposite direction. This share measure fluctuates over the different years. However, the short-term variations in the ratios will not be considered in this study.

3.2 Country Diversity 1980-2000

Country diversity is defined in several specific but complementary ways in the first two criteria. The first equation to be estimated is, $\ln X_r = a + b \ln Y_r - j d_r$, which is logarithmically linear. The results from this estimation are presented in Table 3.2. Because the original form of this equation is $X_r = \hat{a} Y_r^b \exp\{-j d_r\}$, the proportionality parameter is $\hat{a}$. Again the proportionality parameter is significantly different from zero, and we cannot reject the hypothesis. At the same time the b-parameter has high t-values and is increasing over time. This observation indicates that export intensity is increasing over time. In other words the export elasticity with respect to world GDP is increasing. At the same time, the observed export intensity has the form of a size-biased globalisation, since export flows tend to increasingly concentrate on large markets.

Table 3.2: Country diversity of export flows. Regression according to Criterion 1

	1980	1985	1990	1995	2000
a	-6.12 (6.68)	-6.31 (6.82)	-6.60 (6.60)	-8.90 (9.45)	-8.99 (10.51)
b	1.04 (21.97)	1.04 (22.30)	1.04 (20.89)	1.15 (23.86)	1.19 (27.74)
j (10^{-4})	1.51 (4.67)	1.33 (4.25)	1.02 (2.95)	0.73 (2.34)	1.64 (6.04)
R^2 (%)	81.3	80.4	77.4	77.2	84.3

* T-values in parentheses

The distance parameter j does show a tendency of globalisation between 1980 and 1995 but then its effect on trade increases distinctly in 2000. Comparing 1980 and 2000 there is an increased importance for distance on export flows from Sweden to its trading partners. For export flows to Europe and North America there do not seem to be a significant distance effect. To the other geographical areas a distant effect can be assessed (see appendix A).

Two conclusions can be made. First, we cannot reject the assumption of distance-dependent proportionality hypothesis. Second, already an ocular inspection tells us that we can reject the assumption of reduced transaction distances for aggregate export flows during the observed time period.

Our second approach to country diversity is specified in Criterion 2. In this case we measure the value of $C = -\sum_r x_r \ln(x_r / y_r)$, which measures the deviation from pure proportionality. The hypothesis is that the C-value has fallen during the examined time period. Table 3.3 presents the results for Criterion 2.

Table 3.3: Country diversity calculated according to Criterion 2.

	1980	1985	1990	1995	2000
C_0 (Nordic area)	0.676	0,698	0,560	0,505	0,484
C_1 (Northern Europe)	0.242	0,337	0,318	0,319	0,299
C_2 (Southern Europe)	-0.009	0,003	-0,003	0,005	0,050
C_3 (Eastern Europe)	0.003	-0,015	0,000	0,036	0,068
C_4 (North America)	-0.092	-0,133	-0,106	-0,099	-0,122
C_5 (Centr/South Am.)	-0.019	-0,014	-0,016	-0,019	-0,019
C_6 (Africa)	0.018	0,005	0,003	0,002	0,004
C_7 (Asia)	-0.027	-0,031	-0,056	-0,066	-0,070
C_8 (Pacific)	0.013	0,007	0,004	0,011	0,007
C (total)	0.805	0,858	0,704	0,694	0,700

There is no distinct pattern of change in Table 3.3. However, the total C-value is dropping between 1980 and 2000. The reason for this is that C_0 falls during the same period. A more important message is that two of the sub measures, C_0 and C_1, are high, and that is caused by Sweden's high trade affinity (low transaction distance) with the countries in the Nordic and Northern Europe areas.

3.3 Product Diversity

The first criterion considering product diversity is criterion 3, where export share of product group *i* to country *r* is related to its export share of total export, $x_{ir}/_{i}$. The result from estimations of this ratio are presented in Table 3.4.

Table 3.4: Product diversity of export flows. Results according to Criterion 3.

	1980	1985	1990	1995	2000
Nordic area	1.46	1.58	1.62	1.67	1.84
Northern Europe	0.95	1.03	0.89	0.90	0.91
Southern Europe	1.02	1.00	1.04	1.90	0.89
Eastern Europe	1.36	1.75	2.53	1.86	1.72
North America	1.03	0.97	1.14	1.06	0.79
Centr/South America	2.01	2.03	2.44	2.42	1.91
Africa	4.01	4.01	5.69	3.81	3.35
Asia	1.46	1.43	1.76	2.73	2.42
Pacific	1.55	1.44	1.63	1.86	1.47

The calculated ratios show quite disparate results for the geographical areas and no distinctive development over time. The broad picture does tell us that Swedish exports have a specialised pattern to most of its trade partners. This is indicated by a ratio above or below one. We can, however, point out that exports to Northern and Southern Europe are nearly perfectly proportionally distributed, with a ratios close to one.

