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Abstract

This paper examines the effect of trade integration and comparative advantage on one of a country's institutions, which in turn inuences its economic efficiency. The environment we explore is one in which a country's lower classes may revolt and appropriate wealth owned by a ruling elite. The elite can avert revolution by incentivizing a potentially productive middle class to sink their human capital into a relatively unproductive bureaucracy. Thus the bureaucracy serves as an institution through which the elite can credibly commit to make transfers to the rest of society, but in the process this reduces economic efficiency. Trade integration alters the relative value of the elite's wealth. This alters the lower classes' incentive to revolt on the one hand and the elite's incentive to subsidize participation in the inefficient bureaucracy on the other. Therefore, the interaction between a country's comparative advantage and an inefficient economic institution determines whether trade integration increases or reduces economic efficiency. The econometric findings support the model's main prediction.

JEL-Codes: D300, D740, F100, O120, P140.

Keywords: efficiency, institutions, property rights, social unrest, trade integration.

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1. Introduction

It is well-known that effective economic institutions - the rules and norms that govern economic interactions - facilitate economic development. Through the development of this idea, many scholars have explored how security of property rights, the prevalence of corruption, and financial institutions, among others affect economic growth. Yet in many developing countries powerful groups within a society seek to manipulate institutions in order to enhance or maintain their power and wealth if they are not bound by appropriate constraints. This manipulation of institutions potentially undermines economic performance as captured by economic efficiency and equity (e.g., North 1988, Coatsworth 1993, 1998, Engerman and Sokoloff 1997, Hall and Jones 1999, Acemoglu, Johnson and Robinson 2001, 2002, Efendic, Pugh and Adnett 2011).[4]

Although a recent literature has explored how elites manipulate economic institutions, less is known about how the process of globalization, i.e. trade integration, affects the institutions that in turn facilitate economic development. The international trade literature has a long history of explaining variations across countries in their economic outcomes based on heterogeneity in underlying factor endowments. Yet the connection to this way of understanding economic outcomes has largely been overlooked in the literature on the endogenous development of institutions. A surprising conclusion that will emerge from our analysis is that the interaction of factor endowments and the elite's determination of the institution on which we focus can cause globalization to either increase or decrease a country's economic performance.

The framework we explore features heterogeneity in endowments across socio-economic groups (elite, middle class, and workers), comprises two goods (primary products and manufacturers) that are produced using three factors (land, labor, and human capital). The elite's wealth derives from their ownership of 'latifundia', which can be envisioned as large estates suitable for the production of primary products (e.g., mining or agriculture). More generally, the elite's endowment could be thought of as any rent-producing asset. Unlike workers who labor on the latifundia, the middle class possess human capital that can be deployed toward the creation of firms that produce manufactures. Alternately, the middle class can seek employment in the government, which as we will see can be subsidized by the elite in their attempts to stave off revolution. In this setting, if the country has an abundance of human capital relative to land and labor then it has a comparative advantage in manufactures. Otherwise it has a comparative advantage in primary products.

Together, the workers and middle class, referred to collectively as the lower classes, can mount a revolution against the elite which, if successful, would strip the elite of their wealth and political power. But initiating a revolution comes at a cost. Revolution is attractive to the lower classes only if its cost is small relative to the potential gain from appropriating the elite's wealth. To address the threat of revolution, in our model, the elite can facilitate government employment

[4]See Sokoloff and Engerman (2000) for a review of the literature.

contracts for the middle class that are insensitive to their job performance in order to guarantee beyond reasonable doubt that the transfers will be made.[5] In the interest of clarity, government employment plays no other role in our model. We refer to this aspect of government employment as 'pampered bureaucracy' to highlight the role of credible commitment device that it plays for making transfers to the rest of society. It is because the pampered bureaucracy represents a form of commitment device that we can think of it as an institution rather than simply as a representation of government policy. The transfers made to the middle class through the pampered bureaucracy reduce the payoff to revolution to the point where it is no longer worthwhile.

Our modelling approach is based on various accounts of how government employment has been used to maintain political stability. Jones (2012) explains how government employment was used to maintain political stability during the wave of uprisings in the Middle East known as the Arab Spring. *The Economist* (2011) provides anecdotal evidence of the use by various elites of government employment to quell social conflict. This type of influence by the elite over public sector employment decisions is documented for Africa by Acemoglu, Johnson and Robinson (2003), and for Latin America by Sokoloff and Engerman (2000), while Baldacci, Hillman and Kojo (2004) show that larger governments are associated with lower growth in low-income countries. One might be tempted to imagine that the elite might instead make cash transfers to the lower classes, thus temporarily reducing the elite's wealth, but such transfers suffer from a commitment problem: the lower classes know that when threat of revolution passes, so will the elite's incentive to continue transfers (Acemoglu and Robinson 2000). Although the feature of pampered bureaucracy is used for concreteness, it should be understood that more generally this feature represents any economic institution that serves as a credible commitment device through which the elite can make transfers to stave off a revolution but which also lowers productivity.[6]

We next analyze how trade integration affects economic equilibrium. Trade integration affects the distribution of income within a country. The term 'trade integration' is associated with the ongoing process of globalization (i.e., with a reduction in transport and information costs) or with changes in endogenous policy decisions - i.e., tariff levels. For tractability we permit trade integration to be determined exogenously to the elite's decision-making process by the forces of globalization.

In a country with a comparative advantage in primary products, trade integration increases

[5]It is tempting to think that the elite could always suppress any uprising using military force instead of making credible public transfers. However, the elite may fear building a bigger military lest it be coopted by the lower classes and used against them (Acemoglu, Ticchi and Vindigni 2010). This effective upper bound on the size of the military necessitates the use of other institutions such as the one we explore in this paper.

[6]Increasing the size of government may not be the most efficient way to make transfers aimed at maintaining political stability, in comparison to more far-reaching measures such as land reforms (i.e., distributing land fairly among all economic agents). Yet in many cases such reforms are, from the perspective of the elite, both expensive to implement and impractical for the rest of society to enforce, particularly in countries with less well-developed enforcement institutions (e.g., Grossman 1994). Elites thus often seek intermediate mechanisms that would permit their retention of power while also committing to transfers for the purpose of averting revolution.

the wealth of the elite, raising the lower classes' incentive to revolt. This is a direct implication of the Stolper-Samuelson theorem. In this circumstance the elite have an incentive to increase the size of the pampered bureaucracy and this drains human capital from the relatively efficient manufacturing sector. If the country has a comparative advantage in manufactures then the effect on the elite's wealth and hence their incentive to change the size of the pampered bureaucracy is the opposite. The effect of trade integration on economic efficiency thus depends on the relative magnitudes of the standard gains from trade and on the effects on efficiency of a change in the size of the pampered bureaucracy.

We characterize the set of circumstances under which, as a result of trade integration, a change in the size of the pampered bureaucracy overwhelms the standard gains from trade. We find that when the country has a comparative advantage in primary products the deleterious effect of an increase in the size of the pampered bureaucracy on efficiency is relatively more pronounced when the country also has a relatively large middle class and hence a relatively large endowment of human capital. This deleterious effect can overwhelm the positive effects on efficiency that arise from the gains from trade. When the country's comparative advantage is in manufactures, both effects work in the same direction and trade integration always increases efficiency.

Our econometric implementation examines the model's prediction that an increase in trade integration leads to an increase in the size of the pampered bureaucracy in countries with a comparative advantage in primary products, but to a decrease in the size of the pampered bureaucracy in countries with a comparative advantage in manufactures. We will refer to this as the model's 'main prediction.' The main prediction cannot be tested directly, since the size of the pampered bureaucracy is not directly observed and data are only available for total government spending on wages and salaries. However, our econometric methodology allows us to test a direct implication of the model's main prediction, which is that we expect to see a greater effect of trade integration on the size of total government spending on wages and salaries in countries with a comparative advantage in primary products, relative to countries with a comparative advantage in manufactures. The analysis controls for country-specific fixed effects and time-varying country-specific observables, as well as alternative theories of government employment.[7] We first show that the empirical evidence supports the model's implication in a regression that pools all countries in our sample. We then allow for heterogeneity by level of development and show that, as one might expect, there are larger effects associated with our theory among developing countries than among developed countries. This could be because the institutional structure of developed countries is strong enough to largely prevent their elites from influencing government employment decisions or because property rights

[7]In doing so, this analysis goes beyond the theoretical model in that it incorporates the possibility that each government employee's employment serves in part the legitimate functions of government as well as the interests of the elite via the pampered bureaucracy. Our data measure total government employment which incorporates both functions. In the simplest terms, the 'pampered bureaucracy' element can be thought of as giving rise either to shorter working hours for given remuneration or to a higher remuneration rate than in the private sector.

can be more effectively enforced in countries that are more highly developed.[8]

The paper makes several novel contributions. The first contribution is to the literature that studies circumstances under which trade liberalization leads to improved economic performance (Sachs and Warner 1995, Frankel and Romer 1999, World Bank 2001, Dollar and Kray 2002, Campos and Horváth 2012). Critics have argued that liberalization can be detrimental to growth by inhibiting infant industries and learning by doing (Krugman 1981, Young 1991, Hausmann and Rodrik 2002), though the literature has not reached a consensus about the conditions under which trade liberalization is beneficial (e.g., Rodriguez and Rodrik 2001). We contribute to this literature by providing a set of indications as to when trade integration might spur an increase in efficiency and when it might actually lead efficiency to be undermined.

This paper also contributes to the literature that studies how economic elites manipulate economic institutions. Acemoglu and Robinson (2001) focus on inefficient transfers where the desire to attract political support brings about a misallocation of resources towards inefficient sectors. Besley and Persson (2009) examine the failure of an elite to install fiscal capacity as a deliberate step to prevent the possibility of their own assets being taxed. By conditioning on relative factor endowments and on trade integration, our framework provides an explanation for why the manipulation of a given institution can be good for economic performance in some situations but bad in others (Besley and Jayaraman 2010).

Third, in terms of the literature on international trade, there are studies that focus on the relationship between institutions and international trade but do not study social conflict as we do (e.g., Levchenko 2007, Nunn 2007, Costinot 2009, Do and Levchenko 2009, Stefanides 2010, de Jong and Bogmans 2011). There are several studies that do consider the possibility that conflict between groups reduces economic efficiency. But these are set in an open economy macro framework where elite intervention can only have a detrimental effect on efficiency (e.g., Segura-Cayuela 2006, Liu and Ornelas 2010), or where the focus is on civil war (Garfinkel, Skaperdas and Syropoulos 2008) or crime (Dal Bo and Dal Bo 2011), rather than considering differential effects on efficiency based on comparative advantage arising from how a powerful group manipulates institutions to maintain control over their power and wealth as we do here.

Finally, our paper also contributes to the literature on bureaucracy as an element of the competitive rent-seeking process (Tullock 1967, Niskanen 1968, Krueger 1974, Bhagwati 1982, Spinesi

[8]The threat of revolution is generally thought more applicable to developing countries/dictatorships. This may be because the high concentration of a nation's assets in the hands of the elite, prevalent in many developing countries, can make the expected payoff to revolution in these countries relatively high. Conversely, in developed countries, markets tend to be better developed so that the rest of society are able to acquire a diverse portfolio of assets, and consequently do not support expropriation since their own assets may be adversely affected in the process. In general, it may be argued that revolution is the final backstop that underpins all political-economic systems including those in democracies. Under this interpretation, the reason we tend to observe fewer occurrences of political violence in developed countries is because the institutional structure is more supportive of the status quo.

2009, Acemoglu, Ticchi and Vindigni 2011).[9] This literature identifies features of bureaucracy more salient in developing country settings. Bhagwati (1982) incorporates the idea of rent-seeking into a general class of directly unproductive profit-seeking activities; the pampered bureaucracy may be regarded as another example of such an activity. An expansion of such activities coupled with their negative shadow price results in economic contraction, and our work explores one possible set of conditions under which this could occur.

The paper proceeds as follows. Section 2 lays out the basic framework. Section 3 explores how economic equilibrium is affected by trade integration. The political equilibrium and main theoretical findings are described in Section 4. Sections 5 and 6 outline the empirical strategy and present data and summary statistics. Econometric results are presented in Section 7. Section 8 concludes. Additional derivations, proofs, and robustness checks are provided in the Appendix, which is itself divided into seven sections: Appendix A - Appendix G.

