Institutional Quality and Comparative Advantage: an Empirical Assessment

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Abstract

Several papers have recently underlined the relationship between institutional quality and international trade. Institutions are in charge of the enforcement of contracts: good institutions are those which punish the part that breaks the contract, and implement this activity with a high probability of success. Goods can be more or less complex, according to the number of intermediate inputs needed for the implementation. Complex goods require a large number of contracts to be produced, and therefore rely more on the level of contract enforcement of their country. This implies that good contract enforcement, and thus high institutional quality, is a source of comparative advantage in the production of more complex goods. Several theoretical models decline this idea. This paper tests empirically the different predictions of these models following Romalis (2004) specification. I find strong support to the predictions of the different models. New measures of complexity of goods and of institutional quality are employed as robustness check. Attention is drawn to the question of the correct econometric treatment of zero flows of trade.

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Institutional quality is a fundamental determinant of economic development. A seminal work that relates institutions and development is the paper by Acemoglu, Johnson and Robinson (2001) on colonialism and development. In countries where Europeans could not easily settle, colonizers imposed extractive institutions, that did not produce much protection for property rights. The colonial institutions still persist up to the present, and in these countries we observe a strong negative impact of poor institutional quality on income. Several empirical works have inspected the relationship between income levels and institutional quality: Hall and Jones (1999) claim that differences in economic performance among countries are determined by the social infrastructure of a country, which essentially consists of institutions and government policies; Dollar and Kraay (2003) find positive evidence of the impact of both institutions and trade on economic growth, while Rodrik, Subramanian and Trebbi (2004) have shown that institutions are the main factor to explain income levels, much more relevant than trade or geography. Other papers have emphasized how corruption impedes investment and in this way growth (Mauro 1995).

Institutions play a relevant role also in international economics. The literature on capital flows has shown the leading role that a good institutional environment has in promoting and attracting foreign direct investments, thus fostering economic growth and economic development of the host country[1]. Only recently, few papers focused on the relationship that exists between institutional quality and comparative advantage. These models merge two different streams of literature: standard literature on comparative advantage on one side and literature on contract enforcement, based on the Grossman-Hart-Moore model of contract enforcement, on the other.

As North (1991) points out, one of the main activities of institutions is being in charge of the enforcement of contracts. The quality of institutions can be measured by the share of contracts that are enforced, or, in other words, by the probability that judicial system will punish the part that breaks a contract. Goods can be more or less complex, according to the number of intermediate inputs needed for their implementation. Every input entails a contract in order to be acquired. As complex goods require a large number of contracts to be produced, they rely more on the quality of contract enforcement of the country. This implies that good contract enforcement, and thus high institutional quality, is a source of comparative advantage in more complex goods.

Levchenko (2004) and Nunn (2004) investigate this mechanism, which determines a new source of comparative advantage, sharing the same kind of predictions, and present an empirical evidence. Costinot (2004) predicts instead that institutional quality and absolute productivity are complementary sources of comparative advantage. Acemoglu, Antras and Helpman (2006) present a model in which comparative advantage given by institutional quality is larger in goods that present higher complementarity between activities. These two papers are theoretical models and lack an empirical evidence.

[1] See for example Benassy-Quere, Coupet, Mayer (2005) or Alfaro, Kalemli-Ozcan, Volosovych (2005) for recent empirical papers that investigate this relationship.

Do these models find empirical validation? The aim of the present work is to test the different predictions using a common dataset, and rigorous econometric techniques, in order to shed some light on the soundness of these models. Using import data for the United States taken from Feenstra *et al.* (2005) World Trade Flows dataset, I test empirically the prediction that good institutional quality of the exporting country gives a comparative advantage in more complex sectors. The Heckscher-Ohlin prediction that countries capture larger shares of trade in goods that more intensively use their abundant factors, augmented by institutional quality, is tested using Romalis' (2004) specification. Trade data show a large number of zero flows of bilateral trade, thus requiring an estimation techniques, tobit, that takes into account this peculiarity of the data.

I find empirical validation for all the various models considered. I use new measures of complexity of goods and of institutional quality as robustness check.

The remainder of this work is composed of 5 sections. Section 1 presents a review of the models that will be tested. Section 2 outlines the estimation framework. Section 3 presents the data, and discusses the problems related to the structure of trade data and the proposed solution. Section 4 shows the results and the robustness checks. Finally, Section 5 concludes.

1 Related Literature

Four papers have recently shown how institutional quality is a source of comparative advantage in the production of those goods which rely more on institutions. This Section briefly reviews these models.

Costinot (2004) focuses his attention on the impact that the quality of contract enforcement has on the size of productive teams, that is to say, on the efficient organization of production. His model presents a continuum of goods z and one productive factor, labour. In every sector, a continuum of elementary tasks s must be performed in order to produce the good z. This is modelled as a Leontief technology. There is a continuum of workers of mass L, each endowed with h units of labor, where h captures the productivity of the representative worker in the economy.

Costinot assumes increasing returns to scale in the performance of each task. The goods differ in the number of tasks to be performed to produce them, and this determines their complexity. Complex goods need more time for learning[2], and therefore more time to be produced, and the gains from the division of labour are higher.

For every worker, a contract stipulates the output on every elementary task that she performs. Shirking is assumed to be a binary choice: a worker performs her tasks according to the contract, otherwise she does not perform at all. The worker will shirk if and only if the cost of effort is less or equal to the expected present discounted value of her future punishments. Contracts are enforced with a probability function that depends on a parameter $\theta \geq 0$ which is identical across individuals and industries, and captures the quality of institutions in

[2] The cost of learning is assumed fixed and identical for every task.

the country. When $\theta = 0$, institutions are inefficient and contracts are never enforced, while when $\theta = \infty$, institutions are perfect and contract are always enforced.

Costinot derives the efficient team size N_z, as an increasing function of θ. While increasing the team size, workers become more specialized, this implies increasing returns to scale in the performance of each task. Thus, the country where teams are larger, in efficiency units of labour, hN_z, has a comparative advantage in more complex sectors, under autarky. Hence, institutional quality and productivity levels, which both increase hN_z, are independent sources of comparative advantage. The country with larger teams, in efficiency units of labour, will specialize in the more complex goods[3]. This means that this country has a comparative advantage in more complex goods, and the complementary sources of this comparative advantage are the quality of institutions, and productivity levels. The complementarity comes from the product between h and a function of θ. Thus, gains in the quality of institutions have a greater impact in countries with higher workers' productivity, and vice versa. The strong implication of this model is that absolute productivity level confers comparative advantage in more complex sectors.

