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ABSTRACT

It has long been recognized that a country's tariffs are the endogenous outcome of a rent-seeking game whose equilibrium reflects national institutions. Thus, the structure of tariffs across industries provides insights into how institutions, as reflected in tariff policies, affect long-term growth. We start with the commonplace perception among politicians that protection of skill-intensive industries generates a growth-enhancing externality. Modifying the Grossman-Helpman protection for sale model to allow for this, we make two predictions. First, a country with good institutions will tolerate high average tariffs provided tariffs are biased towards skill-intensive industries. Second, there need not be any relationship between average tariffs and good institutions. Using data for 17 manufacturing industries in 59 countries over approximately 25 years, we find that average tariffs are uncorrelated with output growth and that the skill-bias of tariff structure is positively correlated with output growth. We interpret this to mean that countries grow faster if they are able and willing to put a lid on the rent-seeking behaviour of special interest lobby groups.
We show that our results are not compatible with explanations that appeal to (1) externalities per se, (2) initial industrial structure that is skewed towards skill-intensive industries, or (3) the effects of broader institutions such as rule of law and control of corruption.

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1. Introduction

It has long been recognized that a country's tariffs are the endogenous outcome of a rent-seeking game whose equilibrium reflects national institutions e.g., Krueger (1974), Grossman and Helpman (1994) and the review by Gawande and Krishna (2003). Thus, the structure of tariffs across industries can provide insights into how institutions, as reflected in tariff policies, affect long-term growth. We investigate the relationship between a country's domestic institutions and its tariff structure using Grossman and Helpman's (1994; 1995; 2001) 'protection for sale' model. We then take the theoretical predictions to the data by estimating the industry level relationship between tariffs and output growth for a sample of 17 industries in 59 countries over the last 25 years.

Our empirical point of departure is a rich literature on the relationship between average tariffs and per capita GDP growth e.g., Edwards (1992, 1998), O'Rourke (2000), Vamvakidis (2002), Yanikkaya (2003), Clemens and Williamson (2004), Jacks (2005) and DeJong and Ripoll (2006).[1] These papers make a number of contributions, highlighting, for example, how the tariff-growth relationship has changed over time and how it varies with the level of development. However, there are two very specific senses in which these papers are limited in their analysis of the impact of tariffs on growth. First, many of these papers argue that a positive coefficient on average tariffs should be understood to mean that there is a positive externality. Yet a key result of Grossman and Helpman's (1990; 1991) analysis of tariffs, externalities, and endogenous growth is that what matters is not just the average tariff, but the *structure* of tariffs. For example, a country with high average tariffs will grow rapidly if tariffs are highest in research-intensive industries and will grow slowly if tariffs are highest in unskilled-intensive industries. It is not the average tariff alone that matters, but the structure of tariffs. Second, these papers ignore the endogeneity of tariffs e.g., Trefler (1993), Goldberg and Maggi (1999) and Gawande and Krishna (2005). If institutions determine tariff policies then the tariff coefficient in a

[1] These are papers that deal explicitly with average tariffs. There are of course many other papers that deal with openness to international trade more generally.

growth regression may simply be picking up the familiar correlation between institutions and growth e.g., La Porta, Lopez-de-Silanes, Schleifer, and Vishny (1997), Hall and Jones (1999) and Acemoglu, Johnson, and Robinson (2001, 2002). To incorporate tariff structure and tariff endogeneity into the existing empirical literature, one needs a theoretical model that allows for multiple industries, externalities that vary across industries, and tariff endogeneity. This turns out to be possible with just a minor modification of the Grossman and Helpman (1994) protection for sale model. In particular, we introduce externalities into their model.

The model yields two predictions about institutions and tariffs. In the model, 'institutions' are defined narrowly in terms of the game played out between industry lobbyists and the government. (See Greif (2006) for a tighter definition of institutions.) In countries with 'good institutions,' policy makers place a heavy weight on both consumer surplus and future growth while placing little weight on the political contributions of industry lobby groups. In our model, tariffs affect future growth via externalities and these externalities vary across industries. Our first prediction is obvious: there need not be any relationship between good institutions and the average level of tariffs. While consumer surplus is reduced by high average tariffs, future growth is enhanced by high tariffs in industries that generate positive externalities.

Our second theoretical result is more subtle and based on two empirical observations. (1) In almost all countries, unskilled-intensive industries have higher tariffs than skill-intensive industries. (We show this below for our sample as well.) Countries that heavily weight consumer surplus will want to reduce price distortions within the tradeables sector and this requires a reduction in the tariffs of unskilled-intensive industries. (2) Skill-intensive industries generate positive externalities.[2] Thus, countries whose policy makers heavily weight future growth will want high tariffs in skill-intensive industries. Putting these two observations together, the ratio of tariffs in skill-intensive industries to

[2]It is not important here whether this is true or whether it is perceived to be true by policy makers. It is also not important whether skill-intensive industries generate a positive externality or whether unskilled-intensive industries generate a negative externality. See Antweiler and Trefler (2002) for supporting general equilibrium evidence of the existence of positive externalities in skill-intense industries.

tariffs in unskilled-intensive industries will be highest in countries with good institutions. More succinctly, countries with good institutions will have a 'skill-biased' tariff structure.

Summarizing the predictions of our amended protection for sale model, average tariffs are not informative about whether a country has good institutions. In contrast, the skill-bias of the tariff structure is indicative of good institutions.

We use these insights to structure an empirical investigation of the impact of tariffs on long-term industry output growth. We provide a new panel database on tariffs and output for 17 manufacturing industries in 59 countries. The panel ends in 2000 and countries enter as early as 1972. We regress long-term industry output growth on own-industry tariffs as well as on two country level tariff measures, the average tariff and the skill-bias of the tariff structure. We find that average tariffs are uncorrelated with long-term industry output growth: countries with lower average tariffs do *not* grow faster. In contrast, the skill-bias of the tariff structure is highly significant both economically and statistically: countries with relatively higher tariffs on skill-intensive industries grow faster. These results also hold in a country level analysis of the impact of tariffs on long-term per capita GDP growth.

There are several possible interpretations of this result beyond what our model provides. A large part of this paper is devoted to sorting out these possibilities – which explains why a formal model is useful – and to discriminating empirically between alternative interpretations. There are three groups of alternative interpretations.

The first is that we are capturing the broader effects of institutions on growth that have already been documented by La Porta *et al.* (1997), Hall and Jones (1999), Acemoglu *et al.* (2001, 2002) and others. This is not the case. For one, by including nine regional dummies we are explaining sample variation within narrowly defined regions. In contrast, other studies include few or no regional dummies and are largely explaining global sample variation. For another, we include *in a single regression* all six World Bank measures of institutions (Kaufmann, Kraay, and Mastruzzi, 2003). The skill-bias of tariff structure is more powerful than any one of these institutional measures and is almost as powerful as the *joint* effect of all six. We interpret this to mean that we are capturing the effect of the narrow lobbying institution described by Grossman and Helpman's protection for sale model.

The second alternative interpretation of our results is that we are capturing externalities alone. Tariffs in skill-intensive industries promote externalities and this in turn promotes growth. However, unless externalities are much larger than typically estimated, the pure externalities interpretation requires there to have been a massive expansion of skill-intensive industries. We find no evidence of this. Further, the externalities would have had to operate at the economy-wide level rather than the industry level and we find no economy-wide effects such as induced human capital accumulation.

The third alternative interpretation is that countries with a skill-biased tariff structure initially had a large skill-intensive sector. Under this interpretation, all we are finding is that initial production structure matters for future growth. However, we control for initial production structure in all of our specifications.

In summary, average tariffs are uncorrelated with both industry level output growth and country level per capita GDP growth. In contrast, the skill-bias of the tariff structure is an important correlate of long-term growth. We explain this fact using the protection for sale model modified to allow for externalities that affect future growth. Rapid growth occurs in countries whose governments are both willing and able to put a lid on the rent-seeking behaviour of special interest lobby groups. Sections 2 to 4 lay out the model. Sections 5 to 7 present the core empirical work.[3] The remaining sections examine alternative explanations of our results and establish robustness.

2. Protection for Sale

We develop a minor modification of the Grossman and Helpman (1994) 'protection for sale' model that generates a rich set of predictions relating the 'quality' of a country's institutions to its cross-industry distribution of tariffs. The minor modification is an

[3] Our core empirical results appear in tables 6 and 7. The impatient reader can jump straight to these.

inter-sectoral externality. Since almost all of the set-up draws directly from Grossman and Helpman (1994), we proceed with a terse exposition.[4]

A representative consumer has separable utility over $n+1$ goods. Goods $i = 1, \ldots, n$ are tradeable while good $i = 0$ is nontradeable. We take good 0 to be the numeraire. Let p_i be the domestic price of good i and let $p = (p_1, \ldots, p_n)$ be the vector of domestic prices. One unit of good 0 output is produced with 1 unit of labor so that the wage rate is unity. Goods $i > 0$ are produced under constant returns to scale using labor and a specific factor. As a result, output q_i depends only on p_i. The consumer resides in a small open economy facing exogenous world prices. Government policies put a percentage gap $\tau_i = (p_i - p_i^*)/p_i^*$ between domestic prices and exogenous world prices p_i^*. We take these policies to be tariff policies though a more general interpretation is possible. To reduce notation we set $p_i^* = 1$ in what follows. The model with p_i^* unrestricted is relegated to the appendix.

The existence of a specific factor provides a motive for protection. Owners of the specific factor coalesce into a lobby whose welfare is described by $W_i(p)$. Exactly as in Grossman and Helpman (1994), this captures four sources of benefit: (1) rents that accrue to the owners of the specific factor used in industry i, (2) labor income of lobby members, (3) a share α_i of the economy-wide consumer surplus, and (4) a share α_i of the economy-wide tariff revenue. The lobby's share α_i is just the fraction of the voting population that owns some of the specific factor of industry i. In return for protection, the lobby gives the government a political contribution $C_i(p)$. W_i and C_i depend on prices in *all* sectors because there is a pecuniary externality: prices in other sectors affect items 3 and 4.

We now introduce our only departure from the Grossman-Helpman set-up. We allow for the possibility that a tariff in one sector generates an economy-wide externality.

[4] See also Grossman and Helpman (1995, 2001), Helpman (1997), Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Gawande and Krishna (2005) and Mitra, Thomakos, and Ulubaşoğlu (2006). A number of papers consider extensions of the original 'protection for sale' model. Mitra (1999) and Magee (2002) allow for endogenous lobby formation, Bombardini (2005) allows for firm heterogeneity and Chang (2005) allows for monopolistic competition.

Consider just two examples. First, protection of skill-intensive industries raises the demand for skills, thus leading to human capital accumulation and possibly to faster future growth. Conversely, protection of unskilled-intensive industries lowers the returns to human capital accumulation and hence retards growth. Second, skill-intensive industries tend to be industries with complex production (Levchenko, 2004) and industries requiring relationship-specific investments (Nunn, 2005). Because of these features of the production process, these industries are subject to opportunistic behaviour. Policies that promote the growth of these industries raise the demand for a good legal environment, thus leading to growth-enhancing institutional reforms. Along these lines, Acemoglu, Johnson, and Robinson (2005) argue that the rise of international trade in the Atlantic economies during the early modern period promoted a demand for institutional reforms that were growth-enhancing. Puga and Trefler (2006) make a related argument in the context of medieval Venice and then show how rapid growth pushed the political equilibrium towards a more protectionist regime that ultimately choked off the Venetian economy.

For our empirical work, we do not want to prejudge the externality. Thus, we allow the externality to be either positive or negative. To model the externality, let $G(p)$ be the welfare (possibly negative) associated with the externalities generated by price (or tariff) schedule p. We do not need to place any restrictions on G for the results related to our empirical work. However, it will simplify the mathematical expressions if we assume that a tariff in industry i affects the externality only via its affect on net exports $x_i(p_i)$.[5] More concretely, we replace $G(p)$ with $G(x(p))$ where $x(p) \equiv (x_1(p_1), \ldots, x_n(p_n))$. Results without this assumption appear in Appendix A. Further, we can make an independent contribution to the theoretical protection for sale literature if in addition we assume separability: $G(x(p)) = \Sigma_{i=1}^{n} G_i(x_i(p_i))$ for arbitrary differentiable functions G_i.

Notice that the externality operates via G, but not via current output, which is denoted by q_i. This is not important for our theoretical model. We have chosen this route because in the empirical work we separate out factors that affect current output from those that affect

[5]The Grossman-Helpman assumptions ensure that demand and supply in sector i depend only on p_i. Hence x_i depends only on p_i.

future output. Therefore, empirically we tend to think of G as the future welfare stream that accrues from a tariff-induced, growth-promoting or growth-retarding externality. Of course, the theoretical interpretation of G is far more general.

Let $\gamma_i G(p)$ be the externality-induced welfare stream that accrues to lobby i where $\Sigma_{i=0}^{n} \gamma_i = 1$. Then the objective function for lobby i is

$$W_i(p) + \gamma_i G(x(p)) - C_i(p). \tag{1}$$

A key modeling insight in Grossman and Helpman's original paper is to write the government's objective function as $aW(p) + C(p)$ for some constant $a > 0$ where $W(p) \equiv \Sigma_{i=0}^{n} W_i(p)$ and $C(p) \equiv \Sigma_{i=1}^{n} C_i(p)$. a captures the weight the government places on gross welfare relative to political contributions. We extend their approach by defining government welfare as

$$aW(p) + bG(x(p)) + C(p) \quad a, b > 0 \tag{2}$$

where b captures the weight the government places on welfare from externalities relative to political contributions.[6]

Equations (1) and (2) satisfy the Bernheim and Whinston (1986) assumptions. Assuming differentiability of all functions, our equations thus also satisfy the Grossman-Helpman assumptions. We can therefore use the wonderfully simple Grossman-Helpman solution methods. We refer the reader to their paper for additional details, including the concept of 'subgame-perfect Nash equilibrium' that we will be using.

