Pampered Bureaucracy and Trade Liberalization[1]

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Abstract: This paper shows how a nation's elite maintain ownership of their wealth by creating a 'pampered bureaucracy.' The elite thus divert part of an otherwise entrepreneurial middle class from more productive manufacturing activities, reducing economic efficiency. If the country has a comparative advantage in primary products, trade liberalization is potentially destabilizing since it lowers the opportunity cost to the lower classes of challenging the elite for their wealth. If trade liberalization does take place, it may mandate expansion of the pampered bureaucracy. Therefore, trade liberalization may actually reduce economic efficiency. The econometric results provide supportive evidence for our model.

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1. Introduction

A salient feature of many developing countries, notably those in Africa, Latin America and the Middle East, is the existence there of an apparently wasteful government bureaucracy. More striking still is that this bureaucracy often has demanding entry criteria, admitting capable applicants predominantly from the middle classes, but then offers its employees highly protected lifetime employment with limited productivity incentives. We will refer to this institution as a 'pampered bureaucracy'. Varma (1998) documents the division within the middle classes created by the states' actions to set up such an institution and its equivalent created by the middle classes' own efforts in the private sector. Thus Varma (1998) makes a useful distinction, which we will exploit, between the conventional role of the entrepreneurial middle classes as key drivers of economic growth and the less familiar role of the middle classes employed in the pampered bureaucracy as a brake on economic development.

The purpose of this paper is to explore the relationship between potential social conflict, trade liberalization and economic efficiency. The trade literature typically takes factor ownership as fixed. Yet recent research has established the prevalence in countries with highly skewed income distributions and poor property rights enforcement of land expropriation in response to real income shocks.[3] A central focus of the present paper is on the implications for trade liberalization when land may be expropriated. Our paper's first main theoretical result shows how a nation's elite can influence the size of the pampered bureaucracy in order to limit the emergence of a dynamic entrepreneurial middle class which would otherwise develop the means to support the expropriation of the elite's land. Thus, since employment in manufacturing is more productive than in the pampered bureaucracy, increasing the size of the pampered bureaucracy can reduce economic efficiency and in this sense may be regarded as an inefficient economic institution.[4] In the second

[3]Hidalgo, Naidu, Nichter and Richardson (2010) undertake a careful study of over five thousand occurrences of land invasion in Brazil and also note the frequency of such occurrences in other countries like South Africa, Uganda and Venezuela. Their study is important for our work because it helps establish the empirical relevance of the type of redistributive conflict on which we focus. Note that while they do study how economic conditions affect redistributive conflict, they do not focus explicitly on the influence of trade liberalization as we do here. For other studies of such conflict, see Do and Iyer (2006), Dube and Vargas (2006) and Angrist and Kugler (2008).

[4]The pampered bureaucracy also plays an insurance role in the model for the middle classes. Those who choose to work there, rather than risk their human capital in a firm that may fail, raise the expected

main result, if the country has a comparative advantage in primary products then trade liberalization tends to increase the elite's wealth and this increases the incentive for its expropriation, mandating an increase in the size of the pampered bureaucracy. Therefore, by taking explicit account of the potential for social conflict, this paper presents a new explanation for how trade liberalization may actually provoke a reduction in economic efficiency.

These results are obtained by constructing a new model that combines features of an endowments model of international trade with those of a model where one group's endowment may be expropriated by others. There are three goods: commodities, food and manufactures; commodities and food will be referred to collectively as primary products. There are three socio-economic groups within society: the elite, the middle classes and workers. The middle classes and the workers will be referred to collectively as the lower classes. And there are three factors: land, labor and human capital. Land is split into two further subcategories. The elites' wealth (i.e. their endowment) is held in their 'latifundia'; large estates of highly productive land that has been selected for its suitability to grow (or mine) a commodity. There is also an excess supply of low-grade land in the hinterlands which may be settled for free. This land is not suitable for producing the commodity but labor can be employed on this land to produce food. The elite and the workers share an endowment in common; each has a unit of labor which they can use to work in the latifundia or on low-grade land. The middle classes are endowed with human capital which they can sink into a firm that produces a manufactured good. Or, if it exists, the middle classes may alternatively choose a lifetime of employment in the pampered bureaucracy.[5]

A key feature of the model is that the characterization of economic equilibrium, whether under international trade or autarky, is independent of who owns which factors. This feature makes it possible to analyze the lower classes' surplus obtained from revolution, taking the economic equilibrium as given, as the outcome of a Nash bargain. If the lower classes decide to mount a revolution then ownership of the latifundia is transferred

surplus from consumption and this is efficiency enhancing. The contrasting effects of the pampered bureaucracy on economic efficiency will be made precise in due course.

[5]We could endow the middle classes with labor as well, but that would complicate the model without changing the results in a meaningful way.

to them (at a cost), and the elite are left only with the fruits of their labor. We thus have a tractable way to show that the elite attempt to manipulate the size of the pampered bureaucracy in order to reduce to zero the surplus that the lower classes obtain from revolution and hence avert its occurrence.[6]

The main economic margin in the model is the allocation of the middle classes between entrepreneurship and the pampered bureaucracy; it is by the appropriate choice of this margin that revolution can be averted. The elite, via the state, exploit risk aversion among the middle classes about the possible failure of their entrepreneurial ventures to lure them into the pampered bureaucracy. The motivating forces are slightly different under autarky and free trade but the basic outcome is the same. Under autarky, there are two effects. First elite income is used to fund the pampered bureaucracy directly so the surplus from revolution is reduced when the pampered bureaucracy is increased in size. Second, by making entrepreneurs more scarce, this raises the return both to entrepreneurship and also to a career in the pampered bureaucracy since the returns to either career path must be ex ante identical. This in turn reduces the incentive to mount a revolution. Under free trade only the first effect operates since the world price pins down the returns to entrepreneurship. But the qualitative effect of increasing the size of the pampered bureaucracy on the occurrence of revolution is the same under autarky and free trade.[7]

[6]There appears to be a consensus that a nation's elite, particularly in developing countries, can have sufficient influence over its government to effect employment decisions. Such influence is documented for Latin America by Sokoloff and Engerman (2000); for Africa by Acemoglu, Johnson and Robinson (2001); for Saudi Arabia, see State Department (1996). With specific reference to Ghana, Pellow and Chazan (1986) state that the ruling elite "had reduced the role of the state to that of a dispenser of patronage ... [and] ... established a new social stratum directly dependent on the state." The new social stratum that they refer to corresponds to what we call the pampered bureaucracy. Our model reflects most closely the arrangements in Saudi Arabia where the royal family, which controls government, channels oil revenues directly into spending on the bureaucracy (as well as other areas of government employment) and where income taxation and capital taxation are almost non-existent. However, we take the simple structure of our model to proxy more complex arrangements in other regions. In Latin America, for example, taxation was often treated as a quid pro quo for extension of the franchise when this was restricted to the elite. Although the extension of the franchise is now typically universal, Acemoglu and Robinson (2008) argue that the elite have been able to retain until today the 'de facto power' sanctioned by these earlier arrangements.

[7]An alternative channel through which bureaucrats may reduce economic efficiency is through 'directly unproductive profit-seeking (DUP) activities (see Bhagwati 1982 for a comprehensive treatment.) This is where, for example, private sector agents compete to obtain licenses to undertake production or import inputs. The implication is that bureaucrats are behaving in a corrupt fashion and creaming off rents themselves, a practice to which Varma (1998) also pays close attention. The literature on DUP activities is concerned with whether such activities could paradoxically end up increasing efficiency and is not

Following standard predictions from trade theory, if a country in our model has relatively large endowments of land and labor, then it will tend to have a comparative advantage (c.a.) in primary products. If the country has a relatively large endowment of human capital then it will tend to have a c.a. in the production of manufactures. If a country has a c.a. in primary products then, by increasing the income of the elite, trade liberalization tends to mandate an increase in the size of the pampered bureaucracy because otherwise there would be a revolution. Since an increase in the size of the pampered bureaucracy can reduce economic efficiency, this is the channel through which trade liberalization may induce a reduction of economic efficiency. If a country has a c.a. in manufactures then trade liberalization tends to reduce the income of the elite, which in turn facilitates a reduction in the size of the pampered bureaucracy. Hence when a country has a comparative advantage in manufactures, so that the forces just outlined operate in reverse, the effect of trade liberalization on elite incomes may create an additional channel through which trade liberalization improves efficiency.

From the theoretical results of our model, we develop a testable prediction which we take to the data.[8] The prediction is that an increase in trade liberalization (i.e. a fall in transport costs) tends to increase the size of the pampered bureaucracy in countries with a c.a. in primary products relative to those with a c.a. in manufactures. Our econometric results support this prediction across a variety of specifications. We first present evidence that the prediction holds in a regression that pools all countries in our sample. We then allow for heterogeneity by level of development and, as one might expect, find stronger support for our theory among developing countries. This is possibly because

concerned with the possibility of social conflict; meanwhile our pampered bureaucracy does not engage in any DUP-related activities and is entirely passive in this respect.

