

**On the Correlation between Globalization and
Vulnerability in Times of Economic Crisis – A Statistical
Analysis for Europe**

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Abstract: In this paper, we test the hypothesis that more globalized countries in Europe are equally vulnerable to the current crisis as less globalized European countries. To determine the level of globalization, we use the Maastricht Globalization Index (MGI). We measure the severity of the economic crisis with five key economic indicators. The results seem to suggest that the rising level of globalization increases vulnerability to economic crises on the one hand, while, on the other, higher levels of globalization increase the opportunities to deal with a crisis.

Keywords: economic crisis, EU expansion, globality, globalization, indicators, Maastricht Globalization Index, measuring globality

- 1 Globalization is something more than a purely economic phenomenon manifesting itself on a global scale. During the last few decades, human dynamics, institutional change, political relations, and the global environment have become more intertwined. Among these visible manifestations of globalization are the greater international movement of goods and services, financial capital, information and people. In addition, there are technological developments, new and enhanced legal systems, and institutions that facilitate these flows. The growth of international cultural exchanges and the spread of multiculturalism and cultural diversity within many countries are changes on the cultural front. The freer trade of more differentiated products as well as tourism facilitates such developments. Flows of immigration – both legal and illegal – also contribute to today's melting pot societies.
- 2 For many commentators there is little doubt that globalization has produced significant gains at the global level (Bhagwati 2004). Foreign trade in goods and services, capital, technology and labor all move more freely across borders. In recent years, evidence has suggested that globalization is a key driver in helping emerging economies to apply knowledge, regulations, and standards acquired from their Western counterparts in order to become more mature, reliable, and hence stable (Pazarbasioglu, Goswami, and Ree 2007). Thus, globalization may have raised stability; stable economic development is one of the cornerstones of a strong and well-functioning economic system, domestically as well as globally.
- 3 At the same time, globalization is also perceived to be creating new threats: to individuals, societies, and eco-systems. There are fears that it may exacerbate the gap between rich and poor – both within and between countries – creating new threats to human security in terms of financial volatility, political and cultural insecurity, and environmental degradation. During the transition to greater globalization, risks may arise as application of new economic methodologies outpaces their understanding and control. Hence, a high globalization speed may also generate opportunities for speculation, uncertainty, and risk (Spahr 2008).
- 4 The current economic crisis constitutes a serious test for the merits of globalization. Do the more globalized societies enjoy additional stability that cushions the most

extreme effects of the crisis, or are these societies more exposed and vulnerable to shocks in other parts of the world precisely because of their global connectedness? The answer to this question may have important policy implications as it is connected to the choice between protectionism and free trade as the guiding principle to combat the economic crisis.

- 5 In this paper, we test the hypothesis that more globalized countries in Europe are equally vulnerable to the current crisis as less globalized European countries. To determine the level of globality, we use the Maastricht Globalization Index or “MGI” (Martens and Zywiets 2006) and five key economic indicators as a proxy for the severity of the economic crisis.

The Maastricht Globalization Index and Economic Indicators

- 6 The MGI was developed to improve upon the existing indices. Reflecting the need for a balance between broad coverage, data availability, and quality motivated the following choice of indicators (see Table 1) with data for 117 countries. For a detailed discussion on the use of indicators to measure globalization, we refer to Dreher, Gaston and Martens (2008).

Category	Variable name	Variable definition
Political Domain	Embassies	Absolute number of in-country embassies and high commissions
	Organizations	Absolute number of memberships in international organizations
	Military	Trade in conventional arms as a share of military spending
Economic domain	Trade	Imports + exports of goods and services as a share of GDP
	FDI	Gross foreign direct stocks as a share of GDP
	Capital	Gross private capital flows as a share of GDP
Social & Cultural Domain	Migrants	Those who changes their country of usual residence per 100 inhabitant
	Tourism	International arrivals + departures per 100 inhabitants
Technological Domain	Phone	Incoming + outgoing international telephone traffic in minutes per capita
	Internet	Internet users as a share of population
Ecological Domain	Eco footprint	Ecological deficit in global hectares