3. Characterization of the Equilibrium Tariff Structure

We turn now to characterizing the equilibrium tariff structure $(\tau_1, \ldots, \tau_n) = (p_1 - 1, \ldots, p_n - 1)$. Let I_i be a binary indicator taking on a value of 1 if the industry has an

[6] All of our results hold when $a = b$. However, if one thinks of G as the future welfare stream that accrues from the policy-induced externality then b may be determined by a different set of factors than a. For example, there is a well known tendency for governments to overly discount the impact of current decisions on future outcomes. This phenomenon has been repeatedly documented in the literature on political cycles. For example, Besley and Case (1995) find that lack of electoral accountability due to term limits on U.S. state governors leads to fiscal cycles and slower state growth. This suggests that politicians discount the future because of uncertainty about re-election. Such considerations do not affect a, but do affect b.

organized lobby and a value of 0 if the industry is not organized. Let L be the set of industries that are organized. Let $\alpha_L \equiv \Sigma_{i \in L} \alpha_i$ be the share of voters that own a specific factor in an organized industry $i \in L$. Let $\gamma_L \equiv \Sigma_{i \in L} \gamma_i$ be the share of the externality that accrues to these voters.

Theorem 1 (Protection for Sale with an Externality) *The subgame-perfect Nash equilibrium of the trade-policy game satisfies*

$$\tau_i = \frac{I_i - \alpha_L}{a + \alpha_L} \cdot \frac{q_i(p_i)}{x_i'(p_i)} + \frac{b + \gamma_L}{a + \alpha_L} G_i'(x_i(p)). \tag{3}$$

for $i > 0$ where $x_i' \equiv \partial x_i / \partial p_i > 0$ and $G_i' \equiv \partial G / \partial x_i$.

The proof appears in Appendix A. The first term on the right-hand side of equation (3) is identical to Grossman and Helpman's core proposition 2 (as expressed in their footnote 10). The second term on the right-hand side of (3) is new. To understand its significance, without loss of generality choose i so that industries are ordered by the G_i':

$$G_1' < \cdots < G_n'. \tag{4}$$

This ordering of industries means that a tariff in industry $i + 1$ is more growth-enhancing or less growth-retarding than a tariff in industry i. Growth here refers to a one-time increase in welfare. With this choice of industry ranking, the second term in equation (3) is increasing in i. That is, all else equal, equilibrium tariffs are highest in industries where the impact of tariffs is most growth-enhancing or least growth-retarding. Further, and this is central to our argument, the more weight the government places on the externality (the larger is b), the more skewed is the tariff structure towards high-i sectors.

4. Institutions and the Structure of Protection

The Grossman-Helpman game played by the government and n lobbies is part of what Greif (2006) defines as an institution. We focus on the parameters a and b, which are the exogenous pay-off relevant part of Greif's definition. For brevity, we refer to a and b as a country's institutions. It is natural to think of a and b as parameterizing the degree to which national institutions put a lid on rent-seeking behaviour. There is abundant evidence that measures of the prevalence of rent-seeking, and poor institutions generally, are negatively correlated with long-term growth. It is therefore appropriate to say that the larger are a and b, the 'better' are institutions.[7]

We start with a general statement about the effect of institutions on tariffs. Changes in a and b have two effects. There is a *direct effect* that operates through equation (3), holding q_i/x_i' and G_i' fixed. This direct effect is trivial to calculate – simply differentiate equation (3) with respect to a and b. We will sometimes say that the direct effect *holds constant the structure of production*. There is also an *indirect effect* that captures how changes in a and b lead to changes in τ_i, which lead to changes q_i/x_i' and G_i', which feed back into additional changes in τ_i. This is a far more difficult derivative to calculate. The next theorem deals with both the direct and indirect effects. The proof appears in Appendix B.

Theorem 2 (Institutions and Tariff Structure) *For $i = 1, \ldots, n$:*

1. *The total (direct plus indirect) effect of institutions on tariffs is given by*

$$d\tau_i = -\frac{\tau_i}{\phi_i(p_i)} da + \frac{G_i'}{\phi_i(p_i)} db$$

for some function $\phi_i > 0$.

2. *The direct effect (holding constant the structure of production) of institutions on tariffs is given by*

$$d\tau_i = -\frac{\tau_i}{a + \alpha_L} da + \frac{G_i'}{a + \alpha_L} db.$$

[7] Returning to our interpretation of G as the future welfare stream that accrues from a tariff-induced, growth-promoting or growth-retarding externality, it is useful to think about why b might vary across countries. Institutions such as the constitution may promote transparency and accountability, thus forcing the government to be more forward looking. For example, Persson and Tabellini (2003) find that countries with constitutionally mandated strong accountability via the ballot box have reduced levels of both corruption and government ineffectiveness, have better protection of property rights and, ultimately, have faster growth. Thus, one interpretation of b is that it is a measure of accountability via the ballot box. Persson and Tabellini (2003) also find that relative to parliamentary regimes, presidential regimes are associated with significantly worse economic performance due to worse structural policies and a legal system that is less respectful of property rights. Differences in b across countries can thus be due to more subtle cross-country differences in electoral systems. Overall, we expect b to be highest in countries with political systems that display transparency and accountability, and are thus able to find a better balance between the current interests of rent-seeking lobbyists and the future welfare of the society.

This means that better institutions as measured by a larger a, lead to a smaller value of $|\tau_i|$ i.e., to less of a price distortion.[8] [9] Better institutions as measured by b lead to more complex effects on tariffs that we will explain shortly.

Theorem 2 will now be used to draw implications for standard measures of the tariff structure. In our empirical setting we always control for the structure of production. Therefore, we work with the direct effect only in what follows.

A. *Distortions Between Tradeables and Nontradeables: The Average Tariff*

We turn first to the textbook inefficiency created when a tariff-induced price distortion leads to a static mis-allocation of resources. We are interested in how lobbying affects the size of the distortion. Consider first the textbook inefficiency caused by tariffs that distort the price of tradeables relative to nontradeables. By assumption, the nontradeable $i = 0$ sector has a zero tariff. Let us assume for the purposes of empirical work that all tariffs τ_i are non-negative. Then the distortion between the price of tradeables and nontradeables can be modeled as the weighted average tariff

$$E\tau \equiv \Sigma_{i=1}^{n} \theta_i \tau_i \geq 0$$

where the arbitrary positive weights θ_i sum to unity.

From theorem 2, $\partial E\tau / \partial a < 0$. That is, good institutions as measured by a lead to lower tariffs. The same is not true for institutions as measured by b: $\partial E\tau / \partial b$ cannot be signed without additional information about the G_i'. A country with good institutions as measured by large values of b will tolerate high tariffs in industries that generate positive externalities.

[8] To understand ϕ_i, let Ω be the Goldberg and Maggi (1999) objective function adopted to our setting with externalities. Let Ω_{jj} be its second derivative with respect to p_j. Then $\phi_j(p_j) \equiv -\Omega_{jj}(p_j)/x_j'(p_j)$. The second order conditions for a maximum ($\Omega_{jj} < 0$) ensure $\phi_j > 0$. See Appendix B for details.

[9] An obvious question is about the conditions under which the direct effect is larger than the total effect: when is ϕ_i less than $a + \alpha_L$? With quadratic utility, quadratic profits and linear externalities, $\phi_i = (a + \alpha_L) - (I_i - \alpha_L)q_i'/x_i'$. Hence, the total effect of institutions is larger than the direct effect if and only if industry i is organized ($I_i = 1$). Further, the bigger is the supply response (q_i'), the smaller is ϕ_i. That is, countries with good institutions put more weight on Ramsey rule considerations.

This is of interest because researchers who regress per capita GDP growth on average tariffs often appeal to externalities to explain how higher average tariffs can 'cause' higher growth (Edwards, 1992, 1998; O'Rourke, 2000; Vamvakidis, 2002; Yanikkaya, 2003; Clemens and Williamson, 2004; Jacks, 2005; DeJong and Ripoll, 2006). Our results show that because of the endogeneity of tariffs, there is no clear theoretical relationship between growth and average tariffs.

B. *Distortions within the Tradeables Sector: The Variance of Tariffs*

We have explored price distortions between the tradeable and nontradeable sectors. The richness of the Grossman-Helpman framework allows us to examine price distortions *within* the tradeables sector. One measure of these price distortions is the variance of tariffs across sectors,

$$V\tau \equiv \Sigma_{i=1}^{n}\theta_i(\tau_i - E\tau)^2.$$

Part 2 of theorem 2 implies

$$dV\tau = -\frac{2}{a+\alpha_L}V\tau \cdot da + \frac{2}{a+\alpha_L}Cov(\tau_i, G_i') \cdot db \tag{5}$$

where the Cov operator means the covariance. See Appendix C for a proof. This implies that $\partial V\tau/\partial a < 0$ i.e., better institutions as measured by a shrink all tariffs to zero, thus reducing the price distortion within the tradeables sector.

Consider the sign of $\partial V\tau/\partial b$. Casual empiricism suggests that industries which generate positive externalities are often organized and successful at getting what they want from law-makers. Thus, one expects G_i' and $(I_i - \alpha_L)$ to be positively correlated. In this case, we show in Appendix C that $Cov(\tau_i, G_i') > 0$. Thus equation (5) implies $\partial V\tau/\partial b > 0$ i.e., better institutions as measured by b lead to greater price distortions within the tradeable sector. Thus, $\partial V\tau/\partial a$ and $\partial V\tau/\partial b$ are of opposite sign: better institutions can be associated with either larger or smaller price distortions within the tradeables sector.

C. *Externalities and the Skill-Bias of Tariff Structure*

We next consider the externality bias of the tariff structure. Recall that in equation (4) we ranked industries by $G_i' > G_{i-1}'$. That is, a tariff in industry i is more growth-enhancing or less growth-retarding than a tariff in industry $i-1$. An immediate implication of theorem 2 is the following result about the impact of institutions on tariffs holding constant the structure of production:

$$d(\tau_i - \tau_{i-1}) = \left[-\frac{\tau_i - \tau_{i-1}}{a + \alpha_L} \right] da + \left[\frac{G_i' - G_{i-1}'}{a + \alpha_L} \right] db. \tag{6}$$

It is clear that better institutions as measured by b will lead the government to favour industries that generate positive externalities or at least that do not generate overly large negative externalities: $\partial(\tau_i - \tau_{i-1})/\partial b > 0$. Interestingly, there are solid empirical reasons for thinking that $\partial(\tau_i - \tau_{i-1})/\partial a > 0$.

As is well known, almost every country in the world has a tariff structure that is biased towards unskilled-intensive industries e.g., in both rich and poor countries clothing is protected more heavily than computers. More generally, in the data we will be presenting on 3-digit ISIC industries in 63 countries, the cross-industry correlation between tariffs and skill intensity is negative in 52 of 63 countries and significantly positive in only 1 country. The interesting insight comes from equating the ordering of industries by G_i' with the ordering of industries by skill intensity. The connection between skill intensity, human capital and externalities is a familiar one (e.g., Moretti, 2004). If orderings by externalities and skill intensities overlap, then we know empirically that $\tau_i < \tau_{i-1}$. Hence equation (6) implies $\partial(\tau_i - \tau_{i-1})/\partial a > 0$. As a rises, tariffs fall most in unskilled intensive industries. Why? Since tariffs are highest in unskilled intensive industries the easiest way to reduce average tariffs is to reduce tariffs disproportionately on unskilled intensive industries.

We have now established that better institutions as defined by *both a* and b are consistent with a skill-biased tariff structure. This is the first time in our paper that increases in a and b move tariff structure in the same direction. It suggests that measures of the skill-bias of protection play a unique role for determining the correlation between growth and the structure of tariffs. This novel finding comes out of the protection for sale logic.

Table 1. Summary of the Relationships Between Domestic Institutions and the Tariff Structure.

	Average Tariffs: $E\tau$	**Variance of Tariffs:** $V\tau$	**skill-bias of Tariffs:** $SB\tau$
	Price of tradeables vs. nontradeables	Prices within tradeables	Externality
Economic Effect:			
$\partial(\text{Growth})/\partial(\text{tariff variable})$	$-$	$-$	$+$
Political Economy Effect:			
$\partial(\text{tariff variable})/\partial a$	$-$	$-$	$+$
$\partial(\text{tariff variable})/\partial b$	?[1]	$+$[2]	$+$

Notes: [1] Positive if $G_i' > 0$ for all i and negative $G_i' < 0$ for all i. Indeterminate if the sign of G_i' varies across i. [2] Requires an additional assumption that the covariance between $(I_i - \alpha_L)$ and G_i' is either positive or not too negative.

Table 1 summarizes the results of our theory. The 'Economic Effect' row of the table shows, for each feature of the tariff structure, the predicted economic effect on growth. Because average tariffs distort the price of tradeables relative to nontradeables, higher average tariffs reduce growth. (This is a one-time hit to output.) As well, the variance of tariffs distort prices within tradeables, reducing growth. If there is an externality, the economic effect of a skill-biased tariff structure is positive because it distorts the allocation of resources towards industries in a manner that is either more growth enhancing or less growth retarding.

The 'Political Economy Effect' rows show the correlation between tariff structure and institutions a and b. Only for the skill-bias of the tariff structure does the correlation with a have the same sign as the correlation with b. In a regression of growth on tariff measures, these rows give the direction of the endogeneity bias caused by the correlation between tariff policy and institutions a and b. The table will thus guide the implementation of the regressions and the interpretation of the coefficients.

5. Estimating Equations and Data

We now introduce our basic regressions. Let q_{ict} be the output of industry i in country c in year t. We consider only long-term growth so that we take $t = 0$ to be the initial year (usually 1972) and $t = 1$ to be the final year (usually 2000). Our dependent variable is the average annual change in log output, denoted $\ln q_{ic1}/q_{ic0}$.[10] Let τ_{ic0} be the log tariff in industry i in country c in the initial year $t = 0$. Let $E\tau_{c0}$ and $V\tau_{c0}$ be the output-weighted average tariff and variance of tariffs, respectively, in country c in the initial year 0. Let $SB\tau_{c0}$ be the skill-bias of tariffs in country c in the initial year 0. We will define it carefully below. We are interested in the impact of tariffs τ_{ic0} on output growth. However, if we are interested in the full effect of tariffs, then we must recognize that in general equilibrium tariffs in one industry affect output in other industries. Therefore, our industry regressions include the national measures of tariff structure $E\tau_{c0}$, $V\tau_{c0}$ and $SB\tau_{c0}$. This leads to our estimating equation:

$$\ln q_{ic1}/q_{ic0} = \beta_\tau \tau_{ic0} + \beta_E E\tau_{c0} + \beta_V V\tau_{c0} + \beta_{SB} SB\tau_{c0} + \beta_q \ln q_{ic0} + \mathbf{X}_{c0}\beta_X + \alpha_i + \varepsilon_{ic}. \quad (7)$$

Following the tradition of the tariffs-and-growth literature, we regress output changes on tariff levels. See Edwards (1992, 1998), O'Rourke (2000), Vamvakidis (2002), Yanikkaya (2003), Clemens and Williamson (2004), Jacks (2005) and DeJong and Ripoll (2006). This strategy is particularly relevant in our context where tariffs are correlated with institutions a and b that are best viewed as time-invariant country characteristics.