[8]The key issue we face in deriving a testable prediction of our model is that the size of the pampered bureaucracy is not observed. The closest available measure of this across a reasonable range of countries and years (1972-2008 for 76 countries) is total central government spending on wages and salaries. This measure includes not only spending on the bureaucracy but also what we might call 'structural government employment' as well. Assume the latter includes all other forms of employment by the central government. The way that we address this issue is to introduce the identifying restriction that, while the effect of trade liberalization on the size of the pampered bureaucracy is determined by a country's c.a., the effect of trade liberalization on structural government spending is likely to be independent of a country's c.a. One way to justify this assumption is to appeal to earlier work by Rodrik (1998, 2000), who argues that an increase in openness requires an increase in government spending and employment because the government is called upon to play a greater insurance role in response to the greater volatility of a more open economy. Note that while we assume structural government employment is unaffected by c.a., in our robustness checks we do allow for the possibility to the contrary.

the institutional structure of developed countries is strong enough to prevent their elites from influencing government employment decisions and possibly because property rights can be more effectively enforced in countries that are more highly developed.

The literature on social conflict between a nation's elite and the rest of society has attracted a lot of attention recently. So it will be helpful in evaluating the contribution of the present paper to understand the differences between our underlying model of social conflict and those of the prior literature. A canonical model by Acemoglu and Robinson (2000a,b, 2001) identifies a commitment problem between the elite and the poor as a way to understand the extension of the franchise. In their work, the poor have a transitory opportunity to mount a revolution. Revolution cannot be prevented by a transfer of resources from the elite to the poor because the elite cannot credibly commit to continue redistribution in future periods after the opportunity for revolution has passed. Instead the elite may make a credible commitment to redistribution and hence avoid a revolution by conceding to the poor the de jure power to set taxation, moving from dictatorship to democracy in the process.

An important difference between our framework and that of Acemoglu and Robinson is that here the potential for a revolution is not transitory. Thus it is not the elite but the middle classes who have a commitment problem. The middle classes cannot credibly commit not to support a revolution anyway after they have received a transfer from the elite. This renders transfers ineffective in preventing a revolution and motivates the elites' incentive to manipulate the size of the bureaucracy as an alternative. Thus we abstract entirely from the de jure power to set taxation, and focus instead on the de facto power of the different groups in the presence of the pampered bureaucracy. In our framework it is not important whether the political regime is a democracy or a dictatorship. The key feature is that the elite have sufficient resources to influence the structure of government. This sharpens our focus on the implications for the production structure of the model. Using our model it is also possible to explain the occurrence of high levels of inequality within societies in the developing world without the outbreak of political violence.

Acemoglu (2006) also discusses a role for the middle classes. In his framework, there is only one sector and the middle classes are potentially more productive in that sector than the elite. There are parallels here to our framework where the middle classes are

more productive than the elite in manufacturing (while being less productive in the primary products sector of our model). However, the policy mechanisms that he considers are quite different. His aim is to examine how the elite use inefficient policies and institutions to effect revenue extraction and factor price manipulation, thus inefficiently shifting income from the middle classes to themselves and in doing so consolidating their political power. For example, taxation of middle-class production limits their entry into the sector, both extracting revenue from them and at the same time reducing their competition for labor, thus increasing elite incomes through transfers and cheaper labor input costs simultaneously. Thus the mechanisms that he considers through which the elite consolidates their position over the middle classes are different to ours and in this sense the respective analyses may be seen as complementary to one another.

Despite the rapid growth in the literature on social conflict, we are only aware of two other papers, one by Segura-Cayuela (2006) and one by Garfinkel, Skepardas and Syropoulos (2008), that study the interaction between (domestic) social conflict and the efficiency implications of trade liberalization. Take each in turn. Segura-Cayuela's model incorporates the model of Acemoglu (2006) into a model of international trade. In Segura-Cayuela's model, under autarky the general equilibrium price effects of taxation and expropriation feed back to the elite and thereby constrain the extent to which they can impose inefficient policies. Trade liberalization removes these effects (by pinning down prices) and enables the elite to extract revenue and manipulate factor prices while not suffering the adverse price effects, thus reducing efficiency to an even greater extent. Thus, as with Acemoglu (2006), his focus is on a different set of policy instruments to ours and the mechanism through which trade liberalization reduces efficiency is consequently different.

Garfinkel, Skepardas and Syropoulos (2008) examine how trade liberalization affects welfare when a natural resource such as oil is contested by competing domestic groups using real resources. Similar to our work, conflict arises as a result of imperfect property-rights enforcement. A difference between their framework and ours is that in theirs the competing groups are ex ante identical. When comparing autarky and free trade in their framework, the gains from trade must be weighed against the possibly higher resource costs of conflict. They show that importers of the contested resource gain unambiguously

from trade liberalization while exporters of the contested resource lose unambiguously unless the world price of the resource is sufficiently high. Therefore, trade liberalization may be efficiency-reducing in their framework as well, although the mechanism by which this happens is quite different to the one in our model.

Our account of how trade liberalization interacts with the possibility of social conflict is related to Rodrik (1999). He focuses on how the inadequacy of domestic institutions for resolving social conflict, provoked by external shocks, leads to growth collapses. He makes the point that if the institutions could be made to function better then growth would persist. Our emphasis is instead on inefficient institutions that resolve social conflict, yielding the opposite prediction; the more effectively the institution functions (where the effectiveness of the institution that we study is made precise below) the worse economic efficiency is likely to be. We also provide a counterweight to Easterly's (2001) finding that the emergence of a "middle class consensus" is associated with faster economic growth and development. In our model the elite can effectively prevent the emergence of a middle class consensus using the pampered bureaucracy and stymies growth of the manufacturing sector. Rodrik (1997) and Rodriguez and Rodrik (2000) provide useful related discussions.

Other papers in the literature focus on the relationship between international trade and institutions but without incorporating the feature of social conflict. For example, Levchenko (2007) models institutional differences as a source of c.a. within a framework of incomplete contracts and shows empirically that these are an important determinant of trade flows. Do and Levchenko (2009) model institutions as fixed costs of entry in a framework where preferences over entry costs depend on firm size and are endogenously determined in a political equilibrium. In this environment, trade liberalization can lead to higher entry costs when it tilts political power towards a small group of large exporters, who prefer to install high entry barriers. Liu and Ornelas (2009) examine the role of trade agreements in the consolidation of democracy. They show that participation in a trade agreement can act as a commitment device to destroy future protectionist rents, thus reducing the incentive of an autocrat to seize power.[9]

[9]Meltzer and Richards (1981) were among the first to identify a problem of social conflict whereby preferences vary across different groups about the size of government. Robinson, Torvik and Verdier (2006) study the incentives of governments to increase government employment using the proceeds of a natural resource boom in order to win office.

The paper is in eight sections. Section 2 sets out the basic model, determines the sequence of events and provides definitions of economic equilibrium and efficiency. Section 3 determines economic equilibrium under autarky and free trade respectively. The political equilibrium is determined in Section 4. It is here that the main theoretical results are presented. The paper then moves on to the empirical analysis. Section 5 presents a description of the data and some summary statistics. Section 6 discusses the framework for estimation. The main econometric results are presented in Section 7. Conclusions are drawn in Section 8.

2. The Basic Model

We extend an 'endowments model' of international trade to allow, in a novel way, for the possibility of revolution wherein an endowment is reallocated from one group of citizens to another. Each citizen is placed in one of three socioeconomic groups: the rich elite, r, the middle classes, m, or the 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 $\lambda^w = 1 - \lambda^r - \lambda^m$ respectively.

Endowments are as follows: Each member of the elite has an endowment, L, of latifundia (so that the total land in the latifundia is measured by $\lambda^r L$) and a unit endowment of labor; each member of the middle classes has an endowment, H, of human capital; each worker has a unit endowment of labor only. There is an unlimited amount of 'ordinary-land' which is free and may be settled by anyone. If there is a revolution then the elites' latifundia are redistributed among the other groups, leaving the elite with labor only.

There are three homogeneous goods: A commodity, c (think of this as being anything from coffee to gold); food, f; and a manufactured good, g. The commodity is the numeraire in the model. The price of food is denoted by q and the price of manufactures is denoted by p.[10]

[10]Both of these prices are measured relative to the numeraire.