Nunn's work (2005) considers the problem of contract enforcement in a principal-agent framework. In order to produce a good, the final producer needs both standard and customized inputs. The production of customized inputs requires a principal and an agent. Thus, we have a relationionship-specific investment: the value of the investment within the relationship is higher than in its best alternative use outside the relationship. When facing relationship-specific investments, under-investment occurs if contracts cannot be enforced. This happens for the following reason: if contracts are not perfectly enforced, the buyer of the inputs may "hold-up" the supplier by reneging on the initially agreed price. The supplier anticipates the possibility of an opportunistic behaviour and will under-invest in relationship-specific investments. This leads to a suboptimal level of investment, which in turn raises the costs of production. Instead, in the production of the standardized input there are not problems of hold up.

As agents can produce both customized and standardized inputs, the payoffs must be equal in both sectors. This equality yields a ratio between the price of customized inputs, and the price of standardized ones that is decreasing in γ, the quality of the judicial system: in a country with poor quality of institutions, the relative price of customized inputs to standardized inputs is higher than in a country with better institutions.

The efficiency loss due to poor institutional environment varies across industries, according to the importance of relationship specific investments in the production process. If these investments are preponderant in the production process, gains from good contract enforcement are larger. Therefore, industries with a widespread presence of relationship-specific investments are favoured by

[3]This happens because where teams are larger in efficiency units, fixed costs of learning can be spread over larger amounts of output.

a judicial system that provides a high level of contract enforcement. This leads to the conclusion that countries with good contract enforcement have a comparative advantage in the production of relationship-specific goods.

Under free trade, the country with better contract enforcement specializes in the production of the final good that more intensively includes customized inputs. If there are more than two countries, each country specializes in an interval of goods: the country with lowest quality of contract enforcement will specialize in the least customized inputs.

The main difference between Nunn and Costinot is that here the comparative advantage is explained simply by the quality of institutions, while in Costinot the quality of institutions interacts multiplicatively with the productivity of workers.

Like in the other papers analyzed so forth, Levchenko supposes that some sectors rely on institutions more heavily than others. He models the comparative advantage that arises from differences in institutional quality in a different way. He considers the case in which the parties that interact are the factors of production, K and L. In the economy three goods are produced: two goods are produced using only one factor of production, the K-good and the L-good, while the third is produced using both factors, the M-good. As M is the only good that requires the interaction of two factors of production, it can be considered the more institutionally dependent.

When two parties invest in joint production, some part of their investment becomes specific to the production relationship. Like in Nunn's paper, there are relationship-specific investments, which implies under-investment, if contract enforcement is not perfect. A fraction ϕ of capital's investment in the M-good sector becomes relationship-specific, therefore ϕ captures the quality of contract enforcement, and differs across countries. Low values of ϕ correspond to better quality of institutions. When $\phi = 0$, institutions are perfect. After the relationship-specific contract is signed, K can only recover a fraction $1 - \phi$ of the investment. In order to induce K to take part in the production, it must be compensated with a share of the surplus, which is equally shared between the parties ex post through a Nash bargaining.

Two implications emerge. First, the outcome is inefficient as there exists under-investment in the M sector. Secondly, in equilibrium one of the factors, L, has different rewards across sectors: L receives a higher wage in the M-sector. The second result does not appear in Nunn, as he does not suppose that the agents that are interacting in the production represent the factors of production.

Assume that the North has better quality of institutions. It is then able to produce the M-good at a lower price: in the integrated equilibrium, M will be produced using only the northern institutional setting. Thus, we observe that institutional differences affect the pattern of trade like Ricardian productivity differences. But we have also an implication on the labour market: L in equilibrium is segmented, with workers in M earning rents[4]. This means that a

[4] Factor rewards are equalized across countries, but not across sectors. Thus, relative factor rewards across countries depend on which sectors operate in each country.

country is no longer indifferent as to which sectors are active under trade. This second implication is absent in Nunn and Costinot, because this model assumes that K and L are the agents that contract.

The last model that I consider is Acemoglu, Antras, Helpman (2006). They develop a model of contract incompleteness with varying degrees of technological complementarities, and draw implications, among others, on the pattern of trade[5].

They consider the firm choice of the level of technology of production. More advanced technologies are those which involve a greater number of intermediate inputs, and thus a higher degree of specialization[6]. The elasticity of substitution between inputs is given by $1/(1-\alpha)$; as α is positive and smaller that one, the elasticity of substitution is always greater than one, and determines the degree of complementarity of the technology.

They model contract incompleteness assuming that there exists $\mu \in [0,1]$ such that for every intermediate input j, investment in activities $i \in [0,\mu]$ are contractible. Contracts to stipulate investment levels $x(i,j)$ exists for values of $i \leq \mu$. Instead, for $i > \mu$, contract enforcement is not possible. Suppliers choose the investment level in non contractible activities anticipating the ex post distribution of revenue, which is determined by a multilateral bargaining game. Following Hart and Moore (1990), the solution concept for the multilateral bargaining game is given by the Shapley value[7].

In the first period, the firm adopts a technology N. For every intermediate input $j \in [0,N]$, the firm offers a contract. To every j corresponds an investment level $x_c(i,j)$ in contractible activities. In the second period, the firm chooses N suppliers, one for each task. In the following period the workers choose the investment levels $x(i,j)$ for all levels of i. For $i \in (0,\mu)$ the investment level is equal to $x_c(i,j)$. In the fourth period firm and workers bargain over the distribution of the revenue, in the last period the output is sold, and the revenue is distributed. Solving by backward induction they derive that the firm receives a fraction $\gamma \equiv \frac{\alpha}{\alpha+\beta}$ of the revenue. The parameter γ represents the bargaining power of the firm: it is rising in α and decreasing in β, where β is the price elasticity of demand for the final good[8]. A higher elasticity of substitution between intermediate inputs α makes every supplier less essential in production, thus reducing their overall bargaining power, while an increase in the price elasticity of demand for the final good β has the opposite effect. The first-order condition to the optimization problem of the firm yields an unique solution. This

[5] A previous version of this paper (2005) focuses on the complementarity between tasks. It is thus closer to Costinot's model. This paper and its previous version share the same implications on comparative advantage.

[6] The technology level is denoted by N, the number of intermediate inputs. Given N, the production function of the firm is:

$$q = N^{\kappa+1-1/\alpha}\left[\int_0^N X(j)^{\alpha}\,dj\right]^{1/\alpha} \quad 0<\alpha<1, \kappa>0$$

where $X(j)$ is quantity of intermediate input j, for $j \in [0,N]$.

