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Institutions and Comparative Advantage in Services Trade*

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Abstract

Recent studies have highlighted the role of human capital and good economic institutions in establishing comparative advantage in trade in complex institutions-intensive goods. We show that the effect of institutions on comparative advantage in services trade is quite different: in fact, countries with bad institutions rely significantly more on service export. More specifically, as quality of institutions deteriorates, the share of information technology sector (ICT) services export in total ICT export increases significantly and countries with worse institutions get a substantial comparative advantage in the provision of ICT services.

Keywords: Institutions, Comparative advantage, ICT goods and services
JEL: F10, F14

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1. Introduction

Substantial body of analysis has demonstrated the crucial role of human capital and economic institutions in the determination of comparative advantage in complex, institutions-intensive goods.[2] However as the role of services increases the question rises whether weak institutions have similarly dampening impact on comparative advantage in high-value complex services and, relatedly, growth and development.[3] This paper analyses the question of comparative advantage determination focusing on the relative importance of institutions in services versus goods.

Services provision relies less on infrastructure, availability of large number of inputs, property rights and capital investments than production of complex goods. For example, comparing trade in services and trade in goods, Lennon (2009) shows that the effects of variables related to physical geography (distance, contiguity and being landlocked) are significantly lower for services trade than for goods, while the reverse is the case for bilateral trust and contract enforcement environment, networks and cultural similarities.

In order to isolate the relative importance of institutions on services versus goods we focus on one industry that is comparably important, innovative, human capital intensive and high-value in both goods and services provision. Comparison of total goods and services across all sectors would conflate too many differences that exist between goods and services, including human capital intensity, geographical constraints and composition in terms of complexity of provision. Thus we analyze the determination of comparative advantage in services relative to goods by focusing on the information and communications technology (ICT) sector. Both ICT goods and services are expected to be intensive in human capital and thus present a good comparison to study differences between goods and services provision.

Although many determinants of trade patterns, including institutions, may be similar for goods and services,[4] it is the relative importance that determines the comparative advantage patterns. We hypothesize that the causal relationship between institutions and comparative advantage in services exports can starkly differ from goods. Indeeed,

[2] See the comprehensive review of the literature and discussion in Nunn and Trefler (2014).

[3] See, for example, Francois and Hoekman (2010) on the linkages between services trade and potential for gorwth and development.

[4] See literature review in Section 2 for a discussion on the determinants of foreign direct investment and trade patterns goods and services.

this would be the case if services provision relies less on physical infrastructure, capital invetments, physical inputs availability that are highly affected by institutional quality.

We test our hypothesis by estimating the role of institutions on comparative advantage in ICT goods and ICT services. Our panel data on sectoral exports of goods and services, institutional indicators and human capital covers the period between 2000 and 2016. Controlling for year and country fixed effects, we estimate the impact of human capital and average institutional quality on revealed comparative advantage in goods and services.

Such analysis is potentially complicated by the endogenous and reinforcing relationship between institutions and level of human capital. One prominent case where this relationship breaks down is transition economies characterized by high, arguably exogenous, human capital at the level of most advanced countries by the time of the fall of the USSR and Eastern bloc. Although human capital and institutions are strongly correlated, institutional indicators, such as corruption, rule of law, political stability, etc., of transition countries are still below other developing countries. These economies, endowed with high human capital and low institutional indicators, demonstrate high ICT services (e.g., software development) provisions and low ICT goods exports. Share of ICT services exports in total services are at a higher level and grow faster than in other countries. In contrast, share of ICT goods in total goods exports of transition economies is significantly below that of other countries, the latter being consistent with the literature on institutions and comparative advantage in relationship- and investment-intensive goods production.

We find that countries with weak institutions are more likely to have a revealed comparative advantage (RCA) in ICT services exports relative to ICT goods exports. Specifically, standard deviation improvement in institutional quality reduces the probability of revealed comparative advantage in ICT services by around $0.27 - 0.33$. In addition, standard deviation improvement in institutions also reduces the value of RCA index by about 62%. The effect appears to be driven by the complementarity of different institutional measures as the index based on the average has stronger impact than any one institutional measure. Corruption appears to have the largest and most robust impact; in addition, regulatory quality and government efficiency are strong predictors of the probability to have an RCA in ICT services.