Our results about tariffs and institutions examined 'direct effects'. In terms of theorem 2, this means holding constant industrial structure q_i and x_i'. Assuming that the slope of the export function is the same for all countries, x_i' is perfectly correlated with our industry fixed effects α_i. That is, we do not need to separately include x_i' in our equation. This leaves only q_i, which appears in our regression as $\ln q_{ic0}$. We also control for a large number of other country-specific variables $\mathbf{X}_{c0}$ that will be introduced as used.

[10] Note that this is an abuse of notation. More precise notation for our dependent variable would be $\frac{1}{t_1 - t_0} \ln q_{i,c,t_1}/q_{i,c,t_0}$ where t_0 is the initial year and t_1 is the final year.

We are also interested in the relationship between tariff structure and the average annual growth rate of per capita GDP, $\ln y_{c1}/y_{c0}$, where y_{ct} is per capita GDP in country c in year t.[11] This leads to our country level estimating equation:

$$\ln y_{c1}/y_{c0} = \beta_E E\tau_{c0} + \beta_V V\tau_{c0} + \beta_{SB} SB\tau_{c0} + \mathbf{X}_{c0}\beta_X + \varepsilon_c. \tag{8}$$

The sample is determined primarily by the availability of industry level tariff data. The industry level sample consists of 59 countries and the country level sample includes an additional 4 countries. The list of countries appears in table 3. To match the SITC-based tariff data with ISIC-based output data we have aggregated the data up to a common set of 17 manufacturing industries. This is described in Appendix D. There are potentially 1,003 ($= 59 \times 17$) industry level observations. However, some of the output data are missing, leaving us with only 942 industry level observations. Output data are from UNIDO's INDSTAT3 2002 production database as described in UNIDO (2003). There are 63 ($= 59 + 4$) country level observations. Per capita GDP data are from the Penn World Tables (PWT), Mark 6.1. Tariff data are from Lai and Trefler (2002) and UNCTAD (1994). As noted above, in the regressions we use the log of ad valorem tariffs rather than the ad valorem tariffs themselves. This is a minor point that is explained in Appendix D.

6. OLS Results for the Mean and Variance of Tariffs

In this section we present results for the growth-tariff nexus excluding the skill-bias of tariffs $SB\tau_{c0}$. We make two points. First and foremost, we wish to familiarize the reader with the type of regressions we are estimating. Second, we show that there is no relationship between growth and either average tariffs $E\tau_{c0}$ or the variance of tariffs $V\tau_{c0}$. We will, of course, have to persuade the reader that our regressors are orthogonal to the residuals. That is, we must deal with endogeneity bias and omitted-variable bias.

Consider table 4. The first set of columns deal with the industry-country level regressions of equation (7). The second set of columns deal with the country level regressions of

[11] Again, more precise notation would be $\frac{1}{t_1 - t_0} \ln y_{c,t_1}/y_{c,t_0}$.

equation (8). We begin by explaining the many ancillary regressors that comprise $\mathbf{X}_{c0}$. Consider first the 'Cohort Fixed Effects.' The availability of disaggregated tariff data is different for each country so that we are unable to use the same time period for all countries. For 21 countries tariffs are available beginning in 1972, for 30 countries tariffs are available beginning in the 1980-83 period and for 12 countries tariffs are available beginning in the 1985-87 period. See table 3 for details. To control for the three different entry periods of these three cohorts, we include cohort fixed effects i.e., three dummy variables with dummy D_{cj} equal to 1 if country c entered in cohort $j = 1, 2, 3$. (The 1972 cohort dummy is the omitted dummy.) From table 4, these cohort dummies are jointly insignificant.[12]

Consider next the region fixed effects. Ideally, we would like to include country fixed effects. However, our tariff variables $E\tau_{c0}$ and $V\tau_{c0}$ are country characteristics that would be annihilated by country fixed effects. Instead, we take the next best approach which is to include detailed region fixed effects. We define 10 regions distilled from the PWT regional classification and include 9 region dummies in our regressions. See table 3 for a list of which countries are in which regions. We are using far more regional dummies than is typical. This is an important point. *It means the sample variation that we are explaining is all within narrowly defined regions.* Thus, for example, we are using tariff structure to explain growth differences within North Africa/Middle East (Algeria, Egypt, Iran, Morocco, Syria and Tunisia). We are not using tariff structure to explain why Algeria has grown slower than the United States.

In addition to these region fixed effects we also include the familiar country characteristics that appear in growth regressions. These are the log of initial per capita GDP, the log of initial human capital, and the initial investment to GDP ratio. See Appendix D for data sources. Without the 9 region fixed effects, these three country characteristics are statistically significant. However, once the region fixed effects are included the three

[12]The data end in 2000. However, in the country level regressions, there are three countries for which per capita GDP data end in 1996: Singapore, Cyprus and Sierra Leone. A dummy for this 1996 cohort is also statistically insignificant.

country characteristics become statistically insignificant. Our main point here is that it will be very hard to find a statistically significant country characteristic when so many region fixed effects are included. This, we believe, makes our results for the skill-bias of tariffs more persuasive.

Finally, we include industry fixed effects. With 17 industries, we include 16 industry dummies. We also include the log of initial industry output in country c, $\ln q_{ic0}$.

We now turn to the tariff results. Consider first the own tariff effect captured by the tariff in industry i in country c, τ_{ic0}. This can only appear in the industry-country level regressions. The coefficient is positive and statistically significant ($\beta_\tau = 0.005$, $t = 2.20$). As expected, higher tariffs in industry i in country c lead to higher output in industry i in country c. The estimated magnitude is large. For example, a one standard deviation increase in the own tariff leads to a 1.0% standard deviation increase in average annual output growth.[13]

Turning to the tariff structure variables of our theory, average tariffs $E\tau_{c0}$ do not matter for output growth at the industry-country level ($\widehat{\beta}_E = 0.007$, $t = 1.82$). Neither does the variance of tariffs $V\tau_{c0}$ ($\widehat{\beta}_V = -0.019$, $t = 0.53$). When regressing industry-country level variables on country level regressors such as $E\tau_{c0}$, we report t-statistics calculated from clustered standard errors. The third column in the table shows that the clustered standard errors are always smaller than the OLS standard errors. For the remainder of this paper, for country level regressors that appear in the industry-country output regressions we report t-statistics calculated from clustered standard errors.

One way of measuring whether the effects of $E\tau_{c0}$ and $V\tau_{c0}$ are large is to consider their overall effect on average annual per capita GDP growth. We do this in the second set of columns of table 4. Consistent with the industry-country level results, at the country level the mean and variance of tariffs are statistically insignificant. They are also economically small. For example, a one standard deviation fall in the variance of tariffs leads to only a .0006 standard deviation rise in the growth of per capita GDP.

[13]See table 2 for the sample statistics used to derive this.

It is possible that the insignificance of $E\tau_{c0}$ and $V\tau_{c0}$ results from a high degree of correlation of these two variables with the many country characteristics that are also included in the regression. This is not the case. Figure 1 shows that there is no relationship between average tariffs and growth. Figure 1 is a graph of the bivariate plot (i.e., without controls) of $E\tau_{c0}$ against the average annual growth of per capita GDP.[14] Figure 2 shows the partial regression plot (i.e., with controls) from the regression reported in table 4. No relationship is apparent in this plot either. Although we do not report them here, the plots for $V\tau_{c0}$ are similar. These results may seem surprising. However, they are completely consistent with the recent empirical evidence showing that there is no clear relationship between average tariffs and subsequent economic growth. Whether or not there is a significant relationship between average tariffs and growth and whether this relationship is positive or negative depends critically on the countries in the sample (DeJong and Ripoll, 2006) and on the time period under consideration (O'Rourke, 2000; Vamvakidis, 2002; Yanikkaya, 2003; Clemens and Williamson, 2004; Jacks, 2005).

Having established that there is no relationship between average tariffs and growth or tariff dispersion and growth, we turn our focus to the skill-bias of tariffs.

7. The Skill-Bias of Tariff Structure

We construct our measure of the skill-bias of the tariff structure $SB\tau_{c0}$ as follows. Define unskilled workers as those with less than 12 years of schooling. All other workers are defined as skilled. Next, rank industries based on the ratio of skilled workers (S_i) to unskilled workers (L_i). Table 5 displays S_i/L_i for the United States in 1972. Data are from Antweiler and Trefler (2002).

Our first measure of the skill-bias of tariff structure is the cross-industry correlation between skill intensity and initial tariffs:

$\rho_c = Corr\{\tau_{ic0}, S_i/L_i\}$ **"The Correlation Measure of the Skill-Bias of Tariff Structure"**.

[14] To prevent the observations from being too compressed in figure 1 we omit Hong Kong.

As noted earlier, most of the countries in our sample have a negative value of ρ_c. This means that tariffs tend to be high in unskilled-intensive industries and low in skill-intensive industries. Figure 3 plots ρ_c against initial per capita GDP in order to give the reader a sense of the ρ_c. The two are positively correlated. This is an indication of the endogeneity around which our theory was built.

Our second measure is constructed as follows. Choose an arbitrary 'cut-off' industry i^* and define all industries i with S_i/L_i less than S_{i^*}/L_{i^*} as unskilled-intensive and all remaining industries as skill-intensive. Let $\tau_c^{Unskill}$ be the initial year, output-weighted average tariff for unskilled-intensive industries and let τ_c^{Skill} be the initial year, output-weighted average tariff for skill-intensive industries. Our second measure of skill-bias is then

$$DIFF_c \equiv \tau_c^{Skill} - \tau_c^{Unskill} \quad \textbf{“The Difference Measure of the Skill-Bias of Tariff Structure”}.$$

An important question is whether our results are sensitive to the choice of i^*. As we show in section 11 below, it does not matter what we choose for i^* provided it is not extremely close to the very top or very bottom of table 5. For now, we proceed by reporting all results for two choices of i^*. From table 5, there are two values of i for which the ratio of skilled to unskilled workers jumps up. In the main text we use these jump points to define two different i^*, which we refer to as the 'low cut-off' and the 'high cut-off'. Let $DIFF_c^{Low}$ and $DIFF_c^{High}$ be the corresponding difference measures.

Another question is whether our results depend on our definition of S_i/L_i or our use of 1972 U.S. data when constructing our skill intensity rankings. We will also report results using rankings based on alternative measures of skill intensity. These alternative measures use different definitions of S_i/L_i and use data from South Africa in 1997 and from Brazil in 1986. Virtually identical results are obtained with the alternative measures so we relegate these results to section 11. The explanation for this surprising robustness is simple. While skill intensities vary across time and countries, the *relative ranking* of industries based on skill intensity barely varies: leather goods are always very unskilled-intensive and professional equipment is always very skill-intensive.[15]

In total, we have three measures of the skill-bias of tariffs $SB\tau_{c0}$. These are ρ_c, $DIFF_c^{Low}$ and $DIFF_c^{High}$. To give the reader a sense of the data and how the $SB\tau_{c0}$ measures are related to the quality of domestic institutions we plot $DIFF_c^{Low}$ against the two most commonly used measures of a country's institutions: (1) democracy, measured using the average democracy score from 1970 to 1994 from the Polity III database and (2) absence of corruption in government index, measured as the average from 1982 to 1995 from the International Country Risk Guide (ICRG) published by the Political Risk Services Group (PRS). The absence of corruption measure captures the extent to which high government officials are likely to demand and accept bribes connected with special privileges such as import and export licenses, tax breaks, loans, etc. We show the bivariate relationship between the two variables and $DIFF_c^{Low}$ in figures 4 and 5. Similar pictures are obtained if one uses ρ_c and $DIFF_c^{High}$. The correlation coefficient between $DIFF_c^{Low}$ and democracy is 0.60 and the correlation between $DIFF_c^{Low}$ and corruption is 0.61. In contrast, the correlation between $DIFF_c^{Low}$ and per capita GDP growth is only 0.33. Thus, consistent with our protection for sale framework, $SB\tau_{c0}$ is highly correlated with measures of the quality of domestic institutions (recall table 1).

A. *Estimates of the Impact of Skill-Biased Tariff Structure*

Table 6 reports our OLS estimates of the industry-country level output growth regressions (equation 7) with measures of the skill-bias of tariffs included. Table 7 reports the corresponding estimates of the country level per capita GDP growth regressions (equation 8). These are the core empirical tables of the paper.

[15]Note that politicians in rich and poor countries will in general disagree as to which industries should be protected i.e., as to which industry has the largest G_i'. For example, protecting clothing may make sense in Mauritius whereas protecting aircraft may make sense in the United States. See Harberger's (1998) mushrooms model. This is an interesting point which shows up in some of our results. In particular, for poor countries the model does best for relatively small i^* whereas for rich countries the model tends to do relatively best for high i^*. In addition, the best-fit i^* tends to be lower using the South African and Brazilian skill-intensity rankings than using the U.S. skill-intensity rankings. We do not pursue this interesting point further.

Column 1 of tables 6 and 7 report the results using ρ_c as our measure of the skill-bias of the tariff structure. Recall that with so many controls we have not yet found a single country level variable that is statistically significant. In contrast, the coefficient for ρ_c is significant. The t-statistic is 4.23 in the industry output growth regression and 3.66 in the per capita GDP growth regression. The magnitude of the coefficient is very large, a fact that we will detail at the end of this section. Further, the contribution to the R^2 is enormous. *Adding just ρ_c to the country level per capita GDP growth regression raises the R^2 from 0.60 to 0.69. The idea that a single regressor could have such a huge effect in a specification that already has 16 regressors is remarkable.*

Column 3 of tables 6 and 7 replace ρ_c with $DIFF_c^{Low}$ as our measure of the skill-bias of the tariff structure. The results are again statistically significant with a t-statistic of 3.46 in the industry output growth regression and 3.51 in the per capita GDP growth regression. In the latter, $DIFF_c^{Low}$ raises the R^2 from 0.60 to 0.70. Column 7 uses $DIFF_c^{High}$ as our measure. The results are even a little stronger than for $DIFF_c^{Low}$, with the R^2 rising to 0.71.