Table 1: MGI Variables

- 7 The MGI is constructed in a four-stage process (see also UNDP 2002). The first stage is conceptual and choices are made about which variables are most relevant and should be included in the index. In the second stage, suitable quantitative measures are identified for these variables. In the third stage, following Dreher (2006), each variable is transformed to an index with a scale ranging from zero to a hundred (this differs from earlier calculations constructing the MGI). Higher values denote more globalization. The data are then transformed – on the domain level – according to the percentiles of the base year (2000) distribution (using the formula $((V_i - V_{min}) / (V_{max} - V_{min}) * 100)$). In the last and final stage, a weighted sum of the measures is calculated to produce the final score, which is then used to rank and compare countries. The “most globalized” country has the highest globality score. Within each domain, every variable is equally weighted. The MGI scores are simply added, that is, all domains receive the same weight. In this paper, we use the [MGI calculated for 2008](#).
- 8 The MGI values were taken from the global studies for 2000 and 2008. For the analyses in this paper, 29 countries in Europe were selected (see Table 2 for a list), a group of countries for which recent, reliable, and sufficient data were available to determine the MGI as well as the economic crisis indicators. To capture the key facets of the economic crisis, we used the following five indicators (see [Eurostat](#)).

Country	Rank	MGI Change score		
		2008	2000-2008	Change rank 2000-2008
Ireland	1	72.0	20.2	1
Belgium	2	68.4	18.5	3
Switzerland	3	68.3	9.8	-2
Netherlands	4	68.3	19.7	3
France	5	62.5	17.6	7
Austria	6	62.1	12.2	0
United Kingdom	8	58.7	7.4	-5
Germany	9	54.8	8.8	1
Denmark	10	53.8	7.0	-1
Spain	11	53.1	14.9	7
Italy	13	51.7	13.1	3
Sweden	14	51.6	4.5	-6
Estonia	15	50.5	11.5	0
Czech Republic	17	49.3	12.2	2

Norway	20	48.0	-3.0	-16
Greece	21	47.8	12.0	0
Portugal	22	46.8	7.6	-8
Croatia	24	45.5	15.2	4
Slovenia	26	43.2	14.0	5
Hungary	27	43.0	7.7	-5
Bulgaria	29	39.5	13.1	8
Poland	30	37.0	6.5	-3
Slovakia	31	36.3	9.0	4
Finland	32	36.3	-0.6	-12
Romania	35	33.4	8.5	7
Turkey	40	32.1	6.6	-1
Lithuania	47	30.6	9.3	17
Latvia	50	30.2	7.6	2
Macedonia	58	28.6	6.1	0

Table 2:Maastricht Globalization Index (2008)

Real GDP Growth Rate

- 9 Gross domestic product (GDP) is a measure of the economic activity, defined as the value of all goods and services produced less the value of any goods or services used in their creation. The calculation of the annual growth rate of GDP volume is intended to allow comparisons of the dynamics of economic development both over time and between economies of different sizes. For measuring the growth rate of GDP in terms of volumes, the GDP at current prices are valued in the prices of the previous year and the thus computed volume changes are imposed on the level of a reference year; this is called a chain-linked series. Accordingly, price movements will not inflate the growth rate.

Employment Rate

- 10 The employment rate is calculated by dividing the number of persons aged 15 to 64 in employment by the total population of the same age group. The indicator is based on the EU Labor Force Survey. The survey covers the entire population living in private households and excludes those in collective households such as boarding houses, halls of residence and hospitals. Employed population consists of those persons who during the reference week did any work for pay or profit for at least one hour, or were not working but had jobs from which they were temporarily absent.

Annual Average Inflation Rate

- 11 Harmonized Indices of Consumer Prices (HICPs) are designed for international comparisons of consumer price inflation. HICP is used for example by the European Central Bank for monitoring of inflation in the Economic and Monetary Union and for the assessment of inflation convergence as required under Article 121 of the Treaty of Amsterdam.

Total Investment

- 12 This indicator is defined as total gross fixed capital formation (GFCF) expressed as a percentage of GDP, for the public and private sectors. GFCF consists of resident producers acquisitions, less disposals of fixed assets plus certain additions to the value of nonproduced (usually natural) assets realized by productive activity. It also includes certain additions to the value of non-produced assets realized by productive activity, such as improvements to land. The ratio gives the share of GDP that is used by the public and private sector for investment (rather than being used for consumption or exports).