Our findings provide a novel view on the opportunities for trade and growth of coun-

tries with weak institutions. High-technology services provision can provide opportunities for individuals with high human capital in developing countries, reduce incentives for brain-drain and increase return to education in countries with scarce human capital. Moreover, institutional barriers can drive the available human capital from high-technology manufacturing to the provision of human capital-intensive services exports as these are likely to be less intensive in institutions.

The paper continues as follows. Section 2 presents literature review, followed by data description in Section 3. Section 4 presents our empirical strategy. Our results are discussed in Section 5 and Section 6 concludes.

2. Literature Review

There is a substantive research on the relationship between institutions and the patterns of international trade. Anderson and Marcouiller (2002) find that bad institutions significantly constrain import. They argue that imperfect contract enforcement, high level of corruption and in general bad qualities of institutions act as hidden tax on trade. They created a structural model, and after fitting it to data, find that trade expands dramatically when it is supported by strong institutions – specifically, by a legal system capable of enforcing contracts. Berkowitz et al. (2006) complement this research and show empirically how good institutions located in the exporter's country enhance international trade. They are the first to argue that complex products whose characteristics are difficult to fully specify in a contract are likely to be exported from countries with better institutions. Francois and Manchin (2013) analyzes two sides of the market (exporter and importer). They show that low institutions and quality of infrastructure in the developing country may affect market access for export from the developed country. The conclusion is that policy emphasis on developing country market access that does not provide enough support for trade facilitation may be misplaced.

Levchenko (2007) takes a deeper look into the "Hold Up" problem. He argues that the main implication of bad institutions is impossibility to enforce contracts. If the parties cannot enforce contracts, firm-specific relationships are subject to a "Hold Up" problem, i.e., the party that had less relationship-specific investment can threaten to stop the project, and, therefore, obtains a disproportionally high bargaining power in renegotiations. This leads to lower than optimal investment in the creation of complex products.

This results in comparative advantage of complex goods production in countries that have good institutions. The theory was confirmed by Nunn (2007) who created an index of contractual intensity of industries and showed that countries with good contract enforcement specialize in the production of goods for which relationship-specific investments are most important. Moreover, the paper finds that contractual enforcement is more important than physical capital or skilled labor. Li et al. (2012) and Feenstra et al. (2012) confirm these findings for China using firm level data, while Ma et al. (2010) finds similar evidence on firm-level data for developing and transition countries. For more extensive review of comparative advantage provided by domestic institutions see Nunn and Trefler (2014).

Recent study by Araujo et al. (2016) suggests that the impact of institutions is more complex than just a sunk of exporting. The authors develop a model of institutions and export dynamics. The model's predictions are then taken to the firm-level data from Belgium. Key finding is that, although firms enter markets with better contracting institutions with larger volumes, conditional on continued exports, growth of exports is higher in markets with weaker institutions.

The literature, however, says very little about determining comparative advantage in services trade however there are some studies discussing the complementarity between goods and services. Ariu (2016) compares trade in goods with trade in services. Using a dataset from the National Bank of Belgium on export and import transactions of Belgian firms, the paper's results suggest that trade in services and trade in goods are complementary. Firms that specialize on both trade in services and trade in goods represent 10% of all firms but more than 30% of total trade. Beverelli et al. (2017) find that liberalization of services trade restriction improves manufacturing productivity. However, notably, these productivity gains are larger for countries with high institutional quality.

Ramasamy and Yeung (2010) studies determinants that attract FDI in services into a country in panel settings for OECD countries. Their conclusion, however, is that determinants for trade in services are similar to determinants for trade in goods, and, therefore, no new theories are needed to explain trade pattern.

