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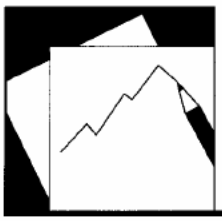

IMF Working Paper

Institutional Quality and International Trade

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Institutional Quality and International Trade

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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.

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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.

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[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.

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[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.

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[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 $\tau^N < \tau^S$.

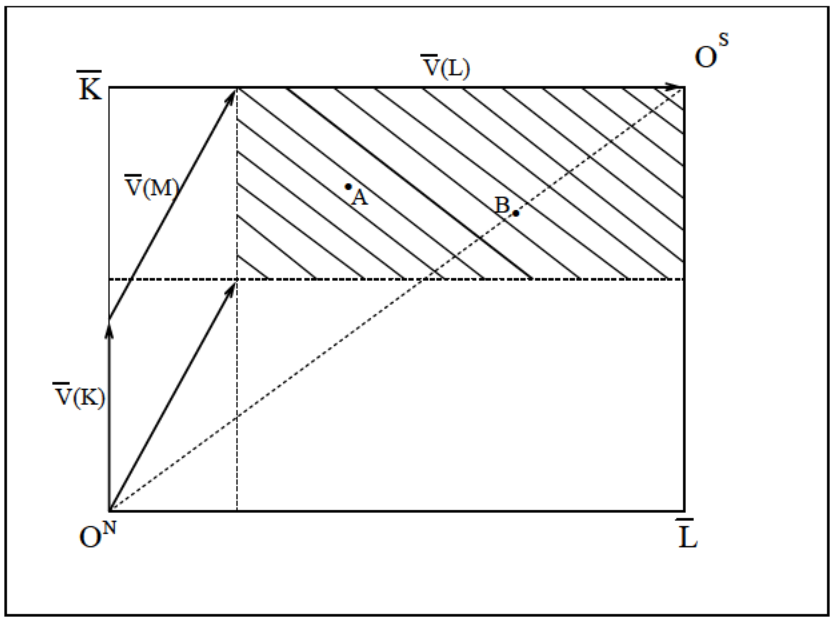
Without institutional differences ($\tau^N = \tau^S$), the model satisfies all the assumptions of the standard Heckscher-Ohlin factor proportions theory (see Helpman and Krugman, 1985, ch. 1). The unequal institutional quality introduces a Ricardian productivity difference in one sector, and thus the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

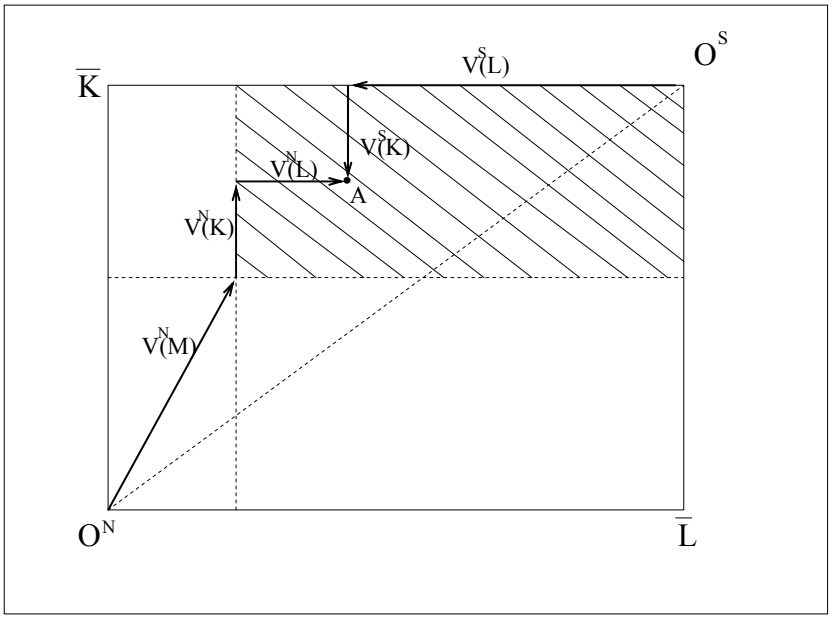


The shaded area represents the FPE set. The key intuition in constructing this set is as follows: the FPE set is those country endowments for which the integrated equilibrium production pattern is replicated by trade in goods. Since the North has an absolute technical advantage in production of the M-good, 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

same $\frac{K}{L}$-ratio, and that after opening to trade we are in the FPE set (e.g., the endowments are given by a point such as *B* on the diagonal in Figure 1). Because $\frac{K^N}{L^N} = \frac{K^S}{L^S} = \frac{\overline{K}}{\overline{L}}$, we know that $E^N = E^T$.[7] This delivers a significant simplification. Because only the Northern technology is used in the *M*-sector under trade, the goods and factor prices under trade are the same as the Northern autarky prices: $w^T = w^N$ and $r^T = r^N$.

The fact that welfare in the North is unchanged implies that the gains from trade accrue entirely to the South. We can show that welfare of both factors unambiguously rises in the South as a result of trade: $w^T > w^S$ and $r^T > r^S$.

More generally, when factor proportions differ between the North and the South, there will be gains from trade to the North as well, and the standard results still obtain: if the North is capital abundant, capital in the North gains while labor loses. However, the South will always benefit relatively more than the North. This is because in the North the gains are driven purely by factor proportions differences, while in the South the factor proportions-driven gains are augmented by an effective technology improvement, as the *M*-good is now produced with superior technology.

To summarize, as a result of trade opening the South loses all of its *M*-sector, but factor rewards increase, as it is able to take advantage of the North's superior institutions purely through trade. All in all, this is a well-behaved setting that confirms the basic intuition a trade economist might have: if the South is institutionally inferior, it can only gain from trade with the North. The main conclusion, then, is that trade bails out the South: the institutionally weak country no longer bears any consequences of its weak institutions. The outcome is markedly different when we think of institutions as the quality of the contractual environment. This is the case we turn to next.

