On the Evolution of Institutional Comparative Advantage

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Abstract

This paper inspects how comparative advantages have changed in the last 30 years. Using trade data on 197 countries over the period 1976-2004, it provides evidence that comparative advantages are not static, but change over time. More interestingly, it shows the rise in relevance of insitutional comparative advantage. Finally, it shows that this results does not hold for some countries (BRIC).

1 Introduction and related literature

Recent literature has shown that institutional quality may be a source of comparative advantage in more institutionally dependent industries. Nonetheless, this literature has provided mainly cross-sectional evidence of this phenomenon. Levchenko (2007) shows that institutional quality gives a comparative advantage in industries that produce more complex goods using a cross section. Nunn (2007) shows that good institutions are a source of comparative advantage in those sectors that produce more relationship-specific goods. He shows that his results are robust using data from 1963.

The aim of the present work is twofold. First, it inspects the evolution of classical determinants of comparative advantage, namely capital and skill

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endowment. Second,it shows the rise in the relevance of institutional quality as an additional source of comparative advantage. Finally, it performs the same analysis across different subset of countries, thus highlighting different patterns of institutional comparative advantage. This allows to draw some policy implications. The remainder of the paper is structured as follows: section 2 describes the empirical model, section 3 deals with the data and section 4 discusses the results. Finally, section 5 concludes.

2 Empirical Specification

In his seminal article (2004), Romalis suggests what has become the standard test for the presence of comparative advantages. His model predicts that countries capture larger shares of production in commodities that intensively use their relatively abundant factors. In an open economy, this is reflected in trade shares. Therefore, the export performance of a country, conditional on factor prices, should be determined by the industry input characteristics of the economy. This is close to the standard Heckscher-Ohlin mechanism for how factor abundance causes commodity trade.

Romalis tests whether countries that are abundant in a factor of production capture larger U.S. imports shares in industries relatively intensive in that factor. His equation relates shares of world production to relative production costs. A country's share of world production of a commodity is decreasing in its relative production cost. By assumption, every country has access to the same production technology. This implies that the only cause of production cost differences are factor price differences: countries therefore capture larger shares of world production in commodities that intensively use their relatively inexpensive factors.

Trade shares are explained by an interaction of factor intensities and relative factor prices. The model assumes that there are no factor intensity reversals. Indeed, a property of the model is that factor shares are fixed for each industry. Therefore, factor intensities are derived using industry data for only one country, the United States. Relative factor prices instead are determined by relative factor abundance. The dependent variable in Romalis' specification is country c' s share in U.S. imports in sector i divided by the average share of industry i in U.S. imports.

Nunn (2007) suggests a more general specification. While the explanatory variables are identical, he proposes a different dependent variable, namely the logarithm of total country c' s export in industry i to all other countries in the world. Therefore, general exports of a country in a given industry towards the rest of the world are supposed to be explained by comparative advantages. As this specification is not centered on the U.S., it allows us to include also the United States in our analysis. In the subsequent analysis Nunn's specification will be adopted. Thus, the equation that will be estimated is the following:

$$\ln x_{ict} = \alpha_c + \alpha_i + \beta_1 inst_i * inst_{ct} + \beta_2 skill_{it} * skill_{ct} + \beta_3 capital_{it} * capital_{ct} + \varepsilon_{ict} \tag{1}$$

where α_c and α_i are country and industry dummies respectively. This dummies are included to control for all unobserved characteristics at country and industry level. Finally, it is important to note that the choice of Nunn's specification against Romalis' one is not too radical as it has been shown (Nicolini, 2007) that these two alternative specifications are empirically equivalent.

The estimation technique chosen are ordinary least squares. Given the large number of zeros in the dependent variable, which is typical of balanced panels of trade data, one could opt for some refined estimators.[1] Nonetheless, some problems in obtaining the convergence of estimates forced us to use standard OLS. However, this choice should not be too problematic. OLS and alternative estimators generally produce coefficient estimates that are coherent (e.g. similar magnitude and similar significance). While OLS could not be the best choice on theoretical grounds, it is still by far the most widely used in empirical analysis. Moreover, given that the analysis will focus on the changes over time in the coefficient estimates, this evolution is invariant across different estimators.

3 Data

The dependent variable comes from the Trade, Production and Protection Database, maintained by the World Bank (Nicita Olarreaga, 2006). It contains information on bilateral trade flows classified by ISIC (International Standard Industrial Classification), Revision 2. In order to investigate the role of comparative advantages we need to consider total exports of each country in each sector. Therefore, we are not interested in the bilateral trade flows but in the

[1] See Santos Silva Tenreyro (2006) for a comparison of different estimators, and a suggestion on the most appropriate econometric techniques.

overall export flow. Thus, we construct our dependent variable by summing trade flows per country and sector across different partners. We obtain a database of manageable size, which contains information on exports by 197 countries in 28 sectors, across 29 years.

Following Romalis (2004) and Nunn (2007), we assume that there are no factor intensity reversals, thus implying that factor shares are fixed for each industry across countries. Therefore, factor intensities can be ranked using factor share data for just one country. I use U.S. industry data for reasons of availability, moreover they are the most satisfactory, as the United States are the largest and most diverse industrial economy.