[7] The Shapley value is a weighted average of the contributions that each player makes to all the coalitions that she can participate.

[8] β comes from the revenue of the firm: $R(q) = A^{1-\beta}q^{\beta}$, where A is a measure of aggregated demand.

choice of investment in non contractible activities, $\bar{x}_n$, rises with the investment level in contractible activities x_c: this complementarity results from the fact that the marginal productivity of an activity rises with investment in other activities. Moreover, the level of technology and investments in both contractible and noncontractible activities are increasing in the fraction of contractible activities, μ, and therefore in the quality of institutions.

Better contract enforcement has greater effect on investment decisions when there are greater technological complementarities. This is their different prediction on technology and contract enforcement. The negative effect of contract incompleteness is greater when there is a strong complementarity, because investment distortions are greater in this case.

Extending the analysis to two identical countries, that differ only for the fraction of activities that are contractible, thus for the level of institutional quality, μ, it is possible to determine the pattern of trade. Take the revenues of two firms with same level of technological complementarity, α, in two different countries. The ratio of these revenues is declining in α, therefore there exists a $\bar{\alpha}_\mu \in (0, 1)$ such that the country with good institutional quality is a net exporter of products with $\alpha < \bar{\alpha}_\mu$, the products with low levels of elasticity of substitution, and a net importer of goods with high levels of the elasticity of substitution $(\alpha < \bar{\alpha}_\mu)$.

They thus derive that good institutional quality gives an endogenous comparative advantage in more contract-dependent sectors, which in this case are the sectors with greater technological complementarity.

2 The Empirical Model

In order to be tested empirically, these models have to be adapted to fit an empirical equation. Following Levchenko (2004), consider a model with many countries, in which each country produces its own variety of the contract dependent good. These varieties, according to the Armington assumption, are imperfect substitutes. The production technology of the contract dependent good needs multiple intermediates in order to be performed. Assume that for each intermediate input producer, the outside option is zero. Each input producer, when participating to the production of the complex good, makes a relationship specific investment, and shirks with a probability ϕ.

If contract enforcement is not perfect, and thus the probability of shirking is positive, we face under-investment. To induce the intermediate producer to form the production team, she must be compensated with a share of the surplus, determined by Nash bargaining. It can be demonstrated that the price of the final good is increasing in its complexity, measured by the number of intermediate inputs needed for the production, n.

This implies that producing complex goods in the country with low quality of institutions is more costly than in the country with good institutions. Through some simplifications, we obtain the following relationship between country k' s share of imports to country l:

$$\ln(s^l_{Mk}) \approx (1-\sigma)n\ln(1+\phi^k) + D_{lk} \tag{1}$$

where σ is the Armington elasticity and D_{lk} summarizes the characteristics of trading countries and of the contract intensive sector, like for example factor intensities.

Assuming that the Armington elasticity is larger than one, we expect that countries with poor institutional quality, and thus high ϕ, will have low import shares in the institutionally dependent sector. This effect is larger the more institutionally dependent is the sector, as measured by the number of intermediate input producers needed to produce the final good. This equation shows the multiplicative relationship between institutional quality and complexity of goods.

To model standard country characteristics that usually determine the pattern of comparative advantage, I have to inspect what is inside D_{lk}. In order to do this, I follow the equation developed by Romalis in his seminal work (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 is reflected in trade shares. This implies that 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 US 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.

I choose to use his equation as it is completely invariant to the number of factors of production that are introduced in the model. I can thus modify the equation in order to introduce institutional quality.

I estimate a three factor model with skilled and unskilled labour and capital. I add institutional quality as a fourth source of comparative advantage. This is my baseline estimate:

$$\begin{aligned} rel\_share_{ic} &= \alpha + \beta_1 inst_i * inst_c + \beta_2 skint3_i * skill_c + \\ &\quad + \beta_3 capint3_i * capital_c + \gamma_c + \delta_i + \varepsilon_{ic} \end{aligned} \tag{2}$$

where i indexes industries and c countries. The dependent variable is country c' s share in US imports in sector i divided by the average share of industry i in US imports, in order to make coefficients comparable across countries, and to account for country size and closeness of trade relationship. According to the theory, we expect β_1, β_2 and β_3 to be positive. I add a set of country dummies γ and industry dummies δ as controls.

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 abundance of skilled labour and of capital are derived from Hall and Jones (1999)[9].

I build on Romalis equation, like Levchenko does, in order to estimate a theory based equation.

The other empirical test existing in literature is the one by Nunn. He estimates a reduced form equation, that explains relative trade shares with the contract intensity of the industry. His model predicts that cost differences between two countries increase more, the greater is the difference in the levels of contract enforcement. For this reason, he includes in the estimation equation an interaction term between the difference in the level of contract enforcement in the two countries and contract-intensity. The prediction from his theory is $\beta_1 > 0$

$$\ln\left(\frac{x_{ic}}{x'_{ic}}\right) = \alpha_{cc\prime} + \alpha_i + \beta_1 z_i(\gamma_c - \gamma_{c'}) + \varepsilon_{icc\prime} \tag{3}$$

where x_{ic} is country c' s export in industry i, z_i is the contract-intensity of industry i, c' denotes the country with worse institutions and $\alpha_{cc'}$ are country pair's fixed effect. In order to control for additional sources of comparative advantage, he includes also interaction terms between the country-pair difference in factor endowments and the factor intensity of production in each industry, following Romalis.

My baseline equation instead builds on the well established equation developed by Romalis, and enriches his specification adding institutional quality as an additional source of comparative advantage. In this way, I am able to test the prediction of Levchenko's and Nunn's models, and seek for confirmation of their results.

More interestingly, I test Costinot model, which is only theoretical, by adding a measure of absolute productivity as an additional source of comparative advantage. Finally, I test the prediction by Acemoglu, Antras and Helpman, introducing a measure of complementarity between inputs, in order to verify if institutional quality gives a comparative advantage in sectors that present a higher level of complementarity.

[9]More on data issues in next Section.

3 The Data

3.1 Data Description

My dependent variable is built using trade data taken from Feenstra *et al.* (2005) World Trade Flows dataset. Bilateral trade flows are classified by 4-digit SIC industry and country of origin. I use import data for the United States for 1998. I employ the customs value of general imports expressed in dollars (*gvalue*)[10]. In 1998, the United States imported goods from 173 countries, virtually every existing country, with few exceptions[11]. Import data cover 391 different SIC codes over 459 manufacturing industries (which represent over 85% of all manufacturing sectors). Nonetheless, a large amount of country-sector bilateral trade flows are reported as missing. As they represent more than half of my observations, I need to take into account this characteristic of the data. Section 3.2 discusses extensively the issue.

