

Andersen, Torben M.; Herbertsson, Tryggvi Thor

Working Paper
Measuring Globalization

IZA Discussion Papers, No. 817

Provided in Cooperation with:
IZA – Institute of Labor Economics

Suggested Citation: Andersen, Torben M.; Herbertsson, Tryggvi Thor (2003) : Measuring Globalization, IZA Discussion Papers, No. 817, Institute for the Study of Labor (IZA), Bonn

This Version is available at:
<https://hdl.handle.net/10419/20062>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

IZA DP No. 817

Measuring Globalization

Torben M. Andersen
Tryggvi Thor Herbertsson

July 2003

Measuring Globalization

Torben M. Andersen

*University of Aarhus,
CEPR, EPRU and IZA Bonn*

Tryggvi Thor Herbertsson

University of Iceland

Discussion Paper No. 817
July 2003

IZA

P.O. Box 7240
D-53072 Bonn
Germany

Tel.: +49-228-3894-0
Fax: +49-228-3894-210
Email: iza@iza.org

This Discussion Paper is issued within the framework of IZA's research area *Internationalization of Labor Markets*. Any opinions expressed here are those of the author(s) and not those of the institute. Research disseminated by IZA may include views on policy, but the institute itself takes no institutional policy positions.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent, nonprofit limited liability company (Gesellschaft mit beschränkter Haftung) supported by Deutsche Post World Net. The center is associated with the University of Bonn and offers a stimulating research environment through its research networks, research support, and visitors and doctoral programs. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public. The current research program deals with (1) mobility and flexibility of labor, (2) internationalization of labor markets, (3) welfare state and labor market, (4) labor markets in transition countries, (5) the future of labor, (6) evaluation of labor market policies and projects and (7) general labor economics.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available on the IZA website (www.iza.org) or directly from the author.

ABSTRACT

Measuring Globalization

The multivariate technique of factor analysis is used to combine several indicators of economic integration and international transactions into a single measure or index of globalization. The index is an alternative to the simple measure of openness based on trade, and it produces a ranking of countries over time for 23 OECD countries. Ireland is ranked as the most globalized country during the 1990's, while the UK was at the top during the 1980's. Some of the most notable changes in the rankings are the decline of the US, Canada, and to a lesser extent Japan. Norway also receives a lower ranking. There are notable improvements in the ranking for Finland, Italy, Portugal, Spain and Sweden. For Portugal and Spain the changes seem to follow EU membership in the mid 1980's.

JEL Classification: F02, C82

Keywords: globalization index, factor analysis, OECD

Corresponding author:

Torben M. Andersen
Department of Economics
University of Aarhus
Universitetsparken
8000 Aarhus C
Denmark
Email: tandersen@econ.au.dk

1. Introduction

Possibly the single most important topic in contemporary policy debates is the role of globalization. Technological changes reducing transport and information costs as well as political decisions to pursue tighter integration have added further momentum to the process of international integration. The impact ranges from changes in information flows, cultural interchanges, and political interdependencies to the effects on trade patterns, specialization, foreign direct investments, and global capital flows. The policy debate spans a wide spectrum of views; from concerns that globalization will fundamentally change society and in particular threaten social standards to views stressing opportunities being created for increased dynamism and growth and as a consequence, increasing standards of living.

A rapidly growing literature on international integration is addressing possible benefits and costs of this secular process. However, lack of good measurements of “globalization” or “international integration” have made empirical testing of the various hypotheses concerning globalisation difficult and sometimes impossible. Therefore, it is becoming increasingly more important to construct such a measure, which is the main task of this paper. But this is obviously not a straightforward matter. Most often, readily available trade measures are used. The literature reports a number of prominent examples of this. A classical issue is whether tighter integration in the world economy is conducive for growth (see e.g. Baldwin (2003)). Numerous empirical analyses of this issue have been conducted, where international integration is most often proxied by openness measured by the aggregate trade share.¹ Another branch of literature has explored whether international integration is a threat to social security arrangements and in particular an extensive welfare state (eventually via race-to-the-bottom effects in social security provisions or taxation). The relation is complex since integration may also increase the demand for welfare arrangements (Rodrik (1997,1998)), and a large literature has been investigating and extending Camerons (1978) finding that more open economies (measured by the trade share) also tend to have large public sectors (see

¹ Usually defined as $0.5(\text{imports} + \text{exports})$ as a share of GDP.

