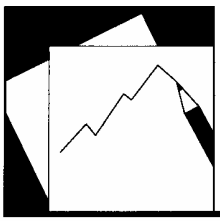
WP/04/xx



IMF Working Paper

Institutional Quality and International Trade

Andrei A. Levchenko

INTERNATIONAL MONETARY FUND

 WP/04/xx

IMF Working Paper

Research Department

Institutional Quality and International Trade

Prepared by Andrei A. Levchenko[1]

Authorized for distribution by Olivier Jeanne

December 2004

Abstract

The quality of institutions—meaning the quality of contract enforcement, property rights, shareholder protection, and the like—has received a great deal of attention in recent years. The purposes of this paper are twofold. First, it studies the consequences of trade when institutional differences are the source of comparative advantage among countries. Institutional differences are modeled within the Grossman-Hart-Moore framework of contract incompleteness. It is shown, among other things, that the less developed country may not gain from trade, and that factor prices may actually diverge as a result of trade. Second, the paper provides empirical evidence of "institutional content of trade:" institutional differences are shown to be important determinant of trade flows.

JEL Classification Numbers: F11, F14, F16

Keywords: Trade patterns, institutions, incomplete contracts

Author's E-Mail Address: alevchenko@imf.org

---

[1]The research described in this paper was part of the work undertaken for the author's Ph.D. dissertation at M.I.T. The author would like to thank Daron Acemoglu, Olivier Blanchard, Simon Johnson, and Jaume Ventura for invaluable guidance and support, Michael Alexeev, Shawn Cole, Andrei Shleifer, Petia Topalova, two anonymous referees, as well as numerous seminar participants for helpful suggestions, and Kevin Cowan and Claudio Raddatz for generously providing their data. Financial support from the National Science Foundation is gratefully acknowledged.

Contents Page

I. INTRODUCTION

What are the sources of trade between the developed world (the North) and developing countries (the South)? How are the gains distributed? How does trade affect factor prices? These questions are especially important to the South. In recent decades it has witnessed a considerable expansion of trade with the North, but, with a few exceptions, has seen almost no narrowing of the North-South income or wage gap (Husted and Melvin, 2001). An important feature of North-South trade is that it occurs between strikingly dissimilar countries. This paper attempts to explore the consequences of one important source of dissimilarity: institutions.[2]

The notion of institutions has received a great deal of attention in recent literature. The term typically refers to a wide range of social structures affecting economic outcomes: contract enforcement, property rights, investor protection, the political system, and the like. Empirical evidence, in particular the series of papers by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (e.g., 1997, 1998), and Acemoglu, Johnson, and Robinson (e.g., 2001, 2002), suggests two important facts. First, institutions matter a great deal for economic performance. Second, the North has much better institutions than the South.

Given the emerging consensus on the primary importance of institutions, it is natural to think that institutional differences could be a source of comparative advantage in North-South trade. What are the features of this trade? In answering this question, the key issue is how to formalize comparative advantage that arises from differences in institutional quality. This paper presents two different approaches, and takes a stand on which one is more appropriate. Any attempt to model institutional differences in an analytical framework requires restricting attention to a particular type of institutions. Here, we focus on what Acemoglu and Johnson (2003) classify as contracting institutions: those arrangements that govern relationships between private economic parties, rather than those between private parties and the government.

The starting point of the analysis is the assumption that some sectors rely on institutions more than others. Dependence on institutions—enforcement of contracts and property rights—is a technological feature of the production process in some industries. This would be the case, for example, if production could not rely on spot markets for inputs, and instead required establishing complex relationships between the factors.

Better institutions in the North then immediately suggest a pattern of comparative advantage. The simplest way of formalizing this would be to model institutions as differences in productivity. We refer to this as the Ricardian view, and present it as a benchmark. Better institutions in the North imply that the North is relatively more productive in the institutionally dependent sectors. The implications are straightforward. First, there will be gains from trade.

---

[2] One possible classification of countries into North and South, based on PPP-adjusted per capita income, is offered in Table A4.

Second, the South stands to gain more from trade, because it stops producing the institutionally dependent goods, and thus no longer suffers the cost of its weak institutions.

Poor quality of institutions may indeed manifest itself in lower productivity in the institutionally intensive sectors, for a variety of reasons.[3] However, there is evidence that lack of proper contract enforcement also leads to significant distortions.[4] Thus, modeling institutional comparative advantage in the basic Ricardian framework may be too reduced-form and miss important parts of the story. Contract enforcement, property rights, investor protection, and the like, matter because they allow agents to overcome frictions that arise when two parties with competing interests enter into a production relationship. In our second modeling approach, institutions govern relationships between factors rather than manifest themselves in productivity.

To make explicit the role of institutions in alleviating distortions, we adopt a commonly used source of frictions for which quality of contract enforcement and property rights is likely to be especially important. Namely, we take the Grossman-Hart-Moore view of contract incompleteness and parameterize institutional quality in the way suggested in Caballero and Hammour (1998). This framework lends itself naturally to modeling institutional comparative advantage: contracts are more incomplete in countries with worse institutions.

When we incorporate institutional differences into the basic Heckscher-Ohlin model of trade, we reach strikingly different conclusions than those obtained under Ricardian view. Under the Grossman-Hart-Moore view, the North gains more than the South, in fact the South may lose from trade. Factor rewards can actually diverge. In the North, labor stands to gain the most from trade. In the South, capital gains the most, while labor is likely to suffer losses.

What is the intuition for these results? Institutions play two key roles in our model. First, contract imperfections lead to factor market distortions that are not captured by the Ricardian view. Imperfect institutions mean that even under perfect intersectoral mobility, factor rewards differ across industries. One of the factors—labor in our model—is compensated more in the institutionally dependent sector. These are the good jobs, in which workers earn rents. Second, institutional differences are a source of comparative advantage: because Northern institutions are better, only the North will produce the institutionally dependent good under trade. After trade opening, the good jobs disappear in the South, and wages decrease as a result. By contrast, the high-paying sector in the North expands to accommodate the entire world demand, resulting in gains from trade over and above those implied by conventional factor-abundance differences.

---

[3]For example, institutions may influence firms' choices of production process, e.g. Cowan and Neut (2002).

[4]Indeed, there is both macro-level (e.g., Blanchard and Kremer, 1997; Claessens and Laeven, 2003), and micro-level evidence (e.g., McMillan and Woodruff, 1999; Johnson, McMillan, and Woodruff, 2002a, 2002b) that institutional arrangements do influence agents' behavior in important ways.

