Structural Change and Economic Dynamics 22 (2011) 162–172

Contents lists available at ScienceDirect

Structural Change and Economic Dynamics

journal homepage: www.elsevier.com/locate/sced

On the evolution of institutional comparative advantages

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ARTICLE INFO

Article history:
Received March 2010
Received in revised form December 2010
Accepted December 2010
Available online 28 December 2010

JEL classification:
D23
F11
L14

Keywords:
Institutional quality
Comparative advantage

ABSTRACT

This article investigates how comparative advantages have changed in the last 30 years. Using export data for 100 countries over the period 1976–2004, it provides evidence that comparative advantages are not static, but change over time. Focussing on three different sources of institutional comparative advantage, it shows that they display different trends over time. Additionally, it shows that these effects are generally stronger for OECD countries.

1. Introduction

The empirical trade literature has generally focussed on two main sources of comparative advantage: capital and skilled labour. However, recent literature has shown that institutions play a role in determining a country's comparative advantage as well.

Indeed, institutional quality, in the form of contract enforcement by the judicial system, may be a source of comparative advantage in those industries which are more contract-intensive. The concept of intensiveness in the use of contracts has been declined in several ways. Levchenko (2007) shows that institutional quality gives a comparative advantage in industries that produce more complex goods. Nunn (2007) suggests that good institutions are a source of comparative advantage in those sectors for which relationship-specific investments are important. Costinot (2009) instead focusses on the complexity of tasks as a measure of an industry's dependence on institutions.

However, other institutions may be relevant sources of comparative advantage. Beck (2003) shows that financial institutions are a source of comparative advantage in industries that rely more on external financing. Cuñat and Melitz (2007) instead consider labour market institutions, and show that labour market flexibility is a source of comparative advantage in sectors with higher volatility.

Apart from Nunn (2007), who shows that his results hold using data from 1997 and, as robustness check, 1963, the empirical tests in the literature have provided so far only cross-sectional evidence of this phenomenon.

Yet, comparative advantages depend on countries' factor endowments and industries' factor intensities, and could therefore evolve over time, according to changes in their determinants.

It is therefore relevant to investigate whether the role of institutions in explaining comparative advantages has changed over time. In order to perform this exercise, I use trade data for the period 1976–2004. The analysis investigates the behaviour over time of standard determinants of comparative advantage, as well as three different features of institutional quality: relationship-specificity, complexity of tasks and financial dependence.

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doi:10.1016/j.strueco.2010.12.003

The empirical evidence provided suggests that institutions are indeed a significant source of comparative advantage. This confirms previous results obtained on cross-sections. However, the article provides new insights on the behaviour of institutional comparative advantages over time. While the complexity of tasks aspect is gaining relevance over time, the financial development seems to be less relevant in recent times. Finally, the feature of relationship-specificity shows a relatively stable effect over time.

Additionally, to investigate if and how cross-country heterogeneity may affect the results, I distinguish between OECD and non-OECD countries. I find that the impact of relationship-specificity and complexity of tasks is larger in OECD countries. However, financial institutions do not determine comparative advantages differently across the two groups.

The remainder of the article is structured as follows: Section 2 reviews the literature on institutions and comparative advantages. Section 3 presents the empirical specification. Section 4 describes the data and Section 5 shows the results. Finally, Section 6 concludes.

2. Institutions and comparative advantages

The Heckscher–Ohlin trade model predicts that countries export the goods whose production more intensely uses each country's abundant factors. The empirical tests have concentrated since the beginning on the role of skilled labour and capital as possible sources of comparative advantage (Keesing, 1966; Baldwin, 1971).

Since then, the literature has moved in the direction of improving the theoretical framework. Dornbusch et al. (1977, 1980) extend the Ricardian model of comparative advantages and the Heckscher–Ohlin model in a continuum of goods. Romalis (2004) integrates the Heckscher–Ohlin model with a continuum of goods (Dornbusch et al., 1980) with the Krugman (1980) model of monopolistic competition, thus providing what is the now standard testable model of comparative advantages.

More recently, several efforts have focussed on extending the model to incorporate additional sources of comparative advantage, generally pointing in the direction of institutional comparative advantage.

Kletzer and Bardhan (1987) include the financial sector in an Heckscher–Ohlin framework and show that the level of development of the financial sector is a source of comparative advantage. This prediction has been tested by Beck (2003), who finds empirical support of their model. The financial development of a country is proxied by the credit to the private sector by financial intermediaries as a share of GDP, while the intensity in the use of finance is proxied by the measure of dependence on external finance proposed by Rajan and Zingales (1998).

Cuñat and Melitz (2007) instead integrate labour market institutions into the model of Ricardian comparative advantage of Dornbusch et al. (1977), finding that higher labour market flexibility generates a comparative advantage in sectors characterized by high volatility. They provide empirical evidence to support this result: data on labour market rigidities are sourced from the World Bank, while the sector's volatility is proxied by the standard deviation of the annual growth rate of firm sales, where firm level information has been sourced from COMPUSTAT.