Andersen (2003) for an introduction and references). A final example is the issue of whether tighter international integration tends to make business cycles more or less synchronized, in which various volatility measures for aggregate economic activity have been related to trade measures (see e.g. Flood and Rose (1998), OECD (2002)). Although trade flows are obviously an important part of the globalization process, they are by no means the whole story. Accordingly, measuring globalization solely by a trade measure like openness may imply too narrow a perspective on the changes induced by international integration.

In the public debate attempts at quantifying parts of the globalization process are often made by the presentation of league tables of nations in which countries are ranked according to various criteria. Such comparisons may be informative, but they suffer from arbitrariness in the selection of data, their irregular appearances and the problem of how to combine the various measures into an overall metric of globalization. An attempt to overcome these problems has been made in the annual A.T. Kearney/*Foreign Policy Magazine* "The Foreign Policy Globalization Index," which includes some 60 countries and is based on measures of technology (number of internet users, internet hosts, and secure servers), political engagement (number of memberships in international organizations, U.N. security council missions in which each country participates, and foreign embassies that each country hosts), personal contact (international travel and tourism, international telephone traffic, and cross-border transfers) and economic integration (trade, foreign direct investments and portfolio capital flows, and income payments and receipts). The index is calculated by first ranking each variable for the included countries on a normalized scale (between 0 and 1, 0 is assigned to the country with the lowest value, and 1 to the country with the highest value), and next weighting these measures (some variables are weighted double relative to others) into an overall index. While informative this index suffers from the problems arising from mixing a variety of variables some of which are only very indirect indicators and others for which the interpretation is open to discussion. Also, an obvious flaw in the index is the fact that it does not correct for the size of the countries. For example, is it natural to expect Luxembourg to host as many foreign embassies as China or to expect Iceland with its 280

thousand inhabitants to take part in as many U.N. security-council missions as the US? Moreover, and even more problematic, the weighting scheme is completely arbitrary and left unmotivated (see Lockwood (2001) for a critique of the way in which the index is calculated, and the arbitrariness it may lead to).

The aim of this paper is to use the multivariate technique of factor analysis to combine several variables believed to be indicators of globalization into a single measure or index of globalization. The focus is on economic integration, that is, integration of goods and capital markets. Factor analysis is essentially a data reduction technique where the aim is to group the explanatory variables into a smaller set of independent variables, or factors, without the essential information from the original dataset being lost (see e.g. Sharma, S. (1996)). The main attraction is that the weighting of various variables is based on statistical methods rather than a-priori judgements. Although much of the recent debate emphasizes the “knowledge society”, access to reliable and comparable data (allowing easy updating of the index) constrains the analysis to 23 OECD countries.

Having compiled an index of globalization, multiple factor analysis gives us an opportunity to investigate two dimensions of globalization: the direct effect, i.e. how countries use the opportunity of integrating into the world economy (as manifested in trade, foreign investment etc.), and an indirect effect: the extent to which the institutional setup in different countries allows for participation in global activities (as seen in freedom to trade with foreigners, freedom to use alternative currencies, and freedom to exchange in international capital and financial markets).

The structure of the paper is as follows: Section 2 presents the basic ideas of factor analysis, and Section 3 outlines the data used in the analysis. The globalization index providing a relative ranking of the countries included in this study is presented in Section 4, which also presents a decomposition of the index into the possibilities countries have in participating in international markets, and their actual participation in global activities. Section 5 offers a few concluding remarks.

2. Factor analysis

The basic idea of factor analysis is to combine several variables into a smaller set of independent variables without losing the essential information from the original dataset. In the specific context here the issue is how to combine various variables related to international integration into a single measure of “globalization”.

Factor analysis represents a variable as a linear combination of several common factors. The factors are not observable and are by construction independent of each other. The explanatory variables that are most clearly related are combined within a single factor. The correlation between the explanatory variables is explained by the common factors, while the remaining variance of a variable is attributed to a unique factor. The factors are derived in a manner that maximizes the percentage of total variance attributed to each successive factor. The greater the variance of the variables explained by the common factors, the better is the fit of the factor model.