General Government Debt

- 13 General government debt comprises total combined debt of central, state, and local governments plus social security funds as a percentage of GDP at current market prices. Debt is valued at nominal (face) value, and foreign currency debt is converted into national currency using end-year market exchange rates. All non-euro data are converted into euro using end-year exchange rates provided by the European Central Bank.

Results

- 14 In search of links between the MGI and economic performance, we first looked for correlations between the MGI and the economic indicators. In 2008, all economic variables except for total investment are significantly correlated with the MGI. In 2000, in contrast, this only applies to the employment rate and the level of inflation.

On the level of the individual domains and variables of globalization for the year 2008, the correlations between the MGI and employment rate and inflation are largely driven by the technological and economic domain of globalization (see Table A.1 for details). The political domain furthermore influences inflation, total investment, and general government debt as well. In addition, there is a strong correlation between the social and cultural domain and employment rate, and between the ecological domain and general government debt.

- 15 To compare the difference in more and less globalized countries, the countries are separated into two sub-samples according to their overall index score. Except for the employment rate and inflation, no significant differences in the economic indicators were found between more and less globalized countries for 2000 and 2008 (details are in Table A.2). More globalized countries seem to do better in terms of employment, and have less inflation. The economic crisis, starting to have its impacts in 2008, affected more and less globalized countries about equally (see Table A.3 for details). Inflation, total investment, and general government debt did not significantly change between 2000 and 2008, whereas GDP growth and employment rates did change significantly for both groups of countries.

Discussion and Conclusions

- 16 The effects of globalization on economic processes have frequently been analyzed using conventional measures of globalization. Edison et al. (2002) who find that no robust relationship exists provide a detailed analysis of the impact of several indicators on financial integration and growth. In this paper, we searched for differences between the economic performance of more and less globalized countries after the start of the latest economic crisis.
- 17 The economic performance indicators for 2008 have undoubtedly been affected by the current economic crisis that started that same year. It is very difficult, however, to determine the magnitude of this influence and its relevance for the changes between 2000 and 2008. In this paper, we provide a first and rough assessment. No evidence was found for significant differences in economic performance between European countries that score relatively high and those that score relatively low on the MGI index of globalization. This supports the idea that, although countries with a higher level of globalization tend to have more mature economic systems with well-established regulations and sophisticated financial instruments, they suffer just as much in crises.
- 18 To determine whether one country is more vulnerable to the economic crisis than another requires a comparison between the situation before and during or after the crisis. A challenge in such cases is to determine what part of the observed changes is attributable to the specific phenomenon in which one is interested. In this paper, the major challenge was to attribute changes in economic performance to the economic crisis and, subsequently, to correlate these attributed changes to differences in MGI scores. Between the reference period of 2000 and 2008, large changes have taken place in the economic performance of many of the countries analyzed. In particular, countries with lower MGI scores seem to have been catching up. Lower-scoring countries experienced higher growth, a larger increase in employment and investment, and a stronger reduction in inflation and government debt. A main driver of these changes seems to be the expansion of the European Union. New member states and countries aspiring EU membership are overrepresented in the group of countries with low MGI scores, which coincides with the group of countries that have been catching up.
- 19 In follow-up studies, it is advisable to try to reduce the effect of EU expansion as a confounding factor by a) reducing the gap between the pre-crisis reference period and the post-crisis period, b) shortening these periods, and c) using time series data. One could consider using quarterly or monthly data, rather than annual data; taking the four quarters of 2007 as the reference periods, rather than the year 2000; and looking at the subsequent quarters (starting with the first quarter of 2008) to analyze how the crisis unfolded.
- 20 Furthermore, what is clear is that the increasing complexity of our global society means that globalization cannot be addressed from a single perspective, country or scientific discipline. The vulnerability to economic crises as experienced in the context of globalization is far more complex than most problems that had to be tackled in the past. To adapt policies and planning to the impacts of the consequences of globalization requires new paradigms and innovative methods. It is our hope that a further analysis of globalization may help in adjusting and optimizing the process of globalization on every level in the direction of a more sustainable development, including a robust economy.