Levchenko (2007) and Nunn (2007) show that contract enforcement is a source of comparative advantage in contract-intensive sectors. While Levchenko (2007) defines the intensity in the use of contracts by the number of intermediate inputs necessary to produce the good, Nunn (2007) focusses on the number of inputs which are relationship-specific. The intuition is that since each intermediate input requires a contract to be purchased, the hold-up problem becomes more relevant whenever many inputs are bought, or contract enforcement is weak. This mechanism is relevant, according to Nunn's results, if the inputs are relationship-specific, since the costs of hold-up for the final good producer are larger in this case rather than if the input is sold on exchanges. Both authors proxy institutional quality by the Rule of Law index provided by the World Bank (Kaufmann et al., 2003). As for the complexity of industries, Levchenko uses the Herfindahl index of intermediate input use, while Nunn presents a measure which weights the different inputs according to whether they are relationship-specific. The classification of goods into those sold on an organized exchange, reference priced or differentiated is provided by Rauch (1999).

Finally, Costinot (2009) considers the complexity of an industry in terms of the number of tasks necessary for production. Building on a Ricardian model of comparative advantages (Dornbusch et al., 1977) he finds that institutions and human capital are complementary sources of comparative advantage in more complex industries. In the empirical evidence provided he proxies the complexity of tasks by the average number of months necessary to be fully trained and qualified in a given industry. Institutional quality is again proxied by the index of Rule of Law (Kaufmann et al., 2003).

The articles reviewed have generally focussed on one institutional determinant of comparative advantage at a time, while controlling for the standard determinants of comparative advantage, namely capital and skilled labour. However, Chor (2010) tests these alternative determinants jointly, finding support for the different institutional effects. Still, he provides evidence using data only for 1990.

The reminder of this article is devoted to test whether the institutional comparative advantages change over time. It thus contributes to the literature on institutions and comparative advantage, as well as the literature on the evolution of comparative advantage.

The Heckscher–Ohlin model predicts that, in an open economy, a country's pattern of production is determined by its relative factor endowments. Therefore, changes over time in factor endowments will be reflected in changes in the export mix. Analogously, changes in factor intensities will affect the export pattern. Fisher and Vega-Redondo (2003) and Fisher and Kakkar (2004) theoretically show, in an evolutionary framework, that comparative advantage may change over time. Hausmann and Klinger (2007) provide empirical evidence on the mechanism behind these changes: they are driven by the proximity of products in the product space. In other words, when a country changes

its export mix, they observe a strong tendency to move towards the production and export of related goods rather than to goods that are farther away.

3. Empirical model

The empirical literature on the tests of comparative advantages generally refers to two alternative econometric specifications. The first is presented by Romalis (2004). His model predicts that countries capture larger shares of production in commodities that intensively use their relatively abundant factors. In an open economy, this pattern of specialization is reflected in trade shares. This implies that the export performance of a country, conditional on factor prices, is determined by the industry input characteristics of the economy.

Trade shares are explained by an interaction of factor intensities and relative factor prices. The model assumes that there are no factor intensity reversals. Therefore, in this empirical model 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 this 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 and the underlying assumptions are identical, he adopts as dependent variable the logarithm of total country c's export in industry i to all other countries in the world. Therefore, this model assumes that comparative advantages explain overall exports of a country in a given industry towards the rest of the world. As this specification is not centered on the United States, it allows to include also the latter country in the analysis. In the subsequent analysis Nunn's (2007) specification will be adopted. However, note that the choice of Nunn's specification against Romalis' one is not too radical as it has been shown (Nicolini, 2009) that these two alternatives are empirically equivalent.

As in Chor (2010), several sources of institutional comparative advantage are tested, jointly with standard determinants. Thus, the equation that will be estimated is the following:

$$\begin{aligned}\ln x_{ict} &= \alpha_c + \alpha_i + \beta_1 cap_{it} * cap_{ct} + \beta_2 skill_{it} * skill_{ct} \\ &\quad + \beta_3 rel\_sp_i * inst_{ct} + \beta_4 compl_i * inst_{ct} \\ &\quad + \beta_5 ext\_dep_i * fin_{ct} + \varepsilon_{ict} \qquad (1)\end{aligned}$$

where all the explanatory variables are interaction terms between each country's endowment of a given factor, and each industry's intensity in the usage of that factor. Thus, $cap_{it} * cap_{ct}$ is constructed as the capital intensity at industry level times capital endowment at country level and tests that capital is a source of comparative advantage. Analogously, $skill_{it} * skill_{ct}$ is the skilled labour effect, $rel\_sp_i * inst_{ct}$ is the relationship-specificity of intermediate input effect identified by Nunn (2007), $compl_i * inst_{ct}$ is the complexity of tasks effect suggested by Costinot (2009) and $ext\_dep_i * fin_{ct}$ is the financial dependence effect tested by Beck (2003). The model includes a set of country (α_c) and industry (α_i) dummies to control for all unobserved characteristics at country and industry level.