Few studies analyze the effect of institutions on the pattern of the service trade. Álvarez et al. (2018) look at the impact of institutions on bilateral trade. The paper finds that institutions are more important determinant for agricultural and raw goods trade than for manufacturing and services trade. Crozet et al. (2016) take firm-level data to

analyze the impact of domestic regulation on international trade in services. They take OECD measure of domestic regulation and detailed French firm-level data and find that the firms are less likely to export to highly regulated markets and that the value of export decreases with the level of regulation in the destination market. Comprehensive analysis of developing countries and service export is provided in Goswami et al. (2012). They analyze the complex nature of reforms and policy making in the service sector that has been recently done in a number of developing countries and how it affected the service trade industry.

De Jong and Bogmans (2011) studies how international trade is affected by inefficient customs and corruption. They find that while in general corruption hampers international trade, bribes at customs offices can enchance it especially with countries with inefficient customs. Another paper that analyses the effect of corruption international trade to FDI is Dutta et al. (2017). They specifically compare the effect of corruption and the effect of human capital. They find that improvement in corruption given much more of an advantage comparing to an equivalent improvement in human capital.

3. Data and Descriptive Statistics

Data description

Data for ICT goods exports, total goods exports, GDP, GDP per capita come from the World Bank's World Develoment Indicators (WDI).

Institutional data is available at World Governance Indicators (WGI) dataset from World Bank. The indicators are provided along six dimentions of institutions: 1) Voice and Accountability, 2) Political Stability and Absence of Violence, 3) Government Effectiveness, 4) Regulatory Quality, 5) Rule of Law and 6) Control of Corruption. The indicators come from a large number of surveys of individuals and firms in developing and developed countries. The description of each indicator is available in Appendix. Unless otherwise specified, the measure of institutions is obtained by taking a simple mean of the six WGI insitutional indicators.

Data on services exports comes from the International Trade Center TradeMap platform and covers years 2000-2018. We are specifically interested in computer and information services which is described in Balance of Payment Manual as follows.

Computer and information services cover computer data and news-related service transactions between residents and nonresidents. Included are databases, such as development, storage, and on-line time series; data processing—including tabulation, provision of processing services on a time-share or specific (hourly) basis, and management of facilities of others on a continuing basis; hardware consultancy; software implementation—including design, development, and programming of customized systems; maintenance and repair of computers and peripheral equipment; news agency services—including provision of news, photographs, and feature articles to the media; and direct, non-bulk subscriptions to newspapers and periodicals.

We can also analyze computer services separately from information services, however, data availablitity may be lower.[5]

As a measure of human capital we use average schooling years for population aged between 25 and 50 years. The data is available from Barro and Lee (2013) dataset on schooling and educational attinment.

Preliminary analysis and descriptive statistics

Descriptive statistics for our main variables are presented in Table A1 in Appendix.

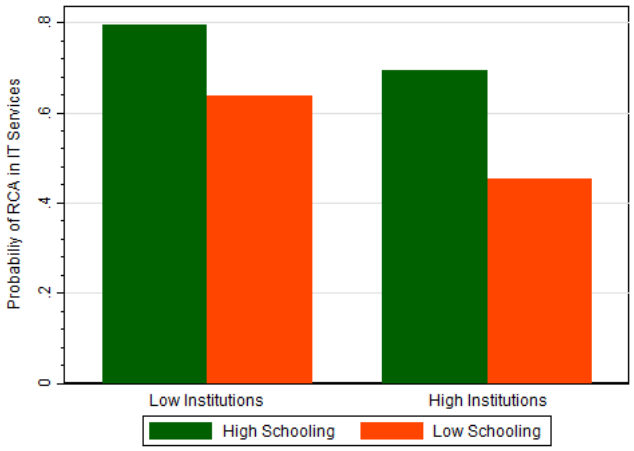
Figure 1 presents the average probability of having a revealed comparative advantage in services over goods in ICT exports.[6] The cross-sectional figure groups low and high institutions (relative to median country), and country-year observations into low and high schooling (relative to median country). Countries with low institutions and countries with high schooling have higher probability of revealed comparative advantage in services. Given schooling, probability of having a revealed comparative advantage is higher for countries with low institutions. Given the institutional quality, probability of having a revealed comparative advantage is higher for countries with high schooling. Put together, highest probability of having a comparative advantage in services is for countries with low institutions and high schooling at about 0.8.