2.1. Production and Income

Production of manufactures occurs as follows. Each member of the middle classes can become an entrepreneur, sinking her human capital into the set-up of a firm. A firm is successful with probability σ; if successful, then a firm built with human capital H produces output using a linear production technology, $g = H$. If the firm is unsuccessful then it yields an output of zero. Thus, for each entrepreneur, setting up a firm yields an (expected) income from entrepreneurship, y^e, of

$$y^e = p\sigma H. \tag{2.1}$$

The share of entrepreneurs in the middle classes is $\theta^e \in [0, 1]$.[11]

Members of the middle classes, like all other citizens, are risk averse. (This will be shown formally below.) As a result they can be attracted to the bureaucracy by an income, y^b, that gives them exactly the same level of expected welfare as they would achieve from entrepreneurship.[12] Determination of y^b is thus contingent upon a formal specification of welfare which is undertaken in the next subsection. Denote the share of entrepreneurs in the total population by θ^b. Since the middle classes can either be bureaucrats or entrepreneurs, $\theta^b = 1 - \theta^e$.

Production of the commodity takes place on a latifundio, which must also employ labor. Latifundia are not used for any other production in the model. The amount of labor employed in the latifundia (whether they belong to the elite before a revolution or to the lower classes afterwards) is $\lambda^c \in [0, \lambda^r + \lambda^w]$. The (aggregate) production technology of the commodity takes the Leontief form $c = \min\{\lambda^r L, \lambda^c\}$.

The remaining amount of labor, $\lambda^r + \lambda^w - \lambda^c$, is employed in 'freehold-agriculture' where it produces food. There, a unit of labor produces output, $\underline{y}$, using low-grade-land (which is free because it is in excess supply) and earns a return $q\underline{y}$. The level of $\underline{y}$ (which determines labor productivity in agriculture) and the market clearing price level q will be determined below as part of labor- and product-market equilibrium. However, at this point let us assume parameters are fixed such that $\lambda^r + \lambda^w > \lambda^r L$ and $\underline{y}$ is sufficiently

[11] Thus the share of entrepreneurs in the total population is given by $\theta^e \lambda^m$.

[12] Throughout the set-up and analysis of the model, for brevity we will drop the adjective 'pampered' and simply use the term 'bureaucracy'.

low that there is excess supply of labor to the commodity sector. This pair of restrictions serves two purposes. It ensures that the return to labor is determined in the freehold-agricultural sector at $q\underline{y}$. It also ensures that elite income can be positive.

Under the assumption that each member of the elite contributes equally towards the costs of the bureaucracy and employs his labor in his own commodity production, elite per-capita income is given by

$$y^r = L - \left(\theta^b \lambda^m y^b + \left(\lambda^c - \lambda^r\right) q\underline{y}\right) / \lambda^r. \tag{2.2}$$

where the first term in brackets is the per-elite-capita cost of the bureaucracy (when divided by λ^r) and the second term in brackets is the share of income that a member of the elite must pay to the workers that he hires. (Note that payment to a member of the elite for his own labor services has been netted out of this expression.) In the event of a revolution, each member of the elite retains his labor income, $q\underline{y}$; in that event, the distribution of the latifundia across the remaining groups will be determined in Section 4.

2.2. Preferences and Demands

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

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

where x_c^i, x_f^i, and x_g^i are consumption of the commodity, food, and manufactures respectively by a member of group i. Utility is maximized subject to the budget constraint, $y^i = x_c^i + q x_f^i + p x_g^i$. If $y^i \in [0, p(\alpha - p)]$ then the consumer's problem has a corner solution wherein $x_c^i + x_f^i = 0$ and $x_g^i = \frac{y^i}{p}$. If $y^i > p(\alpha - p)$ the solution to each member of group i's consumer problem is interior. In that case $x_g^i = \alpha - p$, with x_c^i and x_f^i being determined by endowments and technology, which determine income, market clearing and prices.

Using the solutions to the consumer's problem in the utility function yields the indirect utility function, which provides the following measure of the welfare of a member of

group i, w^i:

$$w^i\left(p, y^i\right) = \begin{cases} \alpha\frac{y^i}{p} - \frac{1}{2}\left(\frac{y^i}{p}\right)^2 & \text{if } y^i \in [0, p(\alpha - p)] \\ y^i + \frac{1}{2}(\alpha - p)^2 & \text{if } y^i > p(\alpha - p). \end{cases} \tag{2.3}$$

It is easily checked that citizens are weakly risk-averse; w^i is weakly concave in y^i. First note that w^i is strictly concave in y^i over the range $y^i \in [0, p(\alpha - p)]$ (i.e. $dw^i/dy^i = \frac{1}{p}(\alpha - y^i) > 0$, and $d^2w^i/dw^iy^{i2} = -\frac{1}{p} < 0$) providing $\alpha > y^i$ for all feasible values of y^i (which will be assumed to hold throughout). Then observe that for $y^i > p(\alpha - p)$, w^i is linear in y^i. Thus overall w^i is weakly concave in y^i. The elite exploit this risk aversion to lure would-be entrepreneurs to the bureaucracy.

Since the income of entrepreneurs is stochastic, (expected) welfare of entrepreneurs is determined stochastically as follows:

$$w^e(p, y^e) = \begin{cases} \sigma\left(\alpha\frac{y^e}{p} - \frac{1}{2}\left(\frac{y^e}{p}\right)^2\right) & \text{if } y^e \in [0, p(\alpha - p)] \\ \sigma\left(y^e + \frac{1}{2}(\alpha - p)^2\right) & \text{if } y^e > p(\alpha - p). \end{cases} \tag{2.4}$$

If a firm is successful then its owners' demands are given by the solutions for x_c^i, x_f^i, and x_g^i as discussed above. If the firm is unsuccessful then its owner's demands are $x_c^i = x_f^i = x_g^i = 0$.[13]

To simplify the analysis, assume that each group has sufficient income so that the solution to each member's consumer problem is interior. (For an entrepreneur this solution is only interior if her firm is successful.) Clearly, the exact conditions rely on the determination of p in equilibrium. However, at this point we can say that for any given market clearing price p, the income of each group is underpinned by a parameter that can be varied to ensure each interiority condition is met. In the case of workers, set $\underline{y} > p(\alpha - p)$. Since elite income is determined partially by the return to labor, this ensures that the condition is met for the elite as well. In the case of entrepreneurs and bureaucrats, set H sufficiently large. Specific details will be provided after the equilibrium determination of p. Note that for consumption of x_a^i and x_f^i to be positive in the outcome of the consumer problem requires $q = 1$; taking all other parameters and p as given, we must set $\underline{y}$ sufficiently low to ensure that the agricultural market and natural-resource-good market clear at this price.

[13] It is understood that all variables concerning entrepreneurs are determined in expectation, although we will not need to make a formal distinction between expected and actual outcomes.

When the economy is open to trade, 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 consider imports and exports explicitly. In the present model the gains to trade are captured through the effect of a change in the terms of trade, p, on w^i. We will think of trade liberalization as exogenous, being driven by falling transport costs, associated in the literature with the process of globalization. Thus we can use the terms 'trade liberalization' and 'a freeing of trade' synonymously.

2.3. The Cost and Size of the Pampered Bureaucracy

To choose employment in the bureaucracy, a member of the middle classes requires an income y^b that attains $w^b = w^e$. This requires, using (2.1) and the second lines of (2.3) and (2.4), a value of y^b that satisfies

$$\sigma\left(pH + \frac{1}{2}(\alpha - p)^2\right) = y^b + \frac{1}{2}(\alpha - p)^2.$$

This is solved by

$$y^b = p\sigma H - \frac{(1-\sigma)}{2}(\alpha - p)^2. \tag{2.5}$$

The middle classes take λ^b as given, filling all available vacancies providing $y^b \geq p\sigma H - \frac{(1-\sigma)}{2}(\alpha - p)^2$. Then $\theta^e = 1 - \theta^b$ is determined residually.

2.4. The Timing of Events

The sequence of events is as follows.

1. The elite decides whether to set up a bureaucracy. If so, it chooses y^b and θ^b.
2. Production is undertaken in the latifundia and on the ordinary land and payments are received by labor. If there is a bureaucracy, employees are recruited and receive payment.
3. The lower classes decide whether or not to mount a revolution. If they do not, factor allocations are as described above. If they do mount a revolution, they incur a fixed

cost, d, and ownership of the latifundia and commodity output is transferred from the elite to the lower classes. (The elite retain their labor income.)

4. The success or otherwise of firms are realized and manufacturing production is undertaken.

5. Demands are realized, markets clear and consumption takes place.

The assumption that the success or otherwise of manufacturing firms is determined after the decision over whether or not to revolt reflects the longer gestation period of manufacturing firms than agricultural production. At first sight, it might have seemed more natural to assume that the decision over whether or not to mount a revolution should come after production of manufactures is undertaken. Taking this alternative approach is more complicated because in that case firm owners would have to be modeled as two separate groups; those whose firms had been successful and those whose had not. The alternative approach would yield essentially the same results but in a less direct and more complicated way.