The bottom line is that the North's superior institutions allow it to specialize in the more desirable industries.[5,6]

While it is reasonable to think of institutions as fixed in the short run, in the long run they may adapt to changing economic conditions. An extension of the model endogenizes institutions to explore the effects of trade opening on institutional quality. The main conclusion is that trade makes bad institutions more costly, and thus opening to trade will lead to institutional improvement. Countries will compete to capture the advantageous sectors, resulting in a race to the top in institutional quality.

The central implication of the model is that institutional differences across countries are an important determinant of trade patterns. We test this prediction with data on U.S. imports disaggregated by country and 4-digit Standard Industrial Classification (SIC) industry, and using a factor content of trade methodology developed by Romalis (2004). Romalis tests whether countries that are abundant in a factor of production capture larger U.S. import shares in industries relatively intensive in that factor. This paper takes the factor content specification and augments it with variation in industry institutional dependence and country institutional quality to test whether countries with better institutions capture higher U.S. import shares in more institutionally dependent sectors. The main finding is that institutional differences are in fact a significant determinant of trade flows.

The Grossman-Hart-Moore framework has recently been used in international trade literature by Grossman and Helpman (2002b, 2002c, 2003) and Antras (2003, 2004). This paper is methodologically related to this literature, but differs from it in two important ways. First, existing contributions typically model the differences between North and South not in terms of institutions, but in terms of technology or factor endowments. As such, these models do not address the consequences of institutional differences acting as a source of comparative advantage. The second difference is in focus. The existing models apply contract incompleteness primarily to analysis of boundaries of multinational firms. This paper derives the welfare implications of trade in the presence of institutional differences, as well as how institutions will in turn be affected by trade.

---

[5]The underlying mechanism, which is that a reallocation of industries between countries resulting from trade will affect welfare through reallocation of rents, is more general. It could also be modeled within the efficiency wage dual labor markets framework of Bulow and Summers (1986), or in a two-sector matching model of Acemoglu (2001). In the context of the interaction between globalization and European labor market institutions, a similar argument has been made by Allais (1994).

[6]This paper is not the first to suggest that when a developed and a developing country open to trade, the North ends up with more desirable sectors. In the Young (1991) model, the South may lose because of decreased learning-by-doing. Galor and Mountford (2003) argue that the 19th century trade opening delayed demographic transition in developing countries, further increasing the South's relative abundance in unskilled labor.

The last part of the paper contributes to a recent strand of empirical literature that deals with the interaction of institutional quality and international trade. Anderson and Marcouiller (2002) use the gravity model to demonstrate that bilateral trade volumes are significantly affected by the trading countries' institutional quality, with better institutions leading to larger trade volumes. Ranjan and Lee (2003) show that bilateral trade volumes are more affected by institutional quality in sectors that they classify as more institutionally intensive. Schuler (2003) examines changes in the composition of trade in the countries of the former Soviet bloc, and shows that as the command economy institutions broke down, net exports in institutionally intensive sectors fell more than net exports in sectors that rely less on institutions. This paper examines industry-level trade shares rather than trade volumes, and thus its approach is complementary to the former two contributions, and much closer in spirit to the latter one.

The rest of the paper is organized as follows. Section II presents a model of international trade. This is done in two parts. As a benchmark, institutions are modeled as Ricardian technology differences across countries, and the main conclusions obtained from that approach are drawn. We then present our preferred way of modeling institutional differences, and show that doing so reverses most of the conclusions obtained under the Ricardian view. In particular, we contrast the predictions of the model regarding welfare, factor reward changes, and effects international factor mobility with the predictions of standard models. Section III presents an extension of the model to a setting in which institutions are endogenously determined. Section IV describes in detail the empirical strategy and results. Section V concludes.

II. THE BASIC MODEL

A. Case I: The Ricardian View of Institutions

It is useful to start with the standard Heckscher-Ohlin paradigm of trade. Consider an economy with two factors, *K* and *L*, and three goods. Two of the goods are produced using only one factor, and thus we call them the *K*-good and the *L*-good. The mixed good, *M*, is produced with both factors.

Agents have identical Cobb-Douglas utility functions in the consumption of the three goods,

$$U(C_K, C_L, C_M) = C_K^{\alpha} C_L^{\beta} C_M^{\gamma}, \tag{1}$$

where α, β, and γ are positive and $\alpha + \beta + \gamma = 1$. Given the goods prices p_K, p_L, and p_M, we let the numeraire be the ideal price index associated with Cobb-Douglas utility:

$$P \equiv \left(\frac{p_K}{\alpha}\right)^{\alpha} \left(\frac{p_L}{\beta}\right)^{\beta} \left(\frac{p_M}{\gamma}\right)^{\gamma} = 1.$$

Consumer utility maximization then leads to the following first-order conditions:

$$p_K = \alpha \frac{C_K^{\alpha} C_L^{\beta} C_M^{\gamma}}{C_K} \tag{2}$$

$$p_L = \beta \frac{C_K^{\alpha} C_L^{\beta} C_M^{\gamma}}{C_L} \tag{3}$$

$$p_M = \gamma \frac{C_K^{\alpha} C_L^{\beta} C_M^{\gamma}}{C_M}. \tag{4}$$

Production technology of the *K*-good and the *L*-good is linear in *K* and *L*. Suppose one unit of capital produces *a* units of the *K*-good, and one unit of labor produces *b* units of the *L*-good. Then profit maximization in the two industries implies that

$$p_K a = r \tag{5}$$
$$p_L b = w, \tag{6}$$

where *r* and *w* are the returns to capital and labor respectively.

The *M*-good is produced with a Leontief technology which combines one unit of *L* and *x* units of *K* to produce *y* units of the *M*-good. This paper takes the view that institutions matter because they facilitate transactions between distinct self-interested economic parties. The *M*-good is the only one which requires joining of two distinct factors of production, and thus it is natural to think of the *M*-good as being institutionally dependent. Under the Ricardian view, imperfect institutions would be thought of as a productivity loss in the *M*-good sector. Suppose in fact that once a production unit has been formed and production had taken place, a fraction τ of the output is lost due to imperfect institutions. The parameter τ is meant to capture institutional quality, and thus it is natural to think of better institutions as lower values of τ. Profit maximization in the *M*-good industry then implies:

$$p_M (1-\tau) y = w + xr, \tag{7}$$

which simply says that the price is equal to the unit cost.