Large number of the observations within the low institutions and high schooling group come from transition economies, which are known to have high human capital and low institutional indicators. Belarus presents a good example. Fundamental educa-

[5]Countries are required to report computer services separately from information services only after BPM6 system methodilogy was introduced, which happened in 2005.

[6]Section 4 defines in detail revealed comparative advantage in services in ICT exports.

FIGURE 1
RCA in ICT Services, by education and institutions



tion in Belarus is at a level of the most advanced countries, which allows 21 universities in the country to educate about 7,000 graduates in ICT industry in a year. ICT services exports of Belarus is thriving: over last 10 years the growth of ICT service is more than 8 times (from 150M USD in 2008 to 1.2B USD in 2017). Belarus is one of the world leaders in ICT service exports per capita. At the same time, ICT goods exports is not growing even close to the level of ICT services export. Over the same time period ICT has grown only about 1.3 times: from $105 million of ICT goods exports in 2008 to $140 million USD in 2016.

4. Empirical Strategy

We estimate the impact of institutions on revealed comparative advantage in ICT services in overall ICT exports. The identification relies on the notion of revealed comparative advantage. Here we assess the role of institutions on the probability of having a comparative advantage in ICT services. That is, a country has a revealed comparative advantage in ICT services if share of ICT services in exports of ICT goods and services is higher than for world average. The revealed comparative advantage index is calculated

as follows:[7]

$$RCA_{it} = \frac{E^s_{it}/(E^s_{it} + E^g_{it})}{\sum\limits_i E^s_{it} / \sum\limits_i (E^s_{it} + E^g_{it})} \tag{1}$$

A country i has a revealed comparative advantage in services exports of ICT in year t is greater than 1.

We then run probit regressions to assess the impact of institutional quality on the probability of having a revealed comparative advantage in services in exports of ICT goods and services. Following Wooldridge (2010) we apply the Mundlak (1978) approach to panel data with fixed effects for probit models. The specification for the underlying latent variable is as follows:

$$\mathrm{Y}^*_{it} = \alpha I_{it} + \boldsymbol{\beta X_{it}} + \lambda \overline{I}_{it} + \boldsymbol{\theta} \overline{\boldsymbol{X}}_{\boldsymbol{it}} + \gamma_t + \epsilon_{it}, \tag{2}$$

where Y^*_{it} denotes whether country i has revealed comparative advantage in ICT services in year t, controls I_{it} denote quality of institutions, $\boldsymbol{X_{it}}$ - vector of controls, γ_t denote the year fixed effects, $\overline{I}_{it}$ and $\overline{X}_{it}$ are country averages of instituions and all control variables that are proxying country-fixed effects in the Mundla (1978) approach, and ϵ_{it} - error term.

We choose the probit model as we would like to test the role of institutions on having a comparative advantage in services or not. In this quest we are not as interested in the assessment of the specific value of RCA. However one might consider that the factors that determine the presence or absence of comparative advantage, might also affect the intensity of the revealed comparative advantage. To address this, we estimate an alternative specification where the dependent variable is the natural logarithm of RCA as an extension and robustness check of our main approach. This specification is then estimated using a panel OLS with fixed effects.

All standard errors are clustered at the country level.

[7] Following Balassa (1965).