To peel back the onion on what is driving the $DIFF_c \equiv \tau_c^{Skill} - \tau_c^{Unskill}$ results, we introduce τ_c^{Skill} and $\tau_c^{Unskill}$ separately. We do this for the low cut-off in column 5. As expected, the coefficient on τ_c^{Skill} is positive and significant: $t = 4.16$ in the industry output growth regression and $t = 3.66$ in the per capita GDP growth regression. Also as expected, the coefficient on $\tau_c^{Unskill}$ is negative and significant: $t = 2.99$ in the industry output growth regression and $t = 3.40$ in the per capita GDP growth regression.

To check that the results are not being driven by outliers, figures 6 and 7 display partial regression plots for the per capita GDP growth regressions. Figure 6 shows the partial regression plot using ρ_c (column 1 of table 7). Figure 7 shows the partial regression plot using $DIFF_c^{Low}$ (column 3 of table 7). From the plots it is clear that the relationships are not being driven by a small number of influential observations. In section 11 below we provide a battery of regression diagnostics aimed at showing that the results are robust to a variety of specification searches.

We have shown that the coefficient on the skill-bias of the tariff structure is statistically significant. It is also economically significant. In the industry output growth regressions, a one standard deviation increase in ρ_c, $DIFF_c^{Low}$ or $DIFF_c^{High}$ is associated with an increase in average annual industry output growth of 0.018, 0.020 and 0.025 log points. These are moderately large numbers both in absolute terms and relative to the 0.073 standard deviation of log output growth. Note that these are effects that are over and above the own-industry effect of τ_{ic0}.

8. Interpretation of the Results for the skill-bias of Tariff Structure

We now turn to the interpretation of these results in a world in which tariffs are set endogenously in a way that leaves the skill-bias of tariff structure positively correlated with domestic institutions. It is useful to collect the possible interpretations of our results into three groups.

1. Real Effects of Tariffs (from economic and technological externalities): In terms of our model, recall that G may be thought of as the future welfare stream that accrues from a tariff-induced, growth-promoting or growth-retarding externality. This externality may come from either economic or technological sources. Protection of industries with relatively large G_i' creates a positive externality or at least reduces a negative externality. It is possible that our coefficients on the skill-bias of tariff structure are picking up these economic and technological effects.

2. Protection for Sale Effects: In terms of our model, we proved that there is a positive correlation between the skill-bias of the tariff structure and the narrow institutions of tariff rent-seeking captured by the a and b parameters. While countries may not be able to prevent all tariff rent-seeking, some countries are better able to put a lid on the worst abuses of tariff rent-seeking, abuses that protect unskilled-intensive industries at the expense of the skill-intensive industries which generate economic and technological externalities. The problem for us is that higher values of a and b likely make it easier for countries to adopt other purely domestic policies that are also good for growth e.g., policies that are more forward-looking and transparent as in Besley and Case (1995) or

Persson and Tabellini (2003). Thus, there is an independent channel through which a and b may affect growth.[16]

3. Broader Effects of Institutions: Countries that can put a lid on lobbying are likely to have a host of other institutions that are favourable to long-term growth such as a strong democratic tradition and a high quality judicial system. Denote this broader set of institutions as a vector $INST_c$ where larger values of $INST_c$ are associated with more growth enhancing institutions. In general, we expect elements of $INST_c$ to be positively correlated with $SB\tau_{c0}$, a and b. If so, then our coefficient on the skill-bias of tariff structure may be picking up the effects of broader institutions on growth.

It is useful characterize the three interpretations of our results formally. Consider a relationship of the form

$$\ln y_{c1}/y_{c0} = \beta SB\tau_{c0} + \varepsilon_c \tag{9}$$

where β captures the economic effects generated by the skill-bias of the tariff structure (point 1 above). The protection for sale effect (point 2 above) can be thought of as a relationship of the form $\partial(\ln y_{c1}/y_{c0})/\partial a_c = \delta > 0$.[17] The broader effects of institutions (point 3 above) can be thought of as $\partial(\ln y_{c1}/y_{c0})/\partial INST_c = \gamma > 0$. In terms of econometrics, this means that $SB\tau_{c0}$ will be correlated with a residual which, assuming linearity, takes the following form

$$\varepsilon_c = \delta a_c + \gamma INST_c + \nu_c. \tag{10}$$

where ν_c is a residual that is uncorrelated with a_c, $INST_c$ and $SB\tau_c$.

Our protection for sale model yields equation (6) which states that the larger is a_c, the larger is $SB\tau_{c0}$. Inverting this relationship yields

$$a_c = \theta SB\tau_{c0} \tag{11}$$

for some $\theta > 0$. Plugging equations (10) and (11) into equation (9) yields

$$\ln y_{c1}/y_{c0} = (\beta + \delta\theta) SB\tau_{c0} + \gamma INST_c + \nu_c.$$

[16] See footnotes 6 and 7 above.

[17] Note that we have placed a country subscript on a and that we are suppressing b because our comments about a apply symmetrically to b.

Thus, we face two econometric problems.

1. Since $INST_c$ is likely correlated with $SB\tau_{c0}$, our estimate of $(\beta + \delta\theta)$ suffers from omitted-variable bias.

2. We have not disentangled the economic effects (β) from the protection for sale effects ($\theta > 0$) that generate other forward-looking, growth-promoting policies ($\delta > 0$).

In the next section we deal with the first of these problems. We then turn to the second problem.

9. An Unsupportable Alternative Interpretation: The Role of Broader Institutions

A standard way of dealing with the problem of endogeneity in equations of the type that we are estimating is to instrument the endogenous variable $SB\tau_{c0}$ with an exogenous variable such as settler mortality (Acemoglu *et al.*, 2001) or legal origins (La Porta *et al.*, 1997). However, such a strategy exacerbates our problem of estimating $\beta + \delta\theta$. By projecting $SB\tau_{c0}$ onto the determinants of broader institutions $INST_c$ we are essentially using the fitted $SB\tau_{c0}$ to estimate γ rather than $\beta + \delta\theta$. This is the wrong strategy. In our situation, instrumental variables requires a variable that is correlated with tariffs, but uncorrelated with either tariff rent-seeking institutions a_c or broader institutions $INST_c$. While one can think of potential instruments, such as initial industrial structure, this will not do because a valid instrument must, in addition to being correlated with tariff structure, have no direct effect on growth. Industrial structure likely has a direct effect via various forms of path dependence e.g., learning-by-doing. In short, identification of a valid instrument is very difficult.

A more sensible strategy is what we call 'saturation'. Specifically, we add into our estimating equation a very large number of non-collinear institutional regressors $INST_c$. If the span of these regressors is large, then we can reasonably claim to have spanned the set of institutions that have broader effects on long-term growth. This eliminates the omitted variable bias.

To implement our saturation strategy, we include in our estimating equations the full set of World Bank measures of governance and the quality institutions as reported in Kaufmann *et al.* (2003). These measures have the advantage of being comprehensive in coverage and being highly correlated with the long-term growth of per capita GDP. They have also proved popular with scholars of institutions e.g., Easterly and Levine (2003). There are six measures in the World Bank database. (1) *Voice and Accountability* measures the extent to which citizens of a country are able to participate in the selection of governments. (2) *Political Stability and Absence of Violence* measures perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism. (3) *Government Effectiveness* measures the quality of public service provision, the quality of bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies. (4) *Regulatory Quality* measures the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. (5) *Rule of Law* measures the extent to which agents have confidence in and abide by the rules of society. This includes perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. Rule of law is a measure of the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions, and importantly, the extent to which property rights are protected. (6) *Control of Corruption* measures the perceptions of corruption conventionally defined as the exercise of public power for private gain. For our purposes, the key feature of these six measures is that their broad scope provides us some assurance that we are going a long way towards saturating the institutions space.

One never sees papers in which many measures of institutions are included together as regressors in a single regression. The reason is obvious – measures of institutions are sufficiently correlated that if more than a few are included in a single regression, one cannot precisely estimate the individual coefficients. Restated, one never sees our saturation strategy because of multicollinearity. As we shall see, while we cannot precisely estimate the six coefficients on $INST_c$ – nor is this what we care about – we can precisely estimate the coefficient on $SB\tau_{c0}$.

Table 6 shows the results of including all six measures into our industry output growth regressions. Consider the results using our correlation measure of the skill-bias of the tariff structure ρ_c. When all six measures of $INST_c$ are included in the regression, the coefficient on ρ_c shrinks towards zero as expected (from 0.067 to 0.064), but the t-statistic does not change at all ($t = 4.23$). The same result holds for all five specifications in table 6, although the shrinkage towards zero is usually larger. For example, the coefficient on $DIFF_c^{Low}$ shrinks from 0.032 to 0.024, but again the t-statistic barely changes (from $t = 3.46$ to $t = 3.35$). Not surprisingly, very few of the six World Bank measures of institutions are individually significant. They are, of course, jointly significant as can be seen from the large increase in the R^2 that occurs when all six measures are added in. The individual insignificance is indicative of a familiar multicollinearity problem. Similar conclusions hold when we include important determinants of institutions such as settler mortality from Acemoglu *et al.* (2001) and legal origins from La Porta *et al.* (1997). Our measures of $SB\tau_{c0}$ are always statistically significant.

Table 7 provides the analogous results for the per capita GDP growth regressions. While the statistical significance is marginal, it is notable that the t-statistics for our $SB\tau_{c0}$ variables are all large relative to any of the six measures of institutions. Also notable is the fact that the coefficients on the $SB\tau_{c0}$ variables shrink by only about a third. Thus, they remain economically very large. Further, a standard variance decomposition shows that even if *all* the correlation between, say $DIFF_c^{Low}$ and $INST_c$ is attributed to $INST_c$, $DIFF_c^{Low}$ still contributes 5% to the R^2. By way of comparison, if all the correlation between $DIFF_c^{Low}$ and $INST_c$ is attributed to $DIFF_c^{Low}$, then $DIFF_c^{Low}$ contributes 10%

to the R^2 and the six variables in $INST_c$ *jointly* contribute 8% to the R^2. Similar results hold for ρ_c and $DIFF_c^{High}$.

We believe it to be an important fact that our measures of the skill-bias of the tariff structure survive in a specification involving a large number of institutional measures (as well as 9 regional fixed effects and various additional country characteristics).

A. *Institutions, Policies, and Administrative Data*

There are likely two reasons why our measures of $SB\tau_{c0}$ provide significant explanatory power beyond that provided by the World Bank measures of institutions. First, the tariff data are precisely measured. This is because they are based on administrative records that countries must accurately report to the GATT/WTO as part of international treaty obligations. Accuracy is ensured by the fact that export-oriented businesses lodge complaints when there is a discrepancy between the administrative records submitted to the GATT/WTO and the customs duties collected locally. Thus, our tariff data are measured precisely. Second, there is a precise interpretation of our measures of $SB\tau_{c0}$: the larger is $SB\tau_{c0}$, the higher are tariffs on skill-intensive industries relative to unskilled-intensive industries. $SB\tau_{c0}$ is the outcome of a clearly articulated policy. In contrast, the concept of institutions is much more diffuse, making measurement of institutional concepts necessarily difficult. For example, what is political instability? Is it a decades-old military insurrection that kills thousands, a velvet revolution that deposes a communist regime without a shot being fired, or a fragmented democracy whose minority governments are forced to the polls almost every year? The very concept of an institution is so complex that it defies the sort of comprehensive and objective measurement that is associated with tariff policies.[18] The result is that we have been able to precisely estimate the coefficient on $SB\tau_{c0}$ even when many measures of institutions were included in our regressions.

[18]Note that we are implicitly emphasizing the difference between institutions and policies.

B. *An Unsupportable Alternative Political Economy Interpretation*

One final political economy explanation of our $SB\tau_{c0}$ result is what Jones (1988) refers to as the luck of the right elites. A country with a powerful elite in a skill-intensive industry may be pressured by the elite to provide infrastructure that is favourable to the industry e.g., public education, protection of intellectual property and a legal environment that supports the use of complex contracts. A country with a tariff structure that is biased towards skill-intensive industries may be a country that is lucky enough to have powerful elites in skill-intensive industries. This effect operates via industrial structure. Let $q_{c0}^{Skill} \equiv \Sigma_{i>i^*} q_{ic0}$ and $q_{c0}^{Unskill} \equiv \Sigma_{i \leq i^*} q_{ic0}$ be the output of the skill- and unskilled-intensive industries in the initial period.[19] If our coefficient on $SB\tau_{c0}$ is capturing Jones' luck of the right elites, then the coefficient on $SB\tau_{c0}$ should go to zero when q_{c0}^{Skill} and $q_{c0}^{Unskill}$ are included in our regressions. This is not the case. These variables are already included in our reported specifications. See tables 6 and 7.

To conclude, there is little evidence that our results are capturing the broader effects of institutions.

10. Unsupportable Alternative Interpretations: Externalities and the Real Effects of a Skill-Biased Tariff Structure

In section 8 we showed that our positive coefficient on $SB\tau_{c0}$ could be driven by three effects: (1) real effects of tariffs β; (2) protection for sale effects $\delta\theta$; and, (3) omitted variable bias associated with the broader effects of institutions γ. In the previous section we ruled out the third effect. In this section we provide four reasons for ruling out the first effect.