2. The Basic Model

We extend a standard model of international trade to allow, in a novel way, for the possibility of social conflict wherein an endowment is reallocated from one group of citizens to another. There are three socioeconomic groups: the rich elite, r, middle class, m, and workers, w. The mass of the total population is normalized to one, and the share of each group in the population is fixed exogenously at λ^r, $\lambda^m > 0$, and $\lambda^w = 1 - \lambda^r - \lambda^m$.

There are three factors of production: land, labor, and human capital. Factor endowments are fixed exogenously. Each member of the elite has an endowment (assumed to be positive), L, of 'latifundia', consisting of high grade land suitable for the production of primary products. Each member of the middle class has a non-negative endowment, H, of human capital. Each member of the elite and each worker has a unit endowment of labor, implying that total labor supplied by the elite and the workers are λ^r and λ^w, respectively. If there is a revolution then the elite's latifundia are redistributed among the other groups.

There are two homogeneous goods: a primary product, c (a mnemonic for 'commodity', for example coffee or gold); and a manufactured good, g. We will refer to these simply as 'primary products' and 'manufactures.' Primary products are chosen as the numeraire and the relative price of manufactures is denoted by p.

2.1. Production and Income

Production of manufactures occurs as follows. Each member of the middle class can use her human capital to set up a firm, thus becoming an entrepreneur. A firm built with human capital H

[9] See Nitzan (1994) for a review of the literature on rent-seeking.

produces output using a linear production technology, $g = H$.[10] Entrepreneurial income, y^e, is thus given by

$$y^e(p) = pH. \tag{2.1}$$

The share of the middle class who elect to become entrepreneurs is denoted θ^e.[11]

For brevity, the adjective 'pampered' will be dropped and we will refer to the inefficient institution simply as the 'bureaucracy'. Members of the middle class can be induced to join the bureaucracy by an income, y^b, that gives them a level of welfare at least as high as they would achieve from entrepreneurship; i.e., such that $v^b \geq v^e$, where v^i is the welfare of a member of group i as measured by their indirect utility function $v^i\left(p, y^i\right)$ (formally specified below).

The share of the middle class that become bureaucrats is denoted θ^b, with $\theta^e = 1 - \theta^b$. Each individual of the middle class takes θ^b as given and they fill all available vacancies provided $v^b \geq v^e$. We first take the size of the bureaucracy, θ^b, as given and use the model to examine the effects of an exogenous change in θ^b. In due course we will allow the size of the bureaucracy to be a variable influenced by the elite. For convenience we will adopt a baseline assumption that $\theta^b \in (0, 1)$, which implies that we can differentiate any function that has θ^b as an argument in order to evaluate the implications of a change in the size of the bureaucracy.

The elite choose y^b to satisfy $v^b = v^e$.[12] Thus

$$y^b(p) = pH. \tag{2.2}$$

For concreteness, our framework applies the simplifying assumption that the bureaucracy is set up specifically for the purpose of making publicly observable transfers. In the interest of clarity, government employment produces nothing and plays no other role in the model. This is a stylized characterization of a situation where the middle class are relatively more productive in manufacturing than in the bureaucracy.

[10] Our results are not sensitive to the linearity assumption, which is made for analytical tractability.

[11] Thus the share of entrepreneurs in the total population is given by $\theta^e \lambda^m$. Where possible, parameters will be suppressed from functional notation throughout the exposition. Therefore, for example, the full functional form $y^e(p; H) = pH$ is expressed as $y^e(p) = pH$. (Although p is taken as given under free trade, it is determined endogenously in autarky and is treated as a variable.)

[12] We assume that y^b is chosen to yield $v^b = v^e$ for expositional purposes only, so that when it comes to the bargaining stage we can consider the middle class as a single homogeneous group. Because we assume that each group is able to resolve its collective action problem, we are able to model the incentives of the workers and the middle class to mount a revolution by a two-player Nash bargain. In general, the elite could also consider an efficiency wage implying $v^b > v^e$, so that a given amount of revenue results in a smaller but higher-paid bureaucracy. As will become clear, allowing bureaucrats and entrepreneurs to act as two separate groups within the middle class would yield exactly the same results via a three-player Nash bargain. This set-up would place an upper bound on y^b when considering $v^b > v^e$.

Primary products may be produced in the latifundia or on low-grade land. The amount of labor employed in the latifundia is $\lambda^c \in [0, \lambda^r + \lambda^w]$. The (aggregate) production technology of primary products in the latifundia takes the Leontief form $c = \min\{\lambda^r L, \lambda^c\}$.[13]

The remaining labor, $\lambda^r + \lambda^w - \lambda^c$, is employed on the low-grade land where it also produces primary products as well but is less productive. On the low-grade land, a unit of labor produces a quantity ω of primary products. Parameters are fixed such that $\lambda^r + \lambda^w > \lambda^r L$, and ω is set sufficiently low that there is excess supply of labor to the latifundia. The role of low-grade land in the model is to pin down the wage of labor used by the latifundia at ω. This in turn puts an upper bound on payments to labor, which ensures that elite income is positive in equilibrium.

We treat the elite as homogenous in the sense that each member of the elite contributes equally towards the costs of the bureaucracy and employs their own labor in his own production of primary products at the common wage rate. They also receive a return L for their endowment of the latifundia, since the price of primary products has been normalized to one. Finally, each member of the elite contributes equally to the pampered bureaucracy.

Elite per-capita income is then given by

$$y^r\left(p, \theta^b\right) = L - \left(\left(\lambda^c - \lambda^r\right)\omega + \theta^b \lambda^m y^b\left(p\right)\right)/\lambda^r. \tag{2.3}$$

The first term in brackets is the share of income that a member of the elite must pay to the workers that are hired, while the second term in brackets is the per-elite-capita cost of the bureaucracy (when divided by λ^r).[14]

In the event of a revolution, the lower classes incur a cost of mounting a revolution, d, and as a result of revolution the latifundia are transferred to them. The conditions under which a revolution may occur or be prevented will be determined in Section 4.

2.2. Preferences and Demands

Each member of group $i \in \{r, b, e, w\}$ has the following quasi-linear utility function:

$$u^i\left(x_c^i, x_g^i\right) = x_c^i + \alpha x_g^i - \frac{1}{2}\left(x_g^i\right)^2, \tag{2.4}$$

where x_c^i and x_g^i are consumption of primary products and manufactures respectively by a member of group i, and α is a positive parameter. Equation (2.4) is maximized subject to the budget constraint, $y^i = x_c^i + p x_g^i$. We will focus on the interior solutions throughout the main text. The generalities of the consumer's problem, including corner solutions, are explored in Appendix A.

[13]The assumption of Leontief production technology does not drive our main results and is for mathematical tractability only. The Leontief technology approximates a constant-elasticity-of-substitution technology wherein the elasticity of substitution between inputs is relatively low. With a high elasticity of substitution between inputs the same qualitative results can be obtained but the analysis is significantly more complicated.

[14]Note that payment to a member of the elite for his own labor services has been netted out of this expression.

The interior solution for each $i \in \{r, b, e, w\}$ is $x_g^i(p) = \alpha - p$, $x_c^i = y^i - x_g^i(p)$.[15] Using these in the utility function yields the indirect utility function, which provides the following measure of the welfare of a member of group i, v^i:

$$v^i\left(p, y^i\right) = y^i + \frac{1}{2}(\alpha - p)^2. \tag{2.5}$$

When trade integration occurs, the demand for imports is measured in the usual way as the excess of domestic demand over domestic supply and the value of exports is equal to the value of imports. However, there is no need to explicitly characterize imports and exports since in our context the gains from trade are completely characterized by the effect of a change in the terms of trade, p, on v^i.

2.3. The Timing of Events

The sequence of events is as follows.

1. The elite decide whether to set up a bureaucracy. If so, they choose y^b and θ^b.
2. Production is undertaken in manufacturing, in the latifundia, and on the low-grade land and payments are received by labor. If there is a bureaucracy, employees receive payment.
3. The lower classes decide whether to mount a revolution. If they do not, factor allocations do not change. If they do mount a revolution they incur the fixed cost, d, and ownership of the latifundia and output of primary products are transferred from the elite to the lower classes. The elite retain their labor endowment and labor income.
4. Demands are realized, markets clear and consumption takes place.

The assumption made in stage 3 that after revolution the elite retain their labor income is made for tractability to ensure that the outcome of the consumer problem is always interior for the elite. Note that if entrepreneurs have an incentive to mount or support a revolution then so do bureaucrats, the latter being rewarded for their support of the revolution at least in part by retention of their jobs in the bureaucracy.[16]

[15] The assumption that the demand curve for manufactures is linear simplifies the analysis but is not essential for our results.

[16] Clearly, the model is static in the sense that the sequence of events is not repeated. At the cost of some extra complexity, our model could be extended to a dynamic setting. Then, the threat of revolution would have to be offset by a commitment to an increase in the size of the pampered bureaucracy not just in the current period but in future periods as well. Following Acemoglu and Robinson (2000), if the opportunity of mounting a revolution arose only occasionally then the commitment problem would arise. This would require a transfer of fiscal authority to the lower classes, possibly through an extension of the franchise. But, again following Acemoglu and Robinson, the opportunity to mount a revolution may arise with sufficient frequency that it is possible to enforce elite promises to make transfers through the pampered bureaucracy. So the assumption required to replicate our results in a dynamic extension of our model would be that the opportunity to mount a revolution arose with sufficient frequency. This would represent a partial weakening of the assumption we make in our (static) setting that the threat of revolution is always present.

2.4. Efficiency

The utilitarian notion of efficiency determines the total surplus available for distribution to citizens, Ω:

$$\Omega\left(p,\theta^b\right) \equiv \lambda^r v^r\left(p\right) + \lambda^m\left(\theta^b v^b\left(p\right) + \theta^e v^e\left(p\right)\right) + \lambda^w v^w\left(p\right),$$

where the three terms measure the surplus available to the elite, middle class and workers, given p. Under the quasi-linear structure of $v_i\left(p,y^i\right)$, given by (2.5), total surplus for a group is given by their income, y^i, and the consumer surplus derived from manufactures. Using (2.5), the above expression for $\Omega\left(p,\theta^b\right)$ simplifies to

$$\begin{aligned}\Omega\left(p,\theta^b\right) \equiv\ & \lambda^r L + \left(1-\theta^b\right)\lambda^m pH + (\lambda^r + \lambda^w - \lambda^r L)\omega \\ & + \frac{1}{2}\left(x_g^i\left(p\right)\right)^2.\end{aligned} \tag{2.6}$$

where the three terms on the first line are the respective incomes of the elite, middle class and labor, and total consumer surplus from manufactures summed across the three groups appears on the second line.

To see the effect of a change in the size of the bureaucracy on efficiency, differentiate $\Omega\left(p,\theta^b\right)$ with respect to θ^b to obtain:

$$\frac{d\Omega\left(p,\theta^b\right)}{d\theta^b} = -\lambda^m pH < 0. \tag{2.7}$$

This expression shows that an expansion of the bureaucracy reduces efficiency. The reason is that an expansion of the bureaucracy draws members of the middle class away from the more productive activity of production in the manufacturing sector.

3. Economic Equilibrium

We will consider economic equilibrium under autarky and free trade respectively. First consider the autarkic equilibrium in which the price adjusts to clear the domestic market. Specifically, the autarky price, p_a, solves the market-clearing condition for manufactures:

$$\lambda^r x_g^r\left(p_a\right) + \lambda^m\left(\theta^b x_g^b\left(p_a\right) + \theta^e x_g^e\left(p_a\right)\right) + \lambda^w x_g^w\left(p_a\right) = \lambda^m\theta^e H. \tag{3.1}$$

The left hand side sums demands across groups. The right hand side gives the supply of manufactures.