Data for factor intensities come from the U.S. Manufacturing database maintained by NBER and U.S. Census Bureau's Center for Economic Studies. Data are available for the years 1976-1996, the most recent year available. $capital_{it}$ is a measure of capital intensity, and is equal to one minus the share of total compensation in value added. $skill_{it}$ is a measure of skilled labour intensity, and is equal to the ratio of non production workers to total employment, multiplied by the total share of labour in value added, while $unskill_{it}$ is the intensity of unskilled labour and is equal to the ratio of production workers to total employment multiplied by the total share of labour in value added.

Trade shares are explained by an interaction of factor intensities and relative factor prices. To determine relative factor prices we use relative factor abundance. The endowment of skilled labour is taken from Barro Lee Database (2000): $skill_{ct}$ is measured al the logarithm of average schooling years in the total population. This information is available for the period 1960-1999 with five-year frequency. The abundance of capital, $capital_{ct}$, is measured by the logarithm of the stock of capital taken from Antweiler and Trefler (2002). Data are available for the period 1972-1992.

Institutional dependence at industry level, $inst_i$, is measured using Nunn's measure, which is based on the relationship-specificity of each sector. Institutional dependence is given by a measure of the relative weight of intermediate inputs that are relationship-specific, according to Rauch's (1999) classification. Four different measures can be constructed, depending on the classification chosen (conservative versus liberal) and the definition of relationship-specificity adopted (differentiated products only or differentiated products and reference priced products).[2]

[2] See Appendix A for the definition of these measures.

Measures of institutional quality, $inst_{ct}$, are taken from the Freedom House Database, which provides information on political rights and civil liberties for 204 countries since 1976. These indicators are measured on a one-to-seven scale, with one representing the highest degree of freedom and seven the lowest. They have been rescaled in the interval [0,1] with increasing values associated with highest economic freedom.

4 Results

A first attempt to size the relevance of different sources of comparative advantage is to pool together all observations, and estimate equation (1). As expected, we find that capital and skill endowment are able to generate larger trade flows in capital-intensive and skill-intensive industries, respectively. This is shown in columns 1 and 2 of table 2. In other words, we find that capital and skill endowment are sources of comparative advantage. More interestingly, columns 3 shows that also institutional quality can be a source of comparative advantage in those industries that are more relationship-specific. If we combine these different sources of comparative advantage in one estimate, we find that they maintain their significance. These estimates are obtained including country and sector dummies. The results are robust to the inclusion of time dummies, as reported in column 5.

The following step in our analysis is to look for any change in comparative advantages over time. Therefore, we estimate our equation for different years, and then look at any possible pattern in the coefficient estimates.

Table 3 shows coefficient estimates obtained regressing export flows on our explanatory variables year by year. For each year there are 1664 observations. Interestingly, we observe that institutional comparative advantage has gained a significant role only in recent years. Figure 1 plots the coefficient estimates against time. This graphic representation helps in understanding the trends in the coefficient estimates. While capital seems to have an almost constant impact in terms of comparative advantages, it is interesting to notice that skill and institutions have gained relevance over time. This results are confirmed if the analysis is performed on three- or five-year intervals.[3]

The next step of our analysis is to inspect whether these sources of comparative advantage have a different relevance for different countries. The subsequent

[3]See Figures A.1 and A.2 in Appendix.

analysis shows how comparative advantages are evolving for different groups of countries.

Firstly, our focus is on European countries. Performing the same equation by year over different aggregates of European countries, namely EU-12, EU-15, Eu-25 and EU-27, we obtain a similar pattern of coefficients. Capital has a constant impact on comparative advantages, and is generally negligible. Skill and Institutions show instead an increasing relevance as sources of comparative advantage. These estimates are obtained using 390 observations per year. This pattern is confirmed when looking at the same estimates performed on three-year or five-year intervals.

BRICs are another group of countries for which it is interesting to inspect the relevance of different sources of comparative advantages. In fact, these countries, namely Brazil, Russia, India and China, have shown dramatic increases in exports, in the recent years. Thus, it would be interesting to understand what drives this increase.

In order to consider this smaller country aggregate I need to considers three-year intervals. In fact, for each country there are only 28 observations on trade flows per year. Thus, to implement the analysis on smaller groups I need to aggregate observations over time, in order to gain degrees of freedom. Moreover, for some countries data on capital and skill endowment are not available (e.g. capital endowment for China, capital and skill endowment for Russia). This implies that a regression for BRIC countries that includes also capital and skill as determinants of comparative advantages would actually be estimated only on Brazil and India. Therefore, in the subsequent analysis I will estimate an alternative specification:

$$\ln x_{ict} = \alpha_c + \alpha_i + \beta_1 inst_i * inst_{ct} + \varepsilon_{ict} \quad (2)$$

Although this choice is due to data limitations, it does not entirely compromise the empirical analysis, given that the main focus of the paper is on institutional comparative advantage. Figure 3 and 4 show, respectively, the evolution of institutional comparative advantage for EU-15 and new members of EU, measured on a three–year interval. Coefficient estimates for these two groups are reported in table 5. Data show clearly two different patterns. One one side, EU-15 countries are slowly taking advantage of their institutional comparative advantage. This source of comparative advantage is gaining relevance in European exports. On the other side, new member states' exports do not seem to be increasingly influenced by institutional comparative advantage. Finally, figure 5 shows the evolution of institutional comparative advantage for BRIC countries. BRIC's exports are clearly not driven by this type of comparative advantage. Firstly, this variable is often not significant, and therefore does not seem to explain export flows of these countries. Moreover, when it is significant, it looses relevance in absolute terms. This suggests that BRIC's exports are guided by other sources of comparative advantage.