The panel of data has three dimensions: industry, country and time. The model is estimated by a two-way least squares dummy variable (LSDV) estimator, which includes country and industry effects. Since zero trade flows are only 4.8% of the sample, there is no need for more refined estimators such as a Tobit or a Poisson pseudo-maximum likelihood estimator (Santos Silva and Tenreyro, 2006). Given how the explanatory variables are constructed, standard errors are clustered at the country–industry level.

4. Data

The dependent variable is sourced from the Trade, Production and Protection Database, maintained by the World Bank (Nicita and Olarreaga, 2006). It contains information on bilateral trade flows classified by ISIC (International Standard Industrial Classification), Revision 2. In order to estimate Eq. (1), I need the information on total exports of each country in each sector. Therefore, I construct the dependent variable by summing export flows per country and industry across different partners. This allows to obtain a database of manageable size, which contains information on exports by 100 countries in 28 sectors, across 29 years. As for the treatment of zero flows of trade, I consider all missing trade data as zero trade flows, following a common practice in the literature. Indeed, the assumption is that if there is no trade reported, it means that, if any, the trade is so negligible to be assumed equal to zero. However, a closer look at data availability (reported in Table A.1 in Appendix A) suggests that for many countries data are available, with some years now and then missing. Therefore, I am not assuming, for example, that exports in Japan were equal to zero in 1993, but I keep these as missing observations. However, any missing value in a given industry in Japan in 1992 is assumed to be a zero export flow. This yields a 4.8% of zero flows of trade in the database.

Following the standard practice in the literature, I assume that there are no factor intensity reversals, thus implying that factor shares for each industry are common across countries. This entails that factor intensities can be ranked using factor share data for just one country. I use U.S. industry data for reasons of availability: data limitations prevent from calculating these measure for a wider set of countries. However, the United States are the most satisfactory choice among countries, since they are the largest and most diverse industrial economy. Additionally, notice that factor intensities may in principle be different across countries, but this would not invalidate the econometric exercise as long as the relative ranking of industries is similar across countries.

Data for factor intensities come from the U.S. Manufacturing database maintained by NBER and U.S. Census Bureau's Center for Economic Studies.[1] Data are available for the period from 1976 to 2004. As in Chor (2010), cap_{it} is a measure of capital intensity, and is equal to the log of the ratio of real capital stock to total employment. $skill_{it}$

[1] See Bartelsman and Gray (1996) for a description of this database.

Table 1
Comparative advantages, pooled sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
cap_i*cap_c	0.288***						0.293***	0.077***
	(0.014)						(0.015)	(0.024)
$skill_i$*$skill_c$		0.072***					0.041***	0.025**
		(0.013)					(0.012)	(0.011)
rel_sp_i*$inst_c$			0.165***			0.079***	0.021	−0.019
			(0.015)			(0.017)	(0.020)	(0.019)
$compl_i$*$inst_c$				0.166***		0.096***	0.064***	0.084***
				(0.015)		(0.016)	(0.019)	(0.018)
ext_dep_i*fin_c					0.072***	0.078***	0.082***	0.061***
					(0.009)	(0.010)	(0.011)	(0.010)
Constant	1.531***	1.488***	1.575***	1.513***	1.484***	1.559***	1.547***	1.366***
	(0.038)	(0.031)	(0.030)	(0.028)	(0.030)	(0.028)	(0.037)	(0.039)
F-test of joint significance of institutional variables						95.03***	41.45***	27.07***
						(0.000)	(0.000)	(0.000)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	No	No	No	No	No	No	No	Yes
Observations	38,246	49,244	52,728	46,644	56,728	45,770	33,005	33,005
R^2	0.733	0.679	0.679	0.683	0.694	0.689	0.742	0.767
Adjusted R^2	0.732	0.078	0.678	0.682	0.694	0.688	0.741	0.767

Notes: Dependent variable is the log of country's *c* yearly export in industry *i* to the rest of the world. Standardized beta coefficients are reported. Standard errors clustered at the country–industry level are shown in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

is a measure of skilled labour intensity, and is constructed as the log of the ratio of non-production-workers to total employment.

Trade shares are explained by an interaction of factor intensities and relative factor prices. To determine relative factor prices I use relative factor abundance. The abundance of capital, $capital_{ct}$, is measured by the logarithm of the stock of capital per worker taken from Antweiler and Trefler (2002). Data are available for the period 1972–1992. The endowment of skilled labour is taken from the Barro Lee Database (2001): $skill_{ct}$ is measured as the logarithm of average schooling years in the total population. This information is available for the period 1960–1999 with five-year frequency.

Moving to the institutional determinants of comparative advantage, I proxy relationship-specificity at industry level, $inst_i$, using Nunn's measure, which is based on the relationship-specificity of each input. 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 of goods chosen (conservative versus liberal) and the definition of relationship-specificity adopted (differentiated products only or differentiated products and reference priced products).[2] In the econometric exercise I use the measure constructed with the liberal classification of goods, and the definition on relationship-specificity based of differentiated products.

Data on the complexity of tasks are taken from Costinot (2009), and correspond to the average number of months necessary to be fully trained and qualified in a given industry, as reported in the 1985 and 1993 Panel Study of Income Dynamics (PSID) surveys. Financial dependence is proxied by the index of external dependence built by Rajan and Zingales (1998), which is defined as the ratio of capital expenditures minus cash flow to capital expenditures. The measure has been computed by the authors using COMPUSTAT data for U.S. firms.