I 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 US 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 US Manufacturing database maintained by NBER and US Census Bureau's Center for Economic Studies for 1996, the most recent year available. $capint3_i$ is a measure of capital intensity, and is equal to one minus the share of total compensation in value added. $skint3_i$ 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 $unint3_i$ 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.

Following Romalis (2004), I explain trade shares by an interaction of factor intensities and relative factor prices. To determine relative factor prices I use relative factor abundance, taken from Hall and Jones (1999). The abundance of skilled labour $skill_c$ is measured by the human capital to labor ratio, which is based on the education levels reported in Barro and Lee (2000). The abundance of capital $capital_c$ is measured by the investment based measure of the capital to labor ratio, sourced from Hall and Jones. These measures are available for 123 countries. As these data refer to some countries that no longer exist, or do not match with countries available in trade dataset, I have to impose some matching rule between countries in different data sets[12].

[10] As a robustness check, I performed some preliminary estimations also with the customs value of imports for consumption measure (*cvalue*). Results do not vary considerably using these different measures. I keep the *gvalue* measure as preferred measure, as I am interested in a measure of imports that includes also intermediate inputs, and not imports for consumption only. Appendix A.1 provides a full definition of these variables.

[11] There are no reported imports from Cuba, Lybia and North Korea.

[12] For example, In Hall and Jones I have data for URSS, which I impose to all the 15 independent countries that originated from it. I check the differences between this dataset,

Institutional dependence at sectorial level, $inst\_dep_i$, is measured using different indexes of concentration of intermediate input use[13]. Instead of limiting my analysis to standard measures used in literature, I develop a number of alternative measures of concentration of intermediate input use. The measures that I use are: entropy, normalized entropy, exponential index, Herfindahl index, normalized Herfindahl index, Gini coefficient, concentration coefficient, share of top 10, 20 and 30 intermediate inputs in total intermediate good expenditure. I use also the number of intermediates employed in the production. This is a rawer measure of complexity of an industry, as it gives the same weight to large and insignificant inputs, ignoring differences in the entity of various inputs. Table 1 in Appendix 2 shows the definitions of these indexes of concentration. I compute these indicators using the US Input-Output Table for 1992. I am assuming that the existing structure of intermediate inputs use in the United States is driven by technology differences across sectors, and that these technological differences carry over to the other countries.

All these measures, except entropy and the number of intermediate inputs, increase with concentration. Then, I multiply by -1 the measures, in order to have a set of indexes that increases with the number of inputs, and therefore the number of contracts. These measures are strongly correlated at 1% significance level with each other. The full set of correlations between different measure of concentration can be found in Table 2 in Appendix 2. We can see that the number of intermediate inputs is positively and significantly correlated with other measures of concentration, but the correlation coefficient is much lower. This confirms the intuition that the number of intermediate inputs is a rawer measure of concentration. Appendix 2 contains also a list of the 10 most contract intensive and the 10 least contract intensive industries. This ordering of industries is coherent with findings by Levchenko and Nunn[14].

Measures of institutional quality, $inst_c$, are taken from the Governance Matters IV Database (Kaufmann *et al.* 2005). This dataset, maintained by the World Bank, provides six different indexes of institutional quality, that range from -2.5 (poor quality) to 2.5 (good quality)[15]. These indicators focus on different aspects of institutional quality: Voice and Accountability, Political Instability and Violence, Government Effectiveness, Regulatory Burden, Rule of Law, which refers specifically to the quality of contract enforcement, and Control of Corruption. These measures are based on a large number of individual variables, which measure the perceptions of governance. For a description of the variables, see Appendix A.1. Table 5 shows top five countries with best institutions and bottom five countries with worst institutions, according to Rule

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and the dataset without this kind of impositions. This practice does not change results significantly, but allows to consider more countries.

[13] The use of measures of concentration, like Herfindahl index, as an indicator of product complexity is acknowledged in literature, see Blanchard Kremer (1997) and Cowan Neut (2002).

[14] While Levchenko measures product complexity with the Herfindahl Index, Nunn builds a measure of contract intensity based on Rauch's (1999) classification of goods into goods sold on an organized exchange; reference priced goods or neither.

[15] These indexes have mean zero and a standard deviation of 1.

of Law measure for 1998. As a robustness check, I use objective measures of contract enforcement taken from the World Development Indicators. These are the number of days required to enforce a contract, the number of procedures to enforce a contract and the years to resolve insolvency. As these variables increase with a poor quality of enforcement, I multiply them by -1. This makes larger values of the variable correspond to better levels of institutional quality. These measures are employed in my estimates both in levels and in logs. Table 6 shows the correlation between different measures of institutional quality at country level. All correlations are positive and significative at 1% level. The coefficients are larger between Governance Matters measures, while we have smaller coefficient of correlation between WDI measures, and between the two sets of measures[16].

The final sample that I consider includes 172 countries and 391 industries.

3.2 Econometric Issues

Feenstra *et al.* dataset contains only positive trade flows between a country and the United States. In order to include also zero flows of trade into my dataset, I assume that all combinations of country and sector that are missing in Feenstra dataset are actually zero flows of trade[17]. This is a standard assumption in the literature that handles trade data (See among other Anderson and Marcouiller 2002, Felbermayr and Kohler 2004).

As zero flows of trade represent more than half of my observations, my dependent variable shows a distribution left-censored at zero. Ordinary least squares are biased and produce an inconsistent estimator, therefore I need a proper estimator. My choice is a maximum likelihood estimator: tobit, which applies an ols estimation for non censored observations, and a probit estimator for the censored ones. Several papers that use trade data have chosen tobit estimator, among others Anderson and Marcouiller (2002), Felbermayr and Kohler (2004), and Swenson (2005).

Alternatively, I could use the Heckman estimator, which estimates first a selection equation, and then estimates ordinary least squares on positive observations only, correcting for the sample bias. The models that I test explain with the same mechanism the entities of trade flows, and the existence or absence of them. Therefore, I am not able to exploit the main advantage of heckman estimator, namely the possibility of having different explanatory variables for the selection and the regression equation. Using the same regressors in the selection equation and in the regression equation may produce very imprecise estimates, as we face severe collinearity between the inverse Mills ratio, which is a function of the explanatory variables, and the explanatory variables themselves[18]. This makes less interesting the use of the heckman estimator.

[16] This could be due to the fact that WDI measures are available for a different year and for a smaller number of countries.