5 Conclusions and Policy Implications

Recent literature has drawn the attention to institutional comparative advantage. Nonetheless, an analysis of its role over time has not been performed previously.

Using a rich database on sectorial export flows for 197 countries over the period 1976-2004, we inspect the relevance of alternative determinants of comparative advantage. We obtain a number of interesting results.

Firstly, institutions and skill endowment seem to be the main drivers of comparative advantages, with a growing weight in more recent years. Moreover, if we look at different country groups, we find that institutional comparative advantage is relevant for European countries, while it does not seem to affect BRIC's export flows. This seems to confirm the common wisdom that BRIC's exports are mainly constituted of simple and cheap goods. On the other side, EU can increase its competitiveness by capitalizing on its institutional comparative advantage. In other words, EU countries should aim at exporting goods that are institutionally intensive, because of their good endowment of institutional quality.

References

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Tables and Figures

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
ln(export)	159964	4.65748	5.42621	0	19.0784
$inst_i$*$inst_c$	127998	0.14233	0.11876	0	0.53137
$capital_i$*$capital_c$	53534	2.36896	1.32043	-0.33217	7.89868
$skill_i$*$skill_c$	78442	0.13410	0.09235	-0.42513	0.51100

Table 1: Descriptive statistics

	(1)	(2)	(3)	(4)	(5)
$capital_i$*$capital_c$	4.280***			4.561***	0.111*
	(0.042)			(0.043)	(0.058)
$skill_i$*$skill_c$		14.30***		24.47***	4.918***
		(0.36)		(0.55)	(0.54)
$inst_i$*$inst_c$			14.95***	8.228***	5.678***
			(0.16)	(0.31)	(0.28)
constant	-7.661***	4.075***	8.242***	-15.30***	7.035***
	(0.28)	(0.20)	(0.20)	(0.31)	(0.36)
Country dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Time dummies	No	No	No	No	Yes
Observations	53534	78442	127998	48256	48256
Adjusted R^2	0.59	0.58	0.60	0.58	0.67

Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2: Testing Comparative Advantages

year	$inst_i * inst_c$		$capital_i * capital_c$		$skill_i * skill_c$	
1976	0.589	(0.594)	-0.315	(0.121)***	0.213	(0.913)
1977	0.302	(0.887)	-0.474	(0.174)***	1.414	(1.382)
1978	0.163	(0.954)	-0.413	(0.200)**	2.748	(1.529)
1979	-0.030	(1.055)	-0.141	(0.198)	1.522	(1.674)
1980	-0.439	(1.023)	-0.271	(0.201)	5.018	(1.865)***
1981	-0.990	(1.024)	-0.151	(0.204)	7.363	(1.884)***
1982	-0.709	(1.034)	-0.277	(0.190)	7.478	(1.807)***
1983	-0.713	(1.061)	-0.177	(0.214)	8.894	(1.944)***
1984	0.031	(1.081)	-0.239	(0.239)	7.751	(2.180)***
1985	-0.344	(1.084)	-0.395	(0.217)*	8.233	(2.255)***
1986	-0.418	(1.092)	-0.602	(0.219)***	7.899	(2.167)***
1987	0.142	(1.132)	-0.424	(0.239)*	7.728	(2.357)***
1988	0.311	(1.204)	-0.088	(0.214)	6.068	(2.313)***
1989	1.912	(1.264)	-0.171	(0.218)	6.851	(2.295)***
1990	0.142	(1.213)	-0.276	(0.193)	9.734	(2.273)***
1991	-0.061	(1.095)	-0.266	(0.184)	8.250	(2.177)***
1992	1.170	(1.113)	-0.097	(0.196)	5.000	(2.356)**
1993	-0.022	(1.115)	-0.371	(0.201)*	11.140	(2.455)***
1994	0.790	(1.041)	-0.361	(0.189)*	11.658	(2.409)***
1995	1.399	(1.077)	-0.430	(0.193)**	12.178	(2.611)***
1996	2.358	(1.126)**	-0.559	(0.193)***	13.561	(2.630)***
1997	1.832	(1.131)	-0.469	(0.192)**	12.289	(2.613)***
1998	3.179	(1.133)***	-0.472	(0.189)**	9.457	(2.564)***
1999	3.801	(1.066)***	-0.400	(0.180)**	8.782	(2.576)***
2000	3.727	(1.204)***	-0.478	(0.205)**	10.898	(2.928)***
2001	4.011	(1.131)***	-0.431	(0.199)**	9.975	(2.850)***
2002	1.153	(1.050)	-0.274	(0.188)	12.499	(2.693)***
2003	2.665	(1.103)**	-0.131	(0.194)	6.547	(2.779)**
2004	2.781	(1.067)***	0.078	(0.185)	11.526	(2.655)***

Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table3: Coefficient Estimates Over Time

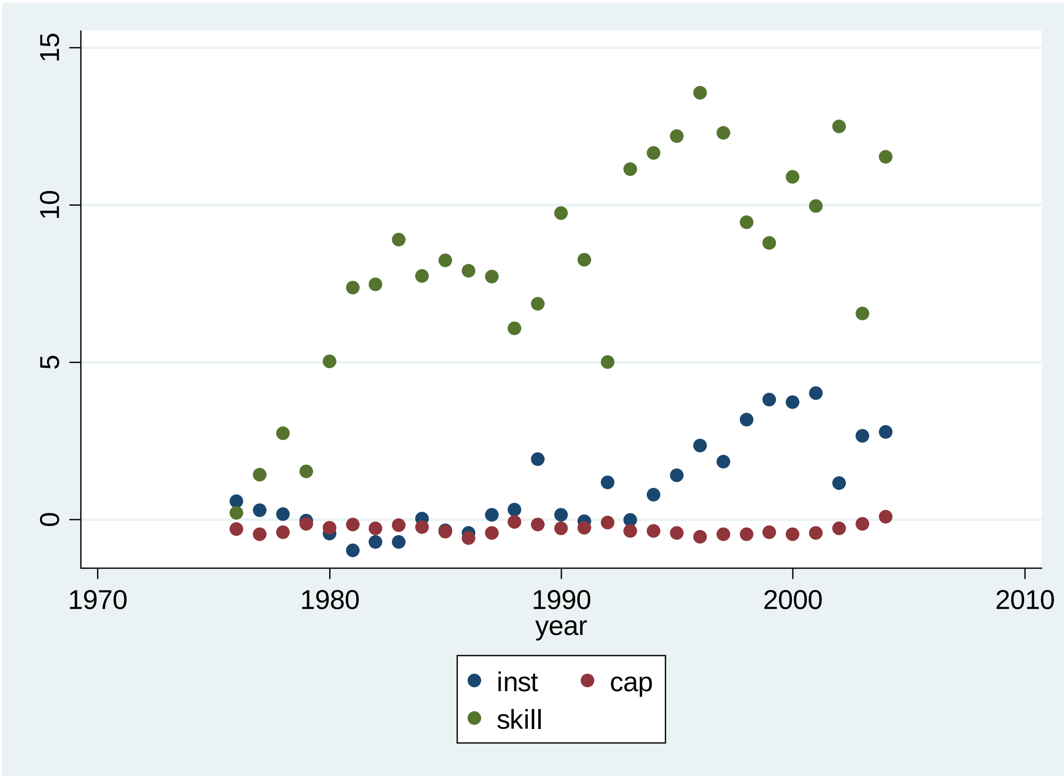

Figure 1: Coefficient Estimates Over Time, yearly

year	$inst_i * inst_c$		$capital_i * capital_c$		$skill_i * skill_c$	
1976	1.447	(3.218)	-0.026	(0.266)	2.264	(3.536)
1977	1.801	(3.411)	-0.292	(0.279)	1.042	(4.029)
1978	0.184	(4.373)	-0.402	(0.309)	3.554	(4.298)
1979	0.038	(3.711)	-0.049	(0.293)	-2.845	(4.453)
1980	0.189	(3.082)	-0.149	(0.276)	3.707	(4.450)
1981	0.320	(2.714)	-0.164	(0.280)	3.457	(4.324)
1982	0.127	(2.619)	-0.253	(0.256)	5.784	(3.973)
1983	-0.340	(2.649)	-0.261	(0.288)	7.671	(4.213)*
1984	1.829	(2.637)	-0.279	(0.320)	6.695	(4.641)
1985	2.009	(2.620)	-0.304	(0.292)	5.612	(4.704)
1986	2.220	(2.628)	-0.390	(0.298)	6.697	(4.537)
1987	2.271	(4.200)	-0.423	(0.316)	8.440	(4.827)*
1988	0.769	(4.213)	-0.280	(0.290)	7.214	(4.821)
1989	-0.765	(5.181)	-0.291	(0.287)	9.066	(4.726)*
1990	5.716	(4.584)	-0.545	(0.298)	3.659	(5.479)
1991	15.012	(4.775)***	-0.879	(0.289)***	4.646	(5.355)
1992	8.837	(4.600)*	-0.756	(0.317)**	2.312	(5.764)
1993	3.961	(3.015)	-0.792	(0.328)**	0.990	(6.190)
1994	7.351	(3.474)**	-0.794	(0.335)**	1.528	(6.607)
1995	9.224	(3.670)**	-0.973	(0.344)***	1.253	(6.876)
1996	11.438	(3.589)***	-1.308	(0.329)***	3.132	(6.690)
1997	11.276	(3.373)***	-1.052	(0.309)***	3.140	(6.287)
1998	10.770	(3.478)***	-1.086	(0.319)***	4.713	(6.482)
1999	10.629	(3.440)***	-1.130	(0.316)***	10.134	(7.044)
2000	9.926	(3.478)***	-1.204	(0.319)***	11.994	(7.122)*
2001	10.575	(3.420)***	-1.214	(0.314)***	12.157	(7.002)*
2002	22.918	(8.040)***	-0.977	(0.304)***	13.819	(6.972)**
2003	21.188	(8.225)***	-1.008	(0.311)***	12.826	(7.132)*
2004	20.619	(8.144)**	-0.870	(0.308)***	13.320	(7.061)*

Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Coefficient Estimates Over Time for EU-27

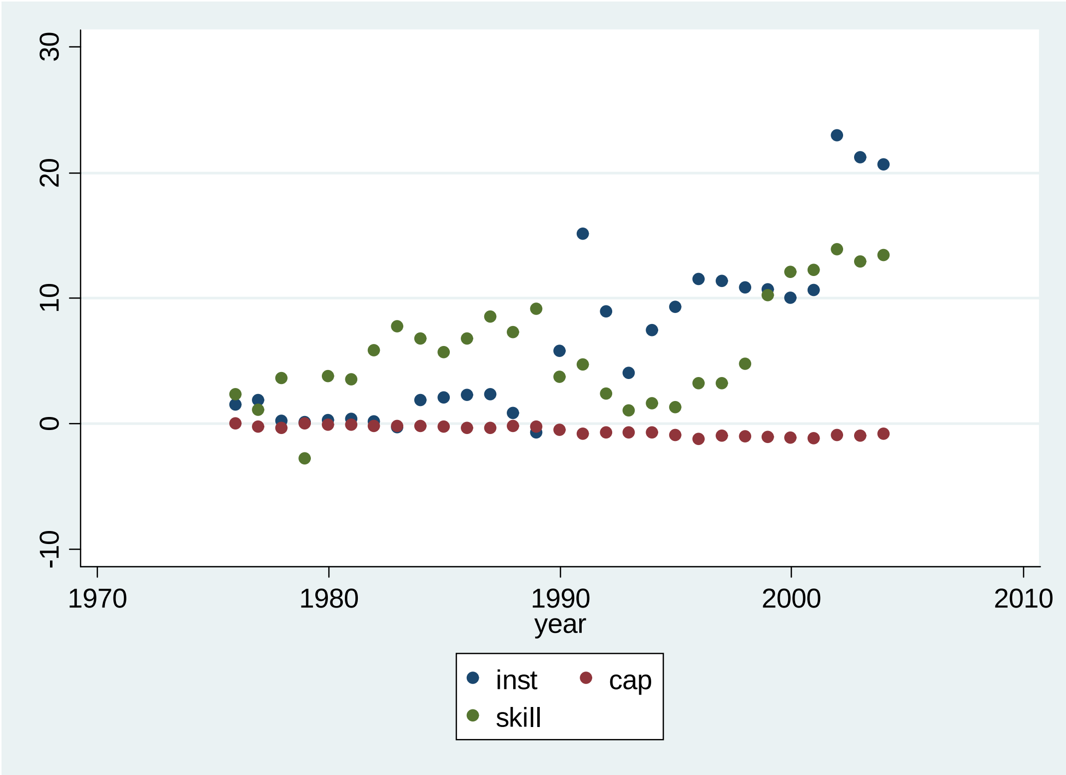

Figure 2: Coefficient Estimates Over Time for EU 27

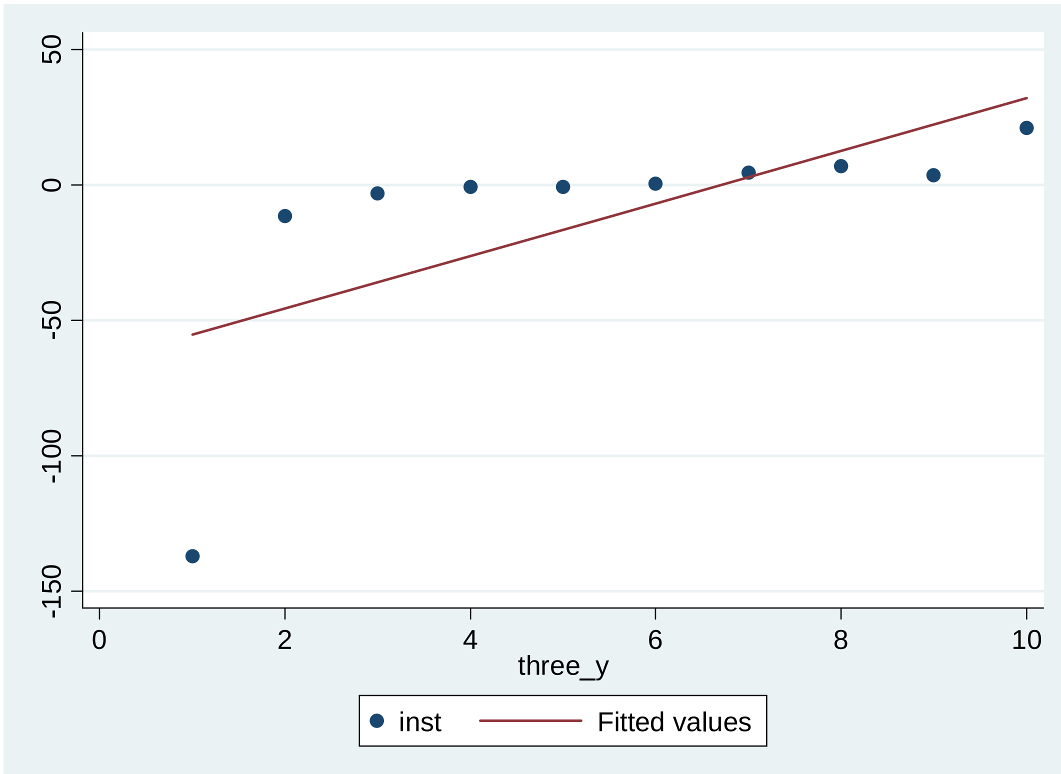

Figure 3: Institutional Comparative Advantage for EU-15, three-year interval

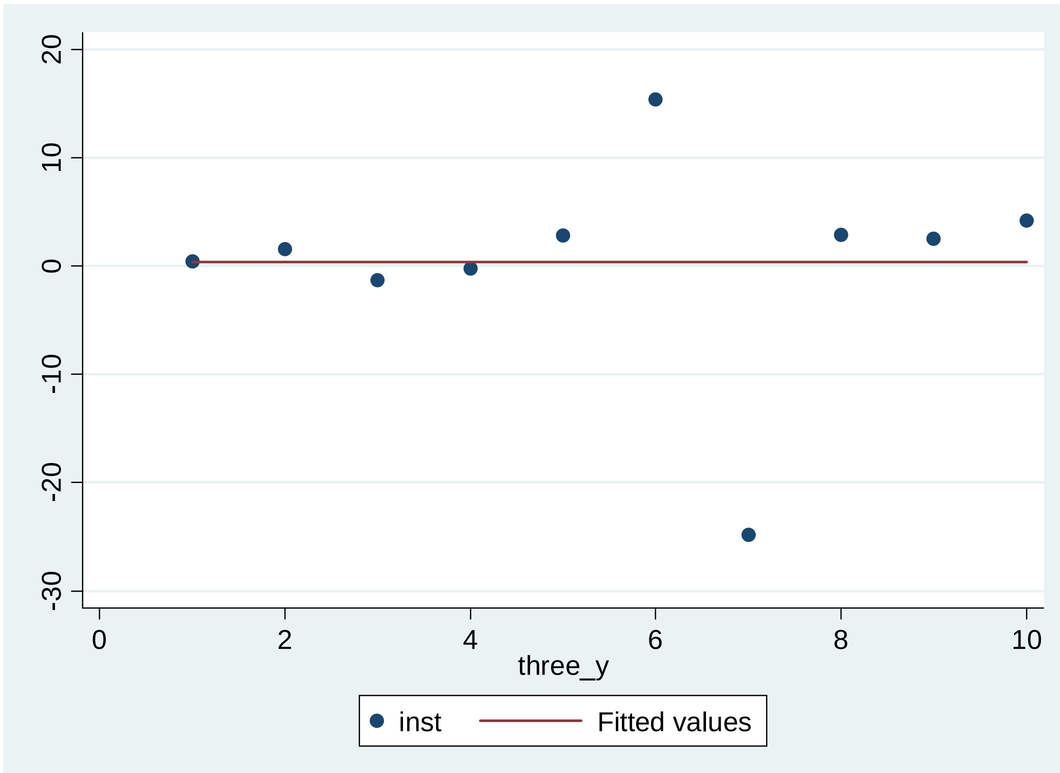

Figure 4: Institutional Comparative Advantage for NMS, three-year interval

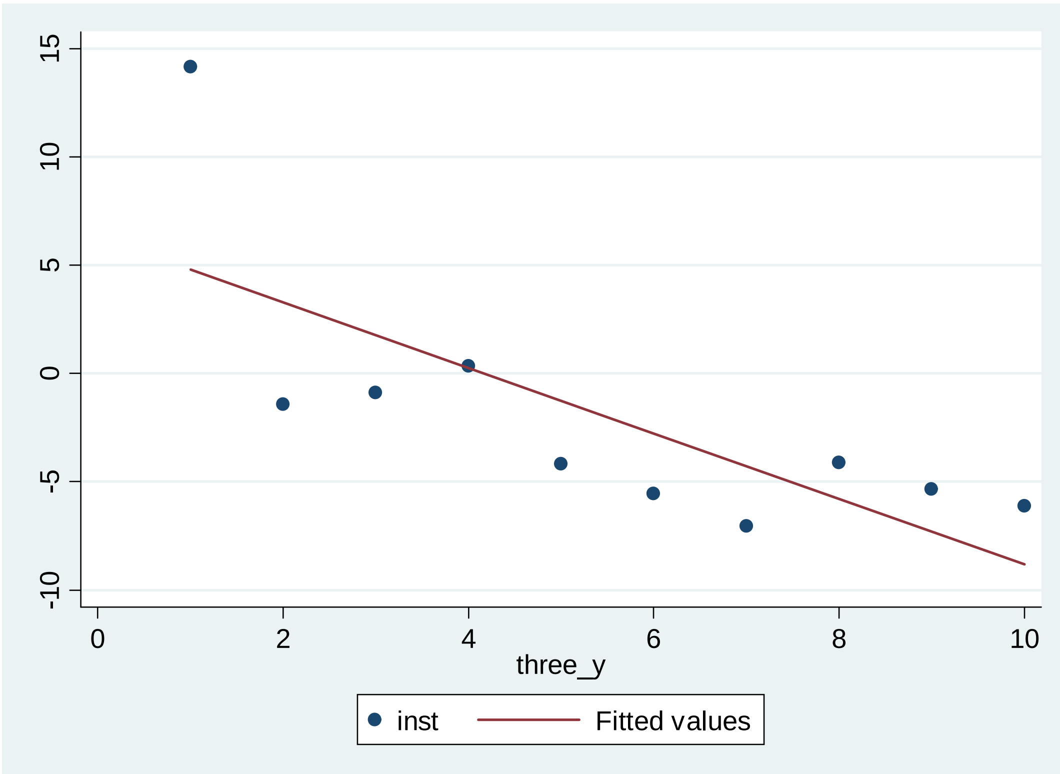

Figure 5: Institutional Comparative Advantage for BRIC, three-year interval

year	*EU-15*		*NMS*		*BRIC*	
1976-78	-137.253	(13.151)***	0.433	(0.586)	14.161	(2.583)***
1979-81	-11.448	(2.49)**	1.610	(1.580)	-1.423	(1.642)
1982-84	-2.972	(2.135)**	-1.286	(1.454)	-0.892	(4.696)
1985-87	-0.611	(2.602)***	-0.205	(1.275)	0.352	(3.369)
1988-90	-0.607	(1.739)*	2.856	(1.305)	-4.174	(1.460)***
1991-93	0.630	(1.255)	15.413	(4.039)***	-5.554	(1.424)***