As for the measures of institutional quality at country level, $inst_{ct}$, the widely adopted index of Rule of Law built by the World Bank cannot be applied in the present exercise, since it is available from 1996 onwards. Therefore, I refer to data from the Freedom House Database, which provides information on political rights and civil liberties for 204 countries since 1976.[3] 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. I present the results obtained using the civil liberties measure, since this index takes into account, among others, the of rule of law.

5. Results

A first attempt to size the relevance of different sources of comparative advantage is to estimate the model pooling together all observations. Table 1 reports the results introducing first one determinant at a time. Standardized beta coefficients are reported: they show the effect of increasing the explanatory variable by one standard deviation, mea-

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

[3] Data are available at http://www.freedomhouse.org.

Table 2
Comparative advantages over time, five-year estimates.

Time period	cap_i*cap_c	$skill_i$*$skill_c$	rel_sp_i*$inst_c$	$compl_i$*$inst_c$	ext_dep_i*fin_c	*F*-test of joint significance of institutional variables	Obs.	R^2	Adj. R^2
1976–1980	0.144***	0.056	0.062*	0.029	0.109***	9.53***	3266	0.812	0.808
	(0.063)	(0.050)	(0.036)	(0.030)	(0.027)	(0.000)			
1981–1985	0.151***	0.035	0.007	0.081***	0.084***	12.77***	5267	0.768	0.764
	(0.051)	(0.045)	(0.032)	(0.028)	(0.017)	(0.000)			
1986–1990	0.136***	0.085**	0.006	0.083***	0.069***	13.28***	6049	0.768	0.765
	(0.040)	(0.039)	(0.029)	(0.027)	(0.015)	(0.000)			
1991–1995	0.112***	0.067*	−0.035	0.085***	0.077***	20.55***	6348	0.789	0.786
	(0.029)	(0.037)	(0.022)	(0.020)	(0.012)	(0.000)			
1996–2000	0.091***	0.033	0.026	0.124***	0.052***	24.28***	6670	0.814	0.811
	(0.027)	(0.022)	(0.026)	(0.023)	(0.011)	(0.000)			
2001–2004	0.112***	0.032**	0.047*	0.132***	0.044***	25.97***	5405	0.807	0.804
	(0.028)	(0.015)	(0.028)	(0.026)	(0.010)	(0.000)			

Notes: Dependent variable is the log of country's *c* yearly export in industry *i* to the rest of the world. Standardized beta coefficients are reported. Industry and country dummies are included in the estimates. Estimates obtained on five-year subsamples. Standard errors clustered at the country–industry level are shown in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

sured in standard deviations of the explanandum. These coefficients allow to directly compare the relative magnitudes of the explanatory variables.

As expected, 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). These results confirm that capital and skill endowment are sources of comparative advantage. Moving to the institutional determinants of comparative advantage, column (3) shows that institutional quality can be a source of comparative advantage in those industries that are more intensive in the use of relationship-specific inputs. Column (4) presents the results considering the complexity of tasks, while column (5) focusses on the role of financial institutions. Also these specifications show a positive and significant coefficient for the variable of interest, thus suggesting that institutional quality is a source of comparative advantage in industries characterized by more complex tasks, and that a good financial development determines a comparative advantage in the industries which rely more heavily on external finance. The table reports the *F*-test for the hypothesis of joint significance of the three institutional variables. The test rejects the null hypothesis, thus suggesting that the three variables are jointly significant. Column (7) presents the full model, which includes controls for capital and skill. Still, the three institutional variables are jointly significant. All the specifications presented include country and industry dummies. Column (8) shows that the results are robust to the inclusion of time dummies.

Taking advantage of the time dimension of the data, I look at the evolution of comparative advantages over time. To this end, I estimate the equation for different time periods, and then look at any possible pattern in the coefficient estimates.

Table 2 shows coefficient estimates obtained regressing export flows on the explanatory variables for five-year intervals, while Fig. 1 presents the estimated coefficients over time. Capital is always showing a positive and statistically significant at 1% coefficient. However, the coefficient is slightly decreasing over time, thus suggesting that capital is becoming less relevant as a source of comparative advantage. The estimated coefficient for skill is positive, but the estimates are less precise. Overall, it seems that the role of skilled labour as a source of comparative advantage is almost unchanged over time.

Moving to the institutional variables, the relationship-specificity feature yields coefficient estimates which are poorly significant, and do not show a clear trend over time. On the other side, the complexity of tasks effect suggested by Costinot (2009) is always positive and significant, with a coefficient magnitude that is rising in size over time. This suggests that institutional quality, and more precisely contract enforcement, is a source of comparative advantage in the production of complex goods, and this effect is gaining relevance over time. Finally, the financial institutions variable presents a positive and significant coefficient. While being always a statistically significant driver of comparative advantage, the magnitude is slightly decreasing over time. Since there has been a generalized improvement in financial institutions over the time period considered,[4] this result suggests that financial development of a country, being less binding as a constraint, is becoming less crucial as a source of comparative advantage. Notice that the interaction term between financial development of a country and the dependence of industries on financial institutions is able to explain also growth and R&D expenditure. Carlin and Mayer (2003) provide empirical evidence with this respect on a sample of OECD countries over the 1970–1995 period.