In the analysis of country diversity, as expressed in Criterion 1, the aggregate flow X_r is related to the demand-level, measured by Y_r^b, and also including distance effects through $j d_r$. In Criterion 4 a similar equation, $X_{ir} = a_i Y_r^{b_i} \exp\{-j_i d_r\}$ is discussed. Model specification tests and Schwarz information criteria indicate that the most appropriate model to study is the one that allows for both the GDP and Distance parameter to vary. The constant is however assumed to be the same for all groups.

Table 3.5: *Product diversity of export flows according to Criterion 4.*

	1980	**1985**	**1990**	**1995**	**2000**
Constant	-7.26 (12.53)	-7.12 (12.68)	-7.91 (14.59)	-10.63 (20.01)	-11.86 (21.13)
b_0	0.84 (23.52)	0.87 (26.05)	0.94 (28.59)	1.04 (32.82)	1.15 (35.26)
b_1	0.63 (17.23)	0.69 (19.99)	0.72 (21.62)	0.91 (28.52)	0.96 (29.77)
b_2	1.02 (28.58)	1.00 (29.79)	1.02 (31.13)	1.12 (35.31)	1.19 (36.62)
b_3	0.82 (22.83)	0.81 (23.71)	0.82 (24.58)	0.98 (30.49)	1.06 (32.43)
b_4	0.78 (21.55)	0.79 (23.12)	0.81 (24.07)	0.96 (29.20)	1.02 (30.72)
b_5	0.95 (26.81)	0.94 (28.42)	0.97 (30.26)	1.11 (35.61)	1.19 (37.27)
b_6	1.04 (30.00)	1.02 (31.36)	1.03 (32.48)	1.16 (37.52)	1.23 (39.05)
b_7	1.05 (30.28)	1.02 (31.47)	1.06 (33.11)	1.19 (38.74)	1.30 (41.09)
b_8	0.94 (27.16)	0.93 (28.62)	0.97 (30.41)	1.10 (35.83)	1.18 (37.57)
b_9	0.84 (18.44)	0.77 (18.43)	0.87 (26.90)	0.90 (21.02)	0.86 (23.21)
j_0 (10^{-4})	2.19 (4.24)	1.70 (3.36)	3.67 (7.05)	2.93 (5.96)	4.01 (7.70)
j_1 (10^{-4})	0.86 (1.49)	1.48 (2.37)	0.45 (0.79)	1.10 (2.19)	0.97 (1.92)
j_2 (10^{-4})	5.47 (10.49)	4.92 (9.85)	4.78 (9.35)	3.84 (7.96)	4.78 (9.70)
j_3 (10^{-4})	4.35 (7.81)	4.08 (7.29)	3.76 (6.75)	3.47 (6.43)	4.01 (7.59)
j_4 (10^{-4})	1.93 (3.38)	1.41 (2.44)	0.69 (1.16)	2.51 (4.01)	3.98 (6.35)
j_5 (10^{-4})	2.55 (5.37)	2.32 (5.11)	1.99 (4.39)	2.05 (4.78)	2.38 (5.55)
j_6 (10^{-4})	2.03 (4.50)	1.93 (4.57)	1.48 (3.37)	1.74 (4.28)	2.11 (5.21)
j_7 (10^{-4})	1.13 (2.55)	0.96 (2.24)	0.86 (1.93)	0.34 (0.86)	1.36 (3.33)
j_8 (10^{-4})	1.98 (4.46)	1.67 (3.94)	1.62 (3.71)	1.30 (3.25)	1.76 (4.35)
j_9 (10^{-4})	11.06 (4.96)	5.06 (3.05)	2.22 (4.85)	3.34 (1.65)	2.35 (1.57)
	69.2	66.7	66.4	66.1	69.7

*T-values in parentheses.

The results from criterion 1, table 3.2, indicated an increasing scale parameter, b. When scrutinizing the scale parameter on the one-digit level, we see that it increases for all the groups and all of them have significant t-values. Among the industry groups, there are mainly two directions of movement in scale,

- Group 2 (Crude materials), 5 (Chemicals), 6 (Manufactured goods), 7 (Machinery and transport equipment) and 8 (Miscellaneous manufactured articles) increases from proportional distribution to being directed towards larger markets.
- Group 1 (Beverages and Tobacco), 3 (Mineral fuels) and 4 (animal and vegetable oils) proceed from smaller markets in 1980 to proportional distribution in 2000.

The distance parameter, j_i, show significant results for nearly all industry groups and years. Product group 1 (Beverages and Tobacco) can be questioned whether there really is a distance effect or not. This group have insignificant t-values 1980, 1990 and 2000, and just above the significance level the other years. The industry groups are evenly distributed between having increasing and decreasing distance effects.

Criterion 5 considers the distribution of the export share of products with regard to each individual country in the measure $H_r = -\sum_i x_{ir} \ln x_{ir}$, which attains its maximum as the distribution is rectangular. The H_r-values are summed across groups of countries and across the entire set of countries for the five years.