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[7]Under the assumptions we made, the prices, and the resource allocation *E*, are a function of the relevant $\frac{K}{L}$-ratio only, and not of levels of endowments. This is easy to establish by plugging the equilibrium values of production and consumption, (8), (9), and (10) into the expressions for equilibrium prices, (2), (3), and (4). Since production in all three sectors can be expressed as a linear function of *L*, the *L*-term will cancel out of the expression for prices, leaving them to depend on $\frac{K}{L}$-ratio only, so long as we can show that *E* depends only on the $\frac{K}{L}$-ratio as well. We can then derive an expression which implicitly describes the equilibrium resource allocation *E* from the equilibrium condition (7). With some manipulation, we can show that equilibrium *E* satisfies:

$$\frac{\gamma}{E} = \frac{\beta}{1-E} + \frac{\alpha x}{\frac{K}{L} - xE},$$

which is a function of the $\frac{K}{L}$-ratio only. Thus, when $\frac{K^N}{L^N} = \frac{K^S}{L^S} = \frac{\overline{K}}{\overline{L}}$, the integrated economy is simply a scaled-up version of the North.

B. Case II: The Grossman-Hart-Moore View of Institutions

In a world where imperfect institutions lead to distortions in the economy, the Ricardian view may fail to capture the consequences of trade that is driven by institutional comparative advantage. Institutional arrangements determine how agents overcome transactional impediments that arise when economic relationships are formed. We now present a modeling approach in which the consequence of these transactional impediments is not to lower productivity, but to create significant distortions.

Modeling Institutional Differences

To model a setting in which contract enforcement and property rights matter, we adopt the approach developed by Williamson (1985), Grossman and Hart (1986), and Hart and Moore (1990) and assume that when two distinct parties invest in joint production, some fraction of their investment becomes specific to the production relationship. A consequence of this investment irreversibility is that it makes the parties more reluctant to enter, introducing inefficiency. One way to get around this problem is to write binding long-term contracts. This is exactly where institutions—contract enforcement and the like—matter a great deal.

It is important to note that this is a very general argument relevant in all kinds of relationships: within firms and at arm's length, between producers within a supply chain, between managers and outside investors, between owners and employees, etc. Institutional quality determines the severity of transactional impediments that generally arise when two or more distinct parties form a production relationship. We focus on the archetypal case in which the parties to the production are *K* and *L*. In order to analyze the impact of institutions on trade outcomes, we start with the 2-factor, 3-good model employed in the previous subsection.

The modeling approach follows Caballero and Hammour (1998). In particular, we assume that a fraction ϕ of capital's investment in the *M*-good sector becomes specific to the relationship.[8] The parameter ϕ is meant to capture quality of contract enforcement and property rights, and its value will differ across countries. In principle, ϕ is a consequence of both technological features of the production process and the institutional environment. This paper naturally favors the latter interpretation. Countries are assumed to have the same underlying production technology that requires *K* to make specific investments. What induces differences in ϕ is the degree to

[8]Generally, specificity is relevant for *L* as well. That is, fractions ϕ^L of *L* and ϕ^K of *K* become specific to the production unit. All that matters for the results, however, is the net effective specificity which in our case would be $\phi^K rx - \phi^L w$ (see more on this in Caballero and Hammour 1998). All the results in this paper hold except for the knife-edge case in which the parameter values are such that the net effective specificity is zero. Thus, we sacrificed ϕ^L for expositional simplicity, and set $\phi^K = \phi$.

which K can avoid specificity by writing enforceable contracts, a reflection of a country's institutional quality.

We think of a better institutional environment as lower values of ϕ. In other words, if contracts and property rights are well-enforced, each agent will be able to recoup its *ex ante* investment to a greater degree. In the limiting case when $\phi = 0$, institutions are perfect and we are back to the standard frictionless setting.

What are the consequences of imperfect institutions? Recall that one unit of L and x units of K are required to produce y units of M. After the production unit is formed, K can only recover a fraction $(1-\phi)$ of the investment. In order to induce K to form the production unit, it must be compensated with a share of the surplus, which is given by the revenue minus the *ex post* opportunity costs of the factors:

$$s = p_M y - w - r(1-\phi)x$$

We adopt the assumption that *ex post* the parties reach a Nash bargaining solution and each receive one half of the surplus. Thus, K will only enter the M-good production if its individual rationality constraint

$$r(1-\phi)x + \frac{1}{2}s \geq rx$$

is satisfied. This can be rearranged to yield:

$$p_M y \geq w + (1+\phi)rx. \tag{11}$$

This approach to modeling institutions is easily embedded in the general equilibrium model of the previous subsection, where p_M, w, r, and the size of the M-sector E are endogenously determined. Notice that in general equilibrium, condition (11) can be interpreted as a joint restriction on w, r, and p_M, and will hold with equality. Writing it in this form shows that it parallels the condition that unit price equals the unit cost, (7).

The rest of the model is unchanged. The closed economy equilibrium is characterized by equations (2) through (6), (11), and (8) through (10).

Institutional imperfections modeled here have two key consequences. First, in general equilibrium one of the factors—L in our case—is segmented: its rewards differ across sectors. Equation (11) makes it possible to calculate the reward to a unit of labor employed in the M-sector:

$$w + \frac{1}{2}\left[p_M y - w - (1-\phi)rx\right] = w + \phi rx. \tag{12}$$

It is clear from this expression that L earns rents in the M-sector, of size ϕrx.

Second, contracting imperfections imply that the outcome is inefficient. There is underinvestment in the M-good production, and w and r are lower than in the efficient case.

This is intuitive. Imperfect institutions imply that it is harder to induce capital to enter the *M*-sector. Compared to the frictionless case, *w* and *r* must be pushed down, and p_M pushed up to satisfy the individual rationality condition for capital. This is achieved by reducing the size of the *M*-sector, which simultaneously pushes the factors into the *K*- and the *L*-sectors, lowering *w* and *r* and raising p_M. The effect is monotonic in ϕ: higher values of ϕ lead to lower *E*, *w*, and *r*. Notice also that for a given level of ϕ, increasing the size of the *M*-sector will raise both *w* and *r*, thereby raising welfare of all factors employed in all sectors.

In the context of trade, we model better institutions in the North by assuming $\phi^N < \phi^S$: a lower fraction of *K* becomes specific to the *M*-sector production unit in the North. This modeling assumption needs some justification, because it may seem counterfactual. After all, in this type of model the parameter ϕ is traditionally thought of as rigidity of labor market institutions or power of unions. Under this interpretation, the North would be expected to have a higher ϕ, because it is typically believed that unions in the North are stronger. Latest empirical evidence suggests that this conventional wisdom is not correct, however. Botero et al. (2003) show that labor market regulations are actually more restrictive in the South than the North.