A. *The Large $SB\tau_{c0}$ Effect Over and Above Large Own-Industry Effects*

The estimated coefficients on $SB\tau_{c0}$ are very large even after holding constant institutions. Consider column 2 of table 6 where the coefficient on ρ_c is 0.064. A one standard deviation

[19] Recall that i^* is the cut-off that appears in table 5. There are two cut-offs: 'low' and 'high'.

increase in ρ_c leads to a 1.9% increase in average annual industry output growth.[20] For $DIFF_c^{Low}$ of column 4 and $DIFF_c^{High}$ of column 8 the increase in average annual industry output growth is 1.3% and 1.7%, respectively. These are large numbers. More importantly, they must be added to the already large own-industry effects of tariffs i.e., added to the effect of the τ_{ic0} regressor. A one standard deviation increase in τ_{ic0} raises the average annual growth of industry output by between 0.8% and 1.0%, depending on the specification. Thus, imagine a one standard deviation increase in the tariff of a skill-intensive industry, an increase that happens to raise ρ_c by one standard deviation. (This is possible within our sample range.) Then the industry's output would rise by 3.6% a year, which is the sum of the above 1.9% effect of ρ_c and a 1.7% effect due to the own-industry effect. (For the latter, see column 2 of table 6.) A 3.6% annual increase in output over roughly 25 years is a huge effect. Finally, we must add to this the fact that all other industries will grow by 1.9% a year faster because the effect of ρ_c is felt on all industries. Thus, it is unlikely that we are capturing the real effects of tariffs.

Turning to the per capita GDP growth equations, a one standard deviation increase in ρ_c raises per capita GDP growth by 0.6%. For $DIFF_c^{Low}$ and $DIFF_c^{High}$ the increases are 0.7% and 0.8%, respectively. These are such large effects in per capita GDP growth rates that it is hard to understand what purely economic process could account for them.

B. ***The Missing Output Effects***

Second, if the large effects on growth rates were due to purely economic effects then we should expect the sequence of economic effects to begin with increases in the output of skill-intensive industries relative to unskilled-intensive industries. Let $q_{ct}^{Skill} \equiv \Sigma_{i>i^*} q_{ict}$ and $q_{ct}^{Unskill} \equiv \Sigma_{i\leq i^*} q_{ict}$ with $t = 0, 1$ be the output of the skill- and unskilled-intensive industries in the initial and final periods. Let $\Delta \ln q_c^{Skill}$ and $\Delta \ln q_c^{Unskill}$ be the corresponding average annual changes over the two periods. If the coefficients on our $SB\tau_{c0}$ variables reflected purely economic processes then including $\Delta \ln q_c^{Skill} - \Delta \ln q_c^{Unskill}$ in

[20]From table 2, a one standard deviation increase is 0.29. 1.9% comes from $0.064 \times 0.29 = 0.019$.

our regressions should dramatically shrink the coefficients on $SB\tau_{c0}$. This is because the proximate effect of a rise in $SB\tau_{c0}$ should be a rise in $\Delta \ln q_c^{Skill} - \Delta \ln q_c^{Unskill}$. The expected coefficient shrinking does not happen in either the industry output regressions or the per capita GDP growth regressions. The coefficients on the $SB\tau_{c0}$ are unchanged and the coefficients on $\Delta \ln q_c^{Skill} - \Delta \ln q_c^{Unskill}$ are statistically insignificant. Thus, whatever the channel through which $SB\tau_{c0}$ operates, it is not through changes in industrial structure. It follows that the coefficient on $SB\tau_{c0}$ likely captures much more than purely economic effects. This is not to say that there are no changes in industrial structure associated with tariffs, but that these effects are being captured by τ_{ic0}.

C. *The Missing Human Capital Effects*

Third, the coefficients on $SB\tau_{c0}$ capture inter-industry effects because the own-industry effects are already controlled for by τ_{ic0}. The most obvious inter-industry (pecuniary) externality is that protection of skill-intensive industries raises the demand for education which then leads to human capital accumulation and an associated human capital externality. However, we find no evidence of this causal mechanism. A cross-country regression of human capital accumulation on $SB\tau_{c0}$ yields a statistically insignificant effect.

D. *Capital Intensity and Inter-Industry Linkages*

Fourth, it is possible that our results stem from the fact that skill intensity is partially correlated with other variables such as capital intensity or the extent of inter-industry linkages (the latter in turn proxying for the possibility of externalities or other real channels). In this case the coefficient on $SB\tau_{c0}$ suffers from omitted variable bias. This theoretical possibility has no empirical basis. For example, let K_i/L_i be the capital intensity of an industry as reported in Antweiler and Trefler (2002). Let $\rho_c^{K/L}$ be the cross-industry correlation between capital intensity and a country's tariffs. That is, $\rho_c^{K/L}$ is the capital intensity counterpart to ρ_c. When $\rho_c^{K/L}$ is used in place of ρ_c, the coefficient is economically and statistically insignificant. In the output regression (column 2 of table 6 with ρ_c replaced by $\rho_c^{K/L}$) the coefficient is -0.009 ($t = -0.37$) and in the per capita GDP regression the coefficient is 0.014 ($t = 1.12$). Similarly insignificant results obtain when ρ_c is redefined to capture inter-industry linkages.

To conclude, we have offered four arguments for why our coefficients on $SB\tau_{c0}$ do not capture the real economic effects of a skill-biased tariff structure. (1) The effect of a skill-biased tariff structure is too large to be an externality, especially given that the effect is over and above own-industry tariff effects. (2) The effect holds even after controlling for shifts in industrial structure towards skill-intensive industries. (3) There is no economy-wide effect via human capital accumulation. (4) There is no comparable effect for the capital-bias of tariff structure or for a tariff structure that is biased towards industries that have large inter-industry linkages (in an input-output sense). (5) The effect is over and above any effects operating via initial industry structure. Thus, by process of elimination there does not appear to be an explanation of our result in terms of the real effects of economic or technological externalities. In the previous section we also ruled out explanations associated with the broader effects of institutions. We conclude from this that the coefficient on the skill-bias of the tariff structure captures a country's willingness and ability to put a lid on the rent-seeking behaviour of special interest lobby groups.

11. Robustness and Sensitivity Analysis

We now show that the results reported in section 7 are robust. We first show that the results are robust to our definition of skilled and unskilled industries. We then show that the results are robust to the measure of skill intensity used. Finally, we show that our reported results are not being driven by a small number of influential observations.

A. *Choice of Cut-off* i^*

To construct $DIFF_c = \tau_c^{Skill} - \tau_c^{Unskill}$ we had to define a cut-off i^* such that all industries above i^* in table 5 were classified as skill-intensive and all industries below or equal to

i^* were classified as unskilled-intensive. We now experiment with i^*. In order to avoid results that are driven by just a few industries, we require $3 < i^* < 14$. Columns 1 and 4 of table 8 report the coefficient on $DIFF_c$ for different choices of cut-off i^*. For example, in the first row ($i^* = 4$) only four industries are classified as unskilled, and in the last row ($i^* = 13$) only four industries are classified as skilled.[21] In the results reported above, the low cut-off was defined as $i^* = 6$ and the high cut-off was defined as $i^* = 12$. These cut-offs appear in bold and correspond to columns 3 (low cut-off) and 7 (high cut-off) of tables 6 and 7. The conclusion from the results reported in columns 1 and 4 of table 8 is that the results are not sensitive to the choice of cut-off.

B. *Using Alternative Skill Intensity Measures*

An important question is whether our results change if we rank industries based on the skill intensities of a developing country. Table 8 also shows what happens when we rank industries using skill intensity data from South Africa in 1997 and Brazil in 1986. Data are from Alleyne and Subramanian (2001) and Shikher (2004).[22] The results for different cut-offs i^* appear in columns 2, 3, 5 and 6 of table 8. The results show that for cut-offs that do not include a small number of industries in either the skilled or unskilled category, the results using either Brazilian or South African skill intensities are very similar to the results using U.S. skill intensities. Thus, our results are not sensitive to our use of U.S. data to construct skill intensities.

C. *Influential Observations*

Figures 6 and 7 showed that our results are unlikely to be driven by influential observations. To investigate further, we re-estimated equations (7) and (8) after omitting influential observations i.e., observations with studentized residuals greater than 2.0, 1.8, 1.5 and 1.0. This is a 'destructive regression diagnostic' suggested by Belsley, Kuh, and Welsch

[21] See table 5 for industry descriptions.

[22] Using the 1972 U.S. data, we have also checked that our results do not depend on our definition of skilled and unskilled workers. We find that alternative definitions yield similar results.

(1980). The results of omitting influential observations are reported in table 9. The first panel reports the baseline estimates for comparison. The second panel reports the results after omitting influential observations. As is apparent, in both the industry-country and country level regressions, each of the measures of the skill-bias of tariffs remains statistically significant.

12. Conclusions

A common approach to examining the relationship between tariffs and long-term growth involves regressing per capita GDP growth on average tariffs. A positive tariff coefficient is typically viewed as evidence of an externality. We made two arguments for looking beyond average tariffs to the structure of tariffs across industries. For one, high average tariffs may be less important than whether tariffs are high in industries that generate positive externalities. For another, tariffs are endogenous and countries with good institutions may tolerate high average tariffs provided that they are in industries that generate positive externalities. To make these points clearly we introduced externalities into the protection for sale model. The model predicts that there need not be any relationship between good institutions and either the average tariff or the variance of tariffs. In contrast, the model predicts that good institutions will be associated with a skill-biased tariff structure.

Guided by these predictions, we examined the determinants of industry output growth and per capita GDP growth. We found that the average tariff and the variance of tariffs are indeed uncorrelated with long-term growth. Further, there is a positive relationship between long-term growth and the skill-bias of the tariff structure. These empirical facts are exactly as predicted by the model.

We then examined three alternative interpretations of our empirical facts. The first is that the facts mirror the broader effects of institutions on growth that have already been documented by La Porta *et al.* (1997), Hall and Jones (1999), Acemoglu *et al.* (2001, 2002) and others. This is not the case. For one, we included a far more extensive set of controls than is typical in the institutions-and-growth literature. These controls included nine regional dummies, which means that we exploited sample variation *within* narrowly defined regions. Thus, for example, we used tariff structure to explain growth differences between countries within Western Africa. We did not use tariff structure to explain growth differences between Western Africa and Western Europe. We also included *in a single regression* all six World Bank measures of institutions (Kaufmann *et al.*, 2003). These measures capture the broader effects of institutions such as rule of law and control of corruption. Not only did our skill-bias-of-tariffs variable survive inclusion of these World Bank measures, but the skill-bias of tariffs was at least as powerful as each World Bank measure. Indeed, in our per capita GDP growth regressions, the skill-bias of the tariff structure contributed 10 percentage points to the R^2, an amount not much less than the *joint* contribution of all six World Bank measures. Thus, our results differ from what is currently available in the institutions-and-growth literature. We interpreted this to mean that we are capturing the effect of the narrow and possibly legal lobbying institutions described by the protection for sale model.

The second alternative interpretation of our findings is that our skill-bias of tariff structure captures externalities. Tariffs in skill-intensive industries promote externalities and this in turn promotes growth. This may indeed be correct, but it does not explain our findings. In our industry level regressions we included both the skill-bias of tariff structure (a country level variable) and the industry level tariff. We found that the latter was very important. This means that own-industry tariffs promote own-industry growth and, in particular, tariffs in skill-intensive industries promote the growth of skill-intensive industries. However, over and above this substantial own-industry effect, a skill-biased tariff structure has a huge impact on output growth in *all* industries. Such a large economy-wide externality would require a massive expansion of skill-intensive industries. We found no such expansion. Further, such a large economy-wide externality would require a massive induced effect on economy-wide aggregates such as human capital that are associated with externalities. We found no evidence of this.

The third alternative interpretation of our findings is that countries with a skill-biased tariff structure initially had a large skill-intensive sector. Under this interpretation, all we found is that initial production structure matters for long-term growth. However, we controlled extensively for initial production structure in all of our specifications.

In summary, we found only a single interpretation of our results that cannot be ruled out: Countries grow faster if they are willing and able to put a lid on the (possibly legal) rent-seeking behaviour of special interest lobby groups.

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Appendix A. Proof of Theorem 1

Let equation (GH*n*) be a shorthand for denoting equation (*n*) in Grossman and Helpman (1994). Let $y_j(p_j)$ be output in industry j. In the text we worked with $G(x(p))$. Here we drop the assumption that p operates on the externality only via exports $x(p)$ and introduce a more general function $\widetilde{G}(p)$ that does not impose the assumption. Then $\widetilde{G}(p)$ replaces $G(x(p))$ wherever the latter appears in the text. From equation (GH14),

$$\sum_{i\in L}\frac{\partial}{\partial p_j}\left[W_i(p)+\gamma_i\widetilde{G}(p)\right]=(I_j-\alpha_L)q_j(p_j)-\alpha_L(p_j-p_j^*)x_j'(p_j)+\gamma_L\widetilde{G}_j'(p) \qquad \text{(A 1)}$$

where $\widetilde{G}_j'(p)\equiv\partial\widetilde{G}(p)/\partial p_j$. From equation (GH15),

$$\frac{\partial}{\partial p_j}\left[aW(p)+b\widetilde{G}(p)\right]=-a(p_j-p_j^*)x_j'(p_j)+b\widetilde{G}_j'(p). \qquad \text{(A 2)}$$

Equation (GH12) extended to our model becomes $\Omega_j(p;a,b)\equiv\Sigma_{i\in L}\left[\frac{\partial}{\partial p_j}W_i(p)+\gamma_i\frac{\partial}{\partial p_j}\widetilde{G}(p)\right]+a\frac{\partial}{\partial p_j}W(p)+b\frac{\partial}{\partial p_j}\widetilde{G}(p)=0$. Thus, from equations (A 1), (A 2) and the definition of τ_j (i.e., $\tau_j p_j^*=(p_j-p_j^*)$) we have

$$\Omega_j(p;a,b)=(I_j-\alpha_L)q_j(p_j)-\alpha_L\tau_j p_j^* x_j'(p_j)+\gamma_L\widetilde{G}_j'(p)-a\tau_j p_j^* x_j'(p_j)+b\widetilde{G}_j'(p)=0 \quad \text{(A 3)}$$

or

$$\tau_j = \frac{(I_j - \alpha_L)}{a + \alpha_L} \frac{q_j(p_j)}{p_j^* x_j'(p_j)} + \frac{b + \gamma_L}{a + \alpha_L} \frac{\widetilde{G}_j'(p)}{p_j^* x_j'(p_j)}.$$

No re-impose the assumption $\widetilde{G}(p) = G(p_0, x_1(p_1), \ldots x_n(p_n))$. Then $\widetilde{G}_j' \equiv \partial \widetilde{G}/\partial p_j = (\partial G/\partial x_j)(\partial x_j/\partial p_j) = G_j' x_j'$. This together with $p_j^* = 1$ yields theorem 1.