Mathematically the factor model in the case of M variables and N factors can be represented as:

$$z_{ji} = \sum_{p=1}^m a_{jp} F_{pi} + d_j U_{ji} \quad (i = 1, 2, \dots, N; j = 1, 2, \dots, M)$$

where in our case z_{ji} is the measure of variable j for country i and U_{ji} is the unique factor. For each factor, the explanatory variables are weighed according to the proportion of the cross-country variance of the variable that is explained by the factor. These weights are called factor loadings, the coefficients a_{jp} in the factor model. d_j is the weight of the unique factor. The values of the common factors for each country, the F_{pi} 's, can be estimated. Those estimates are called factor scores and can be used to rank the countries according to the respective factors. In our case, the factor scores are used to rank the countries with respect to globalization, i.e. a relative measure of globalization.

An important implication of the factor analysis methodology is that it assigns the largest weight to explanatory variables that have the largest variance across countries. This is appealing in our case of cross-country comparison of globalization, since explanatory

variables that are similar between countries do not explain differences in globalization between countries.

The factor solution is not unique when more than one factor is extracted, as each solution can be rotated in infinitely many ways. The “correct solution” is the one which provides the most plausible interpretation. All the rotation methods put additional mathematical constraints on the problem in order to obtain a unique solution. In the first part of the paper we only extract a single factor in order to obtain the globalization index, and therefore we do not need to rotate the solution. However, when more than one factor is extracted (see Section 4.2) we use the *Varimax rotation method*, which aims at obtaining a high loading on one and only one factor.

An important part of the factor analysis methodology is the interpretation of the factors. The normal procedure is to use the researcher’s knowledge of the data, along with information contained in the factor loadings. High loadings on a factor indicate that a high proportion of the variability of the variable can be explained by the factor.²

The interpretation of the factors is quite straightforward in this paper. The explanatory variables of the dataset are taken to be indicators of integration and involvement in international economic interactions. Only one factor is extracted from the dataset and this factor is interpreted to reflect the relative globalization of the respective countries. However, in Section 4.2 we extract two factors from the dataset, which can be interpreted as a decomposition of the globalization index. This is interesting since the first factor can be interpreted as indicating the extent to which the respective countries take part in international markets, while the second indicates the possibilities of the countries to take part in international markets.

Although factor analysis has a number of advances, it also has its downsides. The first is that it is sensitive to changes in the dataset. New observations, such as the inclusion of

² It has been suggested the loadings should at least be greater than 0.60, but many researchers have used cut-off values as low as 0.40, cf. Sharma (1996).

new countries, may change the factor loadings, and thus the estimated factor scores and ranking of the countries. Also, outliers are likely to affect the results by introducing spurious variability in the data (the explanatory variables that have the greatest variation across countries have the highest factor loadings). The results may also suffer from small-sample problems, which is particularly relevant when a limited set of countries is examined. Finally, data limitations may imply difficulties in the statistical identification and economic interpretation of the unobserved factors.

In this analysis, some of these problems are addressed, e.g., Luxembourg was excluded from the analysis, as it proved to be an outlier. The inclusion of Luxembourg affected the factor loadings of the variables, along with the factor scores and ranking order of other countries. Luxembourg is a very special case since it among other things relies heavily on the labour market in neighbourhood countries. Consequently, it is difficult statistically to separate the economic development in Luxembourg from that of its neighbours. In the context of traditional regression analysis, the inclusion of Luxembourg would introduce severe multicollinearity problems. Also, as the analysis is conducted for a relatively long sample period (1979-2000), it is instructive to observe how different datasets affect the estimation of the factor loadings.

When factor analysis is conducted, the first step is to examine whether the dataset is appropriate for factoring. The following steps can be undertaken:

1. Examine the correlation matrix. High correlations indicate that variables can be grouped into homogenous sets of variables, and they are thus appropriate for factor analysis.
2. Examine Kaiser-Meyer-Olkin measure of overall sampling adequacy (KMO) for each variable. The KMO measure provides a means to assess the extent to which the indicators of a construct belong together, i.e. a measure of the homogeneity of variables.³

³ The Bartlett test of sphericity has also been suggested. However, this measure is dependent on sample size and thus rarely used (Sharma 1996).

No statistical tests exist for the KMO measure, but Kaiser and Rice (1974)⁴ suggest the following guidelines in the interpretation: A KMO measure larger than 0.9 is marvelous, larger than 0.8 is meritorious, larger than 0.7 is middling, larger than 0.6 is mediocre, larger than 0.5 is miserable, and below 0.5 unacceptable.