There is a more general objection, however. We are interested in the role of quality of contract enforcement and property rights, and not in labor market institutions. The interpretation of ϕ as a quality of contracting institutions is still appropriate, however. Quality of contracts and property rights will affect employment relationships in ways other than through labor laws. In addition, institutional frictions in other relationships will affect both the production allocation and rewards to labor. For instance, the principal lesson from the papers by La Porta et al. is that institutions matter because managers or inside capital expropriate outside investors. In the Appendix, we show that an extension of the model to a setting in which managers expropriate the outside capital (*K*) is straightforward and leaves all the results below unchanged. The basic model in this section can be thought of as a reduced form of a fuller model which includes managers, and in which the relevant difference between the North and the South is the degree to which the managers can expropriate the outside capital.

Trade

To find the pattern of trade, we can use logic very similar to the Davis (1995) model in the previous section. This is because institutional differences act much like a Ricardian comparative advantage.[9] For a given set of factor prices *w* and *r*, the North's better institutions enable it to

[9]Though the approach to solving the model is similar to Case I, note that thinking of institutions in the contract incompleteness sense requires relaxing a different assumption in the standard Heckscher-Ohlin paradigm. In this case, we keep the common technology assumption, and focus instead on contracting problems. In particular, we must abandon the perfect competition in the factor markets assumption.

produce the *M*-good at a strictly lower price, because it is easier to satisfy *K*'s individual rationality condition (11) in the North.

Proceeding in similar steps, we can solve for the integrated equilibrium in which, not surprisingly, only the Northern institutional setting will be used in *M*-good production. There exists an FPE set, in which the integrated equilibrium prices and production patterns are replicated. This requires, just as above, the factor endowments to be such that the entire integrated equilibrium quantity of *M* can be produced in the North.

Diagrammatically, the FPE set looks exactly the same as in the Ricardian view (Figure 1). We must use the term FPE with caution here. Factor rewards are equalized across countries in each sector, but they now differ across sectors. Thus, relative factor rewards across countries will be determined by which sectors operate in which countries. Nevertheless, the FPE set still has the useful feature that for appropriate factor endowments it allows us to analyze the trade outcomes by first constructing the integrated equilibrium.

The pattern of production and trade is similar to that in the previous section, and is depicted graphically in Figure 2. The South stops producing M altogether, and in the North the size of the *M*-sector grows from $E^N L^N$ to $E^T \overline{L}$ —the entire integrated equilibrium value of production.

Welfare Analysis

We again begin with the simplest case, in which the capital-labor ratios are the same across countries. As we saw above, when institutions are thought of in terms of productivity, all the gains from trade accrue to the South. The North's welfare is unchanged. We can now contrast this with the welfare implications that result under the Grossman-Hart-Moore view.
Once again it is true that *E* is a function of the capital-labor ratio only. Because in the trade equilibrium only the Northern *M*-sector is active, we can use the same argument as before to show that from $\frac{K^N}{L^N} = \frac{\overline{K}}{\overline{L}}$, it follows that the trade equilibrium inherits the autarky prices and relative resource allocation of the North ($E^N = E^T$).[10] We can use this to express the gains from trade in a simple form.

Northern base wage is equal to the pre-trade value: $w^N = w^T$ (also $r^N = r^T$: the total reward to capital is unchanged after trade). But the total rewards to labor are the sum of what labor gets in the *L*-good production and the *M*-good production:

$$W_N^T = w^T L^N + \phi^N x r^T E^N \overline{L},$$

compared to the autarky value of

$$W_N^A = w^T L^N + \phi^N x r^T E^N L^N.$$

[10]The argument is virtually identical to that of footnote 4.

It is clear from these expressions that as $\overline{L} > L^N$, the North gains from trade purely because of the shift towards the high-paying *M*-sector jobs. In contrast to the previous case, the North gains from trade even if the underlying factor rewards are unchanged (that is, even if trade does not bring any conventional comparative advantage driven gains).

The situation in the South is very different. Before trade, the total rewards to labor were:

$$W_S^A = w^S L^S + \phi^S x r^S E^S L^S,$$

and $r^S K^S$ to capital. In autarky, some of the labor force was in the high-paying *M*-sector. After trade, the *M*-sector disappears, and the South inherits the base factor prices of the North. The total income is now

$$W_S^T = w^T L^S,$$

for labor and $r^T K^S$ for capital.

Now we can see the forces that determine gains from trade. Capital wins unambiguously, because $r^T > r^S$. Labor experiences conflicting effects: on one hand, the base wage goes up: $w^T > w^S$. This is the standard comparative advantage effect. But on the other hand, all the high-paying jobs are gone. This is the loss of *M*-sector effect driven by institutional weaknesses. Thus, labor's gains from trade,

$$W_S^T - W_S^A = [(w^T - w^S) - \phi^S x r^S E^S] L^S$$

could be negative.[11] For some parameter values, it is even possible that the country as a whole loses by opening up to trade. That is, labor experiences a net loss that is greater than the gain experienced by capital.

Another result concerns factor price convergence. Under the Ricardian view, factor rewards converged perfectly by virtue of being in the Factor Price Equalization Set. In the present case, we once again observe conflicting effects. Rewards to capital are equalized. Trade affects

[11]This expression relies on the implicit assumption that even though workers are strictly better off in the *M*-sector, they do not expend real resources competing for these jobs. Allowing for this possibility does not qualitatively alter the results in this section, provided that the *M*-sector rents are not dissipated completely. Complete rent dissipation occurs when the total expenditure by competing agents is equal to the total size of the *M*-sector rents. It can be ruled out by some relatively innocuous assumptions. For example, rents are not completely dissipated when agents are risk averse, or when agents differ in how much they value being in the *M*-sector. The latter could occur, for instance, if joining the *M*-sector is associated with dislocation (moving to the city), and agents differ in their disutility from it. For a detailed discussion of conditions under which complete rent dissipation breaks down, see Hillman (1989, pp. 58–72).

relative rewards to labor in two ways. First, in the South the base wage w is pulled up to the level of the North, a force towards convergence. On the other hand, however, a higher share of the Northern labor force is employed in the high-paying M-sector, while in the South it goes to zero. Comparing the mean wages under autarky and trade, we can say unambiguously that the average wage goes up in the North, while it may go up or down in the South. The same forces that erode the gains from trade in the South can also produce factor price divergence resulting from trade.