The only remaining ingredient of the closed-economy equilibrium is market clearing. It is useful to define the following notation. Let *E* be the share of labor force employed in the *M*-sector. This is convenient because the value of *E* completely characterizes the resource allocation in the economy. Given *E* and the relevant endowments *K* and *L*, the production of the *M*-good is

$$X_M = (1-\tau) yEL,$$

the L-good:

$$X_L = b(1-E)L,$$

and the K-good:

$$X_K = a\left(\frac{K}{L} - xE\right)L.$$

Goods market clearing then requires:

$$C_K = a\left(\frac{K}{L} - xE\right)L; \tag{8}$$

$$C_L = b(1-E)L; \tag{9}$$

$$C_M = (1-\tau)yEL. \tag{10}$$

The equilibrium in an economy endowed with K units of capital and L units of labor is a set of prices and the resource allocation $\{p_K, p_L, p_M, r, w, E\}$ characterized by equations (2) through (10).

The model is easily adapted to an international trade setting in the presence of both factor endowment and institutional differences. Suppose that there are two countries, North (N) and South (S), and transport costs between them are negligible. Let K^N, L^N, K^S, and L^S be the factor endowments in the two countries, and let

$$\overline{K} = K^N + K^S$$

and

$$\overline{L} = L^N + L^S$$

be the world quantities. To address the issue of trade in the presence of institutional differences, suppose that fractions τ^N and τ^S of the M-good produced in the North and the South, respectively, are lost due to institutional imperfections. In keeping with the notion that the South has inferior institutions, we assume $\tau^N < \tau^S$.

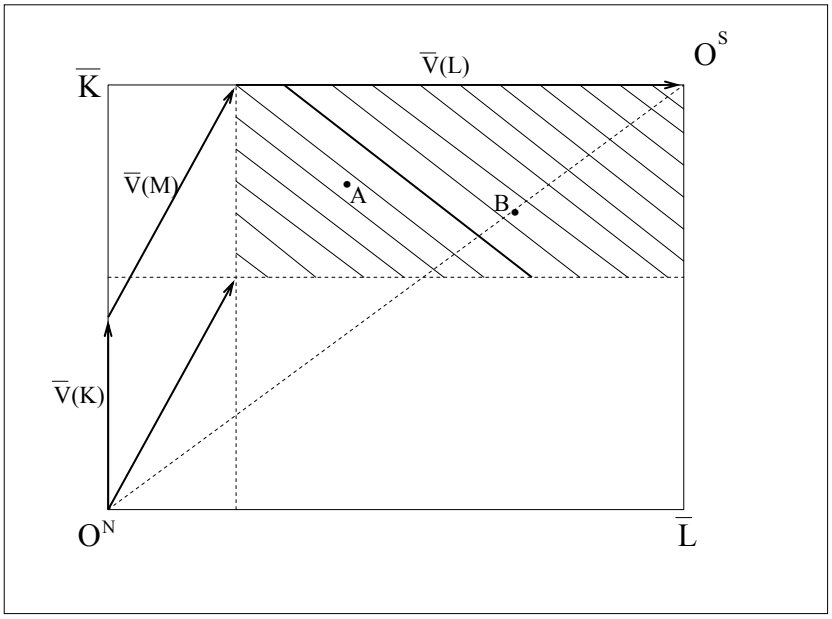
Without institutional differences ($\tau^N = \tau^S$), the model satisfies all the assumptions of the standard Heckscher-Ohlin factor proportions theory (see Helpman and Krugman, 1985, ch. 1). The unequal institutional quality introduces a Ricardian productivity difference in one sector, and thus the model can be analyzed as a special case of the Davis (1995) Heckscher-Ohlin-Ricardo model.

How can we determine the pattern of production and trade? A useful starting point of the analysis is the integrated equilibrium, which is the production pattern that results under perfect factor mobility. It is obtained by solving for the equilibrium of a closed economy endowed with the world quantities of the factors. From the integrated equilibrium production pattern we can

construct a set of partitions of world factor endowments into countries called the Factor Price Equalization (FPE) Set. This is convenient because when country endowments belong to the FPE set, we can show that the integrated equilibrium world resource allocations and prices are replicated purely through trade.

Figure 1 illustrates the analysis. The sides of the box represent the world factor endowments. Any point in the diagram can represent a division of the world factor endowments into countries, where the North's endowments are measured from O^N , and the South's from O^S. We typically think of the North as being relatively capital-abundant. When that is the case, the world endowments will be given by a point above the diagonal, such as *A*. The vectors $\overline{V}(i) = [\overline{L}(i), \overline{K}(i)]$ denote the integrated equilibrium factor allocations in industry *i*.

Figure 1. The World Economy and the Factor Price Equalization Set

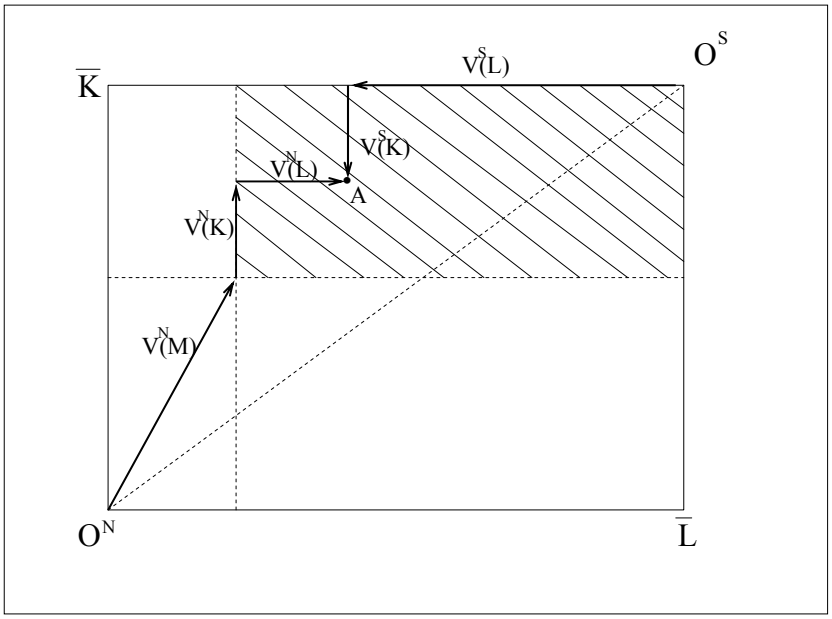


The shaded area represents the FPE set. The key intuition in constructing this set is as follows: the FPE set is those country endowments for which the integrated equilibrium production pattern is replicated by trade in goods. Since the North has an absolute technical advantage in production of the *M*-good, in the integrated equilibrium only the North's institutional setting will be used in that sector. Thus, country endowments can only belong to the FPE set if the entire integrated equilibrium production of the *M*-good can be accommodated in the North. This is the case, for example, at point *A*.