An important aspect of the factor analysis methodology is to determine how many common factors to extract from the dataset. However, this is not a main issue in this paper, as we are basically only interested in extracting a single factor. When we do extract more than one factor, as in Section 4.2, we extract only those factors that have eigenvalues greater than one, where the factors explain at least 60 per cent of the variance together, and each factor individually explains at least 10 per cent of the variance.

3. Data

The initial aim in this paper was to calculate the globalization index for all the OECD countries. However, due to limited data for some (or all) of the countries we were forced to limit our data periods to 1979 – 2000. Also, due to outliers in the data and limited data we have to restrict the analysis to 23 countries, excluding: Czech Republic, Germany, Hungary, Korea, Luxembourg, Poland, and Slovak Republic. The countries and variables have been selected on the criteria that the data should be published regularly over long periods of time. The nine variables fulfilling this criterion and which are thought to be good indicators of globalization are:

- Freedom to Use Alternative Currencies (FreeCurr)
- Freedom of Exchange in Capital and Financial Markets (FreeExchange)
- Freedom to Trade with Foreigners (FreeTrade)
- Gross Private Capital Flows as a Ratio of GDP (CapFlows)
- Export + Import of Goods and Services as a Ratio of GDP (Openness)
- Factor Income Received as a Ratio of GDP (FactorReceived)
- Factor Income Paid as a Ratio of GNP (FactorPaid)

⁴ It is suggested that the KMO measure should be greater than 0.80. However, a measure above 0.60 is tolerable (Sharma 1996).

- Changes in Terms of Trade (ChangesTermsTrade)
- Inflow of Direct Investment as a Ratio of GDP (InDirInv)

The data sources are: Freedom to Use Alternative Currencies, Freedom of Exchange in Capital and Financial Markets, and Freedom to Trade with Foreigners are sub-indices from the Economic Freedom Index, compiled by the Fraser Institute. Data on Gross Private Capital Flows, Export and Import of Goods and Services, Factor Income Received, Factor Income Paid and Changes in Terms of Trade come from the OECD, and information on Inflow of Direct Investment from UNCTAD. It is worth stressing that even fairly straightforward data series cannot readily be collected for a large number of countries. See appendix for a further description of the data.

4. Factor Analysis

We are now able to turn to the empirical analysis with the primary aim of compiling an index indicating the relative globalization of countries. We first present the globalization index calculated based on the *Principal Axis Factoring Method*. Next we offer a multiple factor analysis based on the *Varimax Rotation Method*, which allows us to interpret the findings from the single factor analysis.⁵

4.1 Single Factor Analysis

First we present the results when extracting one factor for the whole sample period. This amounts to constructing a globalization index for the entire sample period. Due to low quality of the data for *CapFlows* in 1999 we report the results for both the entire period 1979-2000 as well as the slightly shorter period 1979-1998. The results are reported in Table 1, and it is seen that there are only marginal changes in the ranking of countries when comparing the two different sample periods. The KMO-test is acceptable but not overwhelming in both cases. Note that the higher the score the more “globalized” the country is.

⁵ When there is more than one factor extracted from the dataset an infinite number of solutions to the factor analysis problem exists. The method we use here aims at obtaining high factor loading on only one factor.

Table 1. Factor scores from the single factor analysis

	1979 – 1998	1979 – 2000
Country	Factor scores	Factor scores
AUSTRALIA	-0.41	-0.51
AUSTRIA	-0.02	0.03
BELGIUM	1.65	1.92
CANADA	-0.20	-0.36
DENMARK	0.45	0.37
FINLAND	0.00	-0.02
FRANCE	-0.36	-0.32
GREECE	-0.93	-0.77
ICELAND	-0.75	-0.66
IRELAND	2.01	2.23
ITALY	-0.67	-0.65
JAPAN	-0.76	-0.74
MEXICO	-1.09	-1.09
NETHERLANDS	1.31	1.30
NEW ZEALAND	-0.28	-0.34
NORWAY	0.13	-0.10
PORTUGAL	-0.56	-0.51
SPAIN	-0.65	-0.60
SWEDEN	0.38	0.42
SWITZERLAND	1.08	0.98
TURKEY	-1.49	-1.43
UNITED KINGDOM	1.64	1.31
UNITED STATES	-0.48	-0.47
KMO TEST	0.62	0.61

This ranking puts a number of smaller European countries in the top as being the relatively most globalized countries, with Ireland ranked number one, Belgium number two and the UK as number three. Larger countries tend to take middle positions, while countries in the periphery are as expected the least globalized. Table 2 reports the factor loadings and communalities from the single factor analysis. Note that the factor loadings describe the contributing of the factor to the variable in question. Communalities give the share of the variance of the variable in question explained by the common factor. Note that when extracting only one factor it holds that squared factor loadings equal the communalities.