1994-96	4.684	(1.598)	-24.814	(4.191)***	-7.060	(6.659)
1997-99	7.097	(1.697)*	2.925	(1.806)*	-4.116	(1.863)**
2000-02	3.662	(1.19)	2.518	(2.738)***	-5.331	(1.913)***
2003-04	21.080	(4.987)***	4.224	(2.290)**	-6.113	(2.366)***

Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Institutional Comparative Advantage for EU-27 and BRIC

Appendix

Data Description

Nunn's (2007) measure: This measure is based on Rauch's classification of goods into three groups: goods traded on an organized exchange (homogeneous goods), reference priced and differentiated products. The classification has been made available at 4-digit SITC Rev. 2 system. I convert this classification into 4-digit 1987 SIC and then 3-digit ISIC (rev. 3).[4] I then construct a concordance from the 3-digit ISIC (rev.3) classification to the IO 1992 classification. Finally, following Nunn (2007), I construct four measures of the proportion of the intermediate inputs that are relationship-specific:

$$inst_i^{nc} = \sum_j \theta_{ij} R_j^{neither\_cons}$$

$$inst_i^{nrc} = \sum_j \theta_{ij} \left(R_j^{neither\_cons} + R_j^{ref.\ priced\_cons} \right)$$

[4] I use the concordances made available by Jon Haveman at http://www.macalester.edu/research/economics/page/haveman.

$$inst_i^{nl} = \sum_j \theta_{ij} R_j^{neither\_lib}$$

$$inst_i^{nrl} = \sum_j \theta_{ij} \left(R_j^{neither\_lib} + R_j^{ref.\ priced\_lib} \right)$$

where the first two adopt Rauch's conservative classification, and the following the liberal classification. θ_{ij} is the ratio of the value of input j in industry i over the total value of all inputs used in industry i. $R_j^{neither}$ is the proportion of input j that is not sold on an organized exchange, nor reference priced, while $R_j^{ref.\ priced}$ is the proportion of input j that is reference priced.