Appendix: Detailed Statistical Results

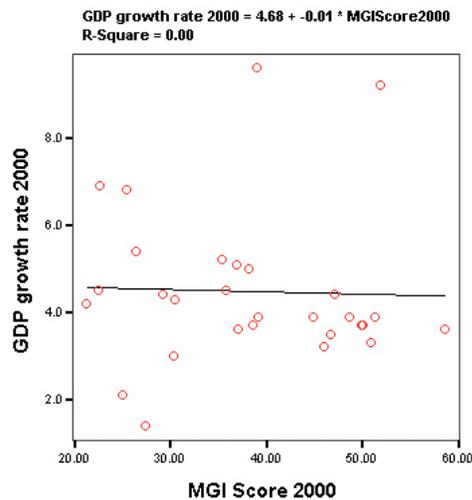
Table A.1 lists Spearman's rho values, representing the correlation between MGI scores and the economic indicators. Spearman rank correlation is a non parametric test that is used to measure the degree of association between two variables. Correlations tagged with a * or a ** mark are significant at the 0.05 level and the 0.01 level respectively. Figure A.1 show the scatter plots of the linear regressions.

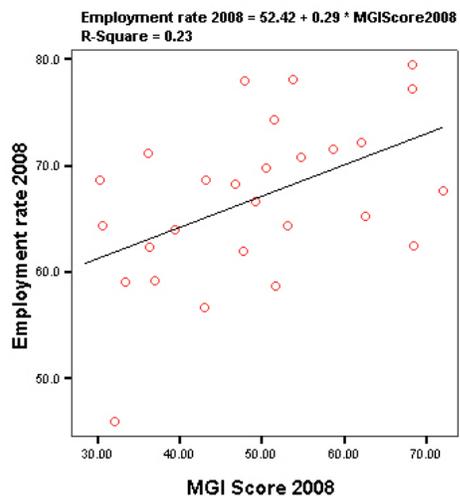
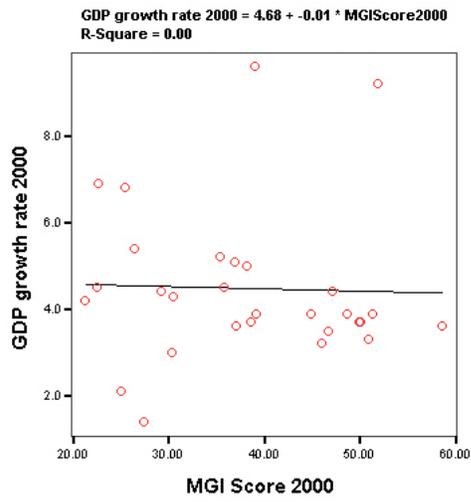
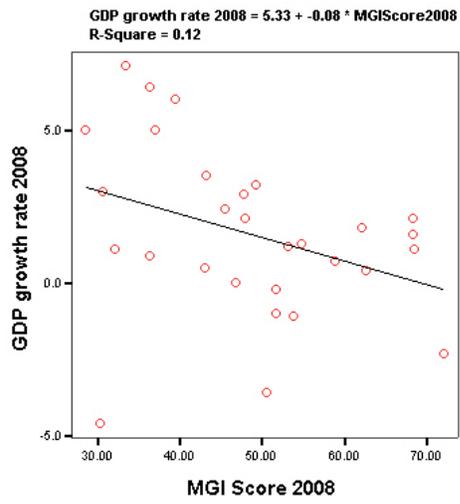
	GDP growth rate	Employment rate	Inflation	Total investment	General government debt
MGI 2000	-0.218	0.707**	-0.469*	0.057	0.171
MGI domains					
Political	-0.229	0.152	-0.502**	-0.157	0.610**
Economical	0.081	0.493**	-0.06	0.253	-0.351
Social & cultural	0.174	0.286	-0.28	0.393*	-0.174
Technological	-0.167	0.674**	-0.457*	0.058	0.099
Ecological	-0.358*	0.11	-0.185	0.2	0.268
MGI variables					
Embassies	-0.348	0.21	-0.404*	-0.217	0.571**
Organizations	-0.247	0.421*	-0.519**	-0.199	0.476*
Military	-0.17	-0.107	0.246	-0.381*	0.163
Trade	0.221	-0.032	0.276	0.431*	-0.427*
FDI	0.025	0.520**	-0.29	0.146	-0.13
Capital	-0.038	0.490**	-0.463*	0.182	0.004
Tourism	0.106	0.333	-0.153	0.393*	-0.074
Migrants	0.141	0.36	-0.496**	0.052	-0.199
Internet	-0.251	0.808**	-0.484**	-0.134	0.17
Phone	-0.172	0.697**	-0.383*	0.075	0.11
Eco footprint	-0.366*	0.159	-0.194	0.16	0.288
MGI 2008	-0.386*	0.446*	-0.694**	-0.348	0.456*
MGI domains					
Political	-0.196	0.001	-0.504**	-0.493**	0.709**
Economical	-0.144	0.533**	-0.117	0.008	-0.166
Social & cultural	-0.192	0.512**	-0.151	0.261	0.013
Technological	-0.448*	0.777**	-0.636**	-0.247	0.153
Ecological	-0.049	-0.031	-0.447*	-0.238	0.509**
MGI variables					
Embassies	-0.176	-0.02	-0.440*	-0.425*	0.620**
Organizations	-0.331	0.25	-0.659**	-0.606**	0.644**
xMilitary	0.227	-0.386*	0.283	-0.012	0.056
Trade	0.127	0.059	0.284	0.437*	-0.435*
FDI	-0.428*	0.625**	-0.526**	-0.265	0.144
Capital	-0.558**	0.672**	-0.550**	-0.33	0.173
Tourism	-0.221	0.336	-0.201	0.111	0.071
Migrants	-0.473*	0.638**	-0.427*	-0.072	0.032
Internet	-0.403*	0.795**	-0.488**	-0.261	0.015
Phone	-0.416*	0.672**	-0.794**	-0.449*	0.414*
Eco footprint	-0.009	-0.031	-0.415*	-0.225	0.509**