Variable	Factor Loadings		Communalities	
	1979 - 1998	1979 - 2000	1979 - 1998	1979 - 2000
FreeCurr	0.34	0.32	0.11	0.10
FreeExchange	0.64	0.60	0.41	0.36
FreeTrade	0.58	0.58	0.33	0.34
Openness	0.73	0.78	0.54	0.61
FactorReceived	0.83	0.85	0.68	0.72
FactorPaid	0.84	0.84	0.71	0.71
ChangesTermsTrade	-0.26	-0.30	0.07	0.09
CapFlows	0.84	0.84	0.70	0.70
InDirInv	0.50	0.67	0.25	0.45

Results as reported in Table 1 do not provide any information on how the relative position of countries has developed over the sample period. The relative ranking may change since the globalization process is a gradual process, which may affect countries differently. Based on factor scores for each single year over the period 1979 to 2000 Table 3 presents country ranks for each single year as well as the average of the traditional trade measure of openness the period 1979-98 along with country ranking according the traditional openness measure.⁶

While the results reported in Table 3 show that there are some outstanding changes in the relative position over the sample period, it is reassuring that the ranking only changes gradually. This is in accordance with the perception that globalization is a gradual process rather than a sudden regime shift at a well-defined date. Some of the most notable changes in the rankings are the declines for the US, Canada, and to a lesser extent Japan. Another notable deteriorated relative position is that of Norway. It is seen that Ireland has been leading the ranging throughout the 1990's, while the UK was at the top during the 1980's. There are notable improvements in the ranking for European countries like Finland, Italy, Portugal, Spain, and Sweden. For Portugal and Spain the changes seem to follow EU membership in the mid 1980's.

⁶ Note that the Spearman Rank correlation between average openness and the index for the period 1979-1998 is 0.73.

Table 3. Rank of country with respect to factor scores, average openness 1979-98 and rank of country with respect to openness

Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Openness*	Rank
AUSTRALIA	13	13	15	14	16	14	15	15	16	10	14	13	19	13	15	13	13	16	18	21	19	19	36%	20
AUSTRIA	8	7	7	8	6	7	9	8	11	9	10	10	9	11	11	10	10	8	8	10	8	9	76%	4
BELGIUM	4	4	2	2	2	2	1	2	2	3	3	2	2	2	3	3	2	2	2	3	2	2	130%	1
CANADA	6	6	6	6	8	9	10	9	9	12	13	11	13	8	14	18	17	13	12	23	23	23	58%	13
DENMARK	9	9	9	10	7	6	7	7	6	6	7	6	5	3	2	2	5	5	7	8	9	8	68%	9
FINLAND	12	12	12	12	13	10	14	13	12	11	12	12	17	12	7	8	8	10	11	6	7	7	59%	12
FRANCE	10	8	11	11	11	12	8	12	10	13	11	14	16	18	13	15	18	18	15	12	12	12	45%	15
GREECE	21	15	13	15	14	20	13	14	14	14	20	22	22	22	22	19	22	20	17	19	16	17	42%	17
ICELAND	16	17	21	20	20	21	20	21	20	21	22	18	12	14	18	16	16	19	21	16	15	15	70%	7
IRELAND	5	5	5	5	5	5	5	5	5	5	2	1	1	1	1	1	1	1	1	1	1	1	116%	2
ITALY	18	20	17	18	19	18	18	19	19	20	17	17	11	9	10	11	14	14	14	15	13	14	44%	16
JAPAN	22	16	16	19	17	16	19	18	17	18	19	21	18	20	19	22	21	23	23	22	22	22	22%	22
MEXICO	20	22	22	23	22	23	23	23	23	23	21	20	20	19	17	20	19	17	19	20	21	21	38%	19
NETHERLANDS	2	2	3	4	3	3	4	4	4	4	4	4	4	4	5	5	6	3	4	2	3	4	103%	3
NEW ZEALAND	15	19	20	16	15	15	17	16	18	15	9	8	7	10	9	9	9	9	9	14	17	16	59%	11
NORWAY	7	11	10	7	9	8	6	6	7	8	8	9	10	15	12	12	12	11	13	11	14	13	74%	5
PORTUGAL	17	21	14	21	21	19	21	20	21	19	15	15	14	16	16	14	11	12	10	9	10	10	68%	8
SPAIN	19	18	18	17	18	17	16	17	13	17	16	16	15	21	21	17	15	15	16	13	11	11	41%	18
SWEDEN	14	14	19	13	12	13	11	10	8	7	6	7	8	7	6	7	4	7	6	4	5	6	65%	10
SWITZERLAND	3	3	4	3	4	4	3	3	3	2	5	5	6	6	8	6	7	6	3	5	4	3	70%	6
TURKEY	23	23	23	22	23	22	22	22	22	22	23	23	23	23	23	23	23	22	22	17	20	20	33%	21
UNITED KINGDOM	1	1	1	1	1	1	2	1	1	1	1	3	3	5	4	4	3	4	5	7	6	5	53%	14
UNITED STATES	11	10	8	9	10	11	12	11	15	16	18	19	21	17	20	21	20	21	20	18	18	18	21%	23