Prices and the pattern of production and trade are easily obtained for a set of endowments within the FPE set. We know that the goods and factor prices are the same as in the integrated equilibrium, and that the entire integrated equilibrium production of the *M*-good is located in the

North. Let $V^j(i) = [L^j(i), K^j(i)]$ be the trade equilibrium use of factors in industry *i* and country *j*. The pattern of production is graphically illustrated in Figure 2 for the factor endowments at point *A*. While in autarky the *M*-good was produced in both countries, under trade the South stops producing *M* altogether, and now its entire factor endowment is dedicated to production of the *K*-good and the *L*-good. In the North the amount of the labor force in the *M*-sector increases to accommodate the entire world demand.

Figure 2. The Pattern of Production



It is useful to establish an expression for gains from trade. To do this, let $\{p_K^N, p_L^N, p_M^N, r^N, w^N, E^N\}$ and $\{p_K^S, p_L^S, p_M^S, r^S, w^S, E^S\}$ denote the autarky equilibria in the North and South respectively, and let $\{p_K^T, p_L^T, p_M^T, r^T, w^T, E^T\}$ be the values that describe the trade equilibrium. The trade values are obtained by solving for the integrated equilibrium. E^T is the fraction of the *worldwide* labor force employed in the *M*-sector, which we know from the discussion above is located entirely in the North.

The assumptions we made on the utility function imply that welfare is proportional to real income. Since we use the price of the optimal consumption basket as the numeraire, the prices that characterize our equilibrium are real. Thus, in autarky, the welfare of *L* and *K* in country *i* is simply $w^i L^i$ and $r^i K^i$, and the aggregate welfare is simply $w^i L^i + r^i K^i$. The gains from trade are thus expressed as the difference in factor rewards between trade and autarky.

To get an intuition about the distribution of gains from trade, it is useful to consider the simplest case. In order to focus solely on the effects of institutions, suppose North and South have the

To ensure that we are really picking up the effect of institutions on trade, we now conduct a number of robustness checks. One obvious concern is whether the result is sensitive to our choice of institutional dependence variable. To address this, we use a set of alternative measures of institutional dependence. We start with two alternative indices of intermediate use concentration, the share of 20 largest intermediates in total intermediate good expenditure, and the Gini coefficient of intermediate good use. These work in a manner similar to the Herfindahl index, assigning a high institutional intensity to industries with dispersed and even intermediate use pattern, and low institutional intensity to industries in which intermediate use is concentrated. Next, we use a simpler measure, which is the number of intermediates used in production. As we discussed above, when some intermediates are insignificant, this measure will show a sector to be institutionally intensive even when effective contract intensity is low. All three of these measures are calculated using the 1992 U.S. Input-Output Use Table. To use a completely different measure, we also calculate the ratio of investment to output. This proxies for institutional dependence if the holdup problem increases with the size of investment. Industries whose technology requires a higher investment to produce will have to rely on contract and property rights enforcement to a greater extent. This measure is calculated using the U.S. Manufacturing database maintained by the National Bureau of Economic Research and U.S. Census Bureau's Center for Economic Studies for 1992. Correlations between the Herfindahl index and the alternative indices of institutional intensity are presented in Table 2.

Table 2. Correlation Coefficients between Alternative Institutional Intensity Indices

	share20	gini	no. of int.	inv/out
herf	0.6696	0.7437	0.2254	0.1318

Table 3 presents the results of using the alternative measures of institutional intensity. Regardless of the measure of institutional intensity used, we find a positive and statistically significant relationship between institutional intensity and trade shares.

Another concern might be that the institutional quality measure is a proxy for some other feature of countries with good institutions. For instance, perhaps the more institutionally intensive goods require higher endowments of skilled labor or capital. To address this issue, Table 4 presents results for several alternative specifications. To aid comparison, Column (1) reproduces the baseline result, Column (2) of Table 1. We then run our basic specification with a full set of interaction terms. Thus, for example, the Herfindahl index is interacted not only with institutional quality, but with skill and capital abundance as well. The results are presented in column (2) of Table 4. While the coefficient on the Herfindahl index and institutional quality interaction term is virtually unchanged and still highly significant, the other two interaction terms involving the Herfindahl index are not significant. This suggests that institutional quality is relatively more important to production of complex goods than skill and capital abundance.

Table 3. Alternative Measures of Institutional Intensity

Dep. Var: Normalized Share of a Country's Imports in Total Imports				
	(1)	(2)	(3)	(4)
(share of 20 largest interm.)*inst	4.13			
	(0.57)***			
(gini coefficient)*inst		21.05		
		(3.09)***		
(number of intermediates/1000)*inst			2.73	
			(1.62)*	
(investment/output)*inst				4.02
				(1.53)***
(skill intensity)*(skill endow)	8.02	8.11	13.79	14.16
	(2.20)***	(2.22)***	(2.12)***	(2.09)***
(capital intensity)*(cap. endow)	0.53	0.52	0.43	0.39
	(0.28)*	(0.28)*	(0.29)	(0.28)
Country Dummies	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes
Observations	31568	31568	31568	31568
Industries	389	389	389	389
Countries	117	117	117	117

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; *Gini coefficient* of intermediate good use, *share of 20 largest intermediates, number of intermediates/1000, and investment/output ratio* are measures of institutional intensity; *inst* is an index of institutional quality from Kaufmann, Kraay and Zoido-Lobaton (2002); *capital intensity*=1-(total compensation)/(value added); *skill intensity*=[(nonproduction workers)/(total employment)]*(1-capital intensity); *skill endow.* and *cap. endow* are natural logs of human and physical capital per worker, respectively, obtained from Hall and Jones (1999). Variable definitions and sources described in detail in the text.

It is also interesting to note that while the conclusions about the institutional content of trade are unchanged with the inclusion of cross-interaction terms, the significance of factor content of trade is eroded. In particular, while in the base specification exports of skill intensive goods were significantly correlated with country skill abundance, the interaction term of skill intensity and institutional quality seems to pick up all the significance. This suggests that institutional quality is relatively more important than skill abundance in generating exports of skill intensive goods.