These results highlight that the institutional dimension is relevant in explaining trade flows, and is a source of comparative advantage. Table 2 reports the *F*-test on the joint significance of the three institutional effects. Again, the null hypothesis is always rejected. Additionally, Table 3 reports the same exercise on three-year intervals. The results found on five-year intervals are confirmed.

[4] The domestic credit provided by the banking sector as a percentage of GDP has been rising from 42% in the period 1976–1978 to 60% in the period 2002–2004.

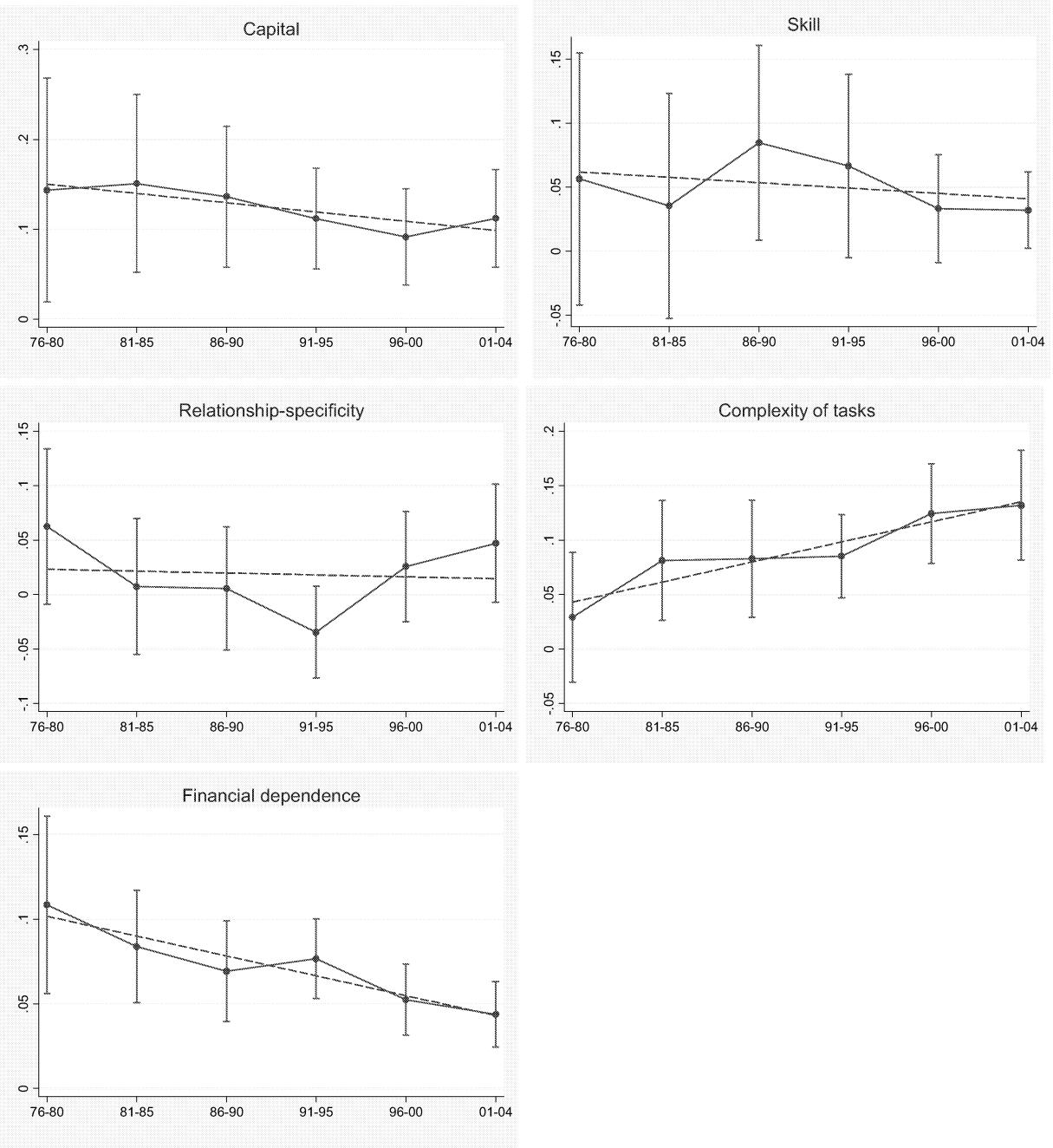

Fig. 1. Coefficient estimates over time. All panels report point estimates obtained on five-year subsamples. Time intervals are show in the horizontal axis. The vertical bars show the 95% confidence intervals. The bold line joins the point estimates, while the dashed line represents the interpolated linear time trend.

Given the large heterogeneity of the countries included in the analysis, I divide the countries into two broad groups: following Nunn (2007), I consider OECD and non-OECD countries. This exercise allows to investigate whether institutions affect trade patterns differently in these two groups.