It is worth emphasizing the intuition for these results. Imperfect institutions have two key consequences in our model. The first is in the international goods market: institutional differences affect country production patterns like a Ricardian productivity difference. Thus, the institutionally dependent good is only produced in the institutionally superior country.

The second is in the labor market: in equilibrium L is segmented, with workers in the institutionally dependent sector earning rents. Thus, a country is no longer indifferent as to which sectors are active under trade. Superior institutions allow the North to capture the more desirable sector, which disappears in the South. This is the effect not accounted for under the Ricardian view.

The results may still appear puzzling. After all, the world as a whole experiences an institutional improvement as a result of trade opening. This institutional improvement is relevant only to the South, because the North's institutions are the same as they were in autarky. Shouldn't the South then be the principal beneficiary of trade opening?

To resolve the seeming paradox, it is useful to contrast the trade outcome with a hypothetical case of institutional improvement in a closed economy. Recall that imperfect institutions imply that E, w and r are all lower than the efficient values. In autarky, improving institutions has two effects on welfare. First, it raises the opportunity costs of the factors, w and r. Second, it allows a higher share of L to move to the high-paying M-sector.

When the institutional improvement is due to trade, as is the case in the South, the first effect is still present, but the second effect goes in the opposite direction. In fact, the worldwide efficiency gain is achieved precisely by moving the M-sector out of the South. Which effect dominates is determined by parameter values. It is useful to consider two extreme examples. First, suppose that the countries are very similar, with the North's institutions being better by an exceedingly small ε: $\phi^S = \phi^N + \varepsilon$. As a result of trade opening, the worldwide institutional improvement has been negligible, and thus for the South the first effect is nearly zero. The second effect is still very strong, as even a small difference in institutions implies that the high-paying sector moves out entirely. The South is sure to lose in this case.

On the other hand, suppose that the North achieved perfect institutions: $\phi^N = 0$. Under trade, there is no longer market segmentation, and the first-best levels of factor prices are achieved in all countries and sectors. In this case, the first effect dominates. Opening to trade with the North

implies that the South reaches the first-best level of aggregate welfare, entirely escaping the costs of its weak institutions.[12]

Once again, the analysis readily incorporates factor endowment differences between countries. In the traditional setting, capital in the North gains, while labor loses from trade. The effect of institutional differences is superimposed on that. Thus, the factor proportions-driven loss to labor is offset by the increase in the size of the high-paying *M*-sector. In the South, the relatively abundant labor's gains are eroded by the loss of the *M*-sector.

Finally, it is also useful to look at how institutional quality affects welfare under trade. In this example, since South loses all of its *M*-sector, its institutional quality ceases to matter. Better Northern institutions can be shown to increase total welfare in both countries. Keeping in mind that superior institutions mean lower ϕ^N, we observe that better institutions in the North increase rewards to both factors in the South:

$$\frac{dw^T}{d\phi^N} < 0 \quad \text{and} \quad \frac{dr^T}{d\phi^N} < 0.$$

In the North, return to capital increases, but the effect on rewards to labor W_N^T is ambiguous: the base wage w^T increases, as does E^T, but per unit rents are lower because of lower ϕ. This is intuitive: there is some benefit to *L* of having a higher ϕ, because it raises the rents component of labor's income.

To summarize, all of the main results that we obtained when considering the Ricardian view are reversed. When institutional differences are a source of trade, the North is certain to gain, while the South may lose. Rewards to labor may actually diverge as a result of trade. In the previous case we saw that the South stands to benefit the most because it is in effect bailed out by trade. In this case the situation is quite the opposite: if anything, it's the North that gets bailed out. In autarky, expansion of the high-paying *M*-sector in the North was limited by the size of the Northern market. After trade, that sector can expand because of the larger market it now serves.

Equilibrium Outside of the FPE Set

The simple structure of the model makes it easy to analyze equilibria that result when factor endowments lie outside of the FPE set. The key simplifying feature is that two of the goods are produced with only one of the factors. Thus, the rewards that factors can earn in the *L*- and *K*-sectors, *w* and *r*, are equalized under trade for any set of endowments:

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[12]Note that while the aggregate welfare is at the first-best level, *L* may still lose from opening to trade, as it can no longer earn rents in the *M*-sector.

$$w_N^T = bp_L^T = w_S^T$$

$$r_N^T = ap_K^T = r_S^T,$$

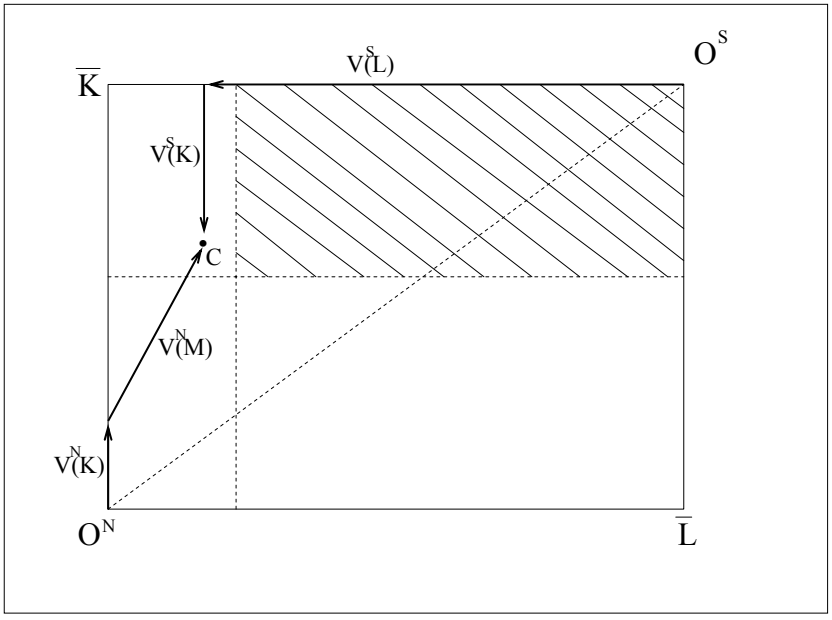
Outside of the FPE set there are several cases to consider. First, when the relative factor endowments are such that the North can produce a quantity of the *M*-good sufficiently close to the integrated equilibrium quantity, the South does not produce the *M*-good. This is because as long as $\phi^N < \phi^S$, and the individual rationality condition for *K* in the North holds with equality:

$$p_M^T y = w^T + (1 + \phi^N) x r^T$$

the South cannot produce *M*:

$$p_M^T y < w^T + (1 + \phi^S) x r^T.$$

Figure 3. Production Pattern Outside of FPE



Such a case is illustrated in Figure 3 for a set of endowments at the point C. In this case the North produces only *K* and *M*, and the entire labor force is employed in the *M*-sector, earning rents. The production of the *M*-good is lower here than under FPE, and thus its relative price is higher. Nevertheless, the South cannot start its own *M*-sector industry, and its entire endowment is dedicated to producing the *K*- and *L*-goods.