Table 4. Alternative Specifications

Dep. Var: Normalized Share of a Country's Imports in Total Imports						
	(1)	(2)	(3)	(4)	(5)	(6)
(herfindahl index)*inst	2.36	2.21	2.02	1.54	1.90	2.67
	(0.64)***	(0.95)**	(0.63)***	(0.84)*	(0.66)***	(2.24)
(skill intensity)*(skill endow)	11.54	2.21	17.33	1.80	10.45	4.33
	(2.18)***	(2.99)	(3.20)***	(4.39)	(2.67)***	(3.81)
(capital intensity)*(cap. endow)	0.49	0.68	0.61	0.16	0.77	0.57
	(0.28)*	(0.40)*	(0.29)**	(0.40)	(0.29)***	(0.43)
(raw mat. intensity)*(raw endow)			40.35	26.85		
			(12.56)***	(14.81)*		
(financial dependence)*(financial develop.)					0.27	
					(0.09)***	
(herfindahl index)*(skill endow)		-2.28		-2.53		
		(4.58)		(4.66)		
(herfindahl index)*(cap. endow)		0.28		0.41		
		(1.04)		(1.04)		
(herfindahl index)*(raw endow)				-35.27		
				(17.78)**		
(capital intensity)*inst		-0.09		0.98		
		(0.58)		(0.77)		
(skill intensity)*inst		3.91		6.68		
		(0.92)***		(1.43)***		
(raw mat. intensity)*inst				0.11		
				(0.77)		
Country Dummies	yes	yes	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes	yes	yes
Observations	31568	31568	31568	31568	20008	18385
Industries	389	389	389	389	276	389
Estimation	OLS	OLS	OLS	OLS	OLS	IV
Countries	117	117	117	117	95	80

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; *Herfindahl index* of intermediate good use measures institutional intensity; *inst* is an index of institutional quality from Kaufmann, Kraay and Zoido-Lobaton (2002). In a 3-factor model, *capital intensity*=1-(total compensation)/(value added); *skill intensity*=[(nonproduction workers)/(total employment)]*(1-capital intensity). In a 4-factor model, raw material intensity=(value of raw material inputs)/(value of raw material inputs+value added); *capital intensity*=[1-(total compensation)/(value added)]*(1-raw material intensity) *skill intensity*=[(nonproduction workers)/(total employment)]*(1-capital intensity)*(1-raw material intensity). *skill endow.* and *cap. endow* are natural logs of human and physical capital per worker, respectively, obtained from Hall and Jones (1999). *Financial dependence* is a measure of dependence on external finance calculated from firm-level Compustat data following the methodology of Rajan and Zingales (1998). *Financial development* is the ratio of private credit to GDP obtained from Beck et al. (2000). In Column (6), *(herfindahl index)*inst* is instrumented with *(herfindahl index)*(log of settler mortality)*. Variable definitions and sources described in detail in the text.

To test robustness further, we expand the number of factors of production by including raw materials as one of the factors. The raw material intensity ($matint4$) is measured as the value of raw material inputs divided by the sum of raw materials and value added. Consequently, the skill and capital intensity in the four factor model are $capint4 = capint3(1 - matint4)$ and $skint4 = skint3(1 - matint4)$, respectively.[23] Raw materials abundance is proxied by the total land area divided by the total population, sourced from the World Bank World Development Indicators CD-ROM. Column (3) in Table 4 presents the results of estimating a four-factor model. Once again, the coefficient on the institutional intensity interaction term is very similar, and just as significant as in the three-factor specification. Finally, we estimate the four-factor model with all the cross-interactions, and present the results in Column (4) of Table 4. The coefficient on the institutional interaction term is slightly lower, but still significant, with a *p*-value of 6.5%.

Recent evidence suggests that countries with more developed financial markets tend to produce and export goods that rely more heavily on external finance (e.g. Beck, 2003). To control for financial comparative advantage, we construct a measure of industry financial dependence based on Compustat firm-level data, and following the methodology of Rajan and Zingales (1998). In particular, for each firm and each year, we define financial dependence as capital expenditure minus cash flow, divided by capital expenditure. We then average this measure for each firm over the period 1989-1998, and take the median across firms in each sector to create a sector-level index of financial dependence.[24] We proxy for country-level financial development with the ratio of private credit by deposit money banks and other financial institutions to GDP for the period 1980-1995, sourced from Beck et al. (2000). Due to limited data availability, the resulting sample includes only 276 industries and 95 countries. Column (5) of Table 4 reports the results of controlling for financial comparative advantage alongside institutions in our base specification. We confirm that differences in financial development are a relevant determinant of trade patterns. Our conclusions regarding institutional comparative advantage are unchanged, as the coefficient of interest is similar in magnitude to the baseline estimate and still highly significant. Institutions affect trade patterns in ways that cannot be accounted for exclusively by differences in financial development.

We also attempt to instrument for institutional quality by using the settler mortality variable introduced by Acemoglu, Johnson and Robinson (2001). Because that variable is country-level, we instrument for the interaction term $inst\_dep_i * inst_c$ by the interaction $inst\_dep_i * settler\_mortality_c$. Because the settler mortality variable is available for only 80 countries, we are left with a smaller sample. The results are presented in the last column of

[23]Once again, the fourth factor, unskilled labor intensity, is implicit.

[24]The number of firms available in each 4-digit SIC sector is generally small, often just 1 or 2 firms. To create meaningful averages, we compute them at 3-digit SIC level. We then drop all observations which were created by averaging less than 10 firms. We are very grateful to Claudio Raddatz for providing us with the necessary firm-level data and helpful advice.

Table 4. The coefficient of interest does not change drastically, but is not significant at conventional levels, with a *p*-value of 23%.

As another robustness check, we see whether the results are driven by certain parts of the sample. Column (1) of Table 5 presents estimation results on a subsample that excludes the North. The breakdown of economies into North and South is taken from Romalis (2004), who classifies as the North industrial economies with per capita PPP-adjusted GDP of at least 50% of the U.S. level. The list of economies belonging to the North is provided in Table A4. It is clear from Column (1) that the results are not driven simply by the North-South differences in import patterns. The coefficient of interest is actually greater in magnitude than in the full sample, and highly significant. Notice also that the coefficients on skill and capital interactions lose significance in the South-only sample, reinforcing the relative importance of institutions. We also perform estimation on the subsample that excludes Sub-Saharan Africa, and present the results in Column (2) of Table 5. The coefficient of interest is slightly lower than in the full sample, and still highly significant. The results are similarly unchanged when the South-East Asian economies are removed from the sample, as evidenced by Column (3). To check whether the results are driven by outlier industries, in Column (4) of Table 5 we estimate our base specification excluding the 10 most institutionally intensive industries.[25] Doing this leaves the coefficients and their significance virtually unchanged.