I estimate the model on the full sample, including interaction terms with the OECD dummy. Since the focus is on the different role of institutions across these two groups of countries, I interact the institutional variables with the OECD dummy. A more general model includes the interaction of all explanatory variables with the OECD dummy. However, in this case the interaction term for capital and skilled labour are never statistically significant.[5] This suggests that capital and skilled labour determine comparative advantages of OECD and non-OECD countries in

[5] Results are not reported, but are available upon request.

Table 3
Comparative advantages over time, three-year estimates.

Time period	cap_i*cap_c	$skill_i$*$skill_c$	rel_sp_i*$inst_c$	$compl_i$*$inst_c$	ext_dep_i*fin_c	*F*-test of joint significance of institutional variables	Obs.	R^2	Adj. R^2
1976–1978	.114	−.023	.081*	.045	.101***	8.03***	1472	.815	.807
	(.075)	(.066)	(.043)	(.037)	(.031)	(0.000)			
1979–1981	.155**	.061	.011	.037	.118***	10.46***	2760	.811	.806
	(.060)	(.047)	(.035)	(.030)	(.024)	(0.000)			
1982–1984	.189***	.062	.024	.074**	.084***	12.36***	3197	.793	.788
	(.056)	(.050)	(.034)	(.031)	(.017)	(0.000)			
1985–1987	.142***	.084*	.011	.068**	.078***	9.77***	3473	.807	.802
	(.048)	(.043)	(.035)	(.030)	(.017)	(0.000)			
1988–1990	.131***	.101**	−.006	.086***	.065***	10.66***	3680	.763	.757
	(.043)	(.041)	(.031)	(.030)	(.016)	(0.000)			
1991–1993	.084***	.102**	−.030	.088***	.063***	13.63***	3795	.787	.782
	(.032)	(.044)	(.024)	(.022)	(.013)	(0.000)			
1994–1996	.101***	.082**	.007	.098***	.065***	18.55***	3887	.852	.849
	(.029)	(.038)	(.024)	(.022)	(.016)	(0.000)			
1997–1999	.092***	.049	.032	.134***	.052***	19.49***	3979	.832	.829
	(.031)	(.045)	(.027)	(.026)	(.011)	(0.000)			
2000–2002	.089***	.076***	.021	.107***	.053***	16.76***	4094	.823	.819
	(.028)	(.029)	(.029)	(.027)	(.011)	(0.000)			
2003–2004	.111***	.041*	.032	.107***	.041***	13.81***	2668	.817	.811
	(.033)	(.023)	(.032)	(.029)	(.010)	(0.000)			

Notes: Dependent variable is the log of country's *c* yearly export in industry *i* to the rest of the world. Standardized beta coefficients are reported. Industry and country dummies are included in the estimates. Estimates obtained on three-year subsamples. Standard errors clustered at the country–industry level are shown in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

the same way. Therefore, I present a more parsimonious specification:

$$\begin{aligned}\ln x_{ict} = {} & \alpha_c + \alpha_i + \beta_1 cap_{it} * cap_{ct} + \beta_2 skill_{it} * skill_{ct} \\ & + \beta_3 rel\_sp_i * inst_{ct} + \beta_4 compl_i * inst_{ct} \\ & + \beta_5 ext\_dep_i * fin_{ct} + \beta_6 rel\_sp_i * inst_{ct} * OECD_c \\ & + \beta_7 compl_i * inst_{ct} * OECD_c \\ & + \beta_8 ext\_dep_i * fin_{ct} * OECD_c + \varepsilon_{ict} \end{aligned} \quad (2)$$

Estimating this equation over five-year intervals yields the results reported in Table 4. As for capital and skill, the results previously found are generally confirmed (albeit point estimates for skill are more imprecise).

Concerning the relationship-specificity feature as a determinant of comparative advantage, the coefficient is not significant. However, the term interacted with the OECD dummy is positive and significant. This suggests that, while not being a significant determinant of comparative advantage when considering the whole sample of countries, this factor has a positive and significant effect in OECD countries. As for the complexity of tasks, there is a similar result: while being weakly significant in the whole sample, the additional effect for OECD members is positive and significant.

These results jointly suggest that institutional quality is a source of comparative advantage in the production of good characterized by high relationship-specificity and complexity of tasks in advanced economies only. Exports of non-OECD economies are not explained by these comparative advantages.

Interestingly, the third institutional effect, the financial development, has a positive and significant effect in the whole sample, while the additional effect for OECD members is not significant. This suggests that financial development is a source of comparative advantage in more financial dependent industries in all countries, and this effect is not statistically different in OECD countries and non-OECD ones. Finally, the same exercise is repeated on three-year intervals. Results are reported in Table 5. The three-year analysis confirms the results obtained on five-year intervals, reported in Table 4.