*Openness is measured here as the average import and export of goods and services/GDP ratio 1979-98

4.2 Multiple Factor Analysis

This sub-section presents a multiple factor analysis that allows for a decomposition of the globalization index presented above. Unfortunately, we are not able to extract factor scores for each single year as in the single factor analysis (see Table 3) as the multiple analyses did not give a solution. However, we are able to report a solution when using the whole sample. The results of the multiple factor analysis for the entire sample period are reported in Table 4. Our criteria is to extract factors with eigenvalues larger than 1.

Country	1979-1998			1979 – 2000	
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2
AUSTRALIA	-0,71	0,44	0,35	-0,58	0,43
AUSTRIA	0,09	-0,67	0,81	0,25	-0,20
BELGIUM	1,63	0,91	0,27	1,46	1,04
CANADA	0,18	-0,57	0,07	0,16	-0,72
DENMARK	0,56	0,57	0,04	0,33	0,67
FINLAND	-0,19	-0,02	0,44	-0,30	0,26
FRANCE	-0,84	0,66	0,22	-0,83	0,69
GREECE	-0,51	-1,34	-0,77	-0,29	-1,58
ICELAND	-0,45	-1,33	0,83	-0,43	-0,76
IRELAND	2,93	-1,01	0,80	3,15	-0,74
ITALY	-0,13	-0,90	-0,53	-0,24	-0,87
JAPAN	-1,29	0,48	0,43	-1,30	0,52
MEXICO	-0,47	-1,85	0,04	-0,30	-1,96
NETHERLANDS	0,84	1,03	0,45	0,89	1,42
NEW ZEALAND	-0,31	0,12	-0,30	-0,17	0,10
NORWAY	-0,60	0,69	1,79	-0,13	0,52
PORTUGAL	0,18	-1,77	-0,35	0,19	-1,65
SPAIN	-0,83	0,79	-0,97	-1,01	0,49
SWEDEN	-0,42	0,51	0,78	-0,38	0,65
SWITZERLAND	0,57	1,15	-1,20	0,45	0,68
TURKEY	-0,60	-0,70	-2,17	-0,96	-1,24
UNITED KINGDOM	1,58	1,00	-0,99	1,27	0,49
UNITED STATES	-1,21	1,84	-0,04	-1,26	1,75
KMO TEST		0,62		0,61	

Three factors fulfil these criteria for the averages in 1979 – 1998 and two for the averages in 1979 – 2000, as can be seen from Table 1. According to the KMO test scores the dataset is mediocre.

Based on information in Table 4 (time period 1979-2000) some interesting differences are revealed, when the overall globalization index is decomposed in the possibility and the actual participation in global economic activities, see Table 5. In terms of possibilities the United States, The Netherlands and Belgium are the most globalized economies, and Mexico, Portugal and Turkey the least. However, when it comes to the actual use of these opportunities Ireland, Belgium, and the UK tops the list and Japan, Unites States and Spain are at the bottom.