Finally, we attempt to disentangle the effects of institutional differences from other country characteristics, such as productivity, that could be proxied for by per capita income. Unfortunately, institutional quality and income are so highly correlated (correlation coefficient of 0.82), that the results are at best only suggestive. Column (1) of Table 6 presents the outcome of using the log of per capita PPP-adjusted GDP in place of institutional quality. Clearly, countries with higher per capita income capture higher import shares in institutionally intensive sectors. Whether that is due to institutional differences *per se*, or some other factor associated with higher per capita incomes cannot be definitively established, as Column (2) shows. Indeed, when both per capita incomes and institutional quality are included in the regression, their coefficients are roughly halved, and neither is significant.[26]

---

[25]Virtually the same results are obtained if we drop the 20 most institutionally intensive sectors, as well as the 10 or 20 least institutionally intensive sectors.

[26]The exercise is complicated by the fact that per capita incomes are also highly correlated with the other country characteristics we use as controls. Indeed, the correlations between per capita incomes and capital and skill abundance are 0.90 and 0.83, respectively, higher than with institutional quality. We tried to allow per capita incomes to explain import shares through all the channels available to us, that is, we included interactions of per capita incomes with the other factors for which we have data. When we do this, the direct effect of institutional quality increases in magnitude, though still falls short of becoming statistically significant. By contrast, the point estimate on the interaction term of per capita GDP and institutional intensity becomes lower in magnitude, and remains insignificant.

Table 5. Alternative Samples

Dep. Var: Normalized Share of a Country's Imports in Total Imports				
	(1)	(2)	(3)	(4)
(herfindahl index)*inst	2.94	1.72	2.24	2.32
	(1.12)***	(0.60)***	(0.70)***	(0.65)***
(skill intensity)*(skill endow)	2.50	18.67	13.12	11.66
	(3.12)	(2.63)***	(2.16)***	(2.21)***
(capital intensity)*(cap. endow)	0.40	1.51	0.55	0.49
	(0.42)	(0.27)***	(0.30)*	(0.29)*
Country Dummies	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes
Observations	22912	26842	28146	30891
Specification	South only	No Africa	No SE Asia	No outliers
Industries	389	389	389	379
Countries	94	81	103	117

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; *Herfindahl index* of intermediate good use measures institutional intensity; *inst* is an index of institutional quality from Kaufmann, Kraay and Zoido-Lobaton (2002); *capital intensity*=1-(total compensation)/(value added); *skill intensity*=[(nonproduction workers)/(total employment)]*(1-capital intensity); *skill endow.* and *cap. endow* are natural logs of human and physical capital per worker, respectively, obtained from Hall and Jones (1999). Variable definitions and sources described in detail in the text.

In columns (3) and (4) we repeat the exercise for the subsample that includes only the South. To the extent that there are major differences in institutions, incomes, and trade flows, the bulk of those will be between the North and the South, rather than within those groups. Focusing on the South may help disentangle the effects of institutions from the rest more successfully. Indeed, in the South subsample, the correlation between institutional quality and income is 0.68, slightly lower than in the sample of all countries. The South subsample provides some evidence that institutions are the most important factor. Column (4) shows that the effect of institutions is both larger in magnitude and relatively more significant than the effect of per capita income. The effect of institutions is borderline significant for the South subsample, with a *p*-value of under 12%, even when per capita GDP is included as one of the controls.

Table 6. Institutions Versus Per Capita Incomes

Dep. Var: Normalized Share of a Country's Imports in Total Imports				
	(1)	(2)	(3)	(4)
(herfindahl index)*GDPPC	2.33	1.26	2.17	0.86
	(0.61)***	(1.19)	(0.97)**	(1.24)
(herfindahl index)*inst		1.29		2.30
		(1.25)		(1.46)
(skill intensity)*(skill endow)	11.53	11.34	2.52	2.15
	(2.25)***	(2.23)***	(3.28)	(3.27)
(capital intensity)*(cap. endow)	0.55	0.53	0.50	0.47
	(0.28)**	(0.28)*	(0.41)	(0.41)
Specification	ALL	ALL	South Only	South Only
Country Dummies	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes
Observations	31366	31366	22710	22710
Industries	389	389	389	389
Countries	115	115	92	92

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; *GDPPC* is log of PPP-adjusted per capita GDP in 1995; *Herfindahl index* of intermediate good use measures institutional intensity; *inst* is an index of institutional quality from Kaufmann, Kraay and Zoido-Lobaton (2002). *Capital intensity*=1-(total compensation)/(value added); *skill intensity*=[(nonproduction workers)/(total employment)]*(1-capital intensity). *Skill endow.* and *cap. endow* are natural logs of human and physical capital per worker, respectively, obtained from Hall and Jones (1999). Variable definitions and sources described in detail in the text.

V. CONCLUSION

Recent literature has greatly improved our understanding of the role of institutions in countries' economic performance. Given the emerging consensus regarding their primary importance, a natural question to ask is: how do institutional differences affect trade outcomes? This paper presented two simple ways of formalizing institutional differences in a trade framework. Under the familiar Ricardian view, the South stands to gain the most from international trade, as it no longer bears the cost of its bad institutions. Under the Grossman-Hart-Moore view, the conclusions are reversed, and quite surprising. The North gains the most from trade, while the South may lose. When institutions are a source of trade, labor in the North and capital in the South are the factors that gain the most. Labor in the South is likely to lose; in fact, wages can diverge as a result of trade. Institutions are quite slow to change, so these results are appropriate in the short run. A different conclusion emerges when we endogenize institutions, something that is meant to capture long-run effects. In autarky, there may be reasons why bad institutions persist indefinitely. International trade, however, leads to a race to the top in institutional quality. Countries improve institutions as they compete to capture a share of the advantageous sectors.

So which view of institutions is more relevant in practice? We made a case that the Grossman-Hart-Moore view better captures the role of contracting imperfections between private parties that enter production relationships. A broader view of institutions may include, for instance, government expropriation and political instability, for which the Ricardian view is perhaps more accurate. Industries could also differ in the kinds of institutions they require. This paper argued that interactions between institutions and trade are important, and are likely to be quite nuanced. What kinds of effects prevail in which circumstances remains an open question.

EXTENSION OF THE MODEL TO THREE PARTIES TO PRODUCTION

Suppose that production of the *M*-good requires joining outside capital *K*, labor *L*, and an entrepreneur. The joining is organized the following way. First, entrepreneurs raise *K*, and establish a company. Then, the company hires workers.