2.5. Definitions of Economic Equilibrium and Efficiency

We will consider economic equilibrium under autarky and free trade respectively. In an autarkic equilibrium, the price adjusts to clear the domestic market. Specifically, the autarkic price, $\bar{p}$, solves the market-clearing condition for manufactures:

$$\lambda^r x_g^r(\bar{p}) + \lambda^m \left(\theta^b x_g^b(\bar{p}) + \theta^e x_g^e(\bar{p})\right) + \lambda^w x_g^w(\bar{p}) = \lambda^m \theta^e \sigma H.$$

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

Under free trade, and because this is a small country, the world price, p_w, is taken as given. By definition, a country produces relatively cheaply the good for which it has a c.a.. So a c.a. in the natural-resource-good or manufactures would imply $p_w < \bar{p}$ or $p_w > \bar{p}$ respectively. And since the market for the importable clears at $\bar{p}$, domestic demand for imports is greater at p_w and so imports are obviously positive under free trade. Trade is balanced in free trade equilibrium so an equal value of the exportable is exported to clear the trade account.

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

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

This definition of efficiency will be useful in analyzing the implications of various different policies that we will examine below.

The reduced-form expression for efficiency is as follows:

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

The first three terms in (2.6) measure the surplus generated by the natural-resource-good, manufactures and agriculture respectively, and the fourth term measures the surplus from consumption of manufactures. By (2.6), a change in the size of θ^b has two conflicting effects on efficiency. On the one hand, through the second term on the right hand side, an increase of θ^b draws human capital away from manufacturing into the less productive bureaucracy and thus reduces economic surplus. On the other hand, through the fourth term, employment in the bureaucracy plays an insurance role for the workers there because it guarantees them a positive level of consumption, compared to one from entrepreneurship that is mired by the possibility of consuming nothing if the firm fails. This insurance role of the bureaucracy means that its expansion may actually increase efficiency. Thus the bureaucracy may or may not be an inefficient institution. These conflicting effects will play a role in the determination of whether trade liberalization reduces efficiency when the size of the bureaucracy is endogenously determined.

3. Economic Equilibrium

Recall that (by assumption on the sufficient size of primitives) $x_g^i\left(p\right) = \alpha - p$ for $i \in \{r, b, w\}$ and $x_g^e\left(p\right) = \alpha - p$ with probability σ and $x_g^e\left(p\right) = 0$ otherwise. Using the fact that $\lambda^w = 1 - \lambda^r - \lambda^m$, write the autarkic market clearing condition for manufactures as

$$\left(1-\lambda^m\left(1-\theta^b\right)\left(1-\sigma\right)\right)\left(\alpha - \bar{p}\right) = \left(1-\theta^b\right)\lambda^m\sigma H.$$

Then the autarky market clearing price is

$$\bar{p} = \alpha - \left(\left(1-\theta^b\right)\lambda^m \sigma H\right) / \left(1 - \lambda^m\left(1-\theta^b\right)(1-\sigma)\right). \tag{3.1}$$

Assume α is large enough to ensure that $\bar{p} > 0$. (Note that this does not conflict with the restriction imposed on α earlier to ensure that welfare is concave in income.) Perhaps the most important property of $\bar{p}$ is that it is increasing in θ^b. Intuitively, increasing the size of the bureaucracy reduces the output of manufactures and thus pushes up their price. By (2.1) and (2.5), an increase in p increases both y^e and y^b. So in autarky the elite can raise the payoff to the middle classes of maintaining the status quo by increasing the size of the bureaucracy and thus make revolution less attractive.

The efficiency implications of trade liberalization 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 to trade. Use in (2.6) the fact that $x_g^i(\bar{p}) = \alpha - \bar{p}$ for $i \in \{r, b, e, w\}$ to obtain

$$\begin{aligned}\Omega\left(\theta^b, p\right) \equiv\ & \lambda^r L + \left(1-\theta^b\right)\lambda^m p\sigma H + (\lambda^r + \lambda^w - \lambda^r L)\underline{y} \\ & + \frac{\left(1-\lambda^m(1-\sigma)\left(1-\theta^b\right)\right)}{2}(\alpha - p)^2.\end{aligned} \tag{3.2}$$

Differentiating this expression with respect to p,

$$\frac{d\Omega}{dp} = \left(1-\theta^b\right)\lambda^m \sigma H - \left(1-\lambda^m(1-\sigma)\left(1-\theta^b\right)\right)(\alpha - p). \tag{3.3}$$

From this expression we can see that, whether the country has a c.a. in manufactures or primary products trade liberalization always raises efficiency. To see this, first use (3.1) to substitute $\bar{p}$ for p, and note that $d\Omega/dp|_{p=\bar{p}} = 0$, while $d^2\Omega/dp^2 = \left(1-\lambda^m(1-\sigma)\left(1-\theta^b\right)\right) > 0$. Thus, efficiency obtains a minimum in autarky. Secondly, observe that if $p = 0$ then $d\Omega/dp < 0$ under the restriction $\alpha > \left(\left(1-\theta^b\right)\lambda^m\sigma H\right) / \left(1-\lambda^m(1-\sigma)\left(1-\theta^b\right)\right)$. With this restriction on α we have that $d\Omega/dp < 0$ for any movement of p away from $\bar{p}$. Under these parameter restrictions, then, trade liberalization implies an increase in efficiency whether the country has a c.a. in primary products or manufactures (in which cases trade liberalization implies a reduction or an increase in p respectively). This result will serve as a useful benchmark against which to compare the efficiency implications of trade liberalization when the size of the bureaucracy is endogenous.

4. Political Equilibrium

Assume that each group, the middle classes and the workers respectively, is able to resolve the collective action problem inherent in the decision over whether or not to revolt. 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 economic surplus generated by a revolution is determined using a Nash Bargaining Solution (NBS), where the bargain is between the middle classes and the workers.[14] 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. To determine the NBS, let us first introduce the following notation. W is the total surplus generated by the lower classes:

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

where the first term on the right hand side measures surplus generated by the middle classes and the second term measures the same for the workers. From this definition, and using (2.1)-(2.5), we can determine a reduced form for the total payoff to the lower classes from maintaining the status quo, W_{sq}:

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

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:

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

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 net of the cost of revolution. Then the total net surplus for the lower classes generated by revolution is

$$h\left(\theta^b, p\right) \equiv W_{rev}\left(\theta^b, p\right) - W_{sq}\left(p\right) = \lambda^r y^r \left(\theta^b, p\right) - d;$$

[14] Since in economic equilibrium $w^b = w^e$, we can model the middle classes as a single group in the determination of political equilibrium.

the income from the commodity less the cost of mounting the revolution. The total surplus received by group $i \in \{m, w\}$, as calculated by the NBS, is given by

$$s^i = \lambda^i w^i \left(p, y^i\right) + \frac{1}{2}\left(\lambda^r y^r \left(\lambda^b, p\right) - d\right).$$

The aim is now to establish that there exists a value of θ^b that would remove the incentive to revolt. We will say that such a value of θ^b satisfies the no-revolution-constraint (NRC), and refer to this value as $\tilde{\theta}^b$, where NRC is written formally as follows:[15]

$$NRC: h\left(\tilde{\theta}^b, p\right) = \lambda^r y^r \left(\tilde{\theta}^b, p\right) - d = 0. \tag{4.1}$$

We will derive an explicit solution for (4.1) in the next subsection.

4.1. The Equilibrium Size of the Pampered Bureaucracy

It is instructive to solve for $\tilde{\theta}^b$ first under free trade and then under autarky. Under free trade, take p as given and use (2.5) to determine $y^b(p)$. Then $\tilde{\theta}^b$ is obtained by rearranging (4.1):

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

For $\tilde{\theta}^b$ to satisfy NRC, it must lie in the interval $[0, 1]$. If the solution lies below zero then this implies that d is too large relative to $\lambda^r y^r\left(\theta^b, p\right)$ for a revolution to be worth while. 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 $\tilde{\theta}^b$ and there is nothing that the elite can do (within the context of the present model) to prevent revolution. For $\underline{y}$ sufficiently small, an increase in L makes this more likely.