More generally, if factor endowments are sufficiently dissimilar, or the North is sufficiently small relative to the South, some production of the *M*-good is possible in the South under trade. Outside of FPE, the most important effect of the model is still present. Compared to autarky, the high-paying *M*-sector shrinks in the South and increases in the North under trade, with the implications for gains from trade that are much the same as in FPE.

C. Factor Prices and Factor Movements

How will factor rewards change as a result of trade opening between a developed country and a developing one? The answer depends on what we think is the difference between the two countries. The most common way of thinking about this issue is to presume that the developed country is relatively capital abundant. This paper has suggested another way, which seems to be at least as relevant empirically: the developed country has better institutions, which allow the factors to be allocated more efficiently.

We can thus compare predictions of our model regarding factor price changes to those derived in the standard factor-abundance model of trade between a poor and a rich country (see, for example, Dixit and Norman (1980)). Since capital is thought to be relatively scarce in the South, the conventional models predict that returns to capital decrease and returns to labor increase when it opens up to trade with the capital-abundant North. In the North it is the opposite: wages go down but return to capital goes up.

These predictions are in sharp contrast with the prediction of this model. Here, Southern capital benefits from opening to trade, whereas labor might lose. On the other hand, the return to capital in the North remains unchanged, whereas rewards to labor increase.[13] These predictions are obtained in the case we considered above where institutional differences were the only source of trade. The model readily incorporates factor proportions differences, and they will still affect factor price changes in the usual way. This example does illustrate, however, that institutional differences could be an important countervailing force to the standard relative factor abundance driven price changes that result from trade.

We can also note here the prediction of this model regarding factor movements. We observe an enormous immigration pressure facing the North from the South, and yet tend to think of capital as a relatively mobile factor. Still, capital does not flow *en masse* from the North to the South, as Lucas (1990) observed. These two facts are not easily rationalized within the basic Heckscher-Ohlin framework. If labor wants to move to the North simply because the world economy is outside of FPE, why doesn't the mobile factor—capital—move to the South to equalize factor rewards? The present framework offers institutions as one plausible explanation of these two facts together.

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[13]It is important to note that this is a direct consequence of assuming that contract incompleteness matters for capital and not for labor ($\phi^K > 0, \phi^L = 0$). Naturally, results are reversed, and more in line with the standard theory if one makes the opposite assumption. We hold the view that the assumption we made is more relevant empirically.

In our model, returns to capital are equalized in all sectors and countries. Thus, it is indifferent as to where it wants to enter production. Labor, however, would much prefer to be in the North. Notice that the source of the migration pressure is not relative factor endowment differences, or differences in productivity. What matters is that once in the North, workers have a chance of joining the high-paying *M*-sector. In the presence of institutional differences, movements of capital—or labor for that matter—cannot equalize factor rewards, as would be the case in a conventional factor proportions model of trade with factor mobility. This is because, as we saw above, rewards to labor will be different even when countries' endowments are identical.

III. INSTITUTIONAL CHOICE

Until now, this paper analyzed the impact of institutional quality on trade outcomes. This section asks the opposite question: how does opening to trade affect institutional quality? The framework above does not allow us to address this, as it treats institutional quality as exogenous. This section adopts a simple political economy model of institutional choice, and analyzes outcomes before and after trade.[14]

We first consider autarky outcome in the two-factor, three-good model developed in the previous section. To analyze institutional choice, we adopt the political economy of special interest groups framework of Grossman and Helpman (2001, ch. 7-8). Suppose there is one policymaker and one interest group representing L—the factor which earns rents when institutions are imperfect.[15]

The policymaker receives a nonnegative contribution of size c from the interest group, and sets institutional quality ϕ to maximize its political objective function $G(\phi, c)$. We adopt the standard assumption that the policymaker maximizes a weighted sum of the aggregate welfare in the economy, $S(\phi)$, and the political contribution:

$$G(\phi, c) = \lambda S(\phi) + (1 - \lambda)c,$$

where $\lambda \in [0, 1]$. In this formulation, λ can be thought of as parameterizing corruption, and shows the extent to which the policymaker is captive to the interest group. At one extreme, when $\lambda = 1$, the policymaker is the benevolent social planner. At the other, when $\lambda = 0$, it

[14]Empirical work (e.g. Acemoglu, Johnson, and Robinson, 2001) provides evidence that institutions are quite slow to change. Thus, this section should be interpreted as modeling the long-run effects.

[15]Strictly speaking, of course, only labor employed in the *M*-sector earns rents, thus in some sense it would be most natural to take only this subset of the labor force to be the interest group. The problem with this choice is that the fraction of the labor force employed in the *M*-sector is itself a function of institutions in our model, so the boundaries of the interest group change with the policy choice. To avoid this problem, we assume that the interest group represents the entire labor force, and choose to ignore disagreements between its different subsets.

cares only about its political contributions, and in effect sets the policy to serve exclusively the special interest.

The interest group influences the policymaker by making its contribution contingent on the government's choice of ϕ. In particular, the interest group confronts the government with a contribution schedule, $c = C(\phi)$, which specifies the contribution the policymaker will receive for each level of ϕ that it might set. The objective function of the interest group is simply *L*'s total welfare, $S_L(\phi)$, net of the contribution:

$$V(\phi, c) = S_L(\phi) - c.$$

The order of events can be thought of as follows: first, the interest group makes its contribution schedule known to the policymaker. Then the policymaker sets institutional quality ϕ. Given this ϕ, agents make their production and consumption decisions.