Recall that $x_g^i\left(p\right) = \alpha - p$ for $i \in \{r,b,e,w\}$. Using the fact that the mass of the total population is normalized to one, write (3.1) as $\alpha - p_a = \left(1-\theta^b\right)\lambda^m H$, from which the autarky market clearing price is

$$p_a = \alpha - \left(1-\theta^b\right)\lambda^m H. \tag{3.2}$$

Setting a lower bound on α at $\underline{\alpha} \equiv \left(1-\theta^b\right)\lambda^m H$ ensures that $p_a > 0$ for all $\alpha > \underline{\alpha}$. Note that p_a is increasing in θ^b. Intuitively, increasing the size of the bureaucracy reduces the output of manufactures and this pushes up their price. By (2.1) and (2.2), an increase in p increases both y^e and y^b, so in autarky the elite can raise the payoff to the middle class of maintaining the status quo by increasing the size of the bureaucracy and thus make revolution less attractive.

Under free trade, and because this is a small country, the world price p_w is taken as given. It is also assumed that the rest of the world produces and consumes primary products and manufactures, i.e., that both goods can be traded. By definition, a country produces relatively cheaply the good for which it has a comparative advantage. So a comparative advantage in primary products would imply $p_w < p_a$; a comparative advantage in manufactures would imply $p_w > p_a$. Observe that, by (3.2), p_a is decreasing in H. So for a given value of p_w it becomes more likely that a country has a comparative advantage in manufactures as H is increased; that is, as the country's endowment of human capital is increased relative to the rest of the world. Therefore, we could determine endogenously the difference between p_a and p_w as a reflection of differences in average factor endowments across countries. Since our econometric implementation does not require explicit measurement of underlying factor endowments, in the analysis that follows we will leave implicit the relationship between them and comparative advantage.

Accordingly, we will parameterize the difference between the world and autarky prices as $p_w = p_a \pm \sigma$, where $\sigma > 0$. If the country has a comparative advantage in manufactures then $p_w = p_a + \sigma$ while if the country has a comparative advantage in primary products then $p_w = p_a - \sigma$. To ensure that $p_w > 0$ requires the following modification to the restriction on α identified above for autarky: we now require $\alpha > \sigma + \underline{\alpha}$. This condition will be assumed to hold throughout. Domestic demand for imports is greater at p_w and so imports are positive under free trade. Trade is balanced in free trade equilibrium so there is an equal value of exports to clear the trade account.

We now evaluate the effects of trade integration on individual factor rewards and see that the Stolper-Samuelson theorem holds in our model (although not strictly for w). First, from (2.1) we have $dy^e/dp = H$. Substituting (2.2) into (2.3) and differentiating with respect to p gives $\partial y^r/\partial p = -\theta^b\lambda^m H/\lambda^r$. We also have $dy^w/dp = 0$. That is, an increase in the (relative) price of manufactures, p, leads to an increase in the (nominal and real) income of entrepreneurs, and the condition $v^b = v^e$ implies that the income of bureaucrats must increase as well. This also implies a fall in the income of the elite, and no change in the income of workers. The converse holds for a fall in p. The welfare implications are less immediate but are consistent with the Stolper-Samuelson theorem. First, $dv^b/dp = dv^e/dp = H - (\alpha - p)$. Appendix A establishes that the condition on H required for the consumer's problem to be interior is precisely $H > (\alpha - p)$, and it follows that an increase in p makes entrepreneurs and bureaucrats better off. On the other hand, $\partial v^r/\partial p = -(\alpha - p) - \theta^b\lambda^m H/\lambda^r$ while $dv^w/dp = -(\alpha - p)$ which are both negative (given $\alpha > \sigma + \underline{\alpha}$) again as we should expect, so that a rise in the price of primary products, captured by

a fall in p, would make the elite and workers better off.

4. Political Equilibrium

Assume that each group within the lower classes, the middle class and the workers respectively, is able to resolve its collective action problem inherent in the decision over whether or not to revolt. Following Tullock (1974), assume that the participation of both groups is required for a revolution to be successful. This could occur, for example, because acting alone the middle class do not have sufficient numbers and the lower classes do not have sufficient economic resources to successfully execute a revolution, while together they do. The objective of the elite will be to reduce the surplus from revolution to zero through its manipulation of the size of the bureaucracy, thus removing the incentive to revolt.

The aim is now to establish that there exists a value of θ^b that would reduce the surplus from revolution to zero, where the surplus is given by the total value of elite net income (less their return to labor) after production has taken place minus the cost of mounting a revolution. We will say that such a value of θ^b satisfies the 'no revolution constraint' (NRC), and refer to this value as $\widetilde{\theta}^b$. The NRC is expressed formally as follows:

$$\begin{aligned} NRC \quad &: \quad h\left(\widetilde{\theta}^b, p\right) = \lambda^r y^r\left(\widetilde{\theta}^b, p\right) - d \\ &= \quad \lambda^r\left(L - (L-1)\,\omega\right) - \widetilde{\theta}^b \lambda^m p H - d = 0. \end{aligned} \tag{4.1}$$

This equation describes the surplus from revolution. The middle class and the working class expropriate the Latifundia. This gives them the income of the elite $\lambda^r y^r\left(\widetilde{\theta}^b, p\right)$, net of labor income, to divide between themselves (via a Nash bargain). The term d is the cost of revolution, so this must be subtracted to obtain the surplus.

To derive an expression for $\lambda^r y^r\left(\widetilde{\theta}^b, p\right)$, i.e. to derive the second line of (4.1), begin from (2.3) and multiply by λ^r to obtain

$$\lambda^r y^r = \lambda^r L - \left(\left(\lambda^c - \lambda^r\right)\omega + \theta^b \lambda^m y^b\left(p\right)\right).$$

The term $\left(\lambda^c - \lambda^r\right)\omega$ is the elite's total labor costs net of their own labor input. We have set up the model so that there is 'full employment' in the latifundia: $\lambda^c = \lambda^r L$. From this we obtain

$$y^r = \lambda^r L - \left(\left(\lambda^r L - \lambda^r\right)\omega + \theta^b \lambda^m y^b\left(p\right)\right).$$

Using $y^b\left(p\right) = pH$ and simplifying, we get

$$\lambda^r\left(L - (L-1)\,\omega\right) - \theta^b \lambda^m p H.$$

We will use (4.1) to study $\widetilde{\theta}^b$ in the next subsection.[17]

4.1. The Equilibrium Size of the Bureaucracy

It is instructive to solve for $\widetilde{\theta}^b$ first under free trade and then under autarky. Under free trade, take p as given and obtain $\widetilde{\theta}^b$ by rearranging (4.1):

$$\widetilde{\theta}^b(p) = \frac{\lambda^r (L - (L-1)\omega) - d}{\lambda^m p H}. \tag{4.2}$$

For $\widetilde{\theta}^b$ to satisfy *NRC*, it must lie in the interval $(0, 1]$. If the solution lies at or below zero then this implies that d is sufficiently large relative to $\lambda^r y^r\left(\theta^b, p\right)$ that a revolution is not attractive. From (4.2), an increase in d makes this more likely. If the solution is greater than one then the *NRC* cannot be satisfied for any value of $\widetilde{\theta}^b$ and there is nothing that the elite can do (within the context of the present model) to prevent revolution. For $\omega \in (0, 1)$, an increase in L makes this more likely. An increase in the cost of revolution tightens the *NRC* while an increase in the value of the latifundia increases the payoff to revolution and hence relaxes the *NRC*. We can now characterize political equilibrium in autarky.

Proposition 1 *(Characterization of Political Equilibrium in Autarky). There exist ranges of d sufficiently small and H sufficiently large that in the autarky equilibrium the equilibrium size of the pampered bureaucracy, i.e. the (unique) value $\widetilde{\theta}^b \in (0, 1]$ satisfying the NRC, prevents a revolution.*

See Appendix D for a proof. The restrictions on d and H are imposed to ensure that $h(0, p_a) > 0$ and $h(1, p_a) < 0$. The proof of this result establishes exact bounds on d and H. There is no conflict with the bound $H > (\alpha - p)$ identified above because both require that H be above a minimum size. The proof then shows that the first derivative of $h\left(\theta^b, p_a\right)$ with respect to θ^b is negative, thus establishing that $\widetilde{\theta}^b$ is unique.

This result shows that, providing the cost of mounting a revolution is not too large, and that the human capital endowment is sufficiently large, it is always both possible and in their interests for the elite to expand the size of the bureaucracy to the point where a revolution is not worthwhile for the lower classes. The bureaucracy thus serves as a mechanism for dissipating rents in that it can be used to push the payoff to revolution below the cost. The rest of society receive no direct benefit from an expanded bureaucracy since, in equilibrium, middle class income is underpinned by the return to setting up a firm and the return to labor is underpinned by the return from working

[17] Since our focus is on the existence of a value of θ^b that brings the surplus from revolution to zero, we do not need to worry about how the surplus would be divided between the middle class and the workers if it were positive. Nevertheless, we can model this division as a Nash bargain. See Appendix B for the conditions under which a solution to $\widetilde{\theta}^b$ exists. See Appendix C for the derivation of the *NRC* and how the surplus would be divided between the middle class and workers under a revolution.

on low-grade land. In what follows we will assume that the cost of revolution d is sufficiently small relative to L that revolution would be worthwhile with no transfers through the bureaucracy, and that H is large enough to make sufficient transfers through the bureaucracy to ensure that the *NRC* binds: the values of d and H lie in their respective ranges for which $\widetilde{\theta}^b \in (0,1)$. The reason for not including the end-point $\widetilde{\theta}^b = 1$ is because we will want the function characterizing $\widetilde{\theta}^b$ to be differentiable.[18]

4.2. The Effects of Trade Integration on the Pampered Bureaucracy

Having now determined the size of a bureaucracy that prevents a revolution in autarky, assuming a bureaucracy exists, we can examine the effects on its size of trade integration. We will focus on the case where the country has a comparative advantage in primary products. The logic works in reverse if the country has a comparative advantage in manufactures. The first step will be to show that, given $\widetilde{\theta}^b \in (0,1)$, trade integration as captured by a reduction of p from p_a creates an incentive to mount a revolution. The second step will be to examine how $\widetilde{\theta}^b$ must be changed in order to prevent revolution under trade integration.

Differentiating the *NRC*, (4.1), with respect to p,

$$\frac{\partial h\left(\theta^b, p\right)}{\partial p} = -\theta^b \lambda^m H.$$

The reduction of p entailed by trade integration increases $h\left(\theta^b, p\right)$, establishing that trade integration generates an incentive to mount a revolution. (Since this holds for any given θ^b and p, it must hold for the specific values $\widetilde{\theta}^b$ and p_a).

To calculate the change in the size of the bureaucracy mandated by trade integration, differentiate the reduced-form expression for $\widetilde{\theta}^b$, (4.2), with respect to p:

$$\frac{d\widetilde{\theta}^b(p)}{dp} = -\frac{\lambda^r\left(L-(L-1)\,\omega\right)-d}{\lambda^m p^2 H}. \tag{4.3}$$

Given the structure imposed on the model, $d\widetilde{\theta}^b(p)/dp < 0$. If the country has a comparative advantage in primary products then trade integration mandates an increase in the size of the bureaucracy to prevent a revolution. Intuitively, the rise in the relative price of primary products (fall in p) increases elite income, y^r, thus raising the surplus to the lower classes available from revolution. However, from (2.3), increasing the size of the bureaucracy, θ^b, serves to lower y^r and with it the payoff to revolution. Providing they are not constrained by the upper bound, $\theta^b = 1$, the elite are able to increase the size of the bureaucracy to prevent revolution in the face of trade

[18] If d were subject to random shocks, the choice of $\widetilde{\theta}^b$ would not necessarily satisfy the *NRC* ex post. Yet even in such a stochastic environment the logic of our deterministic model would apply in that higher income among the elite would still tend to mandate a larger transfer from the elite to the lower classes through the pampered bureaucracy.

integration. If the country has a comparative advantage in manufactures then, by applying the above reasoning with the signs reversed, trade integration mandates a reduction in the size of the pampered bureaucracy. We refer to (4.3) as the model's 'main prediction' because it forms the basis for our econometric implementation.