5. Results

Table 1 presents marginal effects of Probit regressions for the probability to have an RCA in services in ICT exports. Improvement in institutions by one, on average, leads to a decrease in probability to have RCA in ICT services exports by $0.29-0.36$, and the effect is highly statistically significant in all specifications. The effect is very important economically as it means that one standard deviation increase of institutional quality reduces the probability of RCA in ICT services by $0.27-0.33$. GDP and GDP per capita have expected signs, although the coefficients are not precisely estimated. Larger economies are less likely to have an RCA in ICT services, this is in line with trade theory as large countries have high domestic demand and factor supply are more likely to goods attract production with fixed costs, while services provision might be less reliant on fixed costs. Countries with higher income per capita are more likely to have an RCA in ICT services.

All estimations include year fixed except for column 2, and all columns include country averages of all controls that serve as analogues of country fixed effects in Mundlak (1978) approach for Probit model. Columns 1 to 3 and 6 exclude observations with very small export values: sample includes exports of at least USD 1 million of ICT services and goods. Very small values of ICT exports introduce noise in RCA variable: it is not very relevant to speak about an RCA in ICT services versus goods of a country that does not really export either. Column 4 relaxes this sampling requirement, keeping only observations with positive exports. The restriction of positive export values is further relaxed in column 5 where we include also zeros.[8] Column 6 includes additional control for schooling, however the use of this control in a panel setting is difficult due to data availability only for 3 years during the sample period (values for remaining years are obtained by interpolation). Insignificant coefficient of schooling can also be seen as meaning that schooling is similarly important for both ICT goods and services.

Preferred regression is presented in column 3 and includes year fixed effects, GDP, GDP per capita and excludes observations with very little ICT exports. Improvement in institutions by one, on average, leads to a decrease in probability to have RCA in ICT services exports by 0.37 (estimated at 1% significance level).

[8]The results are unaffected if instead of USD 1 million we choose other cutoffs. For example, a cutoff of USD 200 thousand excludes bottom 5% of countries with smallest average exports of ICT services and goods.

TABLE 1
Probability of RCA in ICT services, marginal effects

	(1) Pr RCA	(2) Pr RCA	(3) Pr RCA	(4) Pr RCA	(5) Pr RCA	(6) Pr RCA
Pr RCA						
Institutions	-0.33***	-0.36***	-0.37***	-0.31***	-0.29***	-0.34***
	(0.074)	(0.081)	(0.088)	(0.080)	(0.079)	(0.095)
Log GDP		-0.035	-0.26	-0.24^{+}	-0.16	-0.19
		(0.16)	(0.18)	(0.14)	(0.14)	(0.19)
Log GDP PC		0.079	0.26	0.21	0.12	0.17
		(0.17)	(0.18)	(0.15)	(0.15)	(0.20)
Schooling						-0.024
						(0.022)
Year FEs	Yes	No	Yes	Yes	Yes	Yes
Min USD 1mln	Yes	Yes	Yes	No	No	Yes
Min USD 1	Yes	Yes	Yes	Yes	No	Yes
Observations	1,152	1,149	1,149	1,389	1,404	1,076
R^2						
Adjusted R^2						

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1 includes measure of institutional development as a mean of six WGI institutional indicators. Various institutional indicators, although correlated, represent different aspects of institutional development. Table 2 includes separate estimations with each institutional indicator. Table 2 presents regression analogous to preferred regression in column 3 of Table 1, with the average institutional measure changed for individual indicators.

First, note that all individual indicators have lower magnitude of impact than average measure of institutions, suggesting that the complex of institutional indicators are jointly relevant for comparative advantage. Largest impact, both in magnitude and sta-

tistical significance, is for corruption regulatory quality and accountability, followed by government efficiency and rule of law. To illustrate the effect, one standard deviation improvement in corruption index leads to a reduction of probability of having an RCA in ICT services by 0.25 (the standard deviation of each of the individual institutional characteristics is about one).

5.1. Extension

Probability of having a revealed comparative advantage of main identification strategy focuses on whether a country has a comparative advantage or not, and thereby ignores how strong the comparative (dis-)advantage is. To assess how the institutional factors also influence the intensity of comparative advantage, Table 3 presents OLS estimations with the logarithm of RCA as dependent variable. Overall findings remain unchanged, although the statistical significance is reduced: the institutions coefficients is now significant at 5% level in columns 1-5 and at 10% level in column 6 versus 0.1% significance in Table 1. Improvement in institutions by one unit is associated with a decrease in RCA in ICT services by $57-82\%$ across specifications. As an example, one standard deviation increase in institutional quality corresponds to about 62% reduction in RCA index in the preferred regression in column 3.