Table 5. Rank of countries with respect to factor scores

Country	Actual Rank	Possibility Rank
AUSTRALIA	18	12
AUSTRIA	7	15
BELGIUM	2	3
CANADA	9	16
DENMARK	6	6
FINLAND	14	13
FRANCE	19	4
GREECE	13	21
ICELAND	17	18
IRELAND	1	17
ITALY	12	19
JAPAN	23	9
MEXICO	15	23
NETHERLANDS	4	2
NEW ZEALAND	11	14
NORWAY	10	8
PORTUGAL	8	22
SPAIN	21	11
SWEDEN	16	7
SWITZERLAND	5	5
TURKEY	20	20
UNITED KINGDOM	3	10
UNITED STATES	22	1

In Table 6 we present factor loadings and communalities from the multiple factor analysis:

Table 6. Factor loadings and communalities from the multiple factor analysis

Factor Loadings					
Variable	1979 – 1998			1979 - 2000	
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2
FreeCurr	0.04	0.65	0.08	0.01	0.68
FreeExchange	0.28	0.93	0.17	0.25	0.92
FreeTrade	0.34	0.43	0.39	0.37	0.53
Openness	0.80	0.01	0.32	0.83	0.13
FactorReceived	0.84	0.32	-0.11	0.82	0.26
FactorPaid	0.96	0.06	0.12	0.96	0.08
ChangesTermsTrade	-0.03	-0.16	-0.80	-0.15	-0.33
CapFlows	0.67	0.43	0.14	0.75	0.35
InDirInv	0,52	0.12	-0.01	0.60	0.28

Communalities:		
Variable	1979 – 1998	1979 – 2000
FreeCurr	0.43	0.46
FreeExchange	0.96	0.91
FreeTrade	0.45	0.42
Openness	0.73	0.71
FactorReceived	0.81	0.74
FactorPaid	0.95	0.93
ChangesTermsTrade	0.67	0.14
CapFlows	0.66	0.68
InDirInv	0.28	0.44

Considering the factor loadings for the entire sample period reported in Table 6, it is interesting that all the variables related to actual trade weight highly in factor one, while those related to access or freedom to undertake cross-border activities weight highly in factor 2. This suggests a straightforward interpretation of the two factors, namely, that factor 2 captures the possibility for international economic transactions (the institutional setup), while factor 1 measures the actual use of this option. The two need not coincide since a country can have unlimited access to international markets but use this option moderately, while other countries may have less access but use international markets intensively.

5. Conclusion

Based on the multivariate factor analysis technique this paper has constructed an index summarizing varied dimensions of integration in product and capital market from which a

ranking can be produced of the relative globalization of various countries. The index is based on readily available data, and can therefore easily be updated.

The analysis has shown how countries can be ranked in terms of how globalized they are in terms of international product- and capital market interactions. Interestingly, the index also shows how the ranking has changed over time, reflecting that globalization is a gradual process which has affected countries differently (among other things due to different initial positions). It has also been demonstrated that it is important to distinguish between the access to international markets and the actual use of these markets in gauging how globalized a given country is. As an example the United States is ranked first in terms of access, that is, the formal barriers etc. to participation in international product and capital market activities are the smallest. However, when it comes to actual participation in international product and capital market activities the United States does not hold a top position. Since the overall globalization index weights both factors this also explains why the United States holds a middle rank here.

References

- Agell, J. (1999), "On the benefits from Rigid Labour Markets: Norms, Market Failures, and Social Insurance," *Economic Journal* 109 (supplement), pp. 143-164.
- Andersen, T.M. (2003), "European Integration and the Welfare State," *Journal of Population Economics* 16, pp. 1-19.
- Baldwin, Robert E. (2003), "Openness and Growth, What's the Empirical Relationship," NBER Working Paper No. 9578.
- Cameron, D.R. (1978), "The Expansion of the Public Sector," *American Political Science Review* 72, pp. 1243-1261.
- Foreign Policy – The Magazine of Global Politics, Economics and Ideas
(www.foreignpolicy.com)
- Frankel, J.A., and A.K. Rose (1998), "The Endogeneity of the Optimal Currency Area Criteria," *Economic Journal* 108, pp. 1008-1025.
- Kaiser, H.F. and J. Rice (1974), "Little Jiffy, Mark IV," *Educational and Psychological Measurement* 34, pp. 111-117.