Additional Tables and Figures

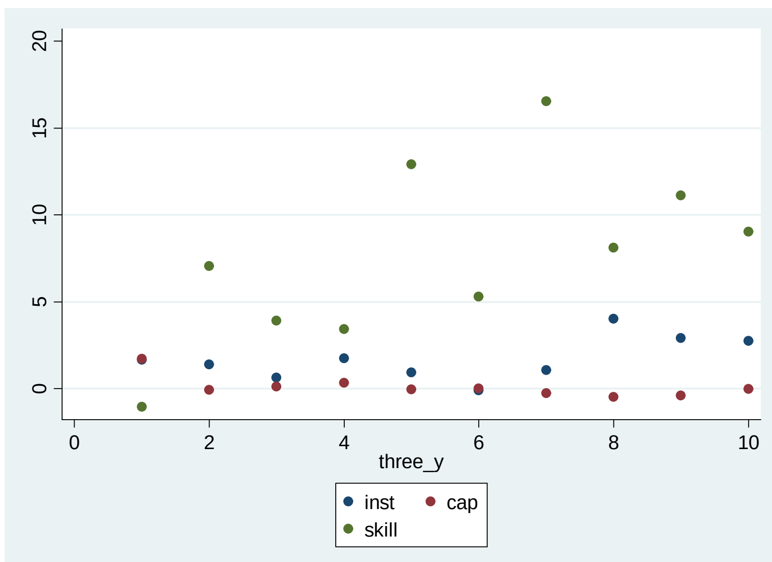

Figure A.1: Coefficient Estimates Over Time, three-year frequency

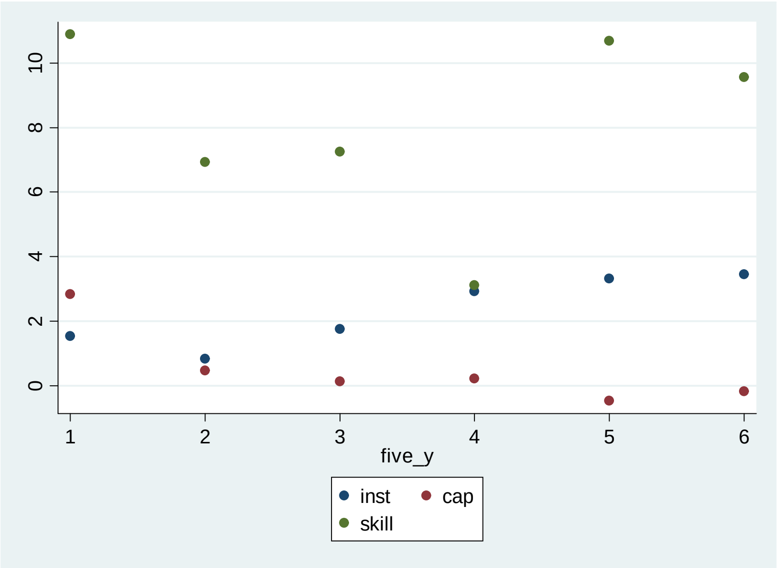

Figure A.2: Coefficient Estimates Over Time, five-year frequency

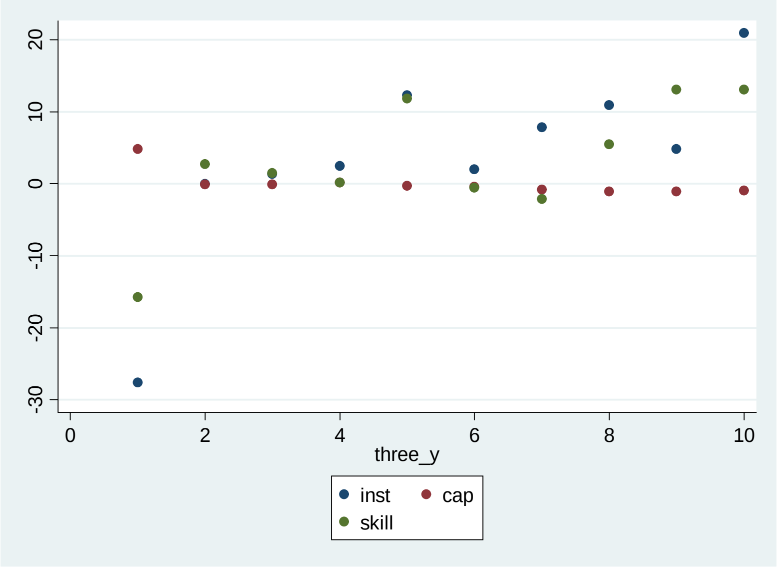

Figure A.3: Coefficient Estimates Over Time for EU-27, three-year frequency

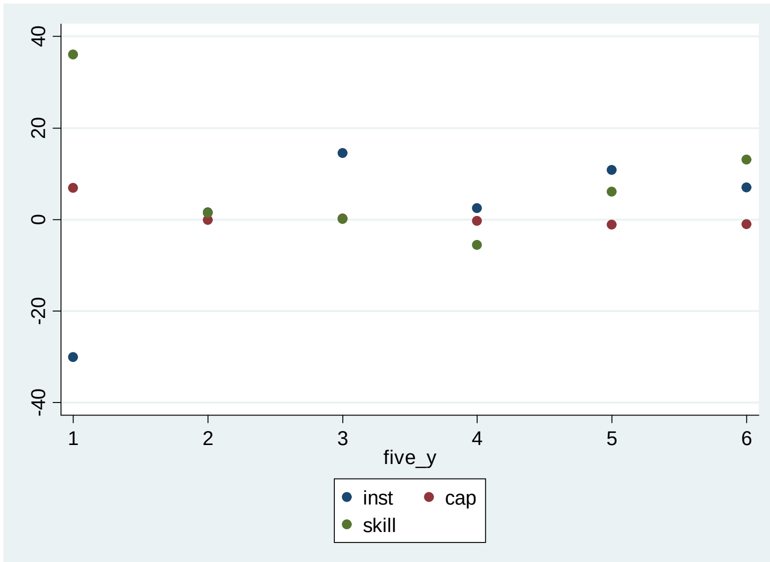

Figure A.4: Coefficient Estimates Over Time for EU-27, five-year frequency