4.3. The Effects of Trade Integration on Efficiency

We can now characterize the effect of trade integration on efficiency. There are two channels. First, trade integration increases economic efficiency to the extent that it facilitates a country's specialization in the good for which it has a comparative advantage. This channel is positive and captures the standard gains from trade. Second, as shown in the previous subsection, for countries with a comparative advantage in primary products trade integration brings about an endogenous expansion in the bureaucracy. From equation (2.7) we know that such an expansion of the bureaucracy reduces economic efficiency, working in the opposite direction to the standard gains from trade. This raises the possibility that, with a comparative advantage in primary products, trade integration could decrease efficiency if the second channel were to outweigh the first. On the other hand, we saw in the previous subsection that when the country has a comparative advantage in manufactures trade integration brings about an endogenous reduction in the size of the pampered bureaucracy. Thus, with a comparative advantage in manufactures, both the first and second channels complement one another and trade integration unambiguously increases welfare.

The following result provides specific details of how trade integration will affect efficiency.

Proposition 2 *(Effects of Trade Integration on Efficiency). Start from an autarky equilibrium with the size of the pampered bureaucracy endogenously determined at* $\widetilde{\theta}^b \in (0,1)$. *If the country has a comparative advantage in primary products then trade integration increases the size of the pampered bureaucracy and if* $\sigma < \lambda^m H$ *this is efficiency-reducing; if* $\sigma > \lambda^m H$ *then trade integration that brings about a sufficiently large fall in the price level raises efficiency above the autarky level. If the country has a comparative advantage in manufactures then trade integration reduces the size of the pampered bureaucracy and hence is always efficiency-increasing.*

For the proof, see Appendix E. Proposition 2 shows that trade integration may indeed reduce economic efficiency and provides the condition when this will happen. This condition focuses on the situation where the country has a comparative advantage in primary products and is couched in terms of σ and $\lambda^m H$. Recall that σ parameterizes the gap between p_a and p_w ($p_a - p_w = \sigma$) while $\lambda^m H$ parameterizes the total amount of human capital in the economy. In the proof we show that a small reduction in p from p_a unambiguously reduces efficiency. This is because the gains from trade from a change in p in the neighborhood of autarky are small; a standard feature of international trade models since efficiency is a U-shaped function of prices. Equation (2.7) shows

that the efficiency loss from the resulting increase in the size of the bureaucracy is linear in p and so must be greater than the gains from trade for a small reduction of p. So for a small reduction of p the second channel must dominate the first and trade integration must reduce efficiency. For a larger reduction of p the gains from trade increase more than linearly and so overwhelm the reduction in efficiency from the increase in the size of the bureaucracy. The terms σ and $\lambda^m H$ parameterize the size of the effects through the two channels. If $\sigma < \lambda^m H$ then the size of the first channel, the price effect on efficiency of moving from p_a to p_w, is too small to overwhelm the efficiency loss due to the movement of human capital from manufacturing to the bureaucracy which is proportional to $\lambda^m H$. If $\sigma > \lambda^m H$ then the gains from trade through lower prices of imported manufactures ($p_w < p_a$) can be sufficiently large to overwhelm the loss in domestic production of manufactures due to expansion of the bureaucracy.[19]

The feature of Proposition 2 that trade integration can reduce economic efficiency if a country has a comparative advantage in primary products has important implications both for our understanding of globalization and for development policy in an environment where governments need to worry about political stability. A key feature of the Washington Consensus was the prescription that developing countries should embrace free trade because of the favorable efficiency implications. While this view has been challenged on many fronts, our framework emphasizes a distinct channel through which trade integration might have adverse consequences for efficiency because of the resulting actions that the government must undertake to maintain political stability. Our framework further highlights that this concern tends to arise for countries with a comparative advantage in primary products and not for those with a comparative advantage in manufactures, emphasizing caution over making blanket prescriptions for development policy.

5. Empirical Approach

Recall that, according to our main prediction, comparative advantage determines the direction of the effect of a change in trade integration on the size of the bureaucracy. It predicts that in response to trade integration, countries with a comparative advantage in primary products will experience a increase in the size of the bureaucracy while countries with a comparative advantage in manufactures will experience a decrease in its size. We would have liked to have been able to take this prediction to the data but the difficulty in doing so is that we cannot observe the size of the pampered bureaucracy directly. The closest we can get across a broad cross-section of

[19]Importantly, the above discussion implies that the elite in a country with a comparative advantage in primary-products benefit from trade integration even though it requires dissipation of rents through the bureaucracy. It might appear that if we allowed the elite to control trade integration given that they were in power, and if the country had a comparative advantage in manufactures, the elite would resist trade integration. However, since revolution would also transfer control of trade policy to the lower classes, elite resistance to trade integration could generate an alternative incentive to mount a revolution. On this basis, even if we allowed the elite to resist trade integration using trade policy, they might be better off giving way to it.

countries and time are data for government spending on wages and salaries, henceforth referred to as 'government employment'.

The availability of data on government employment enables us to test a direct implication of our main prediction: that there should be a larger effect of trade integration on the size of total government employment in countries with a comparative advantage in primary products, relative to countries with a comparative advantage in manufactures. This allows for the possibility that government employment grows in countries with a comparative advantage in primary products but shrinks in countries with a comparative advantage in manufactures, as predicted by our model. But it also allows for the possibility that government employment grows in both types of country but that the growth in countries with a comparative advantage in primary products is larger than that in countries with a comparative advantage in manufactures. The idea here is that, going beyond our model, government employment will include the legitimate functions of government which may grow over time. Then the forces identified in our model simply add that the shrinkage of the bureaucracy component with trade integration in countries with a comparative advantage in manufactures will bring about lower overall growth of government employment.

In Appendix F we provide a formal derivation of this implication, showing that it can be tested for in the data using the following estimating equation:

$$e_{it} = \alpha + \beta \left(T_{it} \times c_i \right) + \gamma T_{it} + \delta \mathbf{Z}_{it} + \tau_t + d_i + \varepsilon_{it}. \tag{5.1}$$

The notation is as follows : i indexes countries and t indexes years; e_{it} is total government employment; T_{it} is a country's level of trade integration; $c_i \in \{0, 1\}$ is an indicator taking a value of 0 if country i's comparative advantage is in manufactures and 1 if its comparative advantage is in primary products; $\mathbf{Z}_{it}$ is a vector of country-specific observables; τ_t are time fixed effects and d_i are country-specific fixed effects. The implication of our model is supported in the data if $\beta > 0$ since this would reflect a relatively large effect of trade integration on government employment in countries with a comparative advantage in primary products. Appendix F also explains how this approach is robust to several complementary mechanisms proposed in the literature on the size of government (e.g., Rodrik 1998, 2000).

It is important for our empirical implementation that other determinants of total government employment do not confound the heterogeneity by comparative advantage in the relationship between trade integration and total government employment. To control for this possibility, country-specific fixed effects $\mathbf{Z}_{it}$ are included in all specifications to remove time-invariant country-specific unobservable confounders. This approach is appealing because it allows for country-specific influences on total government employment (specifically, demographic composition, fractionalization of society along ethnic, linguistic and religious lines, levels of inequality, and the system of government) without requiring explicit measurement of these factors. This also accounts for cross-country variation in institutional characteristics (e.g. the protection of property rights), to the extent that

these remain constant over time throughout our sample period.

Finally, we explicitly control for observable determinants of total government employment that may be correlated with both trade integration and comparative advantage. For example, larger countries may tend to have both a comparative advantage in manufacturing and to experience larger responses of total government employment to changes in trade integration. To capture these country-size effects, we include total gross domestic product (GDP) expressed in millions of US dollars and population in thousands of people. Similarly, countries with higher incomes may tend to have higher wage rates and thus higher central government spending on wages and salaries. This may vary systematically by comparative advantage to the extent that countries with a comparative advantage in manufacturing have higher average wage rates than countries with a comparative advantage in primary products. An ideal measure would be middle class wage rates or the minimum wage. Since no such data exist at the annual level for a wide variety of developing countries, we use per-capita income in thousands of dollars. Additionally, since political or credit constraints may influence total government employment, especially in developing countries, we control for central government revenues.

We also explicitly control for three specific alternate causal channels that could confound the interpretation of our findings. The first would arise if total government employment were disproportionately influenced by balance-of-payments crises occurring in countries that predominantly had the same comparative advantage.[20] We address this possibility by obtaining data from the IMF on all outstanding loans with conditionalities, for each year and for every country in our sample. Using these data, we construct a variable that takes a value of one for a particular country in those years in which it had an outstanding IMF loan to which were attached conditionalities during the previous year and control for it in the regressions.

The second complementary channel would be active if a planned economy, in the process of transition to a market-based economy, underwent trade integration while also altering the level of government employment. To ensure that our results are not driven by this potential confounding channel, we controlled for the years when an economy transitioned to a market-based economy.

A third possibly can be derived under the null hypothesis of Rodrik's social insurance framework (1998, 2000). This possibility may arise if countries with a comparative advantage in primary products experience greater terms-of-trade volatility as a result of trade integration, since production tends to be more specialized in countries with a comparative advantage in primary products than countries with a comparative advantage in manufactures. We include country-specific fixed effects controls for export diversification in levels, but this does not, strictly speaking, account for Rodrik's hypothesis, which is about the impact of diversification on the average partial effect associated with a change in trade integration. To properly account for his hypothesis, we explicitly

[20]These crises were often addressed by obtaining IMF loans issued subject to conditionalities that typically mandated both trade liberalization and a reduction in government expenditures including on employment.

construct the Herfindahl export diversification index for each country and include its interaction with trade integration in the regressions.[21]

6. Data and Summary Statistics

We follow the empirical literature by measuring total government employment with data from the International Monetary Fund's (IMF's) Government Finance Statistics database on central government spending on wages and salaries.[22] 'Wages and salaries' refers to the compensation received in exchange for work or services performed. These payments may be in cash or in kind. The central government is, by definition, the political authority whose jurisdiction extends over the entire territory of a country. Henceforth, as above, 'central government spending on wages and salaries' will be shortened to 'government employment'.

We employ the standard measure of revealed comparative advantage (RCA) due to Balassa (1965).[23] This measure is constructed using trade flows extracted from the World Bank's World Development Indicators (WDI).[24] Let X_{ikt} be country i's exports of product category k to the rest of the world in period t, and let $X_{i\omega t}$ be total exports from country i to the rest of the world within a set of product categories ω. X_{nkt} is the sum of all other countries' (i.e. $j \neq i$) exports in product category k, and $X_{n\omega t}$ are total world exports in the set of product categories. Then $RCA_{ikt} = (X_{ikt}/X_{i\omega t})/(X_{nkt}/X_{n\omega t})$. Following the standard approach, country i has a revealed comparative advantage in product k if $RCA_{ikt} > 1$. RCA is stable over time so we use each country's mode across years as our measure of comparative advantage.[25]

[21] The Herfindahl index is given by $H_i = \sum_{t=1}^{T}\sum_{k=1}^{n}\left[\frac{x_{kt}}{x_i}\right]^2$ where n is the number of different products exported, x_{kt} is total exports of product k in period t, and x_i is total exports from country i in period t. The Herfindahl index lies in the interval $(0, 1)$, with larger values corresponding to more concentration (less diversification) of total exports. This index was constructed using SITC 4 digit product-level trade data obtained from the United Nations COMTRADE Database. The COMTRADE data, though it is less widely available, particularly for developing countries relative to the WDI data used in our main specifications, is available at the level of disaggregation required to construct the Herfindahl index.

[22] An alternative would have been to use data from the International Labor Organization. Unfortunately for our purposes, these data are much more limited in their coverage, both across countries and time, the latter especially prior to 1995. Since our estimation procedure identifies parameters using only within-country variation, we need a sample whose variables exhibit significant variation across time. Fortunately, both trade integration and central government employment varied significantly during our sample period for many countries.

[23] An alternative approach would be to assume a factor-endowments model of comparative advantage and proxy such comparative advantage with factor endowment ratios as in Nunn (2007). Yet, unlike Nunn whose goal is to explain the determinants of comparative advantage, we take comparative advantage as given and examine the implications it has for our model's prediction.

[24] The WDI are presented in five product categories: ore, metals and minerals; fuels; agriculture; food; manufactures. Our 'primary products' variable is constructed as an aggregation of all sectors except manufactures.