Let us now establish the conditions for which there exists a solution $\widetilde{\theta}^b \in [0, 1]$ under autarky. Substituting (2.5), (3.1) and (4.2) into (4.1),

$$\begin{aligned} & h\left(\theta^b, p\right) = \lambda^r y^r\left(\theta^b, \bar{p}\right) - d \qquad (4.3)\\ = \;& \lambda^r \left(L - \lambda^r (L-1)\,\underline{y} - \theta^b \lambda^m \left(\frac{\sigma H \left(\alpha - \frac{\left(1-\theta^b\right)\lambda^m \sigma H}{1-\left(1-\theta^b\right)\lambda^m(1-\sigma)} - \frac{\left(1-\theta^b\right)^2 (\lambda^m)^2 (1-\sigma)\sigma^2 H^2}{2\left(1-\left(1-\theta^b\right)\lambda^m(1-\sigma)\right)^2} \right)}{\lambda^r} \right) \right) - d. \end{aligned}$$

[15] We are essentially concerned about the existance of a value, θ^b, that brings the surplus from revolution to zero. This renders irrelevant the question of how the surplus would be divided between $i \in \{m, w\}$ if it were positive. It would reflect the relative incomes received by the respective groups in the status quo if the revolution failed.

Use the intermediate value theorem to obtain conditions under which there exists a solution $\widetilde{\theta}^b \in [0,1]$. Using values $\theta^b = 0$ and $\theta^b = 1$, by inspection of (4.3), the following endpoints of $h\left(\theta^b, p\right)$ can be determined:

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

Thus, given λ^r, if L is sufficiently large and $\underline{y}$ is sufficiently small relative to d, $h\left(0,p\right) > 0$. Make α or H sufficiently large as to ensure that $h\left(1,p\right) < 0$. Since $h\left(\theta^b, p\right)$ is a continuous function of θ^b, there must exist a value $\tilde{\theta}^b$ that satisfies $h\left(\theta^b, p\right) = 0$. The discussion so far gives us our first main result:

Proposition 1. *Fix λ^r, λ^m, and σ, all in the interval $[0,1]$. Also fix $d > 0$. Then for values of L, α and H sufficiently large there exists a size of the pampered bureaucracy, i.e. a value $\widetilde{\theta}^b \in [0,1]$ satisfying the NRC, that prevents a revolution.*

The proof of this result shows that for α sufficiently large the first derivative of $h\left(\theta^b, p\right)$ is negative with respect to θ^b, thus establishing conditions under which $\widetilde{\theta}^b$ is unique. This result shows that, providing there is sufficient labor and human capital and demand is sufficiently strong, it is always both desirable and possible for the elite to expand the size of the pampered bureaucracy to the point where a revolution is not worth while. If L is too small relative to d then the cost of mounting a revolution, or equivalently the damage done by it, means that it is not worth while and there is no need even to set up a pampered bureaucracy. If H is too small then the pampered bureaucracy cannot be expanded enough to prevent a revolution because there are not enough members of the middle classes to recruit. Note that if H were too small then the elite might alternatively be able to increase σ through institutional reforms that improved the probability of firm survival. For our purposes of the present exercise we will ignore this possibility but return to it in the concluding section.

4.2. The Effects of Trade Liberalization on the Pampered Bureaucracy

Having now determined the size of a bureaucracy that prevents a revolution, $\widetilde{\theta}^b \in [0,1]$ (if it exists), we can examine the effects of trade liberalization. We will focus on the

case where the country has a c.a. in primary products. The logic works in reverse if the country has a c.a. in manufactures. The first step will be to show that, given $\widetilde{\theta}^b \in [0,1]$, trade liberalization as captured by a reduction of p from $\bar{p}$ creates an incentive to revolt. The second step will be to examine how $\tilde{\theta}^b$ must be changed in order to prevent revolution under trade liberalization.

When the country has a c.a. in primary products, trade liberalization generates positive surplus for the elite and thus an incentive to revolt. To show this, write out the reduced form for $h\left(\theta^b, p\right)$ using (2.5) to substitute for y^b but treat p as a parameter:

$$h\left(\theta^b, p\right) = \lambda^r L - \lambda^r \left(L-1\right)\underline{y} - \theta^b \lambda^m \left(p\sigma H - \frac{\left(1-\sigma\right)}{2}\left(\alpha - p\right)^2\right) - d.$$

Differentiating with respect to p,

$$\frac{dh\left(\theta^b, p\right)}{dp} = -\theta^b \lambda^m \left(\sigma H + \left(1-\sigma\right)\left(\alpha - p\right)\right).$$

Since by assumption $\alpha > p$, the reduction of p entailed by trade liberalization increases $h\left(\theta^b, p\right)$, establishing that trade liberalization generates an incentive to revolt (for any given θ^b and p and hence $\tilde{\theta}^b$ and $\bar{p}$).

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

$$\frac{d\tilde{\theta}^b}{dp} = -\frac{\left(\lambda^r L - \lambda^r \left(L-1\right)\underline{y} - d\right)\left(\sigma H + \left(1-\sigma\right)\left(\alpha - p\right)\right)}{\lambda^m \left(p\sigma H - \frac{1-\sigma}{2}\left(\alpha - p\right)^2\right)}. \tag{4.4}$$

Given the structure imposed on the model, $d\tilde{\theta}^b/dp < 0$. If the country has a c.a. in primary products then trade liberalization mandates an increase in the size of the pampered bureaucracy in order to prevent a revolution. Another way to see this is first to observe from (2.5) that a reduction of p results in a reduction in y^b and then, from (4.2), that a fall in y^b mandates an increase in $\tilde{\theta}^b$. Intuitively, the fall in p increases y^r, thus raising the surplus to the lower classes from revolution. However, from (2.2), 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 liberalization. If the country has a c.a. in manufactures then, by applying the above reasoning with the signs reversed, trade liberalization mandates a reduction in the size of the pampered bureaucracy.

We are now in a position to examine the efficiency implications of trade liberalization when the size of the bureaucracy is endogenous. Recall, from (4.2), that $\tilde{\theta}^b$ is a function of p. For convenience, express the equation (4.2) as $\tilde{\theta}^b(p)$. Using $\tilde{\theta}^b(p)$ in (3.2) and differentiating with respect to p,

$$\begin{aligned}\frac{d\Omega}{dp} &= \left(1-\tilde{\theta}^b(p)\right)\lambda^m\sigma H - \left(1-\lambda^m(1-\sigma)\left(1-\tilde{\theta}^b(p)\right)\right)(\alpha-p) \qquad (4.5)\\ &\quad -\lambda^m\left(p\sigma H - \frac{(1-\sigma)}{2}(\alpha-p)^2\right)\frac{d\tilde{\theta}^b(p)}{dp}.\end{aligned}$$

The first line is the same as in (3.3), which was calculated for θ^b exogenous; we noted previously that the first line is negative providing α is sufficiently large. Now note that as θ^b approaches 1 this becomes easier to satisfy since the first term tends to vanish and the second term increases in size. To sign the second line first note that the term in brackets may be positive or negative depending on the size of H relative to α. Providing that H is sufficiently large, the term in brackets is positive. Now recall that $d\tilde{\theta}^b/dp < 0$. So the sign of the second line is positive providing H is sufficiently large relative to α. To evaluate the size of the second line relative to the first, observe from (4.4) that the magnitude of $d\tilde{\theta}^b/dp$ is increasing in L. Therefore, we can make L sufficiently large that the size of the second line is greater than the size of the first. In that case, when the size of the bureaucracy is endogenously determined, it is possible for trade liberalization to be efficiency reducing. We have now established our second main result:

Proposition 2. *Fix λ^r, λ^m, and σ, all in the interval $[0,1]$. Also fix $d>0$. Then for values of L and H sufficiently large, trade liberalization may be efficiency-reducing when the size of the pampered bureaucracy is endogenous.*

Several possibilities are allowed for under Proposition 2. In the discussion that followed (3.3) we argued that at autarky a small change in prices has a small positive effect on efficiency. With the endogenous change in θ^b working in the opposite direction, and with the effect being large if L is large, it is likely that small reductions in p are efficiency reducing. Therefore, a minimum threshold increase in θ^b may be required for trade liberalization to become efficiency improving. This is evident from the first term on the first line of (4.5) which is positive and so tends to work against efficiency improvements from trade liberalization. However, as θ^b tends to 1, this first term tends to zero, making it more

likely that the magnitude of the first line is greater than the magnitude of the second and that trade liberalization improves welfare. It is of course possible either that the value of the terms on the first line is greater than that of the second for all values of $\tilde{\theta}^b(p) \in [0,1]$, in which case trade liberalization is welfare improving as in the standard model. This is more likely for L relatively small. For L relatively large the reverse is more likely with trade liberalization being everywhere efficiency reducing.