The last step is simply the equilibrium outcome of the model in the preceding section. Thus, under the assumptions we put on preferences, we know that aggregate welfare equals aggregate real income:

$$S(\phi) = r(\phi)K + [w(\phi) + \phi x r(\phi)E(\phi)]L.$$

$S(\phi)$ is maximized when institutions are perfect ($\phi = 0$), and decreases as institutions deteriorate ($\frac{dS}{d\phi} < 0$). This is intuitive because imperfect institutions introduce a distortion in an otherwise frictionless setting. The reward to capital, $r(\phi)$, decreases unambiguously in ϕ, as does $w(\phi)$.

Imperfect institutions can arise because the agents extracting rents can lobby the policymaker. The interest group's objective function is labor's real income net of the contribution:

$$V(\phi, c) = [w(\phi) + \phi x r(\phi)E(\phi)]L - c.$$

This makes it apparent why *L* will lobby for positive ϕ: imperfect institutions allow it to earn rents equal to $\phi x r(\phi)E(\phi)L$.

The labor interest group bribes the policymaker to increase ϕ above the socially optimal value of zero. The contribution must be large enough to compensate the government for the disutility it suffers from the resulting decrease in aggregate welfare. It is possible to show that in this

setting the equilibrium institutional quality ϕ^* is the one that maximizes a weighted sum of all agents' welfare levels, with higher weight given to those belonging to the interest group:[16]

$$\phi^* = \arg\max_{\phi\in[0,1]}\{[w(\phi) + \phi x r(\phi)E(\phi)]L + \lambda r(\phi)K\}. \tag{13}$$

This formulation highlights the redistributive nature of bad institutions: ϕ is chosen to maximize a weighted sum of welfare levels of all agents, but the agents belonging to the interest group receive a higher weight. Aggregate welfare decreases as a result.

This setting lets us consider proximate determinants of institutional quality. *Ceteris paribus,* better equilibrium institutions will result for 1) low corruption (higher values of λ); 2) higher capital-labor ratios. This is intuitive. As discussed above, the interest group must bribe the policymaker enough to compensate for the loss of aggregate welfare. Higher bribes will be required when the policymaker places a low value on campaign contributions. In the extreme case when $\lambda = 1$, there is no way for the interest group to induce a departure from perfect institutions.

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[16]This result can be derived as follows. The policymaker's outside option is not to deal with the interest group at all. Thus, the interest group must provide the policymaker with a utility level at least as great as what it would achieve without dealing with the interest group, $\overline{G}$, obtained by:

$$\overline{G} = \max_{\phi\in[0,1]}\{\lambda S(\phi)\}$$

Thus, the interest group solves

$$\max_{\phi\in[0,1]}\{W(\phi) - c\}$$

subject to

$$\lambda S(\phi) + (1-\lambda)c \geq \overline{G},$$

where $W(\phi) = [w(\phi) + \phi x r(\phi)E(\phi)]L$ is the total rewards to labor. Because the interest group has no reason to give the policymaker a utility level higher than $\overline{G}$, the constraint will bind with equality and the political contribution can be backed out:

$$c = \frac{1}{1-\lambda}\left[\overline{G} - \lambda S(\phi)\right]$$

Therefore, the interest group in effect chooses ϕ to maximize a weighted sum of the its own welfare gross of the contribution and the aggregate welfare:

$$\max_{\phi\in[0,1]}\{(1-\lambda)W(\phi) + \lambda S(\phi)\}$$

which is the same as equation (13).

The capital-labor ratio works in a similar way. Recall that the loss of aggregate welfare from imperfect institutions arises because $r(\phi)$ decreases in ϕ.[17] This effect will be more important in a relatively capital-abundant country. In effect, a higher capital-labor ratio leads to a higher natural weight given to capital, which is unambiguously hurt by higher ϕ.

To summarize, in autarky imperfect institutions can arise as an equilibrium outcome of the political process when the parties extracting rents are allowed to lobby the policymaker. Countries with high corruption and low capital-labor ratios are expected to exhibit inferior institutional quality. This analysis is clearly incomplete, because corruption and the capital-labor ratio are surely affected by institutions. However, it does capture the notion that in autarky equilibrium institutions are a function of the characteristics of the economy.

We can now contrast these conclusions to the outcome under trade. When there are two countries that trade with each other, the interest group in each country must take into account institutional quality of the trading partner as well. The optimal institutional quality becomes a best-response function:

$$\phi^i(\phi^{-i}) = \arg \max_{\phi^i \in [0,1]} \{w(\phi^i, \phi^{-i})L^i + \phi^i x r(\phi^i, \phi^{-i})E^i(\phi^i, \phi^{-i})\overline{L} + \lambda r(\phi^i, \phi^{-i})K^i\},$$

$i = N, S$.

Recalling our analysis of the trade equilibrium, it is easy to see that the unique equilibrium in this game is that of perfect institutional quality in both countries: $\phi^N = \phi^S = 0$. This is driven by the fact that the *M*-sector can only be located in the institutionally superior country, and only the superior country's institutions matter in determining the factor prices. If ever $\phi^i \geq \phi^{-i} \geq 0$ with at least one strict inequality, all parties in country *i* benefit from improving institutions to a level just below ϕ^{-i}. Not only do $w(\phi^i, \phi^{-i})$ and $r(\phi^i, \phi^{-i})$ increase as a result, but country *i* also captures the worldwide rents associated with locating the *M*-sector at home.

The mechanisms that made it possible to observe imperfect equilibrium institutions in autarky no longer work in the presence of a trade partner. Notice that the only reason *L* lobbies to increase ϕ above the socially optimal level of zero is because it can earn rents in the *M*-sector. But under trade, *L* will only capture those rents so long as it is the institutionally superior country. In the institutionally inferior country, *L* will actually have an incentive to lobby for institutional improvement, up to a point at which it has at least slightly better institutions than its trade partner. When both countries are determining their institutions this way, they are forced to

[17] As discussed above, this is a direct consequence of the fact that the participation constraint for *K* in the *M*-sector must hold. In the presence of the holdup problem, the constraint is satisfied in part by pushing capital into the *K*-sector, thereby reducing its opportunity cost *r*. The higher the value of ϕ, the lower *r* must be to satisfy the constraint.

choose the best available quality of institutions. In effect, competition to capture the rent-bearing *M*-sector results in a "race to the top" in institutional quality between countries.