The H_r-values are presented in Table 3.6 as a sum for all countries and as an average for different areas of the world. We may note that the flow from Sweden to the Nordic countries is the most diversified with a value around 3.42. Maximum diversification corresponds to 4.17. Hence, product diversity is high to each of the four Nordic countries Denmark, Norway, Iceland and Finland.

Table 3.10: Number and spread of products according to criterion 6

Averages for country groups	1980	1985	1990	1995	2000
Nordic area	3,30	3,37	3,43	3,42	3,42
Northern Europe	3,05	3,03	2,98	2,94	2,86
Southern Europe	2,69	2,77	2,83	2,42	2,42
Eastern Europe	2,62	2,73	2,67	2,66	2,57
North America	1,83	1,88	1,97	1,91	2,84
Central & South America	1,84	1,83	1,76	1,91	1,68
Africa	1,81	2,00	1,92	1,69	1,55
Asia	2,22	2,14	2,08	1,87	1,83
Pacific	2,00	1,95	2,04	1,67	1,65
Total sum across all countries	308	349	345	385	343

From the table we can see that countries in Northern Europe and in North America follow the Nordic area in order. Moreover, Eastern Europe and Southern Europe receive more diversified exports than the remaining parts of the world. The lowest value obtains for Africa. When inspecting the sum of the diversity measure across all countries it increases over these two decades.

4. Conclusions and Discussion of the Results

In this section we summarise and comment on the results with regard to country and product diversity. The ambition is to clarify which globalisation criteria that are satisfied and which are not in our statistical analysis. Moreover, the section provides an attempt to interpret the results.

4.1 Country diversity

The examination of country diversity has followed a distinct strategy. The prime assumption is that diversity of aggregate export flows has the form of a fixed relation between the size of the individual flow and the size of the demand in the destination market. By making the specification of this demand more precise in two steps, and as a consequence the proportionality assumption becomes stepwise more acceptable. In addition to this we can observe the following properties.

The distance-dependent model for estimating country diversity showed that the scale parameter is consistently above unity and increases over the years. This implies that large markets get a disproportionate large share of the export flow. Our regression results also displayed that transaction distances are indeed important and that distance effects are not reduced over time.

What is then the conclusion from the assessment by means of the pure diversity criterion? First, there is a clear deviation from pure diversity. This deviation is almost entirely caused by deviations in the Nordic area and in Northern Europe. To a large extent the assessment of pure diversity provides support to the conclusions that we have made with regard to the distance-dependent model.

4.2 Product diversity

The investigation into product diversity was conducted with the help of three criteria. These criteria aimed at showing product proportionality, scale dependent product diversity and the spread of products.

Our results indicate that only Swedish exports to Northern and Southern Europe are proportionally distributed. To the remaining areas export flows have a degree of specialization. Already in the first criterion of country diversity the scale parameter indicated a bias towards larger markets. This increase in scale is spread across all product groups. In the regression estimation for 2000, there are no product groups with a bias towards smaller markets. Criterion 4 also assesses disparities in the effect of distance on the different groups. The last criterion concludes that the spread of product are most extensive to the Nordic area, followed by Northern Europe and North America.

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Appendix A

	1980	1985	1990	1995	2000
a	-5.71 (5.55)	-5.72 (5.62)	-5.70 (5.26)	-9.04 (8.89)	-8.90 (9.26)
b	1.02 (19.58)	1.01 (20.33)	1.00 (18.78)	1.14 (21.99)	1.18 (24.72)
j_0 (Nordic area) (10^{-3})	-1.18 (1.91)	-1.40 (2.30)	-1.36 (2.04)	-1.73 (2.46)	-1.11 (1.84)
j_1 (Northern Europe) (10^{-3})	-0.24 (0.51)	-0.51 (1.12)	-0.55 (1.08)	-0.70 (1.32)	0.23 (0.52)
j_2 (Southern Europe) (10^{-3})	0.11 (0.50)	0.05 (0.21)	-0.03 (0.11)	-0.15 (0.62)	0.10 (0.46)
j_3 (Eastern Europe) (10^{-3})	0.29 (0.65)	0.52 (1.38)	0.26 (0.62)	-0.24 (0.67)	-0.01 (0.05)
j_4 (North America) (10^{-3})	0.05 (0.37)	0.02 (0.14)	-0.01 (0.08)	0.05 (0.32)	0.38 (2.40)
d_5 (Centr/South Am.) (10^{-3})	0.15057 (3.10)	0.13 (2.82)	0.11 (2.12)	0.06 (1.13)	0.16 (3.86)
j_6 (Africa) (10^{-3})	0.17 (2.62)	0.16 (2.66)	0.15 (2.26)	0.03 (0.51)	0.22 (3.88)
j_7 (Asia) (10^{-3})	0.17 (2.08)	0.19 (2.71)	0.19 (2.53)	0.14 (1.81)	0.23 (3.37)
j_8 (Pacific) (10^{-3})	0.12 (2.71)	0.11 (2.73)	0.06 (1.36)	0.01 (0.32)	0.13 (3.60)
R^2 -adjusted (%)	81.5	81.6	78.9	78.4	85.2

* T-values in parentheses