Sticking to the Grossman-Hart-Moore framework, suppose that in establishing a company, a fraction ψ_K of *K* becomes specific to the relationship. The parameter ψ_K is meant to capture institutional quality in the La Porta et al. sense. Suppose also that when the company hires a worker, a fraction ψ_C of its value becomes specific as well. This parameter can be thought of as capturing the conditions in the labor market as well as technological features of the production process. In both relationships, we assume once again that the *ex post* surplus is split equally between the parties.

Suppose that the entrepreneur's outside option is fixed at zero. Because *K* becomes partly specific to the entrepreneur, its participation constraint will hold with equality. Given its *ex ante* opportunity cost *r*, it will pin down the required return that the company must earn on each unit of *K*, *R*:

$$(1-\psi_K)rx + \frac{1}{2}[Rx - (1-\psi_K)rx] = rx,$$

or,

$$R = (1+\psi_K)r.$$

Since the company becomes partly specific to *L*, its participation constraint will provide a joint restriction on *w*, *r*, and p_M that is analogous to equation (11):

$$p_M y = w + (1+\psi_C)Rx = w + (1+\psi_C)(1+\psi_K)rx.$$

The reward to labor in the *M*-sector is then:

$$w + \psi_C(1+\psi_K)rx, \qquad (A1)$$

which corresponds to equation (12). Both of the key consequences of the baseline model—that workers earn rents in the *M*-sector and that the outcome is inefficient—are unchanged. In this sense, the baseline model without entrepreneurs can be thought of as a reduced form of a fuller model outlined here. It may seem that as long as we are assuming $\psi_C > 0$, extending the model in this way is simply semantics. We would argue that the assumption of positive ψ_C is plausible, and lets us gain a key insight.

Institutional quality in the capital markets, ψ_K, has a first order effect on worker compensation by both changing the size of the *M*-sector and the size of workers' rents (equation A1). The fuller model also lets us isolate better what we believe is the relevant difference between the North and the South. In particular, the assumption we made above that $\phi^N < \phi^S$ can be

interpreted as a combination of $\psi_C^N = \psi_C^S$ and $\psi_K^N < \psi_K^S$. More generally, this parameterization opens the door to a more nuanced analysis. For example, if ψ_C is thought of as power of unions, the decision of where to locate production will be determined by the interaction of that and the contracting environment. If $\psi_C^N > \psi_C^S$, but $\psi_K^N < \psi_K^S$, which way the comparative advantage in the *M*-sector goes is inconclusive.

SUPPLEMENTARY TABLES

Table A1. Sectors with Highest and Lowest Institutional Intensity

Least Institutionally Intensive Industries			Most Institutionally Intensive Industries		
1	2011	Meat packing plants	1	3728	Aircraft parts and equipment, n.e.c.
2	2075	Soybean oil mills	2	3296	Mineral wool
3	2015	Poultry slaughtering and processing	3	3842	Surgical appliances and supplies
4	2429	Special product sawmills, n.e.c.	4	3565	Packaging machinery
5	2021	Creamery butter	5	3643	Current-carrying wiring devices
6	2026	Fluid milk	6	3482	Small arms ammunition
7	2296	Tire cord and fabrics	7	3321	Gray and ductile iron foundries
8	2083	Malt	8	2451	Mobile homes
9	2652	Setup paperboard boxes	9	3484	Small arms
10	2678	Stationery products	10	3569	General industrial machinery, n.e.c.

Table A2. Industry-Level Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
capital intensity	0.61	0.11	0.18	0.95
skill intensity	0.11	0.06	0.01	0.48
herfindahl index of intermediate use	0.13	0.09	0.04	0.78

Table A3. Country-Level Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Institutional quality	-0.013	0.940	-2.166	1.909
log of physical capital per worker	9.241	1.586	5.763	11.589
log of human capital per worker	0.584	0.294	0.072	1.215

Table A4. Economy List

North	South		
Australia	Algeria	Guinea	Peru
Austria	Angola	Guinea-Bissau	Philippines
Belgium	Argentina	Guyana	Poland
Canada	Bangladesh	Haiti	Portugal
Denmark	Barbados	Honduras	Romania
Finland	Benin	Hungary	Russian Federation
France	Bolivia	India	Rwanda
Germany	Brazil	Indonesia	Saudi Arabia
Hong Kong, SAR	Burkina Faso	Iran, Islamic Rep.	Senegal
Iceland	Burundi	Jamaica	Seychelles
Ireland	Cameroon	Jordan	Sierra Leone
Israel	Central African Rep.	Kenya	Somalia
Italy	Chad	Korea, Rep. of	South Africa
Japan	Chile	Madagascar	Sri Lanka
Netherlands	China	Malawi	Sudan
New Zealand	Colombia	Malaysia	Suriname
Norway	Comoros	Mali	Syrian Arab Republic
Singapore	Congo, Dem. Rep.	Malta	Tanzania
Spain	Congo, Rep.	Mauritania	Thailand
Sweden	Costa Rica	Mauritius	Togo
Switzerland	Cote d'Ivoire	Mexico	Trinidad and Tobago
Taiwan, Province of China	Cyprus	Morocco	Tunisia
United Kingdom	Dominican Republic	Mozambique	Turkey
	Ecuador	Myanmar	Uganda
	Egypt, Arab Rep.	Nicaragua	Uruguay
	El Salvador	Niger	Venezuela
	Fiji	Nigeria	Yemen, Rep. of
	Gabon	Oman	Yugoslavia, Fed. Rep. of
	Gambia, The	Pakistan	Zambia
	Ghana	Panama	Zimbabwe
	Greece	Papua New Guinea	
	Guatemala	Paraguay	

Note: The classification of countries into North and South is taken from Romalis (2004). The North consists of industrial countries identified by Romalis as having in 1995 per capita PPP-adjusted GDP of at least 50% of the U.S. level.

REFERENCES

Acemoglu, Daron, 2001, "Good Jobs Versus Bad Jobs," *Journal of Labor Economics*, Vol. 19, pp. 1–21.

———, and Simon Johnson, 2003, "Unbundling Institutions," (Unpublished; Cambridge, Massachusetts: MIT).

Acemoglu, Daron, Simon Johnson, and James Robinson, 2001, "Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, Vol. 91, pp.1369–1401.

———, 2002, "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics*, Vol. 117, pp. 1231–94.

Allais, Maurice, 1994, "Combats pour l'Europe, 1992–1994," (Paris: Clement Juglar).

Anderson, James, and Douglas Marcouiller, 2002, "Insecurity and the Pattern of Trade: An Empirical Investigation," *The Review of Economics and Statistics*, Vol. 84, pp. 342–52.

Antras, Pol, 2003, "Firms, Contracts, and Trade Structure," *Quarterly Journal of Economics*, Vol. 118, pp. 1375-1418.