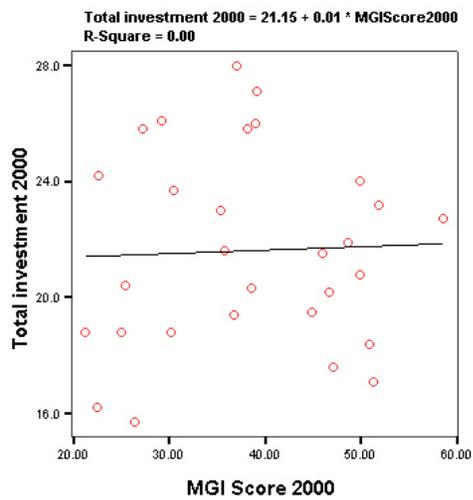
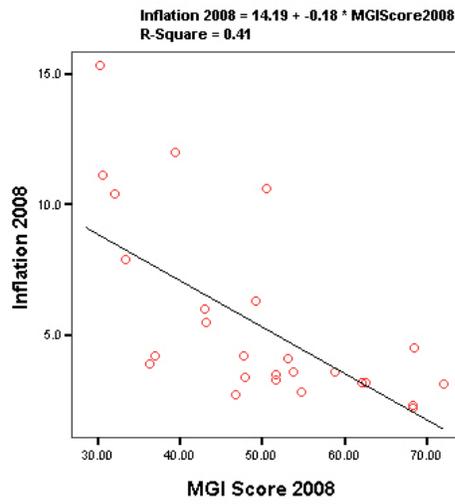
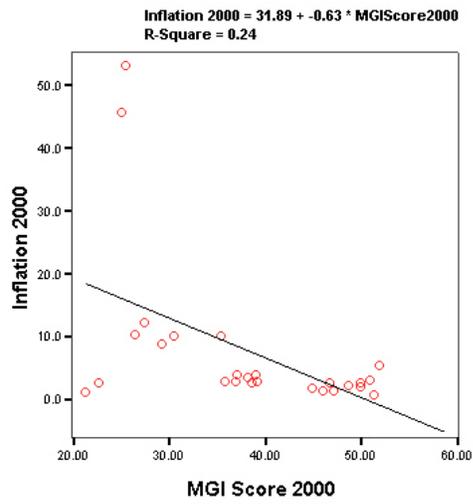
Table A.1: Spearman's rho correlations for MGI and the economic indicators