6. Conclusions

Recent literature has drawn the attention to the role of institutions as a determinant of comparative advantages. Several aspects have been emphasized, ranging from financial institutions (Beck, 2003) to labour market institutions (Cuñat and Melitz, 2007), to relationship-specificity of intermediate inputs (Nunn, 2007) to complexity of tasks (Costinot, 2009). So far, only Chor (2010) has provided some evidence of the relevance of these alternative institutional effects jointly. However, an analysis of the role of institutional comparative advantages over time has not been performed yet, and it is pertinent to investigate whether institutional comparative advantages are a recent phenomenon and how their role has eventually changed over time.

Using a rich database on industry export flows for 100 countries over the period 1976–2004, this article inspects the relevance of alternative determinants of comparative advantage. The results confirm the role of capital and skilled labour as sources of comparative advantages.

Table 4
Comparative advantages across country groups, five-year estimates.

Time period	cap_i*cap_c	$skill_i$*$skill_c$	rel_sp_i*$inst_c$	$compl_i$*$inst_c$	ext_dep_i*fin_c	rel_sp_i*$inst_c$*OECD	$compl_i$*$inst_c$*OECD	ext_dep_i*fin_c*OECD	Obs.	R^2	Adj. R^2
1976–1980	.146**	.020	.063	−.065	.122***	.015	.083***	−.013	3266	.813	.809
	(.064)	(.051)	(.056)	(.049)	(.045)	(.037)	(.032)	(.020)			
1981–1985	.163***	.017	−.078	.058	.079***	.070**	.027	−.000	5267	.769	.766
	(.053)	(.046)	(.050)	(.046)	(.020)	(.030)	(.027)	(.010)			
1986–1990	.146***	.035	−.043	.051	.053***	.060***	.053***	.004	6049	.771	.767
	(.043)	(.041)	(.038)	(.038)	(.019)	(.021)	(.020)	(.009)			
1991–1995	.110***	.031	−.083**	.042	.085***	.053***	.053***	−.013	6348	.791	.788
	(.031)	(.038)	(.033)	(.032)	(.018)	(.020)	(.018)	(.009)			
1996–2000	.080***	.010	.010	.063*	.056***	.029	.062***	−.008	6670	.815	.813
	(.029)	(.022)	(.036)	(.035)	(.015)	(.019)	(.017)	(.008)			
2001–2004	.099***	.020	.026	.066*	.048***	.026	.057***	−.008	5405	.809	.806
	(.030)	(.015)	(.040)	(.037)	(.017)	(.018)	(.016)	(.008)			

Notes: Dependent variable is the log of country's *c* yearly export in industry *i* to the rest of the world. Standardized beta coefficients are reported. Industry and country dummies are included in the estimates. Estimates obtained on five-year subsamples. Standard errors clustered at the country–industry level are shown in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Table 5
Comparative advantages across country groups, three-year estimates.

Time period	cap_i*cap_c	$skill_i$*$skill_c$	rel_sp_i*$inst_c$	$compl_i$*$inst_c$	ext_dep_i*fin_c	rel_sp_i*$inst_c$*OECD	$compl_i$*$inst_c$*OECD	ext_dep_i*fin_c*OECD	Obs.	R^2	Adj. R^2
1976–1978	.122	−.068	.020	−.059	.082	.057	.090**	.005	1472	.817	.809
	(.075)	(.068)	(.077)	(.067)	(.051)	(.052)	(.045)	(.023)			
1979–1981	.153**	.016	−.011	−.050	.157***	.035	.086***	−.031**	2760	.813	.808
	(.063)	(.049)	(.047)	(.042)	(.034)	(.032)	(.027)	(.015)			
1982–1984	.201***	.048	−.079	.055	.080***	.078**	.020	.000	3197	.795	.790
	(.058)	(.052)	(.057)	(.051)	(.020)	(.033)	(.029)	(.010)			
1985–1987	.154***	.054	−.075	.014	.071***	.076***	.055**	−.001	3473	.809	.805
	(.052)	(.044)	(.048)	(.044)	(.022)	(.027)	(.025)	(.011)			
1988–1990	.140***	.047	−.061	.052	.049***	.062***	.054**	.005	3680	.766	.760
	(.044)	(.044)	(.043)	(.043)	(.019)	(.021)	(.022)	(.010)			
1991–1993	.080**	.067	−.079**	.040	.072***	.048**	.053***	−.014	3795	.788	.783
	(.034)	(.045)	(.036)	(.035)	(.020)	(.022)	(.019)	(.009)			
1994–1996	.093***	.056	−.034	.041	.076***	.040*	.056***	−.013	3887	.854	.850
	(.032)	(.039)	(.037)	(.035)	(.018)	(.021)	(.019)	(.009)			
1997–1999	.081**	.016	.019	.077**	.055***	.023	.056***	−.007	3979	.834	.830
	(.033)	(.047)	(.038)	(.037)	(.015)	(.020)	(.018)	(.008)			
2000–2002	.070**	.051*	−.012	.019	.062***	.036*	.078***	−.013	4094	.826	.822
	(.031)	(.028)	(.042)	(.039)	(.017)	(.019)	(.017)	(.008)			
2003–2004	.097***	.030	−.025	.016	.043**	.045**	.070***	−.007	2668	.820	.814
	(.035)	(.023)	(.047)	(.043)	(.019)	(.020)	(.017)	(.009)			

Notes: Dependent variable is the log of country's *c* yearly export in industry *i* to the rest of the world. Standardized beta coefficients are reported. Industry and country dummies are included in the estimates. Estimates obtained on three-year subsamples. Standard errors clustered at the country–industry level are shown in parentheses.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Additionally, institutions are a strong determinant of comparative advantage, as previously found on cross-sectional data.