Table 4 is analogous to Table 2 but with the dependent variable the logarithm of RCA. The corruption index is the best and most robust predictor: it has the strongest impact on the probability of having RCA (2) and by far the strongest impact on the level of RCA with the coefficient -0.49 in Table 4. Note that all the other institutional characteristics also have expected negative coefficient. At the same time regulatory quality, government efficiency and rule of law are not significant in predicting of revealed comparative advantage.

TABLE 2
Probability of RCA in ICT services, marginal effects

	(1) Pr RCA	(2) Pr RCA	(3) Pr RCA	(4) Pr RCA	(5) Pr RCA	(6) Pr RCA
Pr RCA						
Corruption	-0.25***					
	(0.060)					
Gov eff		-0.17**				
		(0.056)				
Pol stab			-0.021			
			(0.034)			
Reg quality				-0.23***		
				(0.060)		
Rule of law					-0.17*	
					(0.070)	
Accontb						-0.087+
						(0.049)
Log GDP	-0.29	-0.23	-0.077	-0.24	-0.20	-0.11
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.17)
Log GDP PC	0.25	0.18	-0.020	0.20	0.15	0.019
	(0.19)	(0.19)	(0.18)	(0.18)	(0.19)	(0.18)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Min USD 1mln	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,149	1,149	1,149	1,149	1,149	1,149
R^2						
Adjusted R^2						

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3
Log of RCA Services vs goods

	(1) Log RCA	(2) Log RCA	(3) Log RCA	(4) Log RCA	(5) Log RCA	(6) Log RCA
Institutions	-0.57*	-0.61*	-0.68*	-0.77*	-0.82*	-0.62^{+}
	(0.28)	(0.28)	(0.29)	(0.38)	(0.39)	(0.32)
Log GDP		-0.27	-0.53	0.25	-0.079	-0.90
		(1.01)	(1.18)	(1.58)	(1.65)	(1.23)
Log GDP PC		0.36	0.63	-0.36	-0.057	0.98
		(1.05)	(1.21)	(1.63)	(1.69)	(1.26)
Schooling						0.12
						(0.11)
Year FEs	Yes	No	Yes	Yes	Yes	Yes
Country FEs	Yes	No	Yes	Yes	Yes	Yes
Min USD 1mln	Yes	Yes	Yes	No	No	Yes
Min USD 1	Yes	Yes	Yes	Yes	No	Yes
Observations	1,152	1,149	1,149	1,386	1,389	1,076
R^2	0.047	0.012	0.049	0.045	0.038	0.056
Adjusted R^2	0.033	0.010	0.034	0.033	0.025	0.039

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.2. Robustness

This subsection provides a robustness test to our baseline defition of ICT services. To include more years in the estimation, we used the definition of ICT services as the sum of computer services and information services. This is necessary as before 2005 the countries were reporting services data under a different classification that combines the two. The alternative definition that we consider in this subsection includes only computer services. This is associated with shorter panel as only observations reported in newer BPM6 classification can be included.

Table 5 below provides the analogue of Table 1 with the alternative definition of IR services that includes only computer services. The number of observations is reduced by about 30% as a result of the shorter panel. The findings are in line with those from