[25] Our empirical implementation requires a correspondence between the Balassa index and pre-trade relative prices. This requirement is known as the Hillman Condition (Hillman 1980). In a dataset of 165 countries from 1970-1998, Hinloopen and van Marrewijk (2008) have shown that this condition typically holds after 1984 and that prior to 1984 this condition is often violated for countries whose exports are concentrated in a small number of sectors. Our main results are slightly stronger when we truncate the data in 1984, suggesting that violations of the Hillman Condition do not drive our empirical results.

We use the standard measure of trade integration, referred to as 'openness,' which is constructed in each year for a particular country by summing its exports and imports across all trading partners and dividing by GDP. Define x_{ijt} as exports from country i to country j in year t and m_{ijt} as imports by country i from country j in year t. Total exports from and imports by country i in year t are given by $X_i = \sum_{j \neq i} x_{ij}$ and $M_i = \sum_{j \neq i} m_{ij}$. Then trade integration is given as $T_{it} = (X_{it} + M_{it})/Y_{it}$, obtained from the Penn World Tables 6.3.

We require that the above data be available for each country in a given year along with data on our control variables, described below. The unbalanced panel spans the years 1972-2008 and includes 100 countries, listed in Table 1, and 1742 country-years.

Two canonical examples from our dataset may help to illustrate the patterns in the data. Bhutan has a comparative advantage in primary products and its 40 percent increase in trade integration over the period 1982 to 1992 was accompanied by an 82 percent increase in government employment as a share of GDP, as our model predicts. Singapore on the other hand has a comparative advantage in manufactures, and its 15 percent increase in trade integration over the period 1985 to 1993 was accompanied by a 41 percent decrease in government employment as a share of GDP, again as our model would predict.

The first column of Table 2 reports summary statistics. In columns (2) and (3) we split the sample into low and high trade integration observations where high trade integration is defined as the logarithm of T_{it} above the mean (0.42). More integrated economies tend to be richer, but smaller, and have higher total government employment relative to less integrated economies.

7. Econometric Findings

Table 3 presents estimates of equation (5.1) in logs. For brevity, we suppress estimates of year effects. Column (1) presents results from an estimate that incorporates, on the right hand side, T_{it} and its interaction with comparative advantage in primary products, along with controls for country population, government revenue, GDP, per-capita income, as well as country and year fixed effects. The covariate of interest, β, is presented in the first row. The coefficient on trade integration interacted with comparative advantage in primary products is positive as predicted by our model and significant at conventional levels. The estimated coefficient of 0.141 implies that an increase in trade integration by one standard deviation (27 percent) is associated with a change in the size of the bureaucracy that is 3.5 percent larger when a country has a comparative advantage in primary products than when it has a comparative advantage in manufactures, consistent with the implication of our main prediction that comparative advantage mediates the influence of trade integration on government employment.

In columns (2)-(5) we control for IMF loans with conditionalities, transitions to market economies, and export diversification. Inclusion of these controls does not affect the statistical

or economic significance of the estimated effect of trade integration on government employment for countries with a comparative advantage in manufacturing and in primary products.

For robustness, Table 4 reports first-difference estimates.[26] The first-difference estimates are similar to the fixed effects estimates and continue to be statistically significant at conventional levels, while the coefficient magnitudes are similar, though somewhat smaller.

In Table 5, we ask whether the main finding holds equally for developing and developed economies as defined by the International Monetary Fund (IMF) in 2010.[27] The first row of the table shows that the estimates of β continue to be positive and statistically significant for developing countries in all specifications, with a larger magnitude compared to the estimates presented in Table 3. In the full specification (column 5 of Table 5), the estimated coefficient of 0.201 implies that, for developing countries, an increase in trade integration by one standard deviation (a 27 percent increase) is associated with a change in the size of the bureaucracy that is 5 percent larger when a country has a comparative advantage in primary products than when it has a comparative advantage in manufactures. The second row shows that the estimates of β for developed countries are in general significantly smaller. This finding provides support for the view that the economic mechanism we propose is likely to be more important for developing economies where weak property rights are relatively pervasive.

Appendix G reports additional robustness checks. We first show that the main prediction continues to hold when we construct a measure of trade integration, proposed by Rose 2004, which is plausibly exogenous relative to economic actors within a country. We also check to ensure that our results do not depend on the inclusion of data from countries not classified as 'developing' by the IMF. Finally, we check to see whether the results are affected when we estimate a dynamic model of government employment spending. Together, these exercises strengthen our confidence in the main finding documented in Table 3, which is that we see a greater effect of trade integration on the size of total spending on government employment in countries with a comparative advantage in primary products relative to countries with a comparative advantage in manufactures, after we condition on country-level observables and alternate drivers of government employment.

[26] As discussed in Appendix F, standard panel unit root tests fail to indicate that the data contain a unit root, which has important implications for the choice between first-difference and fixed-effect estimators. The reason is because the fixed effects estimator (5.1) is statistically efficient when a unit root is not present, and the first-difference estimator is statistically efficient in the specific case where a unit root is present (Wooldridge 2002 pp. 279-281). Thus, rejection of the null of a unit root suggests a preference for the fixed effects model (5.1), whose estimates were reported in Table 3. At the same time, lack of a unit root does not lead the first-difference estimator to be inconsistent, only inefficient.

[27] The aim of including the level of development in the regressions is to capture variation in underlying institutional quality. It could be argued that a preferable approach would be to use a direct measure of institutional quality like POLITY IV or the International Country Risk Guide. The reason we did not adopt this approach is because Glaeser, la Porta, Lopez-de-Silanes and Shleifer (2004) have shown that such direct measures of institutions might not in fact capture the institutional quality of a country but might instead reflect short-run choices made by politicians, either as dictators or as democratically elected representatives of government. On the other hand, there seems to be a consensus that the level of development does go some way to capturing institutional quality broadly defined.

Taken together the findings documented above are consistent with the set of interactions proposed in this paper, which is that globalization can reduce economic efficiency if landed elites respond to trade integration by diverting a productive middle class into a relatively unproductive bureaucracy.

8. Conclusion

The existing literature on economic institutions has drawn attention to the variation in economic performance outcomes across countries with similar institutions. The literature argues that this variation suggests a nuanced explanation of outcomes resting on the endogenous interaction between underlying factor endowments and institutions. This paper explores one explanation for why economic performance may vary based on just such endogenous interactions. We showed how an elite's manipulation in its own interests of a government institution tends can reduce economic efficiency if the country has a relatively small endowment of human capital, but increase economic efficiency if its endowment of human capital was relatively large. Specifically, if the country has a relatively small endowment of human capital, and thus a comparative advantage in primary products, then the elite responds to the real income shock that results from trade integration by increasing the size of the bureaucracy in order to prevent a revolution. One effect of doing so is to reduce the amount of surplus available for expropriation, thus making revolution less attractive. A second effect is to draw resources away from the more efficient manufacturing sector, the channel through which economic efficiency is reduced. Under autarky, another effect is to make entrepreneurs more scarce and thus raise the income of the middle class and hence their interest in maintaining the status quo. In a situation where the country has a relatively large endowment of human capital and hence a comparative advantage in manufactures, trade integration reduces the income of the elite relative to the lower classes. This in turn allows a reduction in the size of the pampered bureaucracy and hence an increase in economic efficiency. We were able to find supportive evidence for the model in the data.

The model of the present paper focused on one particular inefficient economic institution, the pampered bureaucracy, while regarding all other institutions as exogenous. In future research, it would be interesting to explore the interaction of the bureaucracy with other institutions. Our focus on the size of the pampered bureaucracy seems reasonable, holding other institutions constant over the short-run time frame that we consider, since the elite are likely to have direct control over the pampered bureaucracy and be able to adjust its size relatively quickly. But it would be interesting to try to capture the interactions between the bureaucracy and other institutions that adjust more slowly.

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Appendix

A. The Consumer's Problem

Assume that y^i is exogenous. Maximize (2.4) subject to the budget constraint, $y^i = x_c^i + px_g^i$. If $y^i > p(\alpha - p)$ the solution to each member of group i's consumer problem is interior and $x_g^i(p) = \alpha - p$, $x_c^i = y^i - x_g^i(p)$. If $y^i \in [0, p(\alpha - p)]$ then the consumer's problem has a corner solution wherein $x_c^i = 0$ and $x_g^i = \frac{y^i}{p}$. Using these solutions in (4), we get the following general characterization of the indirect utility function:

$$v^i\left(p, y^i\right) = \begin{cases} \alpha\frac{y^i}{p} - \frac{1}{2}\left(\frac{y^i}{p}\right)^2 & \text{if } y^i \in [0, p(\alpha - p)] \\ y^i + \frac{1}{2}(\alpha - p)^2 & \text{if } y^i > p(\alpha - p). \end{cases}$$

This set of solutions can be used to determine the conditions for economic equilibrium based on interior solutions to the consumer's problem focused on in the main text. We will determine these first, and then consider corner solutions afterwards. The conditions are determined in the following result.

Lemma 1 *(Characterization of Economic Equilibrium). Assume $0 < \omega < 1$. There exist ranges of σ and λ^m sufficiently small and ranges of H and L sufficiently large that in economic equilibrium, whether under autarky or free trade, the solution to the consumer problem for each group $i \in \{r, b, e, w\}$ is interior.*

Proof**.** For the consumer problem to be interior for all groups $i \in \{r, b, e, w\}$ we require that, for each i, $y^i \geq p(\alpha - p)$ for all $p \in [p_a \pm \sigma]$. This is most easily established for y^b and y^e so we start with them; these are identical in equilibrium so we will take y^e as representative. By (2.1), we see that we can always set H sufficiently large to ensure that $y^e = pH \geq p(\alpha - p)$. Specifically, in autarky we can substitute for the equilibrium autarky price using (3.2) so that the inequality simplifies to $H \geq \left(1 - \theta^b\right)\lambda^m H$ which is always satisfied. Under free trade, the largest value that the price can take is $p_w = p_a + \sigma$, so that the inequality simplifies to $H \geq \left(1 - \theta^b\right)\lambda^m H + \sigma$. Rearranging this, we see that the inequality is satisfied if and only if

$$H \geq \frac{\sigma}{1 - \left(1 - \theta^b\right)\lambda^m}$$

In order to satisfy $y^w \geq p(\alpha - p)$ we require

$$\omega \geq p(\alpha - p)$$

for all values of $p \in [p_a \pm \sigma]$. The approach will be to first establish that the right hand side of the inequality is strictly concave in p. It will then be possible to identify a condition on α for which the condition is satisfied for the value of p at which $p(\alpha - p)$ is maximized, and hence all other values of $p \in [p_a \pm \sigma]$ as well. Since $d\left(p(\alpha - p)\right)/dp = \alpha - 2p$ and $d^2\left(p(\alpha - p)\right)/dp^2 = -2$, we have that $p(\alpha - p)$ is maximized at $p = \alpha/2$ and that $p(\alpha - p) = \alpha^2/4$ at its maximum. Therefore we require that $\omega \geq \alpha^2/4$, or $2\omega^{\frac{1}{2}} \geq \alpha$. The

restriction $\alpha > \sigma + \underline{\alpha} = \sigma + \left(1-\theta^b\right)\lambda^m H$ may thus be satisfied by making σ and λ^m sufficiently small. Specifically, we can first fix

$$\sigma < 2\omega^{\frac{1}{2}}.$$

Then the restriction is satisfied providing

$$\lambda^m < \frac{2\omega^{\frac{1}{2}} - \sigma}{\left(1-\theta^b\right)H}.$$

Let us now consider the condition on y^r. By (2.3), y^r is increasing in L while $p(\alpha - p)$ does not depend on L, so it is possible to make L sufficiently large that $y^r > p(\alpha - p)$. The specific details are as follows. Using (2.3), for L sufficiently large,

$$\begin{aligned} y^r\left(y^b, \theta^b\right) &= L - \left(\left(\lambda^r L - \lambda^r\right)\omega + \theta^b \lambda^m y^b\right)/\lambda^r \\ &> p(\alpha - p) \end{aligned}$$

where we have substituted $\lambda^r L$ for λ^c in (2.3). Bringing L to the left hand side, substituting for y^b, and simplifying, we have

$$L > \frac{\theta^b \lambda^m pH + \lambda^r\left(p(\alpha - p) - \omega\right)}{(1-\omega)\lambda^r}.$$

Observe that we require $\omega < 1$ for the right hand side of this inequality to be defined. Since L is unconstrained, it is always possible to make L sufficiently large to ensure that this inequality is satisfied. □

We will now illustrate the implications of a corner solution to the consumer problem of workers for the autarky price, p_a, assuming that H and L are sufficiently high that the elite and middle class are at interior solutions to their respective problems. (See the proof of Lemma 1 for the bounds on H and L.) Assume a small positive value for ω. The criterion for workers to be at a corner solution is $\omega < p_a(\alpha - p_a)$, where the solution to p_a will now depend on ω itself. So the approach will be to fix a value of ω and then check that the condition is satisfied after the solution for p_a is found. The appeal of examining a corner solution is that it introduces income effects whereas at the interior solution these are suppressed. Although our approach will yield income effects only for workers, it will give clear indications as to the income effects if the elite and middle class were at corner solutions as well.