Appendix B. Theorem 1 with Changing Industrial Structure

We follow Goldberg and Maggi (1999) in viewing the equilibrium tariff as the maximizer of

$$\Omega(p; a, b) \equiv \Sigma_{i \in L} \left[W_i(p) + \gamma_i \widetilde{G}(p) \right] + \left[aW(p) + b\widetilde{G}(p) \right].$$

Define $\Omega_j \equiv \partial \Omega/\partial p_j$, $\Omega_{ji} \equiv \partial^2 \Omega/\partial p_j \partial p_i$, $\Omega_{ja} \equiv \partial^2 \Omega/\partial p_j \partial a$, and $\Omega_{jb} \equiv \partial^2 \Omega/\partial p_j \partial b$. The first-order condition defining the optimal price is $\Omega_j(p_j(a,b); a,b) = 0$. From the discussion preceding equation (A 3), Ω_j has already been defined in equation (A 3). Assume that $G(x(p))$ is separable in x. Then G_j' depends only on $x_j(p_j)$. It follows that Ω_j is independent of p_i for $i \neq j$ i.e., $\Omega_{ji} = 0$ for $i \neq j$. The second-order conditions thus reduce to $\Omega_{jj} < 0$ for all j. Using this information to differentiate the first order condition $\Omega_j(p_j(a,b); a,b) = 0$ of equation (A 3) yields $\Omega_{jj} \cdot \partial p_j/\partial a + \Omega_{ja} = 0$ or $\partial p_j/\partial a = -\Omega_{ja}/\Omega_{jj} = \tau_j p_j^* x_j'/\Omega_{jj}$. Noting that $\tau_j p_j^* = (p_j - p_j^*)$,$\partial \tau_j/\partial a = (\partial \tau_j/\partial p_j)(\partial p_j/\partial a) = (\partial p_j/\partial a)/p_j^*$ we have

$$\frac{\partial \tau_j}{\partial a} = -\frac{\tau_j}{\phi_j(p_j)} \quad \text{where } \phi_j(p_j) \equiv -\Omega_{jj}(p_j)/x_j'(p_j) > 0.$$

Correspondingly, $\partial p_j/\partial b = -\Omega_{jb}/\Omega_{jj} = -G_j' x_j'/\Omega_{jj}$ so that

$$\frac{\partial \tau_j}{\partial b} = \frac{G_j'}{p_j^* \phi_j(p_j)}.$$

Appendix C. Proof of Equation (5)

From the definition of $V\tau$ and equation (3),

$$\begin{aligned} dV\tau &= 2\Sigma_{i=1}^{n}\theta_i(\tau_i - E\tau)\frac{1}{a+\alpha_L}\left[(-\tau_i + \Sigma_{j=1}^{n}\theta_j\tau_j)da + (G_i' - \Sigma_{j=1}^{n}\theta_j G_j')db\right] \\ &= \frac{2}{a+\alpha_L}\Sigma_{i=1}^{n}\theta_i(\tau_i - E\tau)\left[-(\tau_i - \Sigma_{j=1}^{n}\theta_j\tau_j)da + (G_i' - \Sigma_{j=1}^{n}\theta_j G_j')db\right] \\ &= -\frac{2}{a+\alpha_L}V\tau\cdot da + \frac{2}{a+\alpha_L}Cov(\tau_i, G_i')\cdot db \end{aligned}$$

Plugging in the equation (3) expression for τ_i into $Cov(\tau_i, G_i')$ yields

$$\begin{aligned} &Cov(\tau_i, G_i') \\ &= \Sigma_{i=1}^{n}\theta_i(\tau_i - E\tau)(G_i' - \Sigma_{j=1}^{n}\theta_j G_j') \\ &= \Sigma_{i=1}^{n}\theta_i(\tau_i)(G_i' - \Sigma_{j=1}^{n}\theta_j G_j') \\ &= \Sigma_{i=1}^{n}\theta_i\frac{I_i - \alpha_L}{a+\alpha_L}\cdot\frac{q_i(p_i)}{x_i'(p_i)}(G_i' - \Sigma_{j=1}^{n}\theta_j G_j') + \Sigma_{i=1}^{n}\theta_i\frac{b+\gamma_L}{a+\alpha_L}G_i'(x(p))(G_i' - \Sigma_{j=1}^{n}\theta_j G_j') \\ &= \frac{1}{a+\alpha_L}Cov\{(I_i - \alpha_L)\frac{q_i(p_i)}{x_i'(p_i)}, G_i'\} + \frac{b+\gamma_L}{a+\alpha_L}Var\{G_i'\}. \end{aligned}$$

Thus, $Cov\{(I_i - \alpha_L)\frac{q_i(p_i)}{x_i'(p_i)}, G_i'\} \geq 0$ implies $Cov(\tau_i, G_i') > 0$.

Appendix D. Data: Description and Sources

The annual average growth of real per capita GDP $\ln y_{c1}/y_{c0}$ is calculated as the average annual log change in real per capita GDP. The measure of real per capita GDP used is 'rgdpch' from PWT 6.1. The initial period of the measured growth varies by country and is reported in Table 3. For all countries, except for Cyprus, Sierra Leone and Singapore, the end period is 2000. Because of the unavailability of the Penn World Tables income data for these three countries, the final year is 1996. The unification of East Germany and West Germany in 1990 is handled as follows. The PWT 6.1 provide data for East Germany, West Germany and unified Germany for 1991. Using the data from 1991 and 1992, the income series for West Germany and unified Germany can be spliced by scaling unified Germany's measures down so that it matches the measures for West Germany during the overlapping years.

Log initial output $\ln q_{ic0}$ and the average annual log change in output $\ln q_{ic1}/q_{ic0}$ are from UNIDO's INDSTAT3 2002 production database. We convert the output data from the original 3-digit ISIC classification to our industry classification, which is described in table 8.[23]

The log of initial tariffs τ_{ic0} is from Lai and Trefler (2002) and UNCTAD (1994). $E\tau_{c0}$ is the log of the production-weighted average tariff rate: $E\tau_{c0} \equiv \ln\left(\Sigma_{i=1}^{n}\theta_{ic0}\tau_{ic0}\right)$ where $\theta_{ic0} \equiv q_{ic0}/\Sigma_{j=1}^{n}q_{jc0}$. For all countries we use 1972 production data from Antweiler and Trefler (2002) as weights. It does not matter whether we use production-weighted or unweighted average tariffs, but the former makes more sense. As well, it also does not matter whether we use tariffs or the log of tariffs. We use the latter because a small number of countries, notably Bangladesh and India, have tariffs in some industries that are well above 100%. Taking logs reduces the influence of these rates. $V\tau_{c0}$ is the production-weighted variance of tariffs: $\Sigma_{i=1}^{n}\theta_{ic0}(\tau_{ic0} - E\tau_{c0})^2$.

Skill intensity S_i/L_i is the ratio of workers with 12 years of schooling or more to those with less than 12 years of schooling in industries in the United States in 1972. Antweiler and Trefler (2002) scale the measure so that the skill intensity in the electricity industry is unity. For robustness checks, we use two additional measures of skill intensity across industries. The first is the ratio of skilled labor to unskilled labor across South African manufacturing industries in 1997 from Alleyne and Subramanian (2001). The second is a measure of average human capital across Brazilian manufacturing industries in 1986 from Shikher (2004). The log of initial skilled and unskilled average tariffs, τ_c^{Skill}, $\tau_c^{Unskill}$ are constructed by aggregating the industry level tariff data to form skilled and unskilled average tariff rates. Each country's industry output in 1972 is used as weights. Three countries, Haiti, Guinea and Sierra Leone, are not in Antweiler and Trefler's database. For Haiti, the Dominican Republic's production weights are used when aggregating tariffs.

[23]The concordance used is as follows: Industry 241=ISIC 323; Industry 243=ISIC 331; Industry 245=ISIC 321+322; Industry 247=ISIC 332; Industry 150=ISIC 372; Industry 246=ISIC 361+362+369; Industry 220=ISIC 371; Industry 248=ISIC 324+356; Industry 244=ISIC 341; Industry 231=ISIC 382; Industry 242=ISIC 355; Industry 233=ISIC 384; Industry 140=ISIC 353+354; Industry 232=ISIC 383; Industry 211=ISIC 352; Industry 213=ISIC 351; Industry 249=ISIC 385.

For Guinea and Sierra Leone, we use Senegal's production weights. The log of initial skilled and unskilled production (q_{c0}^{Skill} and $q_{c0}^{Unskill}$) were constructed by aggregating the industry level production data to form skilled and unskilled total production. In country level regressions, production data are unavailable for Guinea so we use Senegal's production data for Guinea when constructing initial skilled and unskilled production measures. Data are from UNIDO's INDSTAT3 2002 production database.

The initial investment-to-GDP ratio inv_{c0} is gross investment (private plus public) divided by GDP, measured in 1985 international prices, from PWT 6.1. The log of initial human capital hk_{c0} is the ratio of workers that completed more than 12 years of education to those that completed less than 12 years of education. Data are from Barro and Lee (1993) with minor updates by Antweiler and Trefler (2002). Because human capital data are unavailable for Haiti, Dominican Republic and Guinea, we use human capital measures from countries with similar education levels. For Haiti we use the Dominican Republic and for Guinea and Sierra Leone we use Senegal. Haiti and Guinea are in the country level regressions, but are not in the industry level regressions.

The set of six institution variables are from Kaufmann *et al.* (2003). Each is a measure of the quality of the institution in 1998. Each of the six measures is an index ranging from -2.5 to 2.5, with a higher number indicating a "better" institution.

Table 2. Summary Statistics.

	Industry-Country Regressions		Country Regressions	
	Mean	Std Dev	Mean	Std dev
Dependent Variables				
Output Growth: $\ln(q_{ic1}/q_{ic0})$	.013	.073		
GDP Growth: $\ln(y_{c1}/y_{c0})$			.018	.019
Tariff Structure				
Average Tariffs: $E\tau_{c0}$	−1.90	1.47	−1.84	1.43
Variance of Tariffs: $V\tau_{c0}$	.028	.046	.028	.046
Industry-Country Characteristics				
Initial Industry Tariff: τ_{ic0}	−2.33	2.03		
Initial Industry Output: $\ln(q_{ic0})$	19.84	2.55		
Country Characteristics				
Initial Income: $\ln(y_{c0})$	8.51	.99	8.38	1.03
Initial Investment: inv_{c0}	2.88	.56	2.79	.65
Initial Human Capital: hk_{c0}	−2.16	1.23	−2.34	1.23
Skill-Bias of Tariff Structure				
Skill-tariff correlation: ρ_{c0}	−.27	.30	−.29	.29
Low Cut-off:				
Skilled Tariff: τ_{c0}^{Skill}	−2.11	1.35	−2.09	1.32
Unskilled Tariff: $\tau_{c0}^{Unskill}$	−1.74	1.64	−1.67	1.60
Tariff Differential: $DIFF_{c0}$	−.37	.55	−.42	.55
Initial Output, Skilled Sector: $\ln(q_{c0}^{Skill})$	22.74	2.30	22.56	2.44
Initial Output, Unskilled Sector: $\ln(q_{c0}^{Unskill})$	22.10	2.02	21.95	2.14
High Cut-off:				
Skilled Tariff: τ_{c0}^{Skill}	−2.39	1.30	−2.36	1.29
Unskilled Tariff: $\tau_{c0}^{Unskill}$	−1.79	1.52	−1.72	1.49
Tariff Differential: $DIFF_{c0}$	−.60	.58	−.64	.59
Initial Output, Skilled Sector: $\ln(q_{c0}^{Skill})$	22.02	2.17	21.86	2.30
Initial Output, Unskilled Sector: $\ln(q_{c0}^{Unskill})$	22.79	2.21	22.62	2.34

Notes: There are 942 observations in the industry-country level output growth regressions and 63 observations in the country level GDP growth regressions.

Table 3. Countries in the Industry-Country Regressions and Country Regressions. Grouped by Geographic Region.

N. Africa & Middle East	West Africa	South East Asia	Eastern Europe
Algeria (1985-2000)	Cote d'Ivoire (1980-2000)	Indonesia (1980-2000)	Cyprus (1983-2000)[2]
Egypt (1981-2000)	Ghana (1982-2000)	Malaysia (1981-2000)	Turkey (1987-2000)
Iran (1980-2000)	Guinea (1980-2000)[1]	Singapore (1983-2000)[2]	
Morocco (1982-2000)	Nigeria (1982-2000)	Thailand (1981-2000)	
Syria (1982-2000)	Sierra Leone (1982-2000)[2]		Western Europe & Offshoots
Tunisia (1982-2000)			
		South West Asia	Austria (1972-2000)
	Latin America & Carib.		Belgium (1972-2000)
South Central Africa		Bangladesh (1983-2000)	Denmark (1972-2000)
	Argentina (1987-2000)	India (1972-2000)	Finland (1972-2000)
Burundi (1980-2000)	Bolivia (1986-2000)	Sri Lanka (1983-2000)	France (1972-2000)
Malawi (1985-2000)	Brazil (1986-2000)	Nepal (1983-2000)	Germany (1972-2000)
Zimbabwe (1983-2000)	Chile (1987-2000)	Pakistan (1982-2000)	Greece (1972-2000)
	Colombia (1986-2000)		Ireland (1972-2000)
	Ecuador (1986-2000)		Italy (1972-2000)
East Africa	Haiti (1982-2000)[1]	East Asia	Netherlands (1972-2000)
	Mexico (1983-2000)		Norway (1972-2000)
Ethiopia (1981-2000)	Paraguay (1980-2000)[1]	China (1982-2000)	Portugal (1972-2000)
Kenya (1982-2000)	Venezuela (1987-2000)	Hong Kong (1985-2000)	Spain (1972-2000)
Madagascar (1986-2000)[1]		Japan (1972-2000)	Sweden (1972-2000)
Mauritius (1981-2000)		Korea, Rep. (1987-2000)	United Kingdom (1972-2000)
Tanzania (1982-2000)			Canada (1972-2000)
			United States (1972-2000)
			Australia (1972-2000)
			New Zealand (1972-2000)

Notes: [1] The country is not in the industry-country output growth regressions. [2] The end period is 1996 in the country level per capita GDP growth regressions.

Table 4. Results for Average Tariffs $E\tau_{c0}$ and the Variance of Tariffs $V\tau_{c0}$.