[17] I hypotize thus that there are not measurement errors in the dataset, and that missing observations are actually flows that do not exist.

[18] See Wooldridge (2002) p.565.

The paper shows the results obtained using tobit. My coefficient estimates using tobit estimator are larger with respect to the same equation estimated by ordinary least squares[19]. Moreover, I find that the significance of the coefficient estimates is generally improved using tobit estimator instead of OLS[20]. My results are robust to the inclusion of industry dummy variables in the equation.

Using tobit estimation, I implement an econometric analysis that is more accurate than previous tests of these models. In fact, Levchenko (2004) estimates an OLS model on the dataset that includes zero flows of trade, thus incurring inconsistent estimates. Nunn (2004) instead uses the dataset without zero flows, missing all the information from the zero flows of trade.

4 Results and Robustness

4.1 The Basic Model

I estimate my baseline equation (2) on a balanced panel dataset that includes zero flows of trade. I show in Table 7 my baseline specification both with a standard measure of institutional quality, and with the use of an objective measure of judicial system from the World Development Indicators. The table shows the results using the entropy measure of concentration. Two different measures of institutional quality are shown: rule of law, and the logarithm of insolvency.

Specification (1) is Romalis baseline specification. Estimate (1) is a least squares dummy variable model, or equivalently a fixed effects panel estimation. I impose that the effect are fixed, and not random. The models considered so far say that country's specificity determines the pattern of trade, therefore I suppose that the source of heterogeneity between observations is not random, but is given by the country dimension[21]. The coefficient on the institutional interacted variable is positive, as expected, and significative at 1% level. Results do not change when using a measure of institutional quality taken from the WDI.

As both dimensions of the panel are large, econometric theory suggests to consider a two-way model. Therefore, it is more appropriate to include fixed effects for both dimensions of the panel: country and industry. Results including industry dummy variables in the model are shown in column (2). I observe that the size of the coefficient estimates is robust to the inclusion of industry dummies.

I can estimate the specifications (1) and (2) using 132 different combinations of proxies for institutional quality at country level and institutional dependence

[19] This confirms an empirical regularity of tobit estimator with respect to OLS, see Greene (2003) p. 768.

[20] These results are not shown in the paper, but are available from the author upon request.

[21] I performed some estimates with random effects tecnique. Theory predicts that if both dimensions of the panel are large, fixed effects coefficient estimates and random effects estimates are the same. Moreover, in this case Hausman test is not helpful in choosing between fixed effects and random effects specification. Actually, I obtain very similar coefficient estimates using random effects and fixed effects. Therefore, I follow my theory based assumption and estimate a LSDV model.

at industry level. The results that I obtain are strongly robust across different specifications.

According to the theory, also the coefficients of the capital interacted variable and the skilled labour interacted variable are positive and highly significant. Generally, I obtain a strong evidence of the standard theory on comparative advantage and of the prediction of institutional quality as an additional source of comparative advantage. The positive sign on the interacted institutional variable says that a country with good institutional quality has larger trade shares in the good that is more complex, and therefore that relies more on a good institutional environment. Positive signs on the interacted variables of capital and skilled labour imply that a good that is much capital intensive captures larger trade shares if the factor that it implies heavily, capital, is abundant in its country. This means in other words that capital gives a comparative advantage in capital intensive goods, and institutions give a comparative advantage in institutionally intensive goods.

These results are consistent with those of Levchenko and Nunn. The basic theory on institutional quality and comparative advantage, developed by Levchenko and Nunn, is confirmed by my empirical investigation. My contribution is in the number of different proxies for concentration of intermediate inputs use that I construct, which gives strong robustness to the results. Moreover, I use newly created objective variables for measuring contract enforcement of a country. Although these variables are available for a reduced number of countries, and refer to a different year, they strongly support the theory's predictions.

Moreover, using a tobit estimator I handle the issue of zero flows of trade, thus obtaining more accurate estimates. In fact, Levchenko tests his model using OLS on a dataset that includes zero flows of trade, while Nunn estimates his different equation considering only positive flows of trade.

4.2 Costinot Model

Costinot model predicts that there exist two complementary sources of comparative advantage: institutional quality and productivity. Gains in the quality of institutions have a greater impact in countries with higher workers' productivity, and vice versa. In order to test this implication of the model, I have to include absolute productivity as an additional source of comparative advantage in more complex sectors. I multiply institutional quality and absolute productivity at country level, thus obtaining a variable, $instprod_c$, that takes into account both sources of comparative advantage. Then, I multiply this variable with the standard measure of complexity at industry level, $inst_i$.

I estimate the following equation:

$$\begin{aligned} rel\_share_{ic} &= \alpha + \beta_1 inst_i * instprod_c + \beta_2 skint3_i * skill_c + \\ &\quad + \beta_3 capint3_i * capital_c + \gamma_c + \delta_i + \varepsilon_{ic} \end{aligned} \tag{4}$$

In order to proxy productivity, I use the logarithm of absolute productivity level, as estimated by Hall and Jones (1999). As a robustness check, I use an alternative measure of absolute productivity of workers: the logarithm of gdp per worker converted in purchasing parity power, taken from Penn World Tables 6.1 (Heston, Summers, Aten 2002). These two measures of absolute productivity are positively correlated with a coefficient of 0.714, significant at 1% level.

I estimate equation (4) across 132 different specifications, using all available different proxies. Table 8 in Appendix shows the results. Altogether, we have a positive coefficient estimate for β_1, always significant at 1% level across different specifications. I observe that the magnitude of coefficient estimates is robust to the inclusion of industry dummy variables. Moreover, results with the measure of productivity derived from the Penn World Tables are of comparable magnitude.

I thus find evidence in favour of Costinot prediction, as the coefficient on the institutional dependence interacted variable has the expected sign, and is always significant. The coefficients on the other variables have the expected signs, and are of comparable size with respect to the results shown in Table 7. I observe that the coefficient attached to the first variable is smaller in size compared to the baseline specification. This may be interpreted as positive but less relevant impact of productivity as a source of comparative advantage in the production of more complex goods.

4.3 Acemoglu, Antras and Helpman Model

Finally, I consider the model by Acemoglu, Antras and Helpman, which predicts that the institutional source of comparative advantage is stronger in presence of complementarities between different activities. In order to test this hypothesis, I have to include a measure of technological complementarity. They derive the degree of complementarity of the technology from the elasticity of substitution between inputs, α. The best way to approximate the elasticity of substitution between activities is to consider the elasticity of substitution between skilled and unskilled labour[22]. I consider these two factors of production as they best represent, when they take part in the production of a good, the interaction between different agents, which is the source of complexity in the theory considered.