It is worth reflecting on what trade liberalization would imply for the incomes of the elite with θ^b endogenous. (We already know that worker income remains fixed and trade liberalization reduces the incomes of the middle classes since it lowers p; under free trade, θ^b is not an argument in the incomes of the middle classes.) Using (2.2) and (2.5),

$$\begin{aligned} \frac{dy^r}{dp} &= -\frac{\tilde{\theta}^b(p)\,\lambda^m}{\lambda^r}\left(\sigma H + (1-\sigma)(\alpha - p)\right) \\ &\quad -\frac{d\tilde{\theta}^b/dp}{\lambda^r}\left(\lambda^m(p\sigma H - \frac{(1-\sigma)}{2}(\alpha-p)^2) + \lambda^r(L-1)\,\underline{y}\right). \end{aligned} \tag{4.6}$$

The first line of (4.6) shows that when θ^b is held constant a reduction of p increases y^r. The second line tells us that the increase of θ^b that results from a reduction of p works in the opposite direction; intuitively, the increase in elite incomes is eroded by the fact that they must pay for a larger bureaucracy to prevent revolution. Turning to NRC, given (4.1) holds before revolution, the elite must increase θ^b by just enough to ensure that it continues to hold after any given reduction in p. Therefore, assuming $\tilde{\theta}^b(p) \in [0,1]$ both before and after trade liberalization, there is no change in elite income, y^r. However, by (2.3), the elite still have an interest in trade liberalization since they enjoy a consumption gain from the fact that p falls. If the country has a c.a. in manufactures then the opposite is true; with the size of the pampered bureaucracy endogenously determined and y^r thus held constant, the elite lose from trade liberalization through a consumption loss as p rises. Based on this property of the model it might appear that if we allowed the elite to control trade policy, then when the country has a c.a. in manufactures the elite would resist trade liberalization. However, since revolution would also give the lower classes control of trade policy, elite resistance to trade liberalization would generate an offsetting incentive to revolt.

5. From Theory to Estimation

We now develop an empirical analogue of (4.4), which gives the relationship between the size of the bureaucracy and openness. First, let O denote the level of economic openness and let $C \in \{0, 1\}$ be an indicator which takes a value of 1 if the country's c.a. is in primary products and 0 if its c.a. is in manufactures. The process of trade liberalization can be expressed in terms of an increase in openness to trade. Standard trade theory predicts a monotonic relationship between openness and the relative price of manufactures, p, which may be expressed as a function; $p(O)$. If the country has a c.a. in primary products ($C = 0$) then an increase in openness brings about a reduction in p, while if the country has a c.a. in manufactures ($C = 1$) then an increase in openness brings about an increase in p. Summarizing this formally:

$$\begin{aligned} \text{If } C &= 0 \text{ then } \partial p/\partial O > 0; \\ \text{if } C &= 1 \text{ then } \partial p/\partial O < 0. \end{aligned} \tag{5.1}$$

Denote by A and B the amount of structural government employment and employment in the (pampered) bureaucracy respectively. Then $D \equiv A + B$, where D denotes total (central) government spending on employment (henceforth 'total government employment'). For present expositional purposes, we will determine both A and B as functions only of p, assuming that all other influences on government employment are subsumed by an error term; $A = A(p) + \varepsilon^a$ and $B = B(p) + \varepsilon^b$.

We now specify formally our identifying restriction. It is that the effect of trade liberalization on structural government employment is not affected by c.a.; $\frac{\partial A}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=1} = \frac{\partial A}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=0}$. We will refer to the identifying restriction as IR and, with some abuse of notation, write it more compactly as follows:

$$IR : \frac{\partial A^{\pi}}{\partial O} = \frac{\partial A^{\mu}}{\partial O},$$

where the superscript π denotes a country with a c.a. in primary products and the superscript μ denotes the same thing for manufactures. Note that in principle this effect could be positive or negative. The important thing to note is that, by IR, variation of central government employment in response to a change in openness that is common across countries with a c.a. in either sector is attributed to variation in A.

We will now show how *IR* is helpful in deriving a testable prediction of our model. Equations (4.4) and (5.1) imply that c.a. determines the direction of the effect of trade liberalization on the size of the pampered bureaucracy. In particular, $\frac{\partial B}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=1} > 0 > \frac{\partial B}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=0}$. Since this result is derived from a static model, we reinterpret its implication as saying that over time, $\frac{\partial B}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=1} > \frac{\partial B}{\partial p}\frac{\partial p}{\partial O}\Big|_{C=0}$. We will refer to this as our main prediction, or *MP*. Again, with some abuse of notation, write *MP* more compactly as:

$$MP : \frac{\partial B^{\pi}}{\partial O} > \frac{\partial B^{\mu}}{\partial O}.$$

Now we can see how the identifying restriction can be used to test whether *MP* holds in the data. First note that countries can be partitioned by c.a. and that the response of D^{π} and D^{μ} to a change in O can be measured. By the foregoing we have:

$$\frac{\partial D^{\pi}}{\partial O} - \frac{\partial D^{\mu}}{\partial O} = \frac{\partial A^{\pi}}{\partial O} - \frac{\partial A^{\mu}}{\partial O} + \frac{\partial B^{\pi}}{\partial O} - \frac{\partial B^{\mu}}{\partial O}. \tag{5.2}$$

Now observe that, by *IR*, a finding of $\frac{\partial D^{\pi}}{\partial O} - \frac{\partial D^{\mu}}{\partial O} > 0$ implies that $\frac{\partial B^{\pi}}{\partial O} > \frac{\partial B^{\mu}}{\partial O}$, which is evidence of *MP*.

To develop the empirical model, we introduce additional flexibility by allowing for persistence in the dependent variable and controls for confounding factors Z. We now introduce the following general functions for A_{it} and B_{it}, which represent A and B in country i and period t respectively:[16]

$$A_{it} = A_{it}(\sum_{t=0}^{\tau} D_{i,t-1}, p(O_{it}), Z_{it});$$

$$B_{it} = B_{it}(p(O_{it}), Z_{it}).$$

where Z_{it} is a vector of time-varying country-specific confounders. These functions replace the functions $A(p)$ and $B(p)$ introduced earlier. We may then write

$$D_{it}(\sum_{t=0}^{\tau} D_{i,t-1}, p(O_{it}), Z_{it}) = A_{it}(\sum_{t=0}^{\tau} D_{i,t-1}, p(O_{it}), Z_{it}) + B_{it}(p(O_{it}), Z_{it}) \tag{5.3}$$

To obtain an estimating equation, we linearly approximate $B_{it}(\sum_{t=0}^{\tau} B_{i,t-1}, O_{it}, Z_{it})$ for each set of countries under monotonicity of $p(\cdot)$ and additive separability of $A(\cdot)$ and $D(\cdot)$:

[16] Allowing B_{it} to depend on previous values of the bureaucracy $\sum_{t=0}^{\tau} D_{i,t-1}$ would complicate the interpretation of coefficients by introducing incomplete adjustment of the pampered bureaucracy within a period to changes in trade exposure.

$$A_{it} = \sum_{t=0}^{\tau} a_t B_{i,t-1} + bp(O_{it}) + \mathbf{c}Z_{it} + \varepsilon_{it}^a;$$
$$D_{it} = dp(O_{it}) + \mathbf{e}Z_{it} + \varepsilon_{it}^d$$

where a_t, b, d are scalar parameters, $\mathbf{c}$ and $\mathbf{e}$ are parameter vectors and ε_{it}^a, ε_{it}^d are idiosyncratic errors. Using equation (5.3) and collecting terms we can then write

$$D_{it} = \sum_{t=0}^{\tau} a_t D_{i,t-1} + (b+d)O_{it} + (\mathbf{c}+\mathbf{e})Z_{it} + \varepsilon_{it}$$

where $\varepsilon_{it} = \varepsilon_{it}^a + \varepsilon_{it}^d$.

We difference the data to remove time-invariant country-specific heterogeneity and to differentiate the effect of openness on the size of the bureaucracy across the two types of c.a. we interact openness with a dummy variable C_i which takes a value of 1 if a country has a c.a. in primary products and $C_i = 0$ if the country has a c.a. in manufactures. This gives us the following estimating equation:

$$\Delta D_{i,t} = \alpha_0 + \sum_{\tau=1}^{T} \alpha_\tau \Delta D_{i,t-\tau} + \beta_1 \Delta O_{it} + \beta_2 \Delta O_{it} \times C_i + \gamma \Delta \mathbf{Z}_{it} + \Delta \varepsilon_{it}, \qquad (5.4)$$

Consider the coefficients β_1 and β_2: β_1 captures the effect of openness on structural government employment and employment in the bureaucracy given that the country has a c.a. in manufactures. Then β_2 gives the difference in the effect of openness on the size of the bureaucracy for countries that have a c.a. in primary products relative to those that have a c.a. in manufactures. In terms of the model, β_2 measures the difference $\frac{\partial B^\pi}{\partial O} - \frac{\partial B^\mu}{\partial O}$ which, by *MP*, is predicted to be positive.