———, 2004, "Incomplete Contracts and the Product Cycle," (unpublished; Cambridge, Massachusetts: Harvard University).

Bagwell, Kyle, and Robert Staiger, 2001, "The WTO as a Mechanism for Securing Market Access Property Rights: Implications for Global Labor and Environmental Issues," *The Journal of Economic Perspectives*, Vol. 15, pp. 69–88.

Beck, Thorsten, 2003, "Financial Dependence and International Trade," *Review of International Economics*, Vol. 11, pp. 296–316.

———, Aslí Demirgüc-Kunt, and Ross Levine, 2000, "A New Database on Financial Development and Structure," *World Bank Economic Review*, No. 14, pp. 597–605.

Blanchard, Olivier, and Michael Kremer, 1997, "Disorganization," *Quarterly Journal of Economics*, Vol. 112, pp.1091–1126, (Cambridge, Massachusetts: MIT Press).

Botero, Juan, Simeon Djankov, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, 2003, "Regulation of Labor," NBER Working Paper No. 9756, (Cambridge, Massachusetts: National Bureau of Economic Research).

Bulow, Jeremy, and Lawrence Summers, 1986, "A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination, and Keynesian Unemployment," *Journal of Labor Economics*, Vol. 4, pp. 376–414.

Caballero, Ricardo, and Mohamad Hammour, 1998, "The Macroeconomics of Specificity," *Journal of Political Economy,* Vol. 106, pp. 724–67.

Claessens, Stijn, and Luc Laeven, 2003, "Financial Development, Property Rights, and Growth," forthcoming *Journal of Finance*.

Cowan, Kevin, and Alejandro Neut, 2002, "Intermediate Goods, Institutions, and Output Per Worker," mimeo, MIT 2002.

Davis, Donald, 1995, "Intra-Industry Trade: A Heckscher-Ohlin-Ricardo Approach," *Journal of International Economics*, Vol. 39, pp. 201–226.

Dixit, Avinash, and Victor Norman, 1980, "Theory of International Trade," (Cambridge: Cambridge University Press).

Feenstra, Robert, John Romalis, and Peter Schott, 2002, "U.S. Imports, Exports, and Tariff Data, 1989–2001," NBER Working Paper 9387 (Cambridge, Massachusetts: National Bureau of Economic Research).

Galor, Oded, and Andrew Mountford, 2003, "Why Are a Third of People Indian and Chinese? Trade, Industrialization and Demographic Transition," mimeo, Brown University, 2003.

Grossman, Gene, and Elhanan Helpman, 1994, "Protection for Sale," *American Economic Review*, Vol. 84, pp. 833–850.

———, 2001, "Special Interest Politics," Cambridge, Massachusetts: MIT Press).

———, 2002a, "Interest Groups and Trade Policy," (Princeton: Princeton University Press).

———, 2002b, "Integration versus Outsourcing in Industry Equilibrium," *Quarterly Journal of Economics*, Vol. 117, pp. 85–120.

———, 2002c, "Outsourcing Versus FDI in Industry Equilibrium," *Journal of the European Economic Association*, Vol. 1, pp. 317–27.

———, 2003, "Outsourcing in a Global Economy," mimeo, Harvard University, 2002.

Grossman, Sanford, and Oliver Hart, 1986, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, Vol. 94, pp. 691–719.

Hall, Robert, and Chad Jones, 1999, "Why Do Some Countries Produce So Much More Output per Worker than Others," *Quarterly Journal of Economics*, Vol. 114, pp. 83–116.

Hart, Oliver, and John Moore, 1990, "Property Rights and the Nature of the Firm," *Journal of Political Economy*, Vol. 98, pp. 1119–58.

Helpman, Elhanan, and Paul Krugman, 1985, "Market Structure and Foreign Trade," (Cambridge, Massachusetts: MIT Press).

Hillman, Arye L., 1989, "The Political Economy of Protection," (Chur, Switzerland: Harwood Academic Publishers).

Husted, Steven, and Michael Melvin, 2001, "International Economics," 5th ed., Addison Wesley Longman.

Johnson, Simon, John McMillan, and Christopher Woodruff, 2002a, "Courts and Relational Contracts," *Journal of Law*, Economics and Organization, Vol. 18, pp. 221–277.

———, 2002b, "Property Rights and Finance," *American Economic Review*, Vol. 92 (5) (December), pp.1335–56.

Kaufmann, Daniel, Aart Kraay, and Pablo Zoido-Lobaton, 2002, "Governance Matters II: Updated Governance Indicators for 2000–01," World Bank Policy Research Department Working Paper No. 2772 (Washington: World Bank).

Krugman, Paul, 1990, "Rethinking International Trade," (Cambridge, Massachusetts: MIT Press).

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, 1997, "Legal Determinants of External Finance," *Journal of Finance*, Vol. 52, pp.1131–1150.

———, 1998, "Law and Finance," *Journal of Political Economy*, Vol. 106, pp. 1113–55.

Lawson, Ann, 1997, "Benchmark Input-Output Accounts for the U.S. Economy, 1992," *Survey of Current Business*, (November).

Lucas, Robert, 1990, "Why Doesn't Capital Flow from Rich to Poor Countries?," *American Economic Review, Papers and Proceedings*, Vol. 80, pp. 92–96.

Maddison, Angus, 2001, "The World Economy. A Millennial Perspective," Development Centre of the Organization of Economic Co-operation and Development.

McMillan, John, and Christopher Woodruff, 1999, "Interfirm Relationships and Informal Credit in Vietnam," *Quarterly Journal of Economics*, Vol. 114, pp.1285–1320.

Rajan, Raghuram, and Luigi Zingales, 1998, "Financial Dependence and Growth," *American Economic Review*, Vol. 88, pp. 559–586.

Ranjan, Priya, and Jae Young Lee, 2003, "Contract Enforcement and the Volume of International Trade in Different Types of Goods," mimeo, UC Irvine.

Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi, 2002, "Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development," mimeo, Harvard University.

Romalis, John, 2004, "Factor Proportions and the Structure of Commodity Trade," *American Economic Review*, Vol. 94, pp. 67–97.

Schuler, Philip, 2003, "Institutions and the Changing Composition of International Trade in the Post-Socialist Transition," Ph.D. Dissertation, University of Maryland, 2002.

Williamson, Oliver, 1985, "The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting," The Free Press.

Young, Alwyn, 1991, "Learning-by-Doing and the Dynamic Effects of International Trade," *Quarterly Journal of Economics*, Vol. 106, pp. 369–405.