Using the interior solutions for r and m, $x_g^r = x_g^m = \alpha - p_a$, and the corner solution for w, $x_g^w = \omega/p_a$ in the autarky market clearing condition (3.1), we have

$$\left(\lambda^r + \lambda^m\right)(\alpha - p_a) + \left(1 - \lambda^r - \lambda^m\right)\omega/p_a = \lambda^m\left(1-\theta^b\right)H.$$

Using the positive root of the solution for p_a, we get

$$p_a = \frac{\varsigma + \sqrt{4\left(1-\lambda^r-\lambda^m\right)\omega + \varsigma^2}}{2\left(\lambda^r + \lambda^m\right)}$$

where $\varsigma = \alpha\left(\lambda^r + \lambda^m\right) - \lambda^m\left(1-\theta^b\right)H$. Note that now the sufficient condition for $p_a > 0$ is that $\alpha\left(\lambda^r + \lambda^m\right) > \underline{\alpha} = \lambda^m\left(1-\theta^b\right)H$. Accordingly, to ensure $p_w > 0$ requires that

$\alpha\left(\lambda^r+\lambda^m\right)>\sigma+\underline{\alpha}$. Given $\alpha\left(\lambda^r+\lambda^m\right)>\sigma+\underline{\alpha}$, we can now see that $p_a>0$ even if $\omega=0$. Therefore, it is always possible to choose a value of ω sufficiently small that $\omega<p_a\left(\alpha-p_a\right)$, thus confirming that a corner solution to the worker's problem is feasible.

The key feature of interest here is how p_a would respond to an increase in worker income, ω. We can see by inspection that the relationship is positive as we would expect. An increase in worker income increases demand for the manufactured good, and hence would increase demand for it in autarky until $\omega=p_a\left(\alpha-p_a\right)$ is reached.

The solution is similar if the elite and middle class are at corner solutions, with H and L appearing on the right hand side of the solution for p_a, and p_a responding positively to an increase in H and L until the levels required for interior solutions are reached.

B. Solution for the 'No Revolution Constraint' (NRC)

Here we establish the conditions for which there exists a solution $\widetilde{\theta}^b\in(0,1]$ under autarky. Substituting (3.2) into (4.1),

$$\begin{aligned} & h\left(\theta^b,p_a\right)=\lambda^r y^r\left(\theta^b,p_a\right)-d \\ = \;& \lambda^r\left(L-\left(L-1\right)\omega\right)-\theta^b\lambda^m H\left(\alpha-\left(1-\theta^b\right)\lambda^m H\right)-d. \end{aligned} \tag{B.1}$$

Conditions under which there exists a solution $\widetilde{\theta}^b\in(0,1]$ can be obtained by the intermediate value theorem. Using values $\theta^b=0$ and $\theta^b=1$ respectively, by inspection of (B.1), the following endpoints of $h\left(\theta^b,p\right)$ are determined:

$$\begin{aligned} h\left(0,p_a\right) &= \lambda^r\left(L-\left(L-1\right)\omega\right)-d; \\ h\left(1,p_a\right) &= \lambda^r\left(L-\left(L-1\right)\omega\right)-d-\alpha\lambda^m H. \end{aligned}$$

Thus, given λ^r, if L is sufficiently large relative to d then $h\left(0,p_a\right)>0$. Make H sufficiently large as to ensure that $h\left(1,p_a\right)<0$. Since $h\left(\theta^b,p\right)$ is a continuous function of θ^b, there must exist a value $\widetilde{\theta}^b$ that satisfies $h\left(\theta^b,p_a\right)=0$.

C. Derivation of NRC and Division of Surplus Under Revolution

The economic surplus generated by a revolution is determined using a Nash Bargaining Solution (NBS), where the bargain is between the middle class and the workers. This surplus is determined in the usual way as the difference between the payoff to the lower classes from revolution and the payoff to them from maintaining the status quo. W is the total surplus generated by the lower classes:

$$W\left(\theta^b,y^r,y^b,y^e,y^w,p\right)\equiv\lambda^m\left(\theta^b v^b\left(y^b,p\right)+\left(1-\theta^b\right)v^e\left(y^e,p\right)\right)+\lambda^w v^w\left(y^w,p\right),$$

where the first term on the right hand side measures surplus generated by the middle class and the second term measures the same for the workers. From this definition, and using

(2.1)-(2.2), we can determine a reduced form for the total payoff to the lower classes from maintaining the status quo, W_{sq}:

$$W_{sq}(p) = \lambda^m \left(pH + \frac{1}{2}(\alpha - p)^2 \right) + \lambda^w \left(\omega + \frac{1}{2}(\alpha - p)^2 \right),$$

where the first term measures the welfare of the middle class and the second term measures that of workers. The total payoff to the lower classes from mounting a revolution, W_{rev}, is determined as follows:

$$W_{rev}\left(\theta^b, p\right) \equiv \lambda^r y^r\left(\theta^b, p\right) - d + \lambda^m \left(pH + \frac{1}{2}(\alpha - p)^2 \right) + \lambda^w \left(\omega + \frac{1}{2}(\alpha - p)^2 \right).$$

Here, the first term measures the gain to the lower classes from revolution in terms of the increase in their income and hence welfare derived through possession of the latifundia and the second term subtracts the cost of revolution. Then the total net surplus for the lower classes generated by revolution is $h\left(\theta^b, p\right) \equiv W_{rev}\left(\theta^b, p\right) - W_{sq}(p) = \lambda^r y^r\left(\theta^b, p\right) - d$. Thus we have (4.1). The total surplus received by group $i \in \{m, w\}$, as calculated by the NBS, is then given by $s^i = \lambda^i v^i(p, y^i) + \frac{1}{2}\left(\lambda^r y^r\left(\theta^b, p\right) - d\right)$.

D. Characterization of Political Equilibrium in Autarky

Proof of Proposition 1. The exact bound on d required for $h(0, p_a) > 0$ is $d < \lambda^r(L - (L-1)\omega)$, which can always be satisfied given the restrictions we have made on other parameters. The exact bound on H required to satisfy $h(1, p_a) < 0$ is

$$H > \frac{\lambda^r(L - (L-1)\omega) - d}{\alpha \lambda^m}$$

The proof of Lemma 1 identified the constraint $H > \sigma / \left(1 - \left(1 - \theta^b\right)\lambda^m\right)$ to ensure that the representative middle class consumer is at an interior solution. There is no conflict between these two constraints since each imposes a lower bound on the size of H; it can be made large enough to ensure that both constraints are satisfied.

It remains only to establish conditions under which $\partial h\left(\theta^b, p_a\right)/\partial\theta^b < 0$. Differentiating (B.1) with respect to θ^b and simplifying, we obtain

$$\frac{\partial h\left(\theta^b, p_a\right)}{\partial \theta^b} = -\lambda^m H\left(\alpha - \left(1 - 2\theta^b\right)\lambda^m H\right)$$

Observe that, for α sufficiently large, $\partial h\left(\theta^b, p_a\right)/\partial\theta^b < 0$. Finally, at $\alpha = \underline{\alpha}$, $\partial h\left(\theta^b, p_a\right)/\partial\theta^b = -\theta^b\left(\lambda^m H\right)^2 < 0$ so for all $\alpha > \underline{\alpha}$ we have that $\partial h\left(\theta^b, p_a\right)/\partial\theta^b < 0$ as required. □

E. The Effect of Trade Integration on Efficiency

Proof of Proposition 2. Using our expression for efficiency $\Omega\left(p, \theta^b\right)$ given by (2.6), we first examine the efficiency implications of trade integration under the assumption that the

size of the bureaucracy, θ^b, is fixed exogenously. This result will serve as a useful benchmark against which to compare the efficiency implications of trade integration when the size of the bureaucracy is endogenously determined. The efficiency implications of trade integration can be evaluated in a straightforward way using (2.6) to obtain a reduced-form expression for Ω in autarky, and then differentiating this with respect to p in order to evaluate the gains from trade. Use in (2.6) the fact that $x_g^i(p_a) = \alpha - p_a$ for $i \in \{r, b, e, w\}$ to obtain

$$\begin{aligned} \Omega\left(p, \theta^b\right) \equiv\ & \lambda^r L + \left(1-\theta^b\right)\lambda^m pH + (\lambda^r + \lambda^w - \lambda^r L)\omega \\ & + \frac{1}{2}(\alpha - p)^2. \end{aligned} \tag{E.1}$$

Differentiating this expression with respect to p,

$$\frac{\partial \Omega\left(p, \theta^b\right)}{\partial p} = \left(1-\theta^b\right)\lambda^m H - (\alpha - p). \tag{E.2}$$

From this expression we find that, whether the country has a comparative advantage in primary products or manufactures, trade integration always raises efficiency. To see this use (3.2) to substitute the reduced form of p_a for p, and note that $\partial\Omega\left(p, \theta^b\right)/\partial p\big|_{p=p_a} = 0$, while $\partial^2\Omega\left(p, \theta^b\right)/\partial p^2 = 1$. Thus, efficiency obtains a minimum in autarky. Given this structure observe how the condition introduced in Section 3, $\underline{\alpha} \equiv \left(1-\theta^b\right)\lambda^m H$, that ensures $p_a > 0$ also ensures that efficiency increases under trade integration as we should expect. This holds regardless of whether the country has a comparative advantage in primary products (in which case trade integration implies $p < p_a$) or a comparative advantage in manufactures (in which case trade integration implies $p > p_a$). Trade integration, either as an incremental step away from autarky or a move right from autarky to free trade, thus implies an increase in efficiency whether the country has a comparative advantage in primary products or manufactures.

The next step is to characterize the effect of trade integration on economic welfare when the size of the bureaucracy is endogenous. Recall from (4.2) that $\widetilde{\theta}^b$ is a function of p. For convenience, express equation (4.2) as $\widetilde{\theta}^b(p)$. Using $\widetilde{\theta}^b(p)$ in (2.6),

$$\begin{aligned} \frac{d\Omega\left(\widetilde{\theta}^b(p), p\right)}{dp} =\ & \left(1-\widetilde{\theta}^b(p)\right)\lambda^m H - (\alpha - p) \\ & - p\lambda^m H \frac{d\widetilde{\theta}^b(p)}{dp}, \end{aligned} \tag{E.3}$$

where now, since θ^b is endogenous, Ω is a function only of p. The first line captures the standard gains from trade and is the same as in (E.2) which was calculated for θ^b exogenous. Recall that this is equal to zero at $p = p_a$ and is unaffected by the fact that now θ^b is chosen endogenously as a function of p. The second line captures the effect on efficiency of an endogenous change in the size of θ^b; recall that, by (4.3), $d\widetilde{\theta}^b/dp < 0$. Therefore trade integration for a country with a comparative advantage in primary products that entails a small reduction in p from the autarky price, p_a, necessarily implies a reduction of economic efficiency. However, for larger reductions in p the first line will be positive and

may dominate the second line, so that trade integration will be efficiency increasing; observe that $d^2\Omega\left(\widetilde{\theta}^b(p), p\right)/dp^2 = 1$, just as with θ^b exogenous.