TABLE 4
Log of RCA Services vs goods

	(1) Log RCA	(2) Log RCA	(3) Log RCA	(4) Log RCA	(5) Log RCA	(6) Log RCA
Corruption	-0.49**					
	(0.19)					
Gov eff		-0.28				
		(0.26)				
Pol stab			-0.18			
			(0.14)			
Reg quality				-0.13		
				(0.22)		
Rule of law					-0.048	
					(0.26)	
Accontb						-0.36+
						(0.20)
Log GDP	-0.60	-0.59	-0.30	-0.43	-0.41	-0.35
	(1.15)	(1.24)	(1.18)	(1.20)	(1.19)	(1.18)
Log GDP PC	0.64	0.60	0.32	0.42	0.36	0.34
	(1.17)	(1.28)	(1.20)	(1.24)	(1.22)	(1.20)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes
Min USD 1mln	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,149	1,149	1,149	1,149	1,149	1,149
R^2	0.051	0.042	0.043	0.039	0.038	0.045
Adjusted R^2	0.036	0.027	0.028	0.023	0.022	0.030

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: unit improvement in institutional quality reduces the probability of having an RCA in ICT services by $0.23 - 0.29$.

TABLE 5
Probability of RCA in ICT services, marginal effects - ROBUSTNESS

	(1) Pr RCA	(2) Pr RCA	(3) Pr RCA	(4) Pr RCA	(5) Pr RCA	(6) Pr RCA
Pr RCA						
Institutions	-0.29***	-0.29**	-0.25**	-0.23*	-0.23*	-0.26*
	(0.084)	(0.091)	(0.097)	(0.096)	(0.096)	(0.11)
Log GDP		0.31	0.30	0.20	0.20	0.20
		(0.22)	(0.23)	(0.24)	(0.24)	(0.26)
Log GDP PC		-0.31	-0.36	-0.22	-0.22	-0.25
		(0.25)	(0.26)	(0.26)	(0.26)	(0.29)
Schooling						0.040
						(0.028)
Year FEs	Yes	No	Yes	Yes	Yes	Yes
Min USD 1mln	Yes	Yes	Yes	No	No	Yes
Min USD 1	Yes	Yes	Yes	Yes	No	Yes
Observations	775	772	772	901	901	706
R^2						
Adjusted R^2						

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6. Conclusion

This article studies the impact of institutions on the determination of comparative advantage patterns in services relative to goods production. We find that improvements in institutions lead to reduction in the likelihood of having an RCA and the value of RCA in services relative goods. The effect is statistically and economically significant.

Our findings suggest that, although institutional constraints may well be impediment for provision and trade of both goods and services. Production of complex goods is associated with fixed costs of of production, reliable provision and availability of various inputs and goods physical infrastructure. All these factors make the institutions the to be a relatively stronger limiting factor for complex goods than complex services provision that might mainly require human capital availability.

Our study focuses on the ICT sector to isolate the differences in goods and services within one sector. ICT sector appears as an obvious choice for such analysis as it is associated with high human capital and comparably important sectoral development for both goods and services. Future research could extend our analysis for other sectors, controlling for human capital intensity and comparability of goods and services provision.

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Appendix A1: Definitions of institutional indicators

Voice and Accountability

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Political Stability and Absence of Violence

Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politicallymotivated violence, including terrorism.

Government Effectiveness

Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Regulatory Quality

Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Rule of Law

Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Control of Corruption

Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Appendix A2: Descriptive statistics

TABLE A1
Summary statistics

	Count	Mean	Std. Dev.	Min	Max
ICT Services	1,619	1.75e+09	5.76e+09	0	6.42e+10
ICT Goods	2,232	1.04e+10	4.10e+10	125.03	5.89e+11
Average Schooling	2,397	8.74	3.28	1.12	16.44
RCA in ICT services	1,477	2.57	2.45	0	14.63
Probability of RCA	1,477	0.67	0.47	0	1
INSTITUTIONS					
Corruption	2,815	-0.08	1.01	-1.87	2.47
Government Efficiency	2,811	-0.05	1.00	-2.45	2.44
Political Stability	2,809	-0.13	0.98	-3.31	1.76
Regulatory Quality	2,811	-0.05	0.99	-2.65	2.26
Rule of Law	2,816	-0.10	1.00	-2.61	2.10
Accontability	2,816	-0.11	0.99	-2.26	1.80
Institutions	2,816	-0.09	0.92	-2.45	1.97