	Industry-Country Regressions Dep. Var.: $\ln(q_{ic1}/q_{ic0})$			Country Regressions Dep. Var.: $\ln(y_{c1}/y_{c0})$	
	β	Clustered *t*	OLS *t*	β	OLS *t*
Tariff Structure					
Average Tariffs: $E\tau_{c0}$	**.007**	**1.82**	**2.45**	**.001**	**.50**
Variance of Tariffs: $V\tau_{c0}$	**-.019**	**.53**	**.54**	**-.014**	**.45**
Industry-Country Characteristics					
Initial Industry Tariff: τ_{ic0}	.005	2.20	2.96		
Initial Industry Output: $\ln(q_{ic0})$	-.010	5.06	8.41		
Country Characteristics					
Initial Income: $\ln(y_{c0})$	.015	1.16	2.49	-.001	.18
Initial Investment: inv_{c0}	-.019	1.53	3.09	.001	.12
Initial Human Capital: hk_{c0}	-.002	.28	.53	.002	.58
Region Fixed Effects					
West Africa	-.173	6.44	7.45	-.065	3.04
East Africa	-.110	4.57	4.82	-.049	2.37
South Central Africa	-.127	4.98	5.26	-.055	2.49
North Africa, Middle East	-.080	2.92	3.85	-.042	2.14
Eastern Europe	-.045	1.07	1.99	-.022	1.03
Latin America	-.036	1.37	1.76	-.037	1.93
East Asia	.026	3.24	1.65	.001	.10
South East Asia	.024	1.15	1.12	-.017	.86
South West Asia	.042	2.21	1.96	-.029	1.46
Cohort Fixed Effects					
1980-1983	.270	1.28	1.35	.037	2.00
1985-1987	-.010	.35	.50	.025	1.36
16 Industry Fixed Effects		Yes		N/A	
R^2		.34		.60	
Observations		942		63	

Notes: The industry-country regressions are estimates of equation (7). The dependent variable is the average annual growth in output of industry i in country c. The country regressions are estimates of equation (8). The dependent variable is the average annual growth of per capita GDP in country c.

Table 5. Skill Intensity: Choosing Cut-Offs for Skilled and Unskilled Categories.

Industry Code	Description	Skill Intensity	% △ in Skill
241	Leather & travel goods	.079	
			62%
243	Wood products	.128	
			3%
245	Textiles & clothing	.132	
			17%
247	Furniture	.154	
			19%
150	Non-ferrous metals	.184	
			9%
246	Non-metallic mineral prod.	.201	
— —	— — — — — — **Low Cut-Off** — — — — — —	— —	**32%**
220	Iron & steel	.266	
			18%
248	Footwear	.315	
			26%
244	Paper products	.397	
			4%
231	Non-electric machinery	.414	
			12%
242	Rubber products	.462	
			.8%
233	Transport equipment	.466	
— —	— — — — — — **High Cut-Off** — — — — — —	— —	**32%**
140	Mineral fuels	.593	
			4%
232	Electric machinery	.617	
			16%
211	Medicaments, toiletry & perf.	.718	
			2%
213	Manufactured fertilizers	.731	
			9%
249	Professional equipment	.797	

Table 6. Industry-Country Output Growth Regressions. Dependent Variable is $\ln q_{ic1}/q_{ic0}$.

	Correlation		Low Cut-Off				High Cut-Off			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Skill Bias of Tariff Structure										
Skill Tariff Correlation: ρ_c	**.067**	**.064**								
	(4.23)	**(4.23)**								
Tariff Differential: $DIFF_c$			**.032**	**.024**			**.043**	**.029**		
			(3.46)	**(3.35)**			**(4.04)**	**(4.42)**		
Skilled Tariff: τ^{Skill}					**.038**	**.030**			**.045**	**.030**
					(4.18)	**(4.26)**			**(4.16)**	**(4.54)**
Unskilled Tariff: $\tau^{Unskill}$					**-.029**	**-.019**			**-.034**	**-.017**
					(2.99)	**(2.65)**			**(3.08)**	**(2.58)**
Other Tariff Structure										
Average Tariffs: $E\tau_{c0}$	.012	.017	.008	.011			.011	.014		
	(3.29)	(4.92)	(2.17)	(3.36)			(3.49)	(4.12)		
Variance of Tariffs: $V\tau_{c0}$	-.005	-.038	.004	-.024	.010	-.016	.058	.011	.059	.012
	(0.15)	(1.02)	(0.12)	(0.54)	(0.26)	(0.36)	(1.69)	(0.29)	(1.72)	(0.30)
Industry-Country Characteristics										
Initial Industry Tariff: τ_{ic0}	.006	.005	.006	.005	.006	.005	.005	.004	.005	.005
	(3.11)	(2.83)	(3.33)	(3.12)	(3.08)	(3.01)	(2.59)	(2.55)	(2.68)	(2.65)
Initial Industry Output: $\ln(q_{ic0})$	-.010	-.010	-.018	-.017	-.018	-.017	-.019	-.018	-.019	-.018
	(7.86)	(8.23)	(8.21)	(8.05)	(8.22)	(8.05)	(8.71)	(8.36)	(8.72)	(8.38)
Initial Production Structure										
Skilled-Sector Output: $\ln(q^{Skill})$			-.006	.005	-.006	.005	.010	.012	.009	.011
			(1.03)	(0.79)	(1.04)	(0.79)	(1.17)	(1.91)	(1.09)	(1.78)
Unskilled-Sector Output: $\ln(q^{Unskill})$			.022	.007	.022	.007	.001	-.001	.002	-.001
			(3.35)	(0.89)	(3.38)	(0.89)	(0.14)	(0.21)	(0.21)	(0.08)
Institutions										
Voice and Accountability		-.023		-.006		-.006		-.009		-.008
		(1.98)		(0.51)		(0.56)		(0.94)		(0.85)
Political Stability		.032		.025		.025		.021		.021
		(3.63)		(2.50)		(2.50)		(2.32)		(2.31)
Government Effectiveness		-.009		-.011		-.010		-.012		-.012
		(0.82)		(0.90)		(0.84)		(0.94)		(0.93)
Regulatory Quality		.030		.028		.027		.029		.028
		(4.34)		(3.58)		(3.50)		(3.52)		(3.40)
Rule of Law		.014		.013		.013		.015		.015
		(0.85)		(0.72)		(0.72)		(0.85)		(0.86)
Control of Corruption		-.036		-.030		-.030		-.027		-.027
		(2.27)		(2.05)		(2.02)		(2.11)		(2.08)
3 Country Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9 Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16 Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.36	.42	.38	.42	.38	.43	.39	.43	.39	.43

Notes:

a. The regressions are estimates of equation (7). The dependent variable is the average annual log change of output in industry i in country c. There are 17 industries (roughly 3-digit ISIC) and 59 countries. There are 942 observations.

b. Appendix table 9 gives the sample period for each country.

c. For all country level variables, clustered t-statistics are reported.

d. The `3 Country Characteristics' are initial year per capita GDP, initial year investment-to-GDP ratio, and initial year human capital stock.

e. Regional fixed effects are the 9 regions that appear in table 2. Cohort fixed effects are dummies for countries entering in 1980-83 and 1985-87. Industry fixed effects are the 16 industry dummies.

Table 7. Country Level Per Capita GDP Growth Regressions. Dependent Variable is $\ln y_{c1}/y_{c0}$.

	Correlation		Low Cut-Off				High Cut-Off			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Skill Bias of Tariff Structure										
Skill Tariff Correlation: ρ_c	**.033**	**.020**								
	(3.66)	**(2.18)**								
Tariff Differential: $DIFF_c$			**.018**	**.012**			**.019**	**.014**		
			(3.51)	**(2.36)**			**(4.03)**	**(2.77)**		
Skilled Tariff: τ^{Skill}					**.019**	**.013**			**.020**	**.014**
					(3.66)	**(2.48)**			**(4.05)**	**(2.80)**
Unskilled Tariff: $\tau^{Unskill}$					**-.017**	**-.011**			**-.017**	**-.012**
					(3.40)	**(2.28)**			**(3.62)**	**(2.50)**
Other Tariff Structure										
Average Tariffs: $E\,\tau_{c0}$	.003	.002	.003	.002			.003	.002		
	(1.80)	(1.24)	(1.46)	(0.89)			(1.66)	(1.15)		
Variance of Tariffs: $V\,\tau_{c0}$	-.014	-.006	.003	.006	.004	.006	.025	.022	.025	.022
	(0.49)	(0.20)	(0.09)	(0.20)	(0.13)	(0.20)	(0.85)	(0.74)	(0.85)	(0.73)
Initial Production Structure										
Skilled-Sector Output: $\ln(q^{Skill})$			-.003	-.002	-.003	-.002	.001	.001	.001	.001
			(1.06)	(0.58)	(1.07)	(0.61)	(0.37)	(0.37)	(0.33)	(0.34)
Unskilled-Sector Output: $\ln(q^{Unskill})$			.004	.003	.004	.003	-.002	-.002	-.002	-.001
			(1.09)	(0.76)	(1.10)	(0.78)	(0.64)	(0.43)	(0.59)	(0.40)
Institutions										
Voice and Accountability		.010		.012		.012		.011		.011
		(1.78)		(2.05)		(1.99)		(1.81)		(1.82)
Political Stability		-.002		-.004		-.004		-.005		-.005
		(0.40)		(0.85)		(0.82)		(1.08)		(1.07)
Government Effectiveness		.002		.003		.003		.003		.003
		(0.30)		(0.43)		(0.44)		(0.50)		(0.50)
Regulatory Quality		.000		.001		.001		.001		.001
		(0.03)		(0.17)		(0.16)		(0.28)		(0.28)
Rule of Law		.009		.008		.008		.007		.007
		(1.02)		(0.94)		(0.91)		(0.86)		(0.86)
Control of Corruption		-.002		-.003		-.002		-.001		-.001
		(0.30)		(0.32)		(0.28)		(0.14)		(0.14)
3 Country Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9 Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.69	.77	.70	.78	.70	.78	.71	.78	.71	.78

Notes:

a. The country regressions are estimates of equation (8). The dependent variable is the average annual growth of real per capita GDP in country *c* . There are 63 observations.

b . Appendix table 9 gives the sample period for each country.

c . The '3 Country Characteristics' are initial year per capita GDP, initial year investment-to-GDP ratio, and initial year human capital stock.

d . Regional fixed effects are the 9 regions that appear in table 2. Cohort fixed effects are dummies for countries entering in 1980-83 and 1985-87.

Table 8. Testing the Robustness of the Results to the Chosen Cut-Off using U.S., South African and Brazilian Skill Intensities.

	Industry-Country Regressions			Country Regressions		
	U.S.A.	S. Africa	Brazil	U.S.A.	S. Africa	Brazil
	(1)	(2)	(3)	(4)	(5)	(6)
Cut-off 4	.036	.038	.011	.018	.015	.006
	(3.81)	(3.90)	(1.23)	(3.21)	(2.66)	(1.28)
Cut-off 5	.031	.043	.036	.017	.015	.015
	(3.36)	(4.13)	(3.46)	(3.12)	(2.76)	(2.94)
Low cut-off	**.032**	**.042**	**.038**	**.018**	**.015**	**.016**
	(3.46)	**(3.92)**	**(4.03)**	**(3.51)**	**(2.68)**	**(3.57)**
Cut-off 7	.029	.039	.037	.016	.017	.016
	(3.12)	(3.91)	(3.84)	(3.02)	(3.58)	(3.51)
Cut-off 8	.033	.030	.029	.015	.014	.014
	(3.43)	(2.87)	(3.40)	(3.23)	(3.11)	(3.26)
Cut-off 9	.030	.028	.027	.014	.013	.014
	(3.27)	(2.56)	(3.20)	(3.18)	(2.91)	(3.30)
Cut-off 10	.023	.024	.027	.012	.012	.014
	(2.54)	(2.42)	(2.97)	(2.94)	(2.80)	(3.07)
Cut-off 11	.021	.017	.025	.011	.010	.013
	(2.53)	(1.34)	(2.93)	(2.88)	(1.71)	(3.00)
High cut-off	**.043**	**.016**	**.020**	**.019**	**.010**	**.010**
	(4.04)	**(1.37)**	**(2.41)**	**(4.03)**	**(1.67)**	**(2.32)**
Cut-off 13	.041	.006	.034	.019	.008	.014
	(5.12)	(0.63)	(2.59)	(4.16)	(1.55)	(2.49)

Notes : The industry-country regressions are estimates of equation (7). The dependent variable is the average annual growth in output of industry i in country c. The country regressions are estimates of equation (8). The dependent variable is the average annual growth of per capita GDP in country c.

Table 9. Robustness Tests. Omitting Influential Observations.

	Industry-Country Regressions			Country Regressions		
	ρ_c	$DIFF_c^{Low}$	$DIFF_c^{High}$	ρ_c	$DIFF_c^{Low}$	$DIFF_c^{High}$
Baseline	.067	.032	.043	.033	.018	.019
	(4.23)	(3.26)	(4.04)	(3.66)	(3.51)	(4.03)
			Omitting influential outliers			
$\lvert\hat{e}_i\rvert > 2.0$	.063	.032	.040	.015	.008	.009
	(4.27)	(3.25)	(3.74)	(1.89)	(2.22)	(2.41)
$\lvert\hat{e}_i\rvert > 1.8$	.059	.034	.040	.014	.009	.011
	(4.07)	(3.56)	(3.81)	(2.05)	(2.49)	(2.99)
$\lvert\hat{e}_i\rvert > 1.5$	.060	.035	.041	.015	.010	.011
	(4.28)	(3.71)	(3.95)	(2.34)	(2.89)	(3.44)
$\lvert\hat{e}_i\rvert > 1.0$	.069	.035	.044	.017	.013	.013
	(5.09)	(3.62)	(4.48)	(2.89)	(4.36)	(4.32)

Notes: Every entry in the table reports a coefficient and *t*-statistic from a regression. The industry-country regressions are estimates of equation (7). The dependent variable is the average annual growth in output of industry *i* in country *c*. The country regressions are estimates of equation (8). The dependent variable is the average annual growth of per capita GDP in country *c*.