It is well known that in models of this form unobserved country effects are correlated with the lagged dependent variable, leading to inconsistency of the parameter estimates. Consistent estimates may be obtained by estimating the Generalized Method of Moments (GMM) estimator originally proposed by Arellano and Bond (1991, henceforth referred to as A/B). Through the moment conditions $E(D_{is}\Delta\varepsilon_{it}) = 0$ for time periods $s \leq t-T$, where T is the terminal time period, the GMM estimator implies that it is valid to instrument $\Delta D_{i,t-1}$ with the lagged differences $\Delta D_{i,t-T}$, $\Delta D_{i,t-T-1}$, ..., $\Delta D_{i,0}$. An attractive feature of this procedure is that the additional moment conditions $E(Z_{is}\Delta\varepsilon_{it}) = 0$ for $s \leq t-T$ allow

us to instrument $\Delta \mathbf{Z}_{it}$ with the lagged differences $\Delta Z_{i,t-T}, \Delta Z_{i,t-T-1}$... and so on. Arellano and Bover (1995) show that lagged levels are often poor instruments for lagged differences. Blundell and Bond (1998, henceforth B/B) show how that problem is mitigated by using a system-GMM estimator which employs the additional moment conditions $E(\Delta D_{it}\varepsilon_{it}) = 0$ and $E(\Delta Z_{it}\varepsilon_{it}) = 0$. This procedure makes it possible to incorporate the levels $D_{i,t-T}$, $D_{i,t-T-1}$, ... and $Z_{i,t-T}$, $Z_{i,t-T-1}$, ... as additional instruments for $\Delta D_{i,t-1}$ and $\Delta Z_{i,t-1}$. For robustness, we report estimates from both estimators. Because these estimators are inconsistent in the presence of serial correlation, for each regression we test for serial correlation in the first-differenced residuals as well as instrument validity using the Sargen test of overidentifying restrictions.

6. Data and Summary Statistics

6.1. Data Construction

As a measure of total government employment across countries and time, D_{it}, we use annual data for central government spending on wages and salaries (1972-2008 in millions of real US dollars) from the International Monetary Fund's Government Finance Statistics database. A full list of countries is given in Table 1. We use a widely accepted measure openness often referred to as 'trade exposure'. To construct this measure, first define Y_i as country i's GDP expressed in millions of constant dollars, x_{ij} and m_{ij} as exports to and imports from country j in millions of constant dollars and $X_i = \sum_{j \neq i} x_{ij}$, $M_i = \sum_{j \neq i} m_{ij}$. Then trade exposure is measured as follows:

$$O_i = \frac{X_i + M_i}{Y_i},$$

which we obtained from the Penn World Tables mark 6.3.[17] In order to identify our parameters, we need to obtain an exogenous source of variation in trade exposure. While country tariff schedules do not typically fluctuate very much, government policy more broadly defined almost certainly does have an influence over trade volumes from year to year. If such policy-induced trade fluctuations are correlated with both openness and c.a. but not with any of the variables in the vector $\mathbf{Z}_{it}$, then our estimate of β_2 will be

[17]These data are available at http://pwt.econ.upenn.edu/php_site/pwt_index.php

biased. As a robustness test, we also employ the commonly-used gravity-based remoteness measure of trade-exposure, used by Helliwell (1998), Rose (2004), and Hijzena, Gorg and Munchin (2008), which is the distance-weighted average of all trading partners' GDPs and hence is exogenous if a country is assumed to be small.[18] Let δ_{ij} be the distance between country i and j. According to that measure, natural openness is measured as follows:

$$\tilde{O}_i = \sum_{j \neq i} \frac{Y_j}{\delta_{ij}}.$$

Our measure of revealed c.a. (RCA) is due to Balassa (1965). We constructed this using trade flows from the World Bank. The index measures the percentage of country i's exports of product category k to some larger set of product categories ω as a share of the world percentage of product k exports relative to total trade.[19] Let X_{ikt} be country i's exports of product category k to the rest of the world in period t, $X_{i\omega t}$ be total exports from country i to the rest of the world within some 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

$$RCA_{ikt} = \frac{\left(\frac{X_{ikt}}{X_{i\omega t}}\right)}{\left(\frac{X_{nkt}}{X_{n\omega t}}\right)}.$$

We define $rca_{pi} = C_i = 1$ if $RCA_{ikt} > 1$ and zero otherwise. In our sample, Rc.a. varies little over time. This temporal stability of c.a. allows us to assume that underlying c.a. is constant across time and use the mode across years as our measure of a country's c.a..

We also control for measurable determinants of total central government employment. Larger countries spend more than smaller countries. To capture country-size effects, we include total gross domestic product expressed in millions of US dollars (Y_{it}) and population in thousands of individuals (N_{it}). Countries with higher GDPs tend to also have higher wage rates. However, it may be that spending on wages and salaries is higher in countries that have a c.a. in manufacturing because average wages are higher than in countries that have a c.a. in primary products. An ideal proxy would be middle class wage

[18] Our main results were unchanged when we instrumented both measures with their own lags.

[19] Our trade data comes from the World Bank's World Development Indicators and is pre-aggregated into 5 product categories, so, $\omega = \{$ore metals and minerals, fuels, agriculture, food, manufactures$\}$.

rates or the minimum wage. Unfortunately, no such data exist at the annual level for a wide variety of developing countries. Instead, we include per-capita income in thousands of dollars (y_{it}) as a control for average wages. In the presence of political or credit constraints, spending should also be partly determined by government revenue. To address this concern, we include central government revenue from the IMF's Government Finance Statistics, in millions of US dollars (R_{it}). Another potential concern may arise if planned economies have a greater tendency to have a c.a. in manufacturing. These economies may have larger governments and, in the transition to capitalism both liberalize trade and reduce government spending . For transition economies, we constructed a dummy variable which assumes a value of 1 in all years subsequent to transition to a market economy ($post\_S_{it}$). Balance-of-payments crises are often addressed by countries taking on IMF loans which come with conditionalities attached. Such conditionalities typically mandate both trade liberalization and reduced government expenditures. We control for this possibility by obtaining, from the IMF, data on all outstanding loans to which are attached conditionalities, and construct a variable which equals one if a country obtained an IMF loan with conditionalities in the previous year (imf_{it}).

The final sample includes 100 countries and 1605 country years, so that over the 36 year period, there are an average of 16.05 observations per country. The first column of Table 2 presents summary statistics. In columns (2) and (3) we split the sample into low and high openness observations where high openness is defined as O_{it} above the mean (.82). More open economies tend to have a smaller population, smaller GDP and government revenue, and higher per-capita income. A larger proportion of less open economies have a (revealed) c.a. in primary products and have IMF loans outstanding.

7. Main Econometric Results

Tables 3 and 4 present the econometric results we have found in testing our theory. Each table is compiled according to the same format. All tables present estimates of equation (5.4) in logs. The first two columns of each table present results using our first measure of openness, O_{it}. Column (1) presents results obtained for the A/B estimation technique while column (2) presents results obtained using the B/B technique. Columns (3) and (4)

repeat the specifications of columns (1) and (2) respectively but using our second measure of openness, $\tilde{O}_{it}$, instead.

Two lags of the dependent variable are sufficient to eliminate serial correlation in the differenced residuals. The first line of results in the table presents estimates of β_2. Recall that our model predicts $\beta_2 > 0$ and this is confirmed by our estimation results. For example, column (1) says that the elasticity of the size of the bureaucracy with respect to openness is 13.8 percent greater in the countries with a c.a. in primary products than for countries with a c.a. in manufactures.

The second line shows that our estimates of β_1 are not significantly different from zero in columns (1) and (2), while in columns (3) and (4) they are negative and significant. Recall that β_1 is the combined average effect of a change in openness on structural government employment and the pampered bureaucracy in countries with a c.a. in manufactures. By Rodrik (1998, 2000) we would expect the former effect to be positive while the latter to be negative. In columns (1) and (2) we find that the coefficients are not significantly different from zero suggesting that the two effects are of similar absolute magnitudes though of opposite sign and thus cancel out. In columns (3) and (4) the estimated coefficients are negative and significant suggesting that the negative effect on the pampered bureaucracy of countries whose c.a. is manufacturing dominates. Turning to the bottom of the table, the Sargan overidentifying restrictions test does not reject the null of instrument validity. Finally, tests of serial correlation at the bottom of the table indicate strong persistence in the levels residuals, providing support for the differenced specification. However, the null of serial correlation is not rejected at the second order, indicating that inclusion of dependent variable lags is sufficient to eliminate serial correlation in the differenced residuals.

As suggested above, higher GDP and average incomes tend to translate into larger bureaucracies though by some estimates not always significantly so. Similarly, population, government revenue or the presence of IMF conditionalities tend to have the predicted sign but do not have a statistically significant effect in all specifications. Interestingly, the countries that have transitioned from planning to capitalism appear to have seen an increase in the size of their bureaucracies. The results from B/B estimation in column (2) are qualitatively similar to those obtained with the A/B estimator.