Using (4.3) to substitute for $d\widetilde{\theta}^b(p)/dp$ in (E.3) we obtain the reduced form

$$\frac{d\Omega\left(\widetilde{\theta}^b(p), p\right)}{dp} = p - (\alpha - \lambda^m H).$$

We next obtain a value of p that minimizes efficiency when θ^b is determined endogenously. Referring to this as $\bar{p}$, we have

$$\bar{p} = \alpha - \lambda^m H.$$

Since $\lambda^m H > \left(1 - \theta^b\right)\lambda^m H$ for $\widetilde{\theta}^b \in (0,1)$, we can see from this solution that $\bar{p} < p_a$. Using this solution for $\bar{p}$, a prediction about whether or not trade integration will reduce efficiency can be parameterized in terms of σ. Assume that the country has a comparative advantage in primary products so that trade integration reduces p to a level below p_a. Our original condition on α must be modified to $\alpha > \sigma + \lambda^m H$ in order to allow for the possibility that $p_w < \bar{p}$.

Now we will identify conditions, in terms of the size of σ, for whether or not trade integration must entail a reduction of efficiency. If we restrict the size of σ to $\sigma < \lambda^m H$ then $\bar{p} < p_w < p_a$. Then trade integration must unambiguously reduce efficiency, because $d\Omega\left(\widetilde{\theta}^b(p), p\right)/dp > 0$ in the interval of p between $\bar{p}$ and p_a, and trade integration brings about a reduction of p. If on the other hand $\sigma > \lambda^m H$ then (since $d^2\Omega\left(\widetilde{\theta}^b(p), p\right)/dp^2 = 1$) in principle trade integration could entail a price reduction large enough to reach a point where $d\Omega\left(\widetilde{\theta}^b(p), p\right)/dp < 0$, so that a sufficiently large price reduction could attain a level of efficiency greater than at autarky.

F. Derivation of Estimating Equation

This section shows how we test an implication of the model's main prediction, as given by Proposition 2, using available data on country-level characteristics. Let us begin by first deriving the implication that we test.

Denote trade integration in country i at period t by T_{it}. A country's comparative advantage is denoted by c_i, where $c_i \in \{0,1\}$ is an indicator taking a value of 0 if country i's comparative advantage is in manufactures and 1 if its comparative advantage is in primary products. Denote a vector of country-specific observables and fixed effects as $\mathbf{\Psi}_{it}$.

Total government spending on wages and salaries, henceforth 'total government employment,' e_{it}, comprises spending on employment associated with the legitimate functions of government, which we will refer to as 'structural government employment,' a_{it}, as well as spending on employment associated with pampered bureaucracy, b_{it}:[28]

$$e_{it}(T_{it}, c_i, \mathbf{\Psi}_{it}) \equiv a_{it}(T_{it}, c_i, \mathbf{\Psi}_{it}) + b_{it}(T_{it}, c_i, \mathbf{\Psi}_{it}) \tag{F.1}$$

[28] Although we are modeling a_{it} and b_{it} as conceptually distinct, our approach is compatible with a situation where

This equation holds by definition, and allows for arbitrary flexibility across countries and time periods in the structural share of total government employment.

Notice that our model's main prediction requires inference about how trade integration and comparative advantage jointly influence spending on the pampered bureaucracy. In practice the econometrician can observe $e_{it}(T_{it}, c_i, \mathbf{\Psi}_{it})$ but not $b_{it}(T_{it}, c_i, \mathbf{\Psi}_{it})$, so inference about $E\left[\frac{\partial b_{it}}{\partial T_{it}}|c_i, \mathbf{\Psi}_{it}\right]$ must be obtained from characteristics of the joint distribution of c_i, e_{it}, T_{it}, and $\mathbf{\Psi}_{it}$. We now show how this is accomplished.

Denote $E\left[\frac{\partial z_{it}}{\partial T_{it}}|c_i, \mathbf{\Psi}_{it}\right]$ as $E[z_c'|\mathbf{\Psi}_{it}]$ where $z \in \{e, a, b\}$. First take expectations of (F.1) over all countries and time periods in the sample, then differentiate the expression with respect to T_{it} to obtain:

$$E[e_c'|\mathbf{\Psi}_{it}] = E[a_c'|\mathbf{\Psi}_{it}] + E[b_c'|\mathbf{\Psi}_{it}]. \tag{F.2}$$

Using (F.2),

$$E[e_1'|\mathbf{\Psi}_{it}] - E[e_0'|\mathbf{\Psi}_{it}] = E[a_1'|\mathbf{\Psi}_{it}] - E[a_0'|\mathbf{\Psi}_{it}] + E[b_1'|\mathbf{\Psi}_{it}] - E[b_0'|\mathbf{\Psi}_{it}]. \tag{F.3}$$

Each term in this equation represents an expectation across countries of how each type of government spending on employment is affected by trade integration. So the left-hand side captures the expected *difference* in the impact of trade integration on total government employment between countries with a comparative advantage in primary products relative to those with a comparative advantage in manufactures.

Now we introduce the following condition:

$$corr\left(\frac{\partial a_{it}}{\partial T_{it}}, c_i|\Psi_{it}\right) = 0. \tag{F.4}$$

where $corr\,(X, Y)$ measures the correlation coefficient between two random variables X and Y. Notice that the condition leaves unrestricted the impact of trade integration on structural government employment in any particular country. Indeed, it allows for an arbitrary level of difference across countries in the extent to which changes in trade integration lead to changes in structural government employment. Since the condition applies only to the relationship between the partial effect $\partial a_{it}/\partial T_{it}$ and comparative advantage, it does not restrict cross-country differences in the relationship between structural government employment and comparative advantage, structural government employment and trade integration, or other spending on structural government employment and other country-specific factors. This condition also leaves the signs of $\partial a_{it}/\partial T_{it}$ and $\partial b_{it}/\partial T_{it}$ undetermined, allowing our empirical model to nest theories that are complementary to ours about the relationship between trade integration and government employment. There are undoubtedly many systematic differences across countries which influence the impact of trade integration and government spending on wages and employment, and which are also correlated with a country's comparative advantage; (F.4) conditions on such characteristics.

We now briefly pause to show how one might contextualize this condition in the presence of two existing theories. First, Rodrik's (1998, 2000) social insurance framework posits that

any particular government employee's salary comprises both components. Therefore, an employee may undertake legitimate functions of government but enjoy, of example, a shorter working week or a longer vacation allowance than a comparable job in the private sector.

increases in trade integration might require governments to play a greater insurance role in the face of increased exposure to terms of trade volatility driven by world market price fluctuations. Under this theory, greater exposure to world price volatility leads to higher rates of employment displacement. This may mandate the government to play a greater role in providing social insurance in the form of government employment, particularly in developing countries where dedicated social security frameworks may be less well developed. Government spending will undoubtedly be impacted differentially across countries by changes in trade integration (i.e. $\partial a_{ik}/\partial T_{ik} \neq \partial a_{jl}/\partial T_{jl}$). But the theory predicts no difference *on average* in the impact of this effect based on a country's comparative advantage: $(E\left[a_1'|\mathbf{\Psi}_{it}\right] = E\left[a_0'|\mathbf{\Psi}_{it}\right] > 0)$.

Under an alternative theory, exposure to world markets has the opposite effect of stabilizing domestic price fluctuations which, under the social-insurance framework just described, would lead to a *decrease* in structural government employment in response to trade integration. But again, this effect on average is not predicted to be influenced directly by a country's comparative advantage, after we have conditioned on country-specific characteristics (i.e. $E\left[a_1'|\mathbf{\Psi}_{it}\right] = E\left[a_0'|\mathbf{\Psi}_{it}\right] < 0$).

Notice that since (F.3) is expressed as a statistical expectation and conditions on c_i, (F.4) implies that

$$E[e_1'|\mathbf{\Psi}_{it}] - E[e_0'|\mathbf{\Psi}_{it}] = E[b_1'|\mathbf{\Psi}_{it}] - E[b_0'|\mathbf{\Psi}_{it}]. \tag{F.5}$$

This means that after controlling for country-specific characteristics, systematic differences across countries in the responsiveness of total government employment to changes in trade integration should be driven by factors that are related to differences in comparative advantage.

Recall that, according to our main prediction, comparative advantage determines the direction of the effect of a change in trade integration on the size of the pampered bureaucracy. That is, it predicts that in response to trade integration, countries with a comparative advantage in primary products will experience an increase in the size of the pampered bureaucracy; $E[b_1'|\mathbf{\Psi}_{it}] > 0$. On the other hand, countries with a comparative advantage in manufactures will experience a decrease in the size of the pampered bureaucracy; $E[b_0'|\mathbf{\Psi}_{it}] < 0$. An implication of our main prediction is therefore that $E[b_1'|\mathbf{\Psi}_{it}] - E[b_0'|\mathbf{\Psi}_{it}] > 0$.

Now consider the following linear model:

$$E[e_{it}|T_{it}, c_i, \Phi] = \alpha + \beta\left(T_{it} \times c_i\right) + \gamma T_{it} + \Phi\mathbf{\Psi}_{it}.$$

Differentiating with respect to trade integration yields $E\left[\frac{\partial e_{it}}{\partial T_{it}}|c_i, \mathbf{\Psi}_{it}\right] = \beta \times c_i + \gamma$. Conditioning on comparative advantage, we can see that $E\left[\frac{\partial e_{it}}{\partial T_{it}}|c_i = 1, \mathbf{\Psi}_{it}\right] = \beta + \gamma$ while $E\left[\frac{\partial e_{it}}{\partial T_{it}}|c_i = 0, \mathbf{\Psi}_{it}\right] = \gamma$. The implication of the model's main prediction derived above can be obtained by subtracting one from the other:

$$E\left[\frac{\partial e_{it}}{\partial T_{it}}|c_i = 1, \mathbf{\Psi}_{it}\right] - E\left[\frac{\partial e_{it}}{\partial T_{it}}|c_i = 0, \mathbf{\Psi}_{it}\right] = \beta.$$

This equation demonstrates that the object of interest is β, which the model predicts to be

positive.[29]

Separating $\mathbf{\Psi}_{it}$ into observables Z_{it}, time-specific effects τ_t, and country-specific effects d_i, and defining the above conditional expectation model at the observation level yields our main estimating equation (5.1):

$$e_{it} = \alpha + \beta\left(T_{it} \times c_i\right) + \gamma T_{it} + \delta \mathbf{Z}_{it} + \tau_t + d_i + \varepsilon_{it}.$$

G. Additional Robustness Checks

Table A1 reports additional robustness checks. All estimating equations include the full vector of controls, time effects and country fixed effects, all of which are suppressed to conserve space. We first examine whether the main implication holds when we use a different proxy for trade integration. We use an alternative measure which, unlike the standard measure, is based on the distance-weighted GDP of a country's trading partners (as used by Rose 2004). This measure is predicated on the idea that the distance-weighted GDP of trade partners proxies for export demand, and thus indirectly influences trade integration. Specifically, define Y_{it} as country i's GDP in year t expressed in millions of constant dollars and let δ_{ij} be the distance between countries i and j. This measure of trade integration is $T_{it} = \sum_{j \neq i} Y_{jt}/\delta_{ij}$. The advantage of this measure is that it potentially provides a more plausibly-exogenous measure of trade integration. Its primary disadvantage is that it is highly correlated within a country across time: the estimated AR(1) coefficient for this measure (with country fixed effects) is 0.99. Columns (1) and (2) re-estimate the specifications from column (5) in Tables 3 and 5, respectively, and show that the estimated coefficient on β continues to be positive as predicted by our theory, but not statistically significant at conventional levels. This is not surprising given the lack of variation within the distance-weighted measure of trade integration.

In column (3), we check to ensure that our results do not depend on the inclusion of data from countries not classified as 'developing' by the IMF. We do this by restricting the sample only to observations drawn from countries which are classified as developing. (We reverted to the standard measure of trade integration for this and all subsequent regressions reported in Table A1). The estimated coefficient continues to be positive and is statistically significant at the 10 percent level. Column (4) presents estimates obtained from a first-differenced version of the specifications from column (5) in Table 5. The estimate of β in column (4) of Table 6 is positive and statistically significant for developing countries at the 10 percent level. Columns (5) and (6) add, to the specifications from column (5) in Tables 3 and 5, a lag of the dependent variable which formally models the dynamic process. Inclusion of the lag does not change significantly the estimated magnitude of β for either the specification where all countries are pooled by level of development or where they are differentiated. Indeed, including the lag apparently increases the level of statistical significance in both specifications; more complicated dynamic models structured around the same basic specification (e.g., lags of the dependent variable) yield similar results.