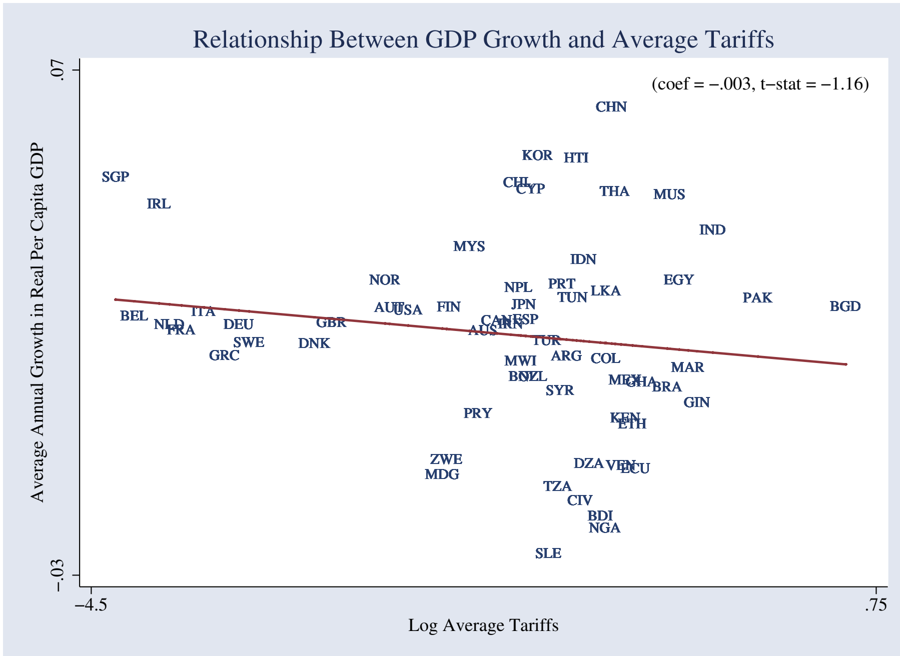

Figure 1. Bivariate Relationship Between $E\tau_{c0}$ and Average Annual Growth of Per Capita GDP.

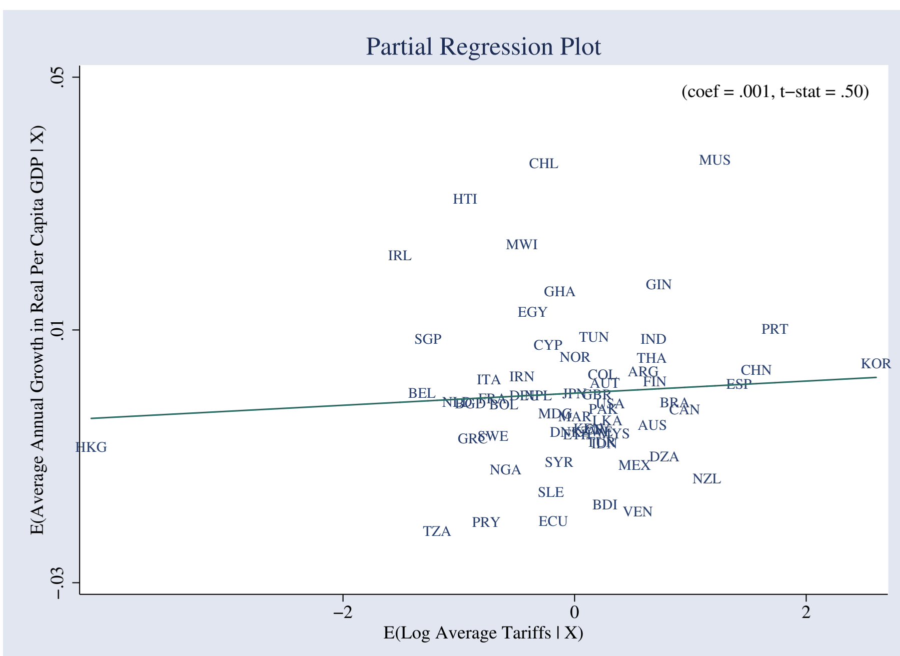

Figure 2. Partial Regression Plot: $E\tau_{c0}$ and Average Annual growth of Per Capita GDP.

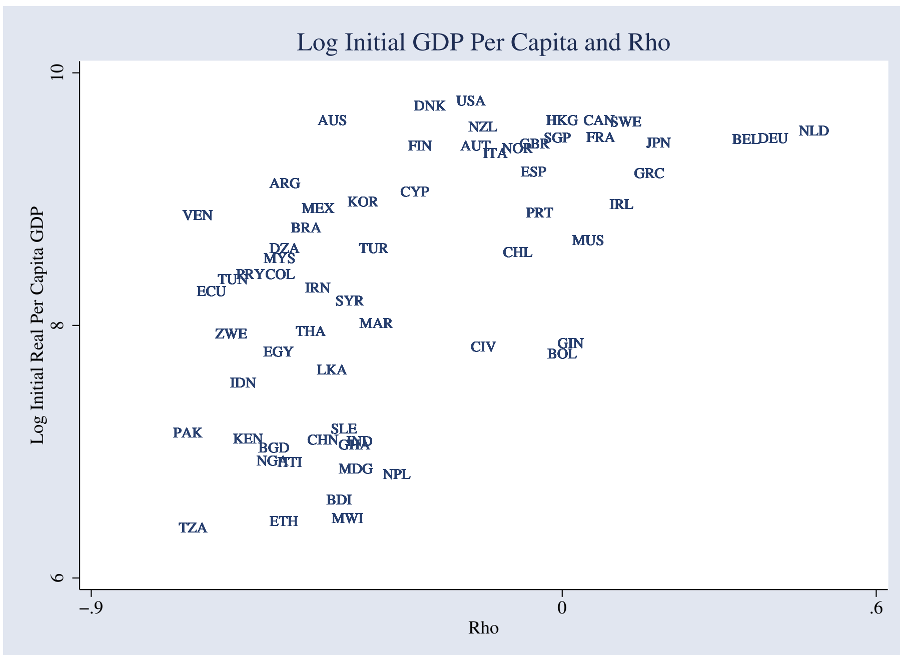

Figure 3. Bivariate Relationship Between Log Initial Per Capita GDP and ρ_c.

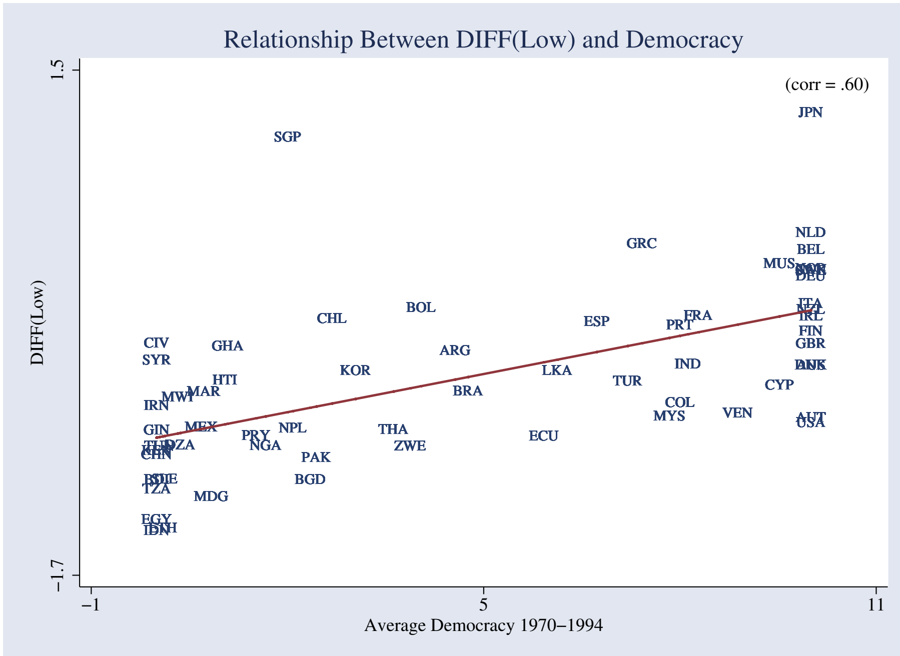

Figure 4. Bivariate Relationship Between $DIFF_c^{Low}$ and Democracy.

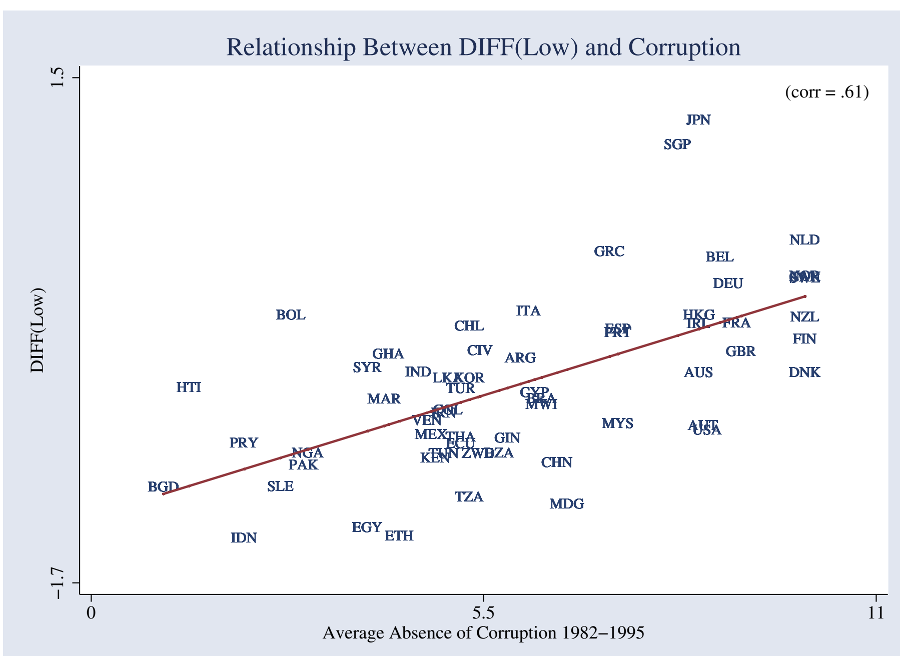

Figure 5. Bivariate Relationship Between $DIFF_c^{Low}$ and Absence of Corruption.

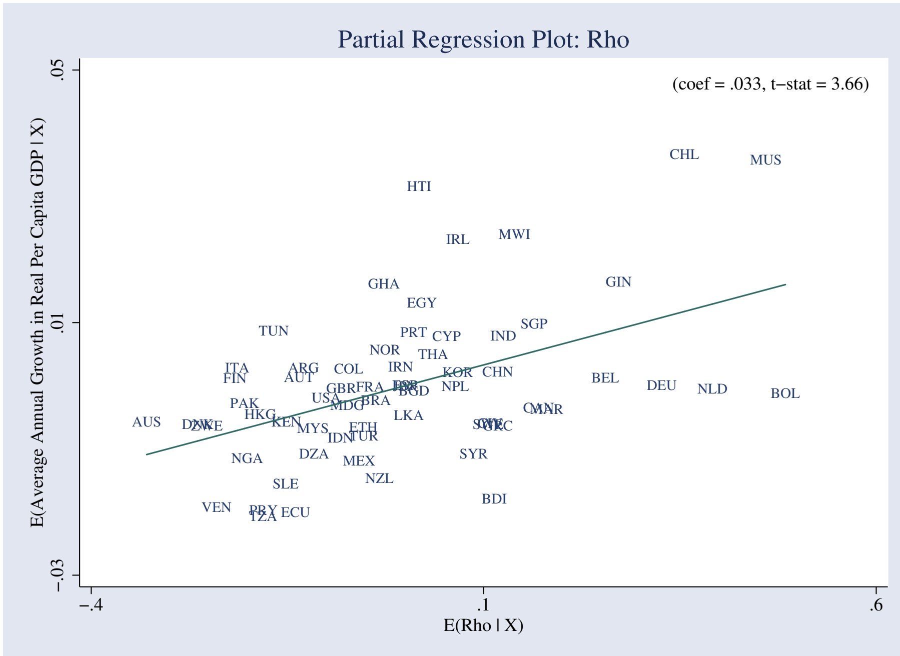

Figure 6. Partial Regression Plot: Average Annual Per Capita GDP Growth and ρ_c.

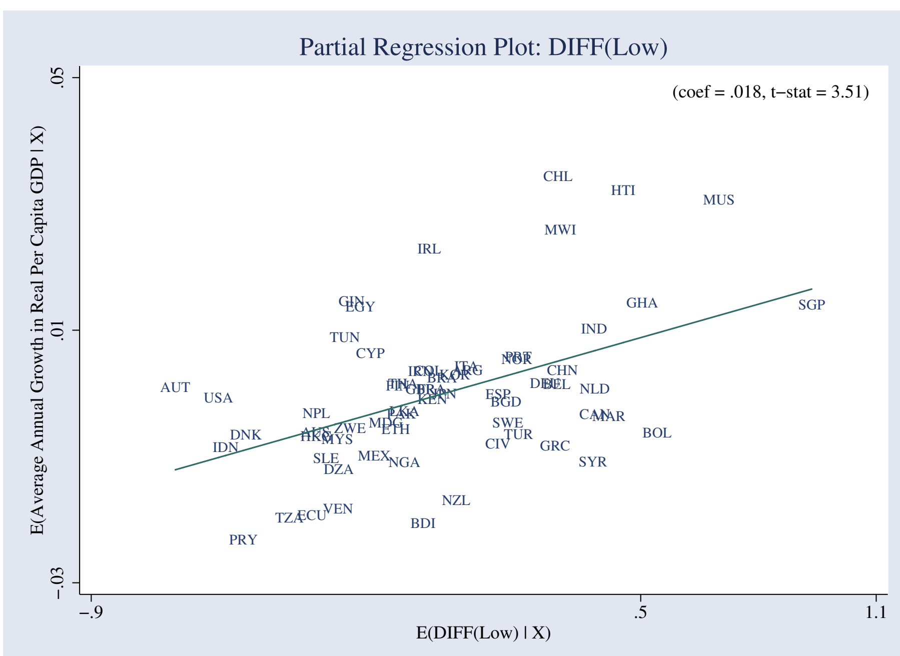

Figure 7. Partial Regression Plot: Average Annual Per Capita GDP Growth and $DIFF_c^{Low}$.