* Significant at the 0.05 level (2-tailed)

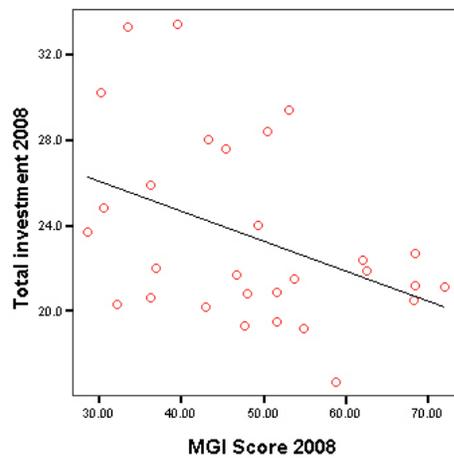
** Significant at the 0.01 level (2-tailed)



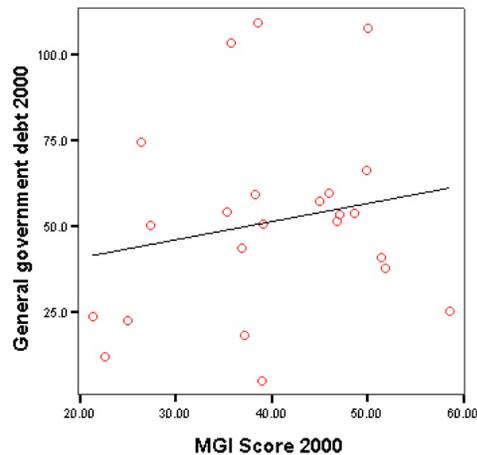




Total investment 2008 = 30.28 + -0.14 * MGIScore2008
R-Square = 0.17



General government debt 2000 = 30.33 + 0.53 * MGIScore2000
R-Square = 0.04



General government debt 2008 = 0.74 + 0.91 * MGIScore2008
R-Square = 0.17

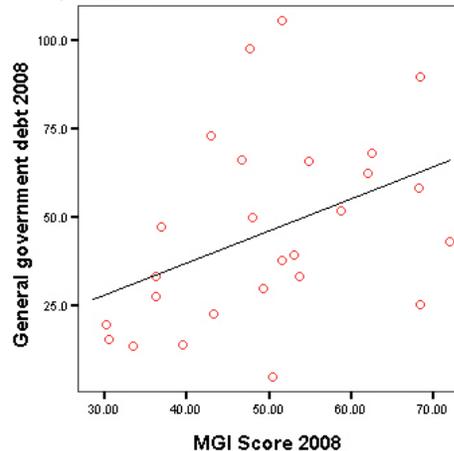


Figure A.1: Scatter plots and linear regression between MGI and the economic indicators

The following tables show the t-values resulting from the t-test of the null hypothesis that there is no difference between (the means of) less and more globalized countries in terms of their economic performance in 2000 and 2008 (Table A.2), and between 2000 and 2008 (Table A.3). A two-sided t- test is a statistical test used in inference, in which a given statistical hypothesis, H_0 (null hypothesis) is rejected when the value of the statistic is either sufficiently small or sufficiently large. T-values tagged with a * or a ** mark are significant at the 0.05 level and the 0.01 level respectively. The threshold used to distinguish between less and more globalized countries is the

average of the 2008 global index mean and maximum values.

Year	GDP growth rate	Employment rate	Inflation	Total investment	General government debt
2000	-0.635	5.040**	-2.240*	-1.39	0.593
2008	-1.659	2.252*	-3.642**	-1.91	1.169

Table A.2 T-test (means between less and more globalized countries within a given year)

* Significant at the 0.05 level (2-tailed)

** Significant at the 0.01 level (2 tailed)

Year	GDP growth rate	Employment rate	Inflation	Total investment	General government debt
All countries	3.793**	-4.804**	0.903	-1.961	1.286
Less globalized	2.324*	-3.418**	1.039	-2.083	0.967
More globalized	4.001**	-4.497**	-1.856	0.015	0.579

Table A.3: T-test (means between less and more globalized countries within a given year)

* Significant at the 0.05 level (2-tailed)

** Significant at the 0.01 level (2 tailed)

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