I assume a constant returns to scale production function with two factors of production: skilled labour and unskilled labour. I consider a constant elasticity of substitution production function:

$$Y_t = A_t \left[\delta S_t^{\frac{\sigma-1}{\sigma}} + (1-\delta) U_t^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

where K is real output, S is the flow of services from skilled workers, U is the flow of services from unskilled workers and A is a Hicks-neutral technological

[22] This is especially true if we consider the previous version of their paper, in which the authors considered the elasticity of substitution between different tasks, performed by different agents.

shifter. δ is a distribution parameter, while σ is the elasticity of substitution between skilled and unskilled labour. The aggregate production function is defined as $F \equiv Y/A$. Assuming competitive markets, first order conditions for profit maximization give the equivalence of real factor prices and the real value of their marginal products. Taking the logarithms I thus obtain:

$$\log\left(F_t/S_t\right) = \alpha_1 + \sigma \log(W_{St}/P_t) \tag{5}$$

$$\log\left(F_t/U_t\right) = \alpha_2 + \sigma \log(W_{Ut}/P_t) \tag{6}$$

where W_{St}, W_{St} and P_t are the prices of skilled labour services, unskilled labour services and aggregate input F_t, and the constants depend on δ. Subtracting (5) from (6) I obtain:

$$\log\left(S_t/U_t\right) = \alpha_3 - \sigma \log(W_{St}/W_{Ut}) \tag{7}$$

which is the equation that I perform in order to obtain coefficient estimates of the elasticity of substitution[23].

I estimate this elasticity using data from US Manufacturing database maintained by NBER and US Census Bureau's Center for Economic Studies, which has data at sectorial level on skilled and unskilled labour inputs and wages from 1958 to1996, spanning over a range of 38 years.

A well-established insight from the empirical literature on elasticity of substitution is that the estimates of the elasticity of substitution vary systematically, depending on the type of data used and the choice of the functional form (Berndt 1976, Berndt 1991). It is well known that cross sectional estimates of the elasticity of substitution give lower estimates in comparison with time series studies.

To handle this problem, I follow two different ways of estimating my elasticities of substitution. I simply estimate them using the time series dimension of my dataset. Alternatively, I can take advantage of both dimensions of my dataset, temporal and sectorial. In order to do this, I merge 4 digits SIC codes that share the same first 2 or 3 digits, thus creating groups by sector activity[24]. In this way I obtain three different sets of estimates of the elasticity of substitution: 391 elasticities, one for each 4 digits SIC code, 97 different elasticities at SIC 3 level or 20 different elasticities at SIC 2 level.

[23] Alternatively, I could have been estimating the following equation:

$$\log\left(W_{St}/W_{Ut}\right) = \alpha_4 - (1/\sigma)\log(S_t/U_t)$$

This equation and equation (7) have the same R^2, which is equal to the ratio of the two estimates of σ.

[24] The numbering of industries in SIC follows the rationale that industries that share the same SIC 2 codes perform the same kind of activity. SIC 3 and SIC 4 codes proceed in further classification. To some 3 digits SIC codes correspond only one 4 digits SIC code. When this occurs, the coefficient σ estimated at SIC 3 level when the grouping variable is SIC 4 is missing. While estimating at SIC 2 level, this problem does not occur, as we have always multiple sub levels corresponding to a SIC 2 level of aggregation.

What interests me is a measure of complementarity between tasks, therefore I multiply the different estimates of the elasticity of substitution by -1. In this way, I obtain three different measures of complementarity, which I can use to test Acemoglu *et al.* predictions. The equation that I estimate is the following:

$$\begin{aligned} rel\_share_{ic} \;=\; & \alpha+\beta_4 compl_i * inst_i+\beta_1 inst_i * inst_c + \\ & +\beta_2 skint3_i * skill_c+\beta_3 capint3_i * capital_c+\gamma_c+\delta_i+\varepsilon_{ic} \end{aligned} \tag{8}$$

The results are shown in Table 9 and 10[25]. First, I estimate the model including only the interaction term between complementarity and complexity, which is the novelty of their model. The coefficient is positive and significant at 1% level. This result is robust to the use of different proxies of complementarity. The magnitude of coefficient point estimates is robust across specifications using different estimates of the elasticity of substitution. This implies that although obtained using different techniques, the measure of complementarity produce all the same kind of results. I have slightly different results when considering the measure of complementarity derived aggregating industries at SIC 3 level. This could be due to the problem of missing values for the complementarity variable that this level of aggregation generates. All the other variables have the expected signs, thus supporting the general predictions of the theory.

I also test their model including both the interaction term between complexity and complementarity, and the standard interaction term between complexity and institutional quality. Estimates of type (2) support again the prediction of the model, showing the expected sign for all variables. The coefficient estimates that I obtain for β_1, β_2, β_3 are the same as those reported in Table 7[26], both for the specification with rule of law and the one with the logarithm of insolvency. This reflects that my baseline estimate is robust to the inclusion of the interaction term between complementarity and complexity. Moreover, I observe that the estimate for β_4 in specification (2) is of comparable magnitude in Table 9 and 10[27], thus suggesting that the coefficient estimate is not sensitive to the use of different proxies of institutional quality at country level.

5 Conclusions

Institutions are a fundamental determinant of economic performance of a country: they impact on growth rates, they explain differences in income levels, they are a key factor in promoting and attracting foreign direct investments. Only recently, few papers have shown that institutional quality matters also as a determinant of trade, more specifically as a source of comparative advantage.

[25] Results are shown only for the specification with country and industry dummies, which is the preferred one as in takes properly into account different specificities of industries.

[26] Results are slightly different when using comp3 as a measure of complementarity.

[27] Specification (1) does not include $inst_c$, therefore it is invariant across Table 9 and Table 10.

Institutions are in charge of the enforcement of contracts. Goods are more complex, if a large number of inputs is needed for their implementation. Every intermediate inputs entails a contract in order to be performed. Complex goods require a large number of contracts to be produced, thus relying more on the level of contract enforcement of the country. This implies that good contract enforcement, and thus high institutional quality, is a source of comparative advantage in more complex goods. Two models (Levchenko 2004, Nunn 2004) obtain this kind of predictions. Costinot (2004) model predicts instead that institutional quality and absolute productivity are complementarity sources of comparative advantage. Acemoglu, Antras and Helpman (2006) present a model in which comparative advantage given by institutional quality is larger in goods that present higher complementarity between activities.