An important feature of this result is that country characteristics no longer matter. The South can be entirely corrupt ($\lambda = 0$), so that the policymaker is completely captive to the special interest group. In autarky, it can have very bad institutions. Nevertheless, trade will force institutional improvement even in the most corrupt country. This is because in a country that has inferior institutions, under trade all groups prefer to improve them, so it no longer matters what weight each group receives. The institutional choice framework therefore provides a scenario in which trade does bail out the South: over time, it forces the less developed country to improve institutions.

It is worth emphasizing that this analysis provides a counterexample to most of the existing arguments about the effect of trade on institutions. It is typically thought that trade leads to a deterioration of institutions in developing countries through a "race to the bottom" effect (see Bagwell and Staiger 2001). Thus, to gain competitiveness, a developing country sacrifices its environmental or labor standards. Here we presented a simple argument to the contrary. In our framework, trade is precisely the mechanism which propels institutional improvement in all trading partners. This result is consistent with the empirical evidence presented by Rodrik, Subramanian and Trebbi (2002), who show that trade has a positive effect on institutional quality in a sample of countries.

This analysis is clearly subject to important caveats. There is a strong degree of history dependence in institutions. Trade barriers, both in the form of transport costs and tariffs, are coming down slowly. In fact, rather improving institutions, a corrupt policymaker may opt to erect trade barriers instead, an option not considered here. This simple framework, however, does capture the key idea that bad institutions are more costly in an open world.

IV. EMPIRICAL EVIDENCE

The basic two-country model we described in the previous sections illustrates the consequences of institutional comparative advantage. When countries open to trade, the institutionally superior country will export the institutionally dependent good. This section aims to test this prediction. The empirical strategy, based on Romalis (2004), exploits variation in institutional quality across countries and dependence on institutions across industries. We use data on U.S. imports disaggregated by industry and country to provide evidence that countries with better institutions capture larger import shares in more institutionally dependent industries.

A. Specification

Because of its simplicity, the basic model we developed above delivers the extreme prediction that the institutionally inferior country does not produce or export the institutionally dependent good, *M*. It is also not useful to talk about import shares in a two-country model. This section outlines an extension of the basic model to derive the predicted relationship between import

shares, industry-level institutional dependence, and country-level institutional quality. Estimation of this relationship serves as a test of the model.

We modify the basic model in three ways. First, we now suppose there are J countries. Second, each country produces its own unique variety of the M-good. We adopt the Armington assumption: varieties of the M-good produced in each country are imperfect substitutes. In particular, while the preferences across the K-, L-, and M-goods are still given by equation (1), now C_M is interpreted as a CES aggregate of the M-good varieties from each country:

$$C_M = \left[\sum_{j=1}^{J} C_{Mj}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}.$$

We assume that $\sigma > 1$, that is, the varieties from different countries are gross substitutes. In any country l, demand for country k's variety of the M-good is given by:[18]

$$C_{Mk}^{l} = \frac{p_{Mk}^{-\sigma}}{\left(\sum_{j=1}^{J} p_{Mj}^{1-\sigma} \right)^{-\frac{\sigma}{1-\sigma}}} C_M^l.$$

The total value of country l's M-sector imports from all countries is:

$$I_M^l = \sum_{\substack{j=1, \\ j \neq l}}^{J} p_{Mj} C_{Mj}^l$$

The share of country k's imports in the M-sector is then:

$$s_{Mk}^{l} = \frac{C_{Mk}^{l}}{I_M^l} = \frac{p_{Mk}^{1-\sigma}}{\sum_{\substack{j=1, \\ j \neq l}}^{J} p_{Mj}^{1-\sigma}}. \tag{14}$$

The third modification of the model is motivated by our objective to exploit cross-industry differences in institutional dependence. In our empirical estimation, we will proxy for institutional dependence with measures of product complexity based on intermediate good use. Intuitively, institutions are more important to industries that require joining of a relatively large number of parties to production, simply because there are more relationships that are potentially distorted due to imperfect institutions.

[18] See Helpman and Krugman (1985, pp. 117-118).

To illustrate the link between product complexity and institutional dependence, we modify the production technology of the *M*-good to include multiple intermediates, in the spirit of Blanchard and Kremer (1997). In particular, suppose that in addition to *K* and *L*, production of the *M*-good requires the use of *(n-1)* intermediates, organized along a chain of production. For simplicity, we assume that each intermediate good producer's outside option is zero. The producer of the first intermediate joins with *x* units of *K* to produce one unit of intermediate 1, and because of contracting imperfections, a share ϕ of *K*'s investment becomes specific to the relationship. Once that unit is produced, the first producer joins with a second intermediate producer, and again a fraction ϕ of the value of the first intermediate good becomes specific to producer 2, and so on. The *(n-1)*-th intermediate producer joins with *L* to produce the final *M*-good, again becoming partly specific to the relationship. In each case, we make our usual assumption that the surplus is divided equally between the parties.

What is the *M*-good price at which production is feasible in this industry? We can solve for it by working backwards from the final goods production stage and using the same reasoning we applied in the no-intermediates case of the basic model. The key is that each time a party to production makes a specific investment, its participation constraint must be satisfied. In equilibrium, if production takes place, p_M must satisfy:

$$p_M y = w + (1+\phi)^n rx, \tag{15}$$

an analog to equation (11). This equation shows that if relationships between parties joining for production are subject to frictions ($\phi > 0$), the price of the final good will be increasing in the product complexity, *n*. This means that for a given level of institutional quality, the amount of *M*-good produced in equilibrium will be lower the higher is the *M*-good's complexity. Also, for a given level of *M*-good's product complexity, a country with better institutions (lower ϕ) will enjoy a higher level of *M*-good production.

Combining equations (14) and (15), suppose that country *k* has a level of institutional quality ϕ^k. Plugging p_{Mk} into equation (14), taking logs, and making a further simplifying assumption that *w* is close to zero,[19] we get the following approximate relationship between country *k*'s share of imports to country *l*:

$$\ln(s^l_{Mk}) \approx (1-\sigma)n\ln(1+\phi^k) + D_{lk}. \tag{16}$$

Using the assumption that $\sigma > 1$, we can thus establish that countries with inferior institutions (higher ϕ) will have lower import shares in the institutionally intensive sector (*M*). Furthermore, this effect will be stronger the more institutionally intensive is the *M*-sector

[19]Alternatively, we could assume that the labor intensity in the *M*-sector production is very low.

(higher n). The last term, D_{lk}, summarizes the features of the trading countries, as well as characteristics of the M-sector, such as factor intensity.