[29]The reason that we cannot associate the marginal effects of trade integration on total government employment, $\beta+\gamma$ for $c_i = 1$ and γ for $c_i = 0$, with marginal effects of trade integration on the pampered bureaucracy is essentially because our theory is silent about the relationship between trade integration and structural government employment.

Table 1. List of Countries

Albania	Dominica	Lesotho	Rwanda
Australia	Dominican Rep	Liberia	Senegal
Austria	Egypt	Lithuania	Seychelles
Azerbaijan	El Salvador	Luxembourg	Singapore
Barbados	Estonia	Madagascar	Slovak Rep
Belarus	Finland	Malaysia	Slovenia
Belgium	France	Maldives	South Africa
Benin	Gabon	Mali	Spain
Bhutan	Georgia	Malta	Sri Lanka
Bolivia	Germany	Mauritius	Sweden
Brazil	Greece	Mexico	Switzerland
Bulgaria	Guinea	Moldova	Tajikistan
Burundi	Haiti	Mongolia	Tanzania
Costa Rica	Honduras	Morocco	Thailand
Croatia	Hungary	Netherlands	Togo
Cyprus	Iceland	Nicaragua	Tunisia
Czech Rep	India	Niger	Turkey
Denmark	Indonesia	Norway	Ukraine
Congo, Rep	Ireland	Pakistan	UAE
Comoros	Israel	Paraguay	United Kingdom
Colombia	Italy	Peru	United States
Chile	Jamaica	Poland	Uruguay
Chad	Kazakhstan	Portugal	Vanuatu
Cameroon	Latvia	Romania	Zambia
Djibouti	Lebanon	Russia	Zimbabwe

The table provides a list of countries for which there exist data on bureaucracy size, GDP, government revenue, International Monetary Fund loans, population, and trade integration. The unbalanced panel spans the years 1972-2008.

Table 2. Mean Country Characteristics by Trade Integration (T.I.)

	All Countries	Low T.I.	High T.I.	P-value (2) vs. (3)
Variable	(1)	(2)	(3)	(4)
e_{it}	508.96 (508.96)	205.18 (305.37)	670.17 (928.81)	0.001
GDP	5,075.3 (6,266.0)	2,551.6 (3,698.2)	8,038.0 (7,325.0)	0.000
Government revenue	908.45 (3,813.3)	964.91 (4,810.3)	841.28 (2,174.7)	0.872
Population	28,985 (91,472)	33,726 (118,153)	23,419 (43,670)	0.577
Per-capita income	3,603.4 (12,744)	2,902.1 (11,499)	4,426 (14,269)	0.553
Proportion				
Comparative advantage in primary products	0.598 (0.450)	0.630 (0.439)	0.561 (0.466)	0.450
Number of countries	100	59	41	–

The table provides basic summary statistics. Column (1) reports average country characteristics for the entire sample. Columns (2) and (3) report average country characteristics for countries with low and high trade integration, which is defined as openness (exports plus imports divided by gross domestic product) above and below the mean (0.42) for all countries. The country characteristics reported are total government employment, gross domestic product, government revenue, population, and per-capita income expressed in domestic currency units. Population is measured in thousands.

Table 3. Determinants of Total Government Employment Spending

	(1)	(2)	(3)	(4)	(5)
Trade integration × primary	0.141**	0.140**	0.158***	0.143**	0.159***
	(0.059)	(0.059)	(0.053)	(0.059)	(0.054)
Trade integration	-0.395*	-0.398*	-0.439**	-2.646	-2.175
	(0.208)	(0.207)	(0.203)	(1.828)	(1.796)
Outstanding IMF loan		-0.017			-0.033
		(0.060)			(0.061)
Transition economy			0.786**		0.785**
			(0.304)		(0.302)
Trade integration × Herfindahl				-0.859	-0.665
				(0.647)	(0.640)
Population	0.781**	0.785**	1.102***	0.745*	1.096***
	(0.374)	(0.376)	(0.281)	(0.396)	(0.298)
Government revenue	0.007	0.008	0.010	0.007	0.010
	(0.014)	(0.014)	(0.013)	(0.013)	(0.012)
GDP	1.041***	1.040***	1.133***	1.054***	1.144***
	(0.122)	(0.121)	(0.089)	(0.122)	(0.087)
Per-capita income	-0.022	-0.023	-0.002	-0.013	0.004
	(0.091)	(0.091)	(0.087)	(0.099)	(0.095)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
R^2	0.88	0.88	0.88	0.88	0.89
Observations	1,742	1,742	1,742	1,610	1,610
Number of id	100	100	100	91	91

The table reports estimates from fixed effect ordinary least squares regressions where the dependent variable is the logarithm of annual total government spending on wages and employment, described in Section 6. The variable of interest is β, reported in the first row, the interaction of trade integration and an indicator variable which takes a value of unity if country i has a comparative advantage in primary products and zero otherwise. All regressions control for population, government revenue, gross domestic product, per-capita income, year- and country-specific fixed effects, all of which are described in Section 6 of the paper. Columns (2)-(5) add additional variables designed to control for specific alternative causal channels. These are an indicator for whether a country has an outstanding IMF loan, an indicator for whether the country is in transition from central planning, and export diversification, all of which are described in Section 7. Heteroskedasticity and autocorrelation robust standard errors clustered at the country-pair level appear in parentheses beneath the coefficient estimates. *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4. First-Difference Estimates

	(1)	(2)	(3)	(4)	(5)
Trade integration	0.083*	0.083*	0.066	0.109**	0.102**
× primary	(0.048)	(0.048)	(0.051)	(0.053)	(0.050)
Trade integration	-0.348***	-0.335***	-0.562**	-0.335**	-0.582**
	(0.125)	(0.125)	(0.237)	(0.131)	(0.239)
Outstanding IMF loan	-0.022				0.010
	(0.049)				(0.057)
Transition economy		0.294			0.516*
		(0.277)			(0.288)
Trade integration × Herfindahl			-0.134**		-0.246***
			(0.065)		(0.093)
Population	0.249***	0.256***	0.202**	0.312***	0.322***
	(0.086)	(0.088)	(0.100)	(0.108)	(0.109)
Government revenue	0.003	0.004	0.004	0.004	0.006
	(0.015)	(0.015)	(0.014)	(0.014)	(0.013)
GDP	1.143***	1.140***	1.177***	1.086***	1.094***
	(0.062)	(0.064)	(0.069)	(0.071)	(0.068)
Per-capita income	-0.130	-0.128	-0.182*	-0.042	-0.056
	(0.089)	(0.089)	(0.096)	(0.106)	(0.099)
R^2	0.82	0.82	0.82	0.82	0.83
Observations	1,602	1,602	1,602	1,482	1,482
Number of id	100	100	100	90	90

The table reports estimates of first-difference parameters where the dependent variable is the difference of the logarithm of annual total government spending on wages and employment, described in Section 6. The variable of interest, β, reported in the first row, is the interaction of trade integration and an indicator variable which takes a value of unity if country i has a comparative advantage in primary products and zero otherwise. All regressions control for population, government revenue, gross domestic product, per-capita income, year- and country-specific fixed effects, all of which are described in Section 6 of the paper. Columns (2)-(5) add additional variables designed to control for specific alternative causal channels. These are an indicator for whether a country has an outstanding IMF loan, an indicator for whether the country is in transition from central planning, and export diversification, all of which are described in Section 7. Heteroskedasticity and autocorrelation robust standard errors clustered at the country-pair level appear in parentheses beneath the coefficient estimates. *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5. Heterogenous Impact Across Development Classifications

	(1)	(2)	(3)	(4)	(5)
Trade integration	0.182*	0.180*	0.194*	0.199*	0.201**
× primary × developing	(0.104)	(0.103)	(0.098)	(0.106)	(0.099)
Trade integration	0.104**	0.104**	0.146***	0.102*	0.143***
× primary × developed	(0.051)	(0.051)	(0.036)	(0.052)	(0.037)
Trade integration	-0.327	-0.327	-0.412	-3.902**	-3.167*
× developing	(0.297)	(0.296)	(0.294)	(1.807)	(1.826)
Trade integration	-0.734***	-0.739***	-0.685***	-4.567**	-3.655*
× developed	(0.222)	(0.219)	(0.210)	(1.822)	(1.881)
Outstanding IMF loan		-0.018			-0.031
		(0.060)			(0.060)
Transition economy			0.791**		0.776**
			(0.312)		(0.308)
Trade integration × Herfindahl				-1.369**	-1.060
				(0.634)	(0.656)
Population	0.769*	0.773*	1.124***	0.769*	1.127***
	(0.399)	(0.401)	(0.292)	(0.401)	(0.295)
Government revenue	0.009	0.010	0.011	0.011	0.013
	(0.014)	(0.014)	(0.013)	(0.013)	(0.012)
GDP	1.046***	1.045***	1.136***	1.061***	1.150***
	(0.123)	(0.122)	(0.091)	(0.123)	(0.087)
Per-capita income	-0.016	-0.017	0.015	0.005	0.026
	(0.099)	(0.099)	(0.093)	(0.099)	(0.093)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
R^2	0.88	0.88	0.89	0.88	0.89
Observations	1,715	1,715	1,715	1,610	1,610
Number of id	100	100	100	91	91

The table reports estimates from fixed effect ordinary least squares regressions where the dependent variable is the logarithm of annual total government spending on wages and employment, described in Section 6. The variable of interest is β, the interaction of trade integration and an indicator variable which takes a value of unity if country i has a comparative advantage in primary products and zero otherwise. In this table, β is estimated separately for developing (first row) and developed (second row) countries, as defined by the International Monetary Fund and described in Section 7. All regressions control for population, government revenue, gross domestic product, per-capita income, year- and country-specific fixed effects, all of which are described in Section 6 of the paper. Columns (2)-(5) add additional variables designed to control for specific alternative causal channels. These are an indicator for whether a country has an outstanding International Monetary Fund loan, an indicator for whether the country is in transition from central planning, and export diversification, all of which are described in Section 7. Heteroskedasticity and autocorrelation robust standard errors clustered at the country-pair level appear in parentheses beneath the coefficient estimates. *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A1. Sensitivity Checks

	(1)	(2)	(3)	(4)	(5)	(6)
Trade integration	0.177*		0.124*		0.117***	
× primary	(0.102)		(0.075)		(0.035)	
Trade integration	1.074		-1.855		-1.953*	
	(0.665)		(2.040)		(1.009)	
Trade integration		0.104		0.172*		0.153**
× primary × developing		(0.105)		(0.095)		(0.066)
Trade integration		0.867		0.044		0.095***
× primary × developed		(1.280)		(0.035)		(0.018)
Trade integration		2.344*		-0.279		-2.823**
× developing		(1.275)		(0.227)		(1.111)
Trade integration		-1.042		-0.539***		-3.185**
× developed		(1.986)		(0.197)		(1.226)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.90	0.91	0.84	0.81	0.94	0.94
Observations	1,531	1,531	966	1,482	1,482	1,482
Number of id	87	87	61	90	90	90

The table reports sensitivity checks. All estimating equations include the full set of control variables described in Sections 6 and 7, which are suppressed to conserve space. Columns (1) and (2) re-estimate the specifications from column (5) in Tables 3 and 5, respectively, using the alternative measure of trade integration (described in Section 7). Column (3) re-estimates the specification from Column (5) in Table 3 only on the sample of observations drawn from developing countries (defined in Section 7 of the paper). Column (4) re-estimates differenced versions of the specifications from column (5) in Table 5. Columns (5) and (6) add, to the specifications from (5) in Tables 3 and 5, a lag of the dependent variable. Heteroskedasticity and autocorrelation robust standard errors clustered at the country-pair level appear in parentheses beneath the coefficient estimates. *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.