Using trade data for the United States taken from Feenstra *et al.* (2005) World Trade Flows dataset, I test empirically the basic prediction of comparative advantage given by institutional quality. Moreover I test the different predictions by Acemoglu *et al.* and by Costinot. The models are tested using different adaptations of Romalis' (2004) theory based equation.

Empirical analysis confirms the predictions of all the models. I use new measures of complexity of goods and of institutional quality as robustness check. I also consider the problem of the correct treatment of zero flows of trade in my dataset: I estimate a tobit model, that fits the case of truncated or censored data.

As further test of robustness, I could test the model on a reduced sample that includes only developed countries to check if my results are driven by broad differences in the countries in the dataset. Another concern may be that the institutional quality variable is a proxy for other features of countries with good institutions. To check for this I could interact the measure of complexity with skill and capital abundance, as I may suppose that more complex goods require higher endowments of skilled labor and capital.

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A Appendix

A.1 Data Description

A.1.1 Trade Measures

The dependent variable is country c' s share in US imports in sector i. I divide it by the average share of industry i in US imports, in order to make coefficients comparable across countries, and to account for country size and closeness of trade relationship. My variable is constructed using the *gvalue* variable from Feenstra *et al.* dataset. I check that using *cvalue* results do not vary.

gvalue: is the customs value of general imports in dollars. It is the value of imports as appraised by the U.S. Customs Service. It is generally defined as the price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance and other charges incurred in bringing the merchandise to the United States. We are considering general imports, which measure the total physical arrivals of merchandise from foreign countries, whether such merchandise enters consumption channels immediately or is entered into bonded warehouses or Foreign Trade Zones under Customs custody.

cvalue: is the custom value of imports for consumption in dollars. It measures the total of merchandise that has physically cleared through Customs either entering consumption channels immediately or entering after withdrawal for consumption from bonded warehouses under Customs custody or from Foreign Trade Zones.

A.1.2 Measures of Institutional Quality

I have six measures from the Governance Matters IV Dataset (Kaufmann *et al.* 2005). These are indexes that range from -2.5 to 2.5, with low values corresponding to poor institutional quality. These indicators are based on a huge amount of variables that measure the perception of government quality, which belong to 37 separate data sources, constructed by 31 different organizations. All measures are for 1998. These measures are:

Voice and Accountability: measures the level of political, civil and human rights.

Political Instability and Violence: measures the likelihood of violent threats to, or changes in, government, including terrorism.

Government Effectiveness: measures the competence of the bureaucracy and the quality of public service delivery (the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of civil service from political pressures, and the credibility of the government's commitment to policies).

Regulatory Burden: measures the incidence of market-unfriendly policies, as for example price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development.

Rule of Law: measures the quality of contract enforcement, police, and courts, as well as the likelihood of crime and violence. This is our preferred variable as it refers specifically to the quality of contract enforcement.

Control of Corruption: measures the exercise of public power for private gain, including both petty and grand corruption and state capture.

I use also measures of institutional quality taken from the World Development Indicators. The virtue of these measures is that they are not indexes, but raw numbers. Unfortunately, these data are available only for 2004, but I choose to use them as they are the only measure specific for contract enforcement that is not an index.

Number of procedures to enforce a contract: is the number of independent actions, mandated by law or courts, that demand interaction between the parties of a contract or between them and the judge or court officer.

Time required to enforce a contract: is the number of calendar days from the filing of the lawsuit in court until the final determination and, in appropriate cases, payment.

Time to resolve insolvency: is the number of years from the filing for insolvency in court until the resolution of distressed assets.

A.2 Tables

Table 1: Measure of Concentration in Intermediate Input Use

Entropy	$E = -\sum_{i=1}^{n} p_i \ln p_i$ where $0 \leq H \leq \ln n$ and $p_i = \frac{x_i}{X} = \frac{x_i}{\sum_{i=1}^{n} x_i}$
Normalized Entropy	$E_0 = \frac{E}{E_{\max}} = \frac{E}{\ln E}$ where E is Entropy
Exponential Index	$EX = e^{-H} = \prod_{i=1}^{n} p_i^{p_i}$
Herfindahl Index	$H = \sum_{i=1}^{n} p_i^2 = \sum_{i=1}^{n} \frac{x_i^2}{X^2}$ where $\frac{1}{n} \leq H \leq 1$
Normalized Herfindahl Index	$H^* = \frac{H - \frac{1}{n}}{1 - \frac{1}{n}}$ where $0 \leq H^* \leq 1$
Gini Coefficient	$G = \frac{2}{n^2 \overline{x}} \sum_{i=1}^{n} \left(\left(i - \frac{n+1}{2} \right) x_i \right)$ where $0 \leq G \leq 1$ and $\overline{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$
Concentration coefficient	$C = \frac{n}{n-1} G$ where G is Gini Coefficient
Share of top 10 intermediate inputs	$S = \sum_{i=1}^{10} p_i$ where x_i are in decreasing order
Number of intermediate inputs	$N = \sum_{x_i \neq 0} 1$

Table 2: Correlation Between Different Measures of Concentration

	E	E_0	EX	H	H^*	G	C	S_{10}	S_{20}	S_{30}	N
E	1										
E_0	1.000	1									
EX	0.914	0.915	1								
H	0.917	0.917	0.949	1							
H^*	0.917	0.917	0.949	1.000	1						
G	0.941	0.941	0.771	0.745	0.745	1					
C	0.941	0.941	0.771	0.745	0.745	1.000	1				
S_{10}	0.942	0.942	0.778	0.755	0.755	0.977	0.977	1			
S_{20}	0.896	0.896	0.718	0.671	0.671	0.985	0.985	0.962	1		
S_{30}	0.848	0.848	0.662	0.608	0.608	0.967	0.967	0.912	0.980	1	
N	0.375	0.375	0.319	0.227	0.227	0.466	0.466	0.339	0.460	0.544	1

Variables definition:
E = Entropy; E_0 = Normalized Entropy; EX = Exponential Index; H = Herfindhal Index;
H^* = Normalized Herfindhal Index; G = Gini Coefficient; C = Concentration Coefficient;
S_{10} = Share of Top 10 Intermediate Inputs; S_{20} = Share of Top 20 Intermediate Inputs;
S_{30} = Share of Top 30 Intermediate Inputs; N =Number of Intermediate Inputs
All correlations are significant at 1% level

Table 3: 10 Most Contract Intensive Industries according to Herfindhal Index

3728	Aircraft and missile equipment
3296	Mineral wool
3483	Ammunition, except for small arms
3821	Laboratory apparatus and furniture
3842	Surgical appliances and supplies
3565	Packaging machinery
3549	Metalworking machinery
3643	Wiring devices
3482	Small arms ammunition
3321	Iron and steel foundries