- Lockwood, B. (2001), "How Robust is the Foreign Policy/Kearney Index of Globalisation," CSGR Working Paper No. 19/01 (www.csgr.org).
- OECD (2002), *Employment Outlook* 71.
- Rodrik, D. (1997), *Has globalization gone too far?*, Institute for International Studies, Washington.
- Rodrik, D., 1998, Why do More Open Economies Have Bigger Governments, *Journal of Political Economy* 106, 997-1032.
- Sharma, S. (1996), *Applied Multivariate Techniques*, John Wiley and Sons.

Appendix A: Data

- Data for *FreeCurr*, *FreeExchange* and *FreeTrade* were only available for the years 1970, 1975, 1980, 1985, 1990, 1995, 1997 and 1999. Data for the years in between were obtained by extrapolation and data for the years 2000 and 2001 were obtained by assuming unchanged values since 1999.
- Data for *CapFlows* were not available for Denmark in 1979 and 1980. The data were obtained by extrapolation using data for the years 1978 and 1981.
- Data for *CapFlows* were not available for Belgium. To obtain these data averages for France and Netherlands were used.
- Data for *CapFlows* were not available for any of the countries in 1999. The missing data were obtained by extrapolation using data for the years 1998 and 2000.
- Data for *CapFlows* were not available for Greece and New Zealand in 1998 and 1999. Data for these years were obtained by extrapolation using data for the years 1997 and 2000.
- Data for *CapFlows* in Iceland were only available until 1998. Data for the years 1999 and 2000 were obtained by calculating the average changes for the years 1993 - 1998 and assuming the same changes for the years 1998 - 2000.
- Data for *FactorPaid* and *FactorReceived* for New Zealand were only available until 1997. Data for 1998 - 2000 were obtained by calculating the average changes for the years 1992 - 1997 and assuming the same changes for the years 1997 - 2000.
- Data for *InDirInv* were only available as a total for Belgium and Luxembourg. Data for Belgium and Luxembourg were used for Belgium.
- Data for *InDirInv* were only available with a 5 year interval until 1990. Data for the years in between were obtained by extrapolation.
- Data for *InDirInv* were not available for Switzerland until 1985. Data for the years prior to that were obtained by calculating the average changes for the years 1985 - 1990 and assuming the same changes for the years before.

IZA Discussion Papers

No.	Author(s)	Title	Area	Date
803	R. Lalive	Social Interactions in Unemployment	3	06/03
804	J. H. Abbring	Dynamic Econometric Program Evaluation	6	06/03
805	G. J. van den Berg A. van Vuuren	The Effect of Search Frictions on Wages	6	06/03
806	G. J. van den Berg	Multiple Equilibria and Minimum Wages in Labor Markets with Informational Frictions and Heterogeneous Production Technologies	6	06/03
807	P. Frijters M. A. Shields N. Theodoropoulos S. Wheatley Price	Testing for Employee Discrimination Using Matched Employer-Employee Data: Theory and Evidence	5	06/03
808	F. Docquier H. Rapoport	Remittances and Inequality: A Dynamic Migration Model	1	06/03
809	S. Commander M. Kangasniemi L. A. Winters	The Brain Drain: Curse or Boon?	1	06/03
810	J. H. Abbring G. J. van den Berg	A Simple Procedure for the Evaluation of Treatment Effects on Duration Variables	6	06/03
811	M. Corak W.-H. Chen	Firms, Industries, and Unemployment Insurance: An Analysis Using Employer-Employee Data	1	06/03
812	J. T. Addison T. Schank C. Schnabel J. Wagner	German Works Councils in the Production Process	3	06/03
813	E. P. Lazear	Firm-Specific Human Capital: A Skill-Weights Approach	5	06/03
814	G. Ridder G. J. van den Berg	Measuring Labor Market Frictions: A Cross-Country Comparison	6	07/03
815	A. Aakvik K. G. Salvanes K. Vaage	Measuring Heterogeneity in the Returns to Education in Norway Using Educational Reforms	6	07/03
816	T. T. Herbertsson J. M. Orszag	The Early Retirement Burden: Assessing the Costs of the Continued Prevalence of Early Retirement in OECD Countries	3	07/03
817	T. M. Andersen T. T. Herbertsson	Measuring Globalization	2	07/03

An updated list of IZA Discussion Papers is available on the center's homepage www.iza.org.