Our empirical analysis aims to test this prediction using import data for the U.S.. Of course, any empirical test of the impact of institutions on trade patterns must control for other determinants of trade. Romalis (2004) developed a simple empirical model which shows that factor endowments of skilled labor, unskilled labor, and capital are important in explaining U.S. import patterns across countries and industries. We augment his model to include institutional intensity. Specifically, we estimate:

$$rel\_share_{ic} = \alpha + \beta_1 inst\_dep_i * inst_c + \beta_2 skint3_i * skill_c + \beta_3 capint3_i * capital_c + \gamma_c + \delta_i + \varepsilon_{ic},$$

where i indexes industries and c countries. In particular, rel_share_{ic} is country c's U.S. import share in sector i, normalized as we will explain below. Industry-level variables $capint3_i$ and $skint3_i$ are measures of capital and skill intensity, and country-level variables $capital_c$ and $skill_c$ measure capital and skill abundance. To these we add an industry-level measure of institutional dependence ($inst\_dep_i$), and a country-level measure of institutional quality ($inst_c$). Motivated by equation (16), we are most interested in the coefficient on the institutions interaction term, β_1. A positive estimate of β_1 would provide evidence consistent with the predictions of the model: countries with better institutions capture higher trade shares in institutionally intensive sectors. Our estimation includes a full set of both country and industry dummies.

B. Data Sources and Variable Definitions

We use data on the 1998 U.S. imports classified by 4-digit SIC industry and country of origin, available on the National Bureau of Economic Research website. Overall, there is trade data for 177 countries and 389 industries. The left hand side variable that we use, rel_share_{ic}, is country c's trade share in sector i, divided by the average share of country i in U.S. imports. This is done to make the coefficient comparable across countries and is meant to account for country size and the closeness of its trade relationship to the United States.[20]

Our empirical strategy requires a variable that captures industry-level institutional dependence. There is no well-accepted industry-level index of institutional dependence, and, indeed, the very notion is much more vague than, for example, capital intensity. Consistent with the model outlined in the previous subsection, we proxy for $inst\_dep_i$ with a measure of product

[20]A log-transformation cannot be used because many of the import shares are 0. Dropping all observations in which import shares are zero and estimating a specification with $log(rel\_share_{ic})$ as the dependent variable improves both the fit of the regression and the significance of the coefficient of interest.

complexity. In particular, we use the Herfindahl index of intermediate input use, computed from the U.S. Input-Output Use Table for 1992.[21]

The Herfindahl index has been used to measure product complexity and proxy for institutional dependence in the literature (e.g. Blanchard and Kremer 1997, Cowan and Neut 2002). The rationale for using it rather than simply the number of intermediates employed in production is the following. If intermediate input use is dominated by one or two inputs (high concentration), and all the other intermediates are used very little, then what really matters to the final good producer is the relationship it has with the largest one or two suppliers. The scope for and importance of expropriation by suppliers of minor inputs is probably much smaller than by important suppliers. Thus, simply taking the number of intermediates may give excessive weight to insignificant input suppliers and overestimate the effective reliance on institutions. Because the Herfindahl index increases with concentration, we multiply it by -1 in order to have a measure that increases in institutional intensity.

We control for factor intensity differences in production coupled with factor endowment differences across countries. In particular, we take as a baseline a three-factor model, with unskilled labor, skilled labor and capital. Capital intensity ($capint3$) of an industry is measured as one minus the share of total compensation in value added. Skilled labor intensity ($skint3$) is then the ratio of nonproduction workers to total employment multiplied by the total share of labor in value added, $(1 - capint3)$. Unskilled labor is the third factor.[22] These are 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. While all industry-level measures are calculated using U.S. data, the estimated coefficients are interpretable as long as there are no factor intensity or institutional intensity reversals.

Country-level measures of skilled labor and capital abundance are adopted from Hall and Jones (1999), and are available for 123 countries. Finally, to measure institutional quality we use the index developed by Kaufmann, Kraay and Zoido-Lobaton (2002), which is a composite indicator of protection of property rights and strength of the rule of law for the 1990's. The index ranges between -2.5 (lowest institutional quality) and 2.5. The final sample contains 117 countries and 389 industries.

Table A1 lists some of the least and most institutionally intensive sectors. Industry-level variables are summarized in Table A2. Institutional dependence is slightly negatively correlated with capital intensity (correlation coefficient of -0.131), and positively, but not strongly,

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[21]We use this and other measures intermediate input use concentration following the work of Cowan and Neut (2002). We are grateful to Kevin Cowan for sharing the Stata code that generates these measures.

[22]A measure of unskilled labor intensity is not included in the regression because by construction it is spanned by the constant term, $capint3$, and $skint3$.

correlated with skill intensity (correlation of 0.277). Summary statistics for country-level variables are given in Table A3. The economies for which all the necessary data are available are listed in Table A4.

C. Results and Robustness

The baseline results are presented in Table 1. Column (1) is the closest to the basic Romalis (2004) three-factor specification, and does not include industry dummies. The coefficient on the interaction term is of the expected sign and highly significant. The effect is quantitatively important as well. In a country that moves from the 25th to the 75th percentile in institutional quality, the predicted relative import share in the good occupying the 25th percentile in institutional intensity decreases by 0.09, and the predicted relative import share in the good corresponding to the 75th percentile in institutional intensity increases by 0.18. The effect is quantitatively similar to the analogous effects in capital and skill intensity and abundance. The model is robust to inclusion of industry dummy variables, which is done in column (2) of Table 1. The coefficient on the interaction term is very similar to the base specification, and its significance is unchanged.

Table 1. Baseline Specification

Dep. Var: Normalized Share of a Country's Imports in Total Imports		
	(1)	(2)
(herfindahl index)*inst	2.51	2.36
	(0.68)***	(0.64)***
herfindahl index	-4.12	
	(0.69)***	
(skill intensity)*(skill endow)	12.34	11.54
	(2.05)***	(2.18)***
skill intensity	-10.57	
	(1.76)***	
(capital intensity)*(cap. endow)	0.53	0.49
	(0.30)*	(0.28)*
capital intensity	-4.51	
	(3.00)	
Country Dummies	yes	yes
Industry Dummies	no	yes
Observations	31568	31568
Industries	389	389
Countries	117	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.

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]

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[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.

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