Table 4: 10 Least Contract Intensive Industries according to Herfindhal Index

2011	Meat packing plants
2075	Soybean oil mills
2015	Poultry slaughtering and processing
2013	Sausages and other prepared meat products
2429	Special product sawmills
2021	Creamery butter
2911	Petroleum refining
2026	Fluid milk
3317	Steel pipe and tubes
2296	Tire cord and fabrics

Table 5: Institutional quality according to rule of Law

5 Best	5 Worst
Switzerland	Congo, Dem. Rep
Singapore	Somalia
Norway	Liberia
New Zealand	Equatorial Guinea
Austria	Iraq

Table 6: Correlation Between Different Measures of Institutional Quality

	voice	polst	goveff	regqual	rulelaw	contrcorr	insolv	procenf	dayenf
voice	1								
polstab	0.710	1							
goveff	0.716	0.773	1						
regqual	0.710	0.686	0.818	1					
rulelaw	0.698	0.806	0.923	0.795	1				
contrcorr	0.699	0.747	0.933	0.725	0.946	1			
insolv	0.287	0.280	0.348	0.348	0.356	0.349	1		
procenf	0.493	0.435	0.467	0.436	0.455	0.453	0.397	1	
dayenf	0.257	0.330	0.346	0.272	0.352	0.335	0.264	0.412	1

Variables definition:
voice=Voice and Accountability; polst=Political Instability and Violence; goveff=Government Effectiveness; regqual=Regulatory Burden; rulelaw=Rule of Law; contrcorr=Control of Corruption; insolv=Time to resolve insolvency; procenf=Number of procedures to enforce a contract; dayenf=Days required to enforce a contract
All correlations are significant at 1% level.

Table 7: Baseline Model

Dep. Var.: Normalized Share of Country's Imports in Total Imports				
	entrxrule		entrxlinsolv	
	(1)	(2)	(1)	(2)
inst_i*inst_c	1.80 (.57)***	1.67 (.53)***	.66 (.20)***	.59 (.18)***
inst_i	-.94 (.33)***		.20 (.24)	
skint3_i*skill_c	58.04 (13.78)***	59.06 (14.56)***	72.70 (18.23)***	73.78 (19.18)***
skint3_i	-59.22 (13.23)***		-71.12 (17.29)***	
capint3_i*capital_c	3.11 (.81)***	2.99 (.81)***	2.99 (.80)***	2.87 (.80)***
capint3_i	-35.30 (8.46)***		-34.87 (8.43)***	
Country Dummies	Yes	Yes	Yes	Yes
Industry Dummies	No	Yes	No	Yes
Observations	52380		44620	

Notes. Robust Standard errors in parentheses; * significant at 10%; ** significant at 5%

*** significant at 1%. Variable descriptions in Appendix A.1

Table 8: Costinot Specification

Dependent Variable: Normalized Share of Country's Imports in Total Imports								
	logA				log gdp per worker (ppp)			
	entrxrule		entrxlinsolv		entrxrule		entrxlinsolv	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$inst_i$*$instprod_c$	.21 (.06)***	.19 (.06)***	.07 (.02)***	.07 (.02)***	.16 (.05)***	.15 (.05)***	.06 (.02)***	.05 (.01)***
$inst_i$	-.98 (.34)***		.15 (.23)		-1.00 (.35)***		.09 (.22)	
$skint3_i$*$skill_c$	59.07 (14.13)***	60.16 (14.95)***	73.03 (18.44)***	74.09 (19.40)***	57.91 (13.92)***	59.46 (14.90)***	72.67 (18.74)***	73.79 (19.71)***
$skint3_i$	-59.96 (13.51)***		-71.37 (17.45)***		-59.03 (13.44)***		-71.04 (17.71)***	
$capint3_i$*$capital_c$	3.12 (.81)***	3.01 (.82)***	2.99 (.80)***	2.87 (.80)***	3.15 (.80)***	3.04 (.79)***	3.02 (.80)***	2.89 (.80)***
$capint3_i$	-35.44 (8.48)***		-34.86 (8.43)***		-35.55 (8.24)***		-34.96 (8.44)***	
CountryDummies	No	Yes	No	Yes	No	Yes	No	Yes
IndustryDummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52380		44620		50440		43844	

Notes: Robust standard error in parentheses; * significant at 10%; ** significant at 5%;

*** significant at 1%. Variable definitions in Appendix A.1

Table 9: Acemoglu Antras and Helpman Specification

Dep. Variable: Normalized Share of Country's Imports in Total Imports						
	(1)			(2)		
	comp2	comp3	comp4	comp2	comp3	comp4
comp_i*inst_i	3.21 (.92)***	1.04 (.34)***	1.44 (.41)***	3.39 (.94)***	.97 (.33)***	1.52 (.42)***
inst_i*inst_c				1.67 (.53)***	1.51 (.55)***	1.67 (.53)***
skint3_i*skill_c	77.59 (18.59)***	75.53 (19.61)***	77.59 (18.59)***	59.06 (14.57)***	58.80 (15.63)***	59.06 (14.57)***
capint3_i*capital_c	3.18 (.83)***	2.30 (.91)***	3.18 (.83)***	2.99 (.81)***	2.19 (.91)**	2.99 (.81)***
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52380	46710	52380	52380	46710	52380

Notes. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Variable definitions in Appendix A.1. Table shows result with entropy and rule of law

Table 10: Acemoglu Antras and Helpman Specification

Dep. Variable: Normalized Share of Country's Imports in Total Imports						
	(1)			(2)		
	comp2	comp3	comp4	comp2	comp3	comp4
$comp_i$*$inst_i$	3.21 (.92)***	1.04 (.34)***	1.44 (.41)***	3.09 (.91)***	.96 (.34)***	1.39 (.41)***
$inst_i$*$inst_c$				.59 (.18)***	.51 (.19)***	.59 (.18)***
skint3$_i$*skill$_c$	77.59 (18.59)***	75.53 (19.61)***	77.59 (18.59)***	73.78 (19.18)***	70.15 (19.88)***	73.78 (19.18)***
capint3$_i$*capital$_c$	3.18 (.83)***	2.30 (.91)***	3.18 (.83)***	2.87 (.80)***	1.89 (.90)**	2.87 (.80)***
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52380	46710	52380	44620	39790	44620

Notes. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Variable definitions in Appendix A.1. Table shows result with entropy and log of insolvency