The empirical analysis presented improves on previous tests by exploiting the time dimension. The empirical test focusses on three features of institutional comparative advantage, which show different behaviours over time. The relationship-specificity effect is rather stable over time. Instead, the complexity of tasks seems to be increasingly relevant. On the other side, the magnitude of the effect given by the financial development, while being always positive and significant, decreases over time. Interestingly, the institutional variables are jointly significant across different time intervals, thus suggesting that institutional comparative advantage is not a "new" phenomenon. The behaviour over time of the institutional features considered suggests however that different institutional aspects may gain relevance over time.

Moreover, by distinguishing the effect for OECD countries, I find that the relationship-specificity and the complexity of tasks are relevant especially for OECD countries, while the financial development seems to be relevant for all countries equally.

Overall, the empirical exercise presented contributes to the literature by showing that comparative advantages are not static, but change over time. While standard the sources of comparative advantages, capital and skilled labour, seem to have a constant or slightly decreasing impact over time, the institutional determinants of comparative advantages present more variability over time.

Acknowledgements

The author would like to thank seminar participants at DYNREG Workshop (Milan, 2008), 10th Annual Meeting of the European Trade Study Group (Warsaw, 2008) and XVII AISSEC Scientific Conference (Perugia, 2009). The editor Luigi Marengo and two anonymous referees provided helpful comments. Financial support from DYNREG Project, 6th EU Research Framework Programme is gratefully acknowledged.

Appendix A.

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. This classification has been converted into 4-digit 1987 SIC and then 3-digit ISIC (rev. 3).[6] Then, I construct a concordance from the 3-digit ISIC (rev. 3) classification to the IO 1992 classification. Finally, following Nunn (2007), I build four measures for the proportion of the intermediate inputs that are relationship-specific:

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

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

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

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

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.

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

Table A.1
Countries included in the analysis.

Algeria	76-04	Latvia	94-04
Argentina	80-04	Lithuania	92-04 (93)
Armenia	97-04 (98,01)	Macau	76-04
Australia	79-04	Malawi	77-04 (92–93)
Austria	78-04	Malaysia	78-04
Azerbaijan	96-04	Malta	90-04
Bangladesh	77-04 (99)	Mauritius	80-04
Belgium-Luxemburg	78-04	Mexico	89-04
Benin	92-02	Moldova	94-04
Bolivia	77-04	Mongolia	96-03
Botswana	00-01	Morocco	76-04
Brazil	83-04	Mozambique	94-02 (98)
Bulgaria	92,96-04	Myanmar	93
Cameroon	76-04 (81,83–85,88,91–94)	Nepal	82-03 (00–01)
Canada	78-04	Netherlands	78-04
Chile	83-04	New Zealand	79-04
China	85-04	Nigeria	91-03 (92–95)
Colombia	78-04	Norway	76-04
Costa Rica	86-04	Oman	81-04
Cote D'Ivoire	76-03 (80,84,86–94,01)	Pakistan	82-04 (94)
Cyprus	76-04	Panama	86-04
Czech Republic	93-04	Peru	76-04
Denmark	76-04	Philippines	77-04
Ecuador	78-04	Poland	80-04
Egypt	81-04	Portugal	79-04
El Salvador	86-04	Qatar	81-04 (86–87,97)
Ethiopia	93-03 (94,96)	Romania	89-04
Finland	76-04	Russian Federation	96-04
France	78-04	Senegal	77-04 (82–85,88)
Gabon	76-04 (84–92,95)	Singapore	79-04
Germany (76-90 West)	78-04	Slovakia	94-04
Ghana	92-04 (93–95)	Slovenia	92-04
Greece	76-04	South Africa	76-04 (86–91)
Guatemala	86-04	Spain	78-04
Honduras	86-04	Sri Lanka	79-04 (95–98,00)
Hong Kong	78-04	Sweden	76-04
Hungary	76-04	Switzerland	76-04
Iceland	77-04	Taiwan	89-04
India	78-04	Tanzania	95-04
Indonesia	80-04	Thailand	76-03 (02)
Iran	97-04	Trinidad and Tobago	79-03
Ireland	76-04	Tunisia	80-04
Israel	81-04	Turkey	85-04
Italy	77-04	Uganda	94-04
Japan	76-04 (93)	Ukraine	96-03
Jordan	81-04 (96)	United Kingdom	78-04
Kenya	80-04 (89)	United States	78-04
Korea	76-04	Uruguay	83-04
Kuwait	87-01	Venezuela	82-04
Kyrgyzstan	95-04 (97)	Yemen	76-04 (77,82–90,92–94)

Notes: Source is Nicita and Olarreaga (2006).

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