The results presented in Table 4 make a distinction between developed and developing countries. We follow the International Monetary Fund's (IMF's) definition of developing countries. Making this split strengthens somewhat the support for the main prediction of our model. The first row of the table shows that our estimates of β_2 are positive and significant for developing countries in all specifications. The second row shows that the evidence of this for developed countries is weaker, with the results in columns (3) and (4) being not significantly different from zero. In columns (1), (2) and (3) of the second row, our estimates of β_1 for developing countries are not significantly different from zero. The results for developed countries, shown in row (4), indicate that the estimates of β_1 are negative and significant. The coefficients for the other control variables as well as specification tests, which are the same as in Table 3, are similar to those presented in Table 3 and are at least as well determined.

8. Conclusions

In this paper, we have shown how a country's elite may be able to create a pampered bureaucracy and manipulate its size in order to maintain social stability. One effect of increasing the size of the pampered bureaucracy is to reduce the amount of surplus available for expropriation, thus making revolution less attractive. Another is to make entrepreneurs more scarce, thus raising the income of the middle classes and hence their interest in maintaining the status quo. In a situation where the country has a c.a. in primary products, trade liberalization increases the income of the elite relative to the lower classes and thus mandates an increase in the size of the pampered bureaucracy relative to countries that have a c.a. in manufactures in order to maintain social stability. We were able to find support for this prediction in the data.

We think that the main idea of the present paper could usefully be developed in a number of directions. One would be to think about how the model could be used to motivate the social conflict that has arisen as a result of the prescriptions of conditionality imposed by the International Monetary Fund and World Bank. Such conditionality required that recipients of loans should 'stabilize, privatize and liberalize.' Elaborating on the second and third requirements, (the first is concerned with the macroeconomic

environment and is beyond the scope of the present paper) these were for a country to reduce the size of government while liberalizing trade. The present paper suggests a new way in which an externally imposed reduction in the size of government in conjunction with trade liberalization may trigger social unrest in countries that have a c.a. in primary products. It would be interesting to explore this idea in greater detail.

The model of the present paper has focused on one particular aspect of government while regarding all other institutions as exogenous. It would be worth thinking explicitly about the interaction of the various different institutions that have been incorporated in our model. Governments do have control over the probability with which firms are successful (σ) and the cost of undertaking a revolution (f). Our focus on the size of the pampered bureaucracy seems reasonable, holding these other institutions constant, since the government is likely to have direct control over it and can adjust its size relatively quickly. But it would be interesting to try to capture the interactions between all these institutions in a more sophisticated way.

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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

Notes: This table provides a list of countries for which there exist data on bureaucracy size, GDP, government revenue, IMF loans, population, c.a. and openness. The unbalanced panel spans the years 1972-2008.

Table 2. Mean Country Characteristics, by Openness

	All Countries (1)	Low Openness (2)	High Openness (3)	P-value (2) vs. (3) (4)
Number of countries	100	59	41	–
Means				
B_{it}	508.96	535.73	474.16	0.176
	(508.96)	(984.94)	(786.05)	
Y_{it}	6284.0	6615.9	5852.7	0.060
	(8067.9)	(8436.36)	(7546.5)	
R_{it}	798.96	1129.2	369.76	0.001
	(4401.8)	(5344.8)	(2668.7)	
N_{it}	38665	63364	6571.1	0.000
	(119592)	(154264)	(12439)	
y_{it}	4000.5	2280.7	6236	0.000
	(14.258)	(2.287)	(16.819)	
Proportions				
rca_p	0.670	0.733	0.602	0.000
	(0.470)	(0.021)	(0.490)	
imf_{it}	0.155	0.174	0.130	0.016
	(0.362)	(0.379)	(0.336)	
$post\_S_{it}$	0.110	0.0301	0.213	0.000
	(0.313)	(0.173)	(0.410)	

Column (1) reports average country characteristics for the entire sample. Columns (2) and (3) report average country characteristics for countries with low and high openness where high openness is defined as greater than the mean (.82). B_{it}, Y_{it}, R_{it} and y_{it} are in domestic currency units. N_{it} is the population in thousands, rca_p denotes primary commodity resource intensity. imf_{it} takes a value of 1 if a country has an outstanding IMF loan in period t. $post\_S_{it}$ takes a value of 1 for all years in which a country is classified as post Soviet.

Table 3. Dynamic Panel Estimates - Determinants of Tot. Gov't Empl. Spending

	(1) A/B	(2) B/B	(3) A/B	(4) B/B
Openness (t) × primary	0.138***	0.155***	0.069**	0.091***
	(0.040)	(0.043)	(0.029)	(0.018)
Openness (t)	-0.209	-0.063	-1.325***	-0.449***
	(0.177)	(0.165)	(0.117)	(0.049)
GDP (t)	0.753***	0.546***	0.787***	0.561***
	(0.082)	(0.070)	(0.017)	(0.020)
Government revenue (t)	0.009	0.018	0.006***	0.009***
	(0.013)	(0.013)	(0.002)	(0.002)
Population (t)	-0.215	-0.051	0.633***	-0.010
	(0.146)	(0.115)	(0.052)	(0.010)
Per-capita income (t)	0.453**	-0.054	-0.103***	-0.004
	(0.219)	(0.058)	(0.030)	(0.021)
Outstanding IMF loan (t)	-0.032	0.011	-0.089***	-0.007
	(0.032)	(0.052)	(0.008)	(0.017)
Post-Soviet (t)	0.279***	0.368***	0.325***	0.410***
	(0.106)	(0.119)	(0.063)	(0.04)
$\Delta D_{i,t-1}$	0.432***	0.627***	0.411***	0.620***
	(0.054)	(0.061)	(0.017)	(0.017)
$\Delta D_{i,t-2}$	-0.092***	-0.109***	-0.0943***	-0.107***
	(0.026)	(0.035)	(0.006)	(0.005)
Sargan Test (p-value)			1.00	1.00
Serial correlation:				
1st order (p-value)	0.000	0.000	0.000	0.001
2nd order (p-value)	0.294	0.293	0.289	0.155
Observations	1345	1473	1254	1377
Number of id	94	100	89	95

Column (1) and (2) report estimates from the A/B and B/B estimators using O_{it}. Columns(3) and (4) report estimates from the two estimators using $\tilde{O}_{it}$. Sargan overidentifying test p-values and tests of 2nd order autocorrelation reported below regression results. Constants suppressed. Two-step GMM standard errors in parentheses *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 4. Dynamic Panel Estimates - Determinants of Tot. Gov't Empl. Spending
Heterogeneous effects by development level

	(1) A/B	(2) B/B	(3) A/B	(4) B/B
Openness (t) × primary × developing	0.140*** (0.011)	0.175*** (0.013)	0.141** (0.058)	0.128** (0.057)
Openness (t) × primary × developed	0.093*** (0.010)	0.136*** (0.032)	0.003 (0.038)	0.029 (0.041)
Openness (t) × developing	0.015 (0.055)	-0.051 (0.035)	0.749 (0.515)	-0.234* (0.140)
Openness (t) × developed	-0.626*** (0.095)	-0.227*** (0.040)	-1.597*** (0.127)	-0.577*** (0.051)
GDP (t)	0.818*** (0.023)	0.597*** (0.031)	0.785*** (0.024)	0.559*** (0.021)
Government revenue (t)	0.011*** (0.001)	0.012*** (0.002)	0.012*** (0.002)	0.011*** (0.002)
Population (t)	-0.326*** (0.0408)	-0.060 (0.043)	-0.061 (0.043)	0.015 (0.033)
Per-capita income (t)	0.477*** (0.067)	-0.075*** (0.022)	0.560*** (0.062)	-0.0133 (0.010)
Outstanding IMF loan (t)	-0.0488** (0.019)	0.015 (0.017)	-0.065*** (0.008)	-0.025 (0.021)
Post-Soviet (t)	0.358*** (0.057)	0.360*** (0.036)	0.064 (0.072)	0.283*** (0.056)
Sargan Test (p-value)			1	1
Serial correlation:				
1st order (p-value)	0.000	0.000	0.000	0.000
2nd order (p-value)	0.302	0.371	0.106	0.124
Observations	1321	1448	1254	1377
Number of id	93	99	89	95

Column (1) and (2) report estimates from the A/B and B/B estimators using O_{it}. Columns(3) and (4) report estimates from the two estimators using $\tilde{O}_{it}$. Sargan overidentifying test p-values and tests of 2nd order autocorrelation reported below regression results. Constants and lags in $\Delta D_{it-\tau}$ suppressed. Two-step GMM standard errors in parentheses *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively.