A Political Economy Model of Resource Pricing with Evidence from the FuelMarket

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Abstract

This paper suggests that institutional developments may not have monotone effects on the efficiency of economic policy. The paper develops a model and offers evidence from fuel pricing across countries to show that improvements in the rule of law and democracy may initially enable the public to increase its share of the economy's rents mainly through distortionary policies that transfer the rents in-kind and limit the funds that the politicians can divert toward their private interests. In later stages, when politics becomes competitive and checks and balances grow strong, the public is more assured of receiving the benefits of marginal government funds and demands more efficient policies. The magnitudes of such effects seem substantial and the gains from institutional and policy designs that can mitigate the commitment problems between the public and the politicians can be large. The empirical work generates other insights into the determinants of fuel prices as well. In addition, the perspective developed here offers explanations for other phenomena such as the association between the spread of democracy and the proliferation of distortionary policies in the developing countries over the past several decades.

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1. Introduction

Many governments directly or indirectly control the prices of resource products such as energy and water. These controls have resulted in large variations in domestic prices of such products across countries even when the products are readily tradable. The price of gasoline can serve as a good example. According to the data collected by the World Bank, retail price of super gasoline in 1998 ranged between US$0.01 and US$1.36 per liter. This implies massive subsidization of fuel in the countries at the low end of this range and possibly large taxes in countries at the other end. For example, taking the average world price of gasoline as its opportunity cost, this range implies gasoline subsidies well over 5 percent of GDP in countries such as Iran and Yemen and taxes reaching 2 to 3 percent of GDP in Cote d'Ivoire and Albania. This wide range and considerable redistribution through one single product is not just a developing country phenomenon. The same calculations indicate a subsidy of about 1 percent of GDP in the United States compared to 1-2 percent of GDP taxation in Europe. Changing the reference price for these calculations change what one calls a tax or a subsidy, but it does not change the enormity of differences across countries in this respect.

Casual empiricism suggests that the size of resource endowment may be an important determinant of domestic resource prices. The weighted average gasoline price, for example, is about 14 cents per liter in OPEC countries as opposed to 51 cents in the rest of the world. This might be because of trading costs or because OPEC quotas drive a wedge between foreign market prices and the opportunity cost of oil at home. The same may apply to other resources to various degrees. However, a closer look suggests that supply and trading costs may not be the whole story. Consider, for example, domestic pricing of fuel within with OPEC countries. As Table 1 shows, there is a lot of variation among OPEC countries that is not connected to oil supply. For instance, Iran's oil production relative to the size of its population and its non-oil economy is very similar to that of Algeria, but its fuel prices are less than one-sixth of those in Algeria. Even compared to countries such as Oman, Qatar, UAE, and Saudi Arabia that produce much more oil, Iran's fuel prices are in the order of one-third to one-six. The same points can also be seen among major non-OPEC oil-producers in the lower part of Table 1. These countries do on average charge lower prices than the world average, but there is a lot of variation among them. While some price fuel very low, some others set their domestic fuel prices quite high, most notably those in Europe and Africa—such as Congo, Gabon, Denmark, Norway, and the United Kingdom. Going beyond oil producers and looking across all countries, the correlation between domestic fuel prices and per capita oil production is about 0.26. Using total production, rather than its per capita level, reduces the correlation to 0.14. Obviously, the supply-demand story and OPEC quotas may be playing a role, but one needs much more complex story to explain the variation in fuel prices across countries.

Table 1. Fuel Prices, Production, and Implicit Subsidies in Oil-Rich Countries, 1998

Countries	Price of Super Gasoline (US$ per liter)	Price of Diesel Fuel (US$ per liter)	Daily Per Capita Oil Production (% of Barrel)	Implicit Gasoline Subsidy (% of GDP)*
OPEC Countries				
Qatar	0.16	0.15	142.97	n.a.
Kuwait	0.17	0.13	117.91	3.07
United Arab Emirates	0.28	0.18	92.34	1.02
Saudi Arabia	0.16	0.10	46.45	3.41
Libya	0.22	0.17	27.35	n.a.
Venezuela	0.14	0.08	14.25	3.37
Iraq	0.01	0.01	9.70	n.a.
Iran	0.05	0.02	5.99	5.36
Algeria	0.31	0.16	4.75	1.01
Nigeria	0.13	0.10	1.78	4.97
Indonesia	0.16	0.07	0.79	3.87
OPEC Weighted Ave.	0.14	0.09	6.19	3.27
Non-OPEC Exporters				
Norway	1.21	1.10	71.04	–1.14
Brunei	0.13	0.12	56.98	1.92
Oman	0.31	0.26	39.35	1.15
Gabon	0.63	0.39	29.82	–0.18
Trinidad and Tobago	0.39	0.20	9.58	0.71
Congo (formerly Zaire)	0.50	0.50	9.52	–0.03
Canada	0.41	0.39	8.70	0.48
Bahrain	0.26	0.18	7.41	1.89
Angola	0.38	0.19	6.12	0.25
United Kingdom	1.11	1.11	4.82	–1.30
Denmark	1.05	0.85	4.50	–0.88
Russian Federation	0.28	0.18	4.14	2.52
Non-OPEC Exporter Ave.	0.38	0.27	4.33	0.60
Non-OPEC World Ave.	0.51	0.35	0.80	–0.09

* Assuming that the opportunity cost of gasoline is the average world price weighted by gas consumption.

Source: World Bank, *World Development Indicators*, 2001, and Energy Information Administration website, eia.doe.gov.

The literature on redistribution offers a number of interesting ideas that can help explain why governments make inefficient transfers to interest groups. One line of research has focused on normative models where the government maximizes some weighted social welfare function, but has limited information about individuals. In this setting, in-kind transfers may improve allocation through self-selection or through changes in the consumption pattern (see, among others, Meltzer and Richard, 1985, Guesnerie and Roberts, 1984, Besley and Coate, 1991, and Cremer and Gahvari, 1997). Based on related argument, Rodrik (1986), Wilson (1990), and Becker and Mulligan (1998) have also suggested that governments may find it advantageous to use inefficient transfer methods to deal with endogenous distortions. Although these results are normative, the same effects can arise in positive political economy models, where voters or political forces want to redistribute income, while avoiding deadweight losses as much as possible (Blomquist and Christiansen, 1999). This makes the normative models potentially useful for explaining the redistributions, especially in the case of goods complementary to labor supply or serving basic needs, where voters may want to target some less well-off groups. They also may apply in case of policies addressing externalities where there is imperfect information about the agents involved. However, either of these effects is difficult to see in the case of resource products such as gasoline. If anything, dealing with the negative environmental externalities of many resource products imply corrective taxes, which in fact may be what the countries that set high prices intend to do. But, then why does this concern not arise in countries that keep prices low?

On the positive, political economy side of the literature, two other major lines of thought have developed. One line has emerged from the debates of "Chicago" and "Virginia" schools of political economy over the question whether political competition can weed out inefficient methods of redistribution (Stigler, 1971; Becker, 1983 and 1985; Tullock, 1983). Coate and Morris (1995) provide an excellent review of this literature and show that inefficient transfers can occur only if the public has limited information about the politicians and about the projects that they implement with public funds. The reason is that such a situation allows the politicians favoring special interests to make transfers to those interests inefficiently through public projects. The public might be interested in removing the inefficiency, but the two types of imperfect information jointly preclude revelation mechanisms that allow some transfers to special interests, but in direct and efficient forms.

The other major political economy line of research has explored the externalities of inefficient redistribution methods for the interest groups. The argument is that lobbies may prefer some forms of redistribution to others because of those forms may commit the government to the policy more strongly or help interest groups overcome their own collective action problems. For example, Nugent (1989) provides an example from Tunisian manufacturers who lobbied for quotas instead of more efficient tariffs because the former allowed them to better control the distribution of benefits. Acemoglu and Robinson (2000) give the commitment argument a concrete form by developing a model where special interests can enhance their political influence and ensure the continuation of policies favorable to them if they recruit more individuals to their ranks. In this context, lobbies may demand redistribution forms that induce people to move to economically inefficient jobs. For example, agents in a declining industry may seek government support policies that attract more people to the industry and, thus, help maintain the industry's political weight. This generates a political economy equilibrium with suboptimal labor allocation. However, it does not necessarily imply redistribution through inefficient pricing or in-kind transfers, because cash transfers to entrants would do the same. The model also assumes that groups can be influential only if all their members are in the same line of activity. If this assumption is relaxed and agents from different parts of the economy can come together to press the government for benefits, they are likely to prefer cash transfers that cause to allocative inefficiency.

The causes of inefficient redistribution identified in the political economy literature certainly shed further light on the forms of transfer to special interests. But, again they seem inadequate for explain transfers through resource prices. Resource products are typically consumed by very broad segments of the population. As a result, the use of inefficient methods is unlikely to be the consequence of attempts to disguise the transfers or to build a minimum group sizes. In fact, the alternatives of cash transfers vs. subsidies are often widely debated and governments end up on the side of cash transfers much more than the public. In fact, in some cases attempts to switch to cash transfers have led to strong public reaction in the polls or in the streets (as in Jordan in 1996).

Even if one adopts the existing models of inefficient transfers as a description of resource pricing, a major challenge remains in using them to explain the enormous policy differences across countries. Why do energy consumers in the Middle East, Central Asia, and some other oil-rich countries manage to receive hefty redistributions through cheap fuel, while their counterparts in similarly endowed European or African countries end up paying higher prices? Do polities in Europe and Africa have less information asymmetry vis-à-vis their governments compared to the rest of the world? Parameterizing the existing models to explain such phenomena does not seem to be an easy task.

In this paper, I offer an explanation for inefficient mass transfers based on the limited control of the public over the actions of the ruling politicians. When there are resources at the disposal of the government, the public is concerned that the politicians may try to embezzle those resources and serve narrow interests rather than distributing them more broadly. When the politicians have a free hand in allocating such resources and are not concerned about public reaction in election booths or streets, they simply take over the funds and distribute very little of it to the public. For example, if the country produces oil, they charge high prices for fuel and collect large funds, which they can then appropriate toward their private interests. This may be the story in some African countries. At the other end of the spectrum, in a country with strong checks and balances and with competitive elections that allow the public to punish malfeasant politicians rather easily, the politicians cannot misappropriate much of the resources. Being assured that it can enjoy the resources, the public naturally prefers efficient pricing transfers, which can take the form of tax reductions or public good provision. This may be the situation in more developed countries, where high prices are tolerated and even supported by the public.

Inefficient mass transfers occur mostly in the middle of the institutional spectrum. The public has some power to demand the distribution of part of the resource rents to itself and knows that the rest will be partially embezzled. In that case, the optimal strategy for the public may be to try to receive the resource rents through in-kind transfers before they are realized in cash form in the hands of the government. In the oil market, for example, this can manifest itself as demands for low fuel prices and strong reaction to any price hike, rather than letting the politicians to charge high prices and gain control of the rents. The latter option gives the politicians an opportunity for malfeasance that may be too difficult correct when the mechanisms of *ex post* punishment through elections are imperfect. In this setting, the size of the resource matters in an interesting way. When the rent is larger, the public tries to receive more of it in-kind to leave less for the politicians. The politicians also find it in their interest to reduce public opposition by sharing the rents to ensure that they can enjoy the rest of the big pie. In the oil market, for example, this means that domestic fuel prices should decline with the size of the available oil resources. This would be the case even if trading oil is costless and there is no monopoly or monopsony problem. The effect arises because lowering the price is the best way that the public can share in the rent when its control over the politician is weak, but not negligible. This seems to be closer to the experiences of countries with partial political development, as in some Middle Eastern and Latin American countries.

The above discussion suggests (and I show more formally below) that the limited control hypothesis implies a U-shaped relationship between the efficiency of redistribution and the institutional capabilities of the public to monitor and discipline the politicians. This perspective also suggests that the magnitude of inefficient transfers depends on the size of the resources available to the government. These observations provide hypotheses that can be put to empirical test. Confirmed by the data, the relationships offer a rich framework that can help shed light on the complex picture of resource policies across countries. The findings can also have important positive and normative implications. In particular, they suggest that the policy inefficiencies induced by agency problems between the government and the public may not decline monotonously as the institutional capabilities of a country improve. For example, as democratic institutions develop in a country, the government may at first be obliged to adopt more distortionary distributive policies and only at higher stages of institutional development be able to turn to more efficient redistribution schemes. From a normative perspective, the results suggest that in evaluating policies, the extent of trust between the politicians and the public should be taken into account and attention must be paid to build that trust as effort is exerted to promote more efficient policies.

The case for the above claims is made here first by developing a model that makes the required assumptions explicit and derives the relationships between the institutional characteristics and the form of transfer as the equilibrium of a game between the politicians and the public. Then, fuel price data is used to put the model to test. These steps are laid out in sections 2 and 3 below. Section 4 concludes.

2. A Political Economy Model of Resource Pricing

Consider an economy with discrete periods and an infinite horizon, where the government owns a resource or, if privately owned, has the right to control its rents through regulatory or tax/subsidy policy. Suppose that during each period the resource yields a constant amount, $x \geq 0$, of a tradable product (such as oil) whose opportunity cost, p, is also constant in all periods. The opportunity cost is the international price of the product plus any externalities that consuming the product may entail. Let the domestic demand during period t, $t = 1,\ldots, \infty$, be denoted by $d(r_t)$, where $r_t \geq 0$ is the price in the domestic market in period t. The domestic price is under full control of the government either by its ownership rights or by its regulatory/tax/subsidy powers. If $x - d(r_t) > 0$, the country enjoys a surplus of the product and earns $p[x - d(r_t)]$ through exports (and through reductions in externalities, clean up costs, etc., if any). If $x - d(r_t) < 0$, the domestic demand is met by importing the resource. The net proceeds from the operation regarding the resource in period t are:

$$(1) \qquad n(r_t) = r_t\, d(r_t) + p[x - d(r_t)].$$

If the net proceeds are positive, they enter the government budget and can be redistributed as cash.[1] When the net proceeds are negative, they covered by lump-sum taxes. Assume that at some high prices the domestic demand becomes sufficiently elastic such that $n(r_t)$ remains finite. Furthermore, assume that $n(r_t)$ has a unique maximum at some price, r^+. This maximum is implicitly determined by:

$$(2) \qquad r^+ = \frac{p}{1 - 1/\eta(r^+)}.$$

[1] The distribution of the proceeds may also take the form of increased public service provision (or reduction in public services in case the net proceeds are negative). Adding such features does not change the basic results. I avoid them to keep the model simple.

where $\eta(r) = -rd'(r)/d(r)$, $0 < \eta < \infty$, is the absolute value of the price elasticity of domestic demand. Note that r^+ is always above the opportunity cost, p. Also, $n(r_t)$ is always positive at some range of r because $n(p) \geq 0$ and if there is a point r_0 where the net proceeds become zero, $n(r_0) = 0$, we have $r_0 \leq p$.

Suppose the country's population consists of two infinitely-lived groups: the politicians and the "public." I will treat the public as a unified actor and specify its utility during period t as:

(3) $$v(a_t, r_t) = y + a_t n(r_t) + s(r_t),$$

where y is its (stationary) non-resource income during each period, $a_t \in [0,1]$ is the share of net proceeds that is distributed to the public, and $s(r_t)$ is the consumer surplus of the public from buying the product at price r_t. Naturally, $d(r_t) = -s'(r_t)$.[2] When the net revenues are negative, $n(r_t) < 0$, we have $a_t = 1$ because the tax needed to cover it must be entirely paid by the public.

For a given value of a_t, the optimal domestic price from the public's point of view is implicitly determined by:

(4) $$r^*(a_t) = \frac{p}{1 + \dfrac{1 - a_t}{a_t \eta(r^*(a_t))}}.$$

$r^*(a_t)$ is always between 0 and p, with $r^*(0) = 0$ and $r^*(1) = p$. The second-order condition of this problem requires:

(5) $$\frac{\partial^2 v}{\partial r_t^2} = (2a_t - 1)d' - (1 - a_t)dd''/d' < 0.$$

Finiteness of $n(r_t)$ and $s(r_t)$ guarantees that this condition holds for some r_t that solves (4). To avoid complications that have little consequence for the end result, let's assume that condition (5) holds globally, so that r^* is unique. This will also make it easy to show that $r^*(a_t)$ is increasing in a_t:

(6) $$\frac{\partial r^*(a_t)}{\partial a_t} = -\left(\frac{\partial^2 v}{\partial r_t^2}\right)^{-1}\left(\frac{\partial^2 v}{\partial a_t \partial r_t}\right) = -\left(\frac{\partial^2 v}{\partial r_t^2}\right)^{-1}\frac{d}{a_t} > 0.$$

Figure 1 depicts the position of $r^*(a_t)$ and the key values of the domestic price in the a-r diagram.

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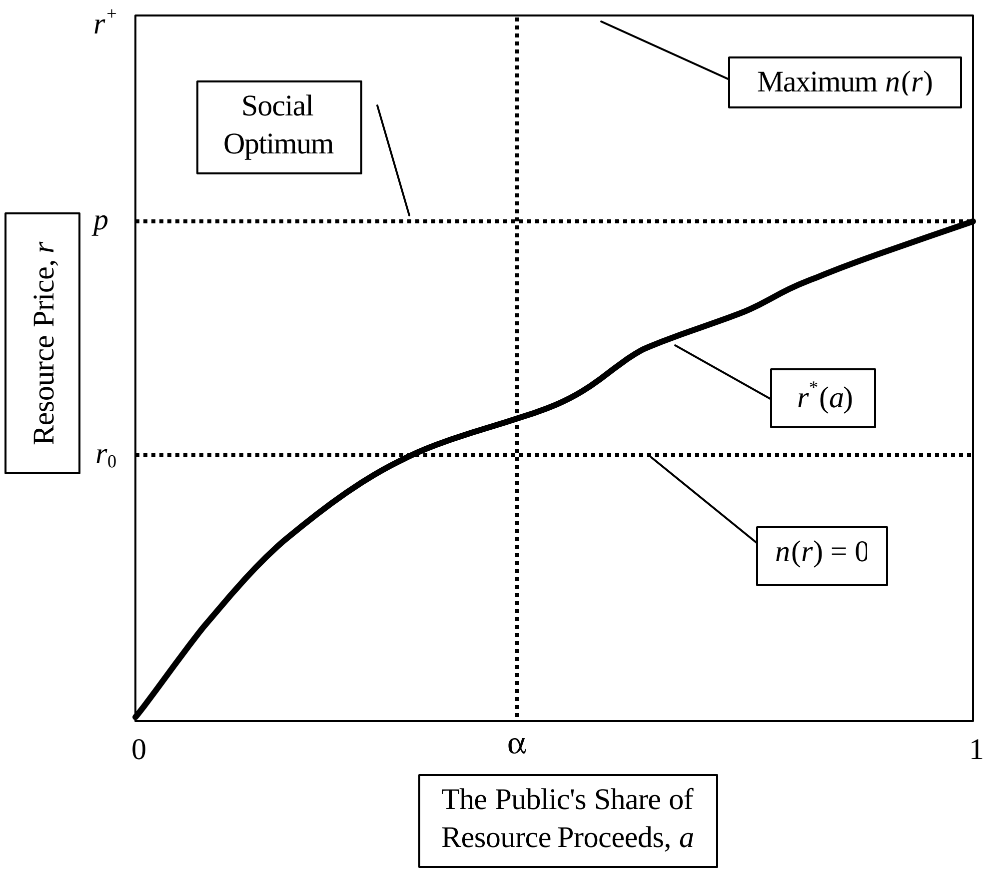
[2] This can be derived by specifying the public's utility of consuming quantity d of the product as $u(d)$ and noting that when $s(r) = \max_d u(d) - rd$, then $-s'(r)$ must equal the optimal value of d.

Figure 1. Policy Preferences of the Public and the Politicians



The politicians are individuals who have the skills to run the government and set policies. Assume that their number is large and that during each period only one of them can control the government. When outside the government, the utility of a politician is zero. When a politician controls the government in period t, his utility consists of a "position rent," $b > 0$—which comprises of any rents from controlling other government resources as well as possible "ego rents"—and the value of the resource proceeds that are not distributed to the public:[3]

(7) $u(a_t) = b + (1 – a_t)n(r_t).$

[3] It is common in many political economy models to assume that the politician also values the welfare of the public. But, that effect comes about in this model through the rewards that the public may offer the politician by letting him take a higher share of the rents. Attributing altruism to the politicians is not needed for the results and only adds unnecessary complication.

The presence of $(1–a_t)n(r_t)$ in the ruling politician's utility is the central aspect of the model. It signifies the idea that the politician may be able to benefit from diverting part of the resource proceeds toward his private interests. For example, the ruling politician may use the resource revenues to pay for projects or to create government obligations that mainly benefit himself and the individuals associated with him. Even if the politician may promise to surrender certain amounts of cash to the public at the end of the period, he may not leave enough money in the treasury to fulfill his promise or he may create surprise inflation and dilute the value of the money delivered. Of course, such opportunities depend on the institutional setup of the country (e.g., the extent of corruption and the rule of law). One way to capture country differences in this respect is to introduce a parameter, $\alpha \in [0,1]$, as the minimum share of the resource proceeds that the public can guarantee itself through checks and balances, rule of law, and other institutional mechanisms that limit the politician's malfeasance on an *ex ante* basis as opposed to *ex post* electoral reactions to *fait accompli*. The extent to which the public tries to impose discipline on the ruling politician through periodic elections and occasional protests after it learns about the fate of government funds will be modeled separately. The parameter α measures the public's capability to limit the politician's day-to-day activities before he can divert government funds. The public is not obliged to limit the payoff of the politician and may want to grant him a share of revenues higher than $1–\alpha$. But, that is an option for the public and, in case the public uses that option, it can enforce any share for the politician that it chooses above $1–\alpha$. Only the shares below $1–\alpha$ are not enforceable by the *ex ante* checks and balances. A high α implies that the ruling politician has fewer opportunities to unilaterally divert the available public funds to his private interests. All this, of course, matters when the net proceeds are positive. When $n(r_t) < 0$, all the cost is passed on to the public ($a_t = 1$) and the politician receives only his position rent, b.

Given the utilities of the public and the politicians, the aggregate welfare of the economy can be expressed as:

(8) $$w(r_t) = y + n(r_t) + s(r_t) + b.$$

It is easy to verify that $w(r_t)$ reaches its maximum when the domestic price matches the opportunity cost, $r_t = p$. This level is above the public's preferred price, r^*, but below r^+, which maximizes $n(r)$ and, therefore, is the most preferred price for the politician when $a_t < 1$. [When $a_t = 1$, the ruling politician is indifferent with respect to the price.] The resolution of the conflict between the politician and the public depends on the structure of the game, which is specified below.

A factor other than the *ex ante* constraint on a_t that counteracts with the politician's desire to divert funds is his concern over public support. Such a concern arises from the political actions of the public, which can be modeled as periodic elections. Suppose that at the start of each period, the nature randomly selects a challenger from among the politicians outside the government. The incumbent politician and the challenger each announce a domestic price during the current period and then the public casts a vote. If the public votes positively (expresses satisfaction with the resource policy of the incumbent), the incumbent stays in office for another period. If the public votes negatively (expresses dissatisfaction), the incumbent is dislodged with probability $\mu < 1$.[4] The winner of the election implements his announced price, carries out the domestic and foreign sales, and decides on the share of funds to divert during that period. The rest of the funds are distributed to the public at the end of the period. If net proceeds are negative, the needed tax is collected during the period.

Although the public's reaction to the politicians is depicted as elections, the model can be interpreted more broadly. The reaction may take other forms of public approval or disapproval, including street demonstrations and uprisings. But, its essential role—which is the imposition of a cost on the incumbent in case the public disapproves of his policies—has basically the same effects as elections. Of course, the ease with which the public can challenge the incumbent politician varies according to the mechanisms available to punish the ruling politician. This variation is captured by the parameter μ, which reflects the openness and competitiveness of the political system in the country. A higher μ means that the public has an easier time and a greater power to punish the politician.

The strategy for the incumbent and the challenger in period t is to choose a domestic price, r_t, and if elected, to determine the share of net resource proceeds to distribute to the public, a_t. The strategy for the public in period t is to vote for or against the incumbent based on the announced domestic prices and the rate of fund distribution in the previous period. Given these strategies, we can specify the payoffs of the players and arrive at the equilibrium of the game. To simplify the presentation of these steps, assume that an incumbent politician who loses his positions never returns as a challenger in future elections. Also, for now suppose that there are thresholds, $\bar{r}$ and $\bar{a}$, such that if $r_t > \bar{r}$ or $a_{t-1} < \bar{a}$ at any time in the past, the public votes against the incumbent in the current period elections. The long memory of the public helps ensure maximum punishment for a politician who disregards the thresholds expected by the public. If the public sets $\bar{a}$ less than α, then it authorizes the politician to capture a larger share of the revenues than $1-\alpha$ and the politician can take over a share up to $1-\bar{a}$ with no penalty. The thresholds $\bar{r}$ and $\bar{a}$ will be derived as part of the rational behavior of the public in a sub-game perfect Nash equilibrium. At each decision node in equilibrium, the player making the decision maximizes his discounted future income given the strategies of the other players.

[4] The probabilistic nature of the outcome could be due to the presence extraneous factors that may affect the preferences of the public concerning the candidates.

If the incumbent politician has ever ignored the public's expected distribution rate or price threshold in the past, he will face a chance, μ, of removal from office in every future election and an *ex ante* ceiling $1-\alpha$ on his share of resource proceeds in all future periods regardless of what he does. As a result, he can do best by setting $r = r^+$ and $a = \alpha$ as long as he is in office. In this case, his lifetime payoff at the start of each period will be

$$(9) \qquad U^0 = \frac{1-\mu}{1-\delta(1-\mu)}\,[b + (1-\alpha)\,n(r^+)],$$

where δ is the discount factor. Suppose the incumbent has always respected the thresholds in the past. If he chooses $r \le \bar{r}$ and $a \ge \bar{a}$ in the current and all future periods, his lifetime utility at the start of the current period will be:

$$(10) \qquad U^1(a,r) = \frac{1}{1-\delta}\,[b + (1-a)\,n(r)],$$

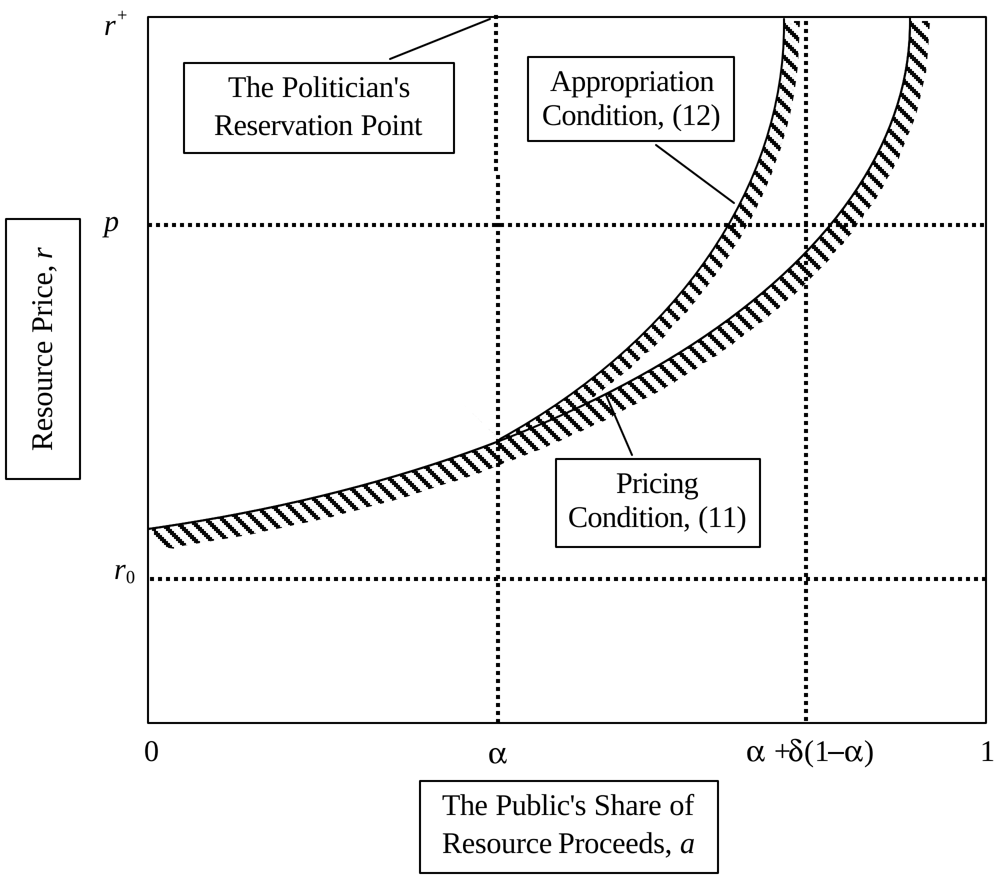
To examine the conditions under which the incumbent respects the thresholds, two issues must be considered. The first is that the politician should not find it worthwhile to ignore the threshold on the price. To arrive at the condition that guarantees this, note that if the politician violates the limit on r_t, he will be facing adverse votes in all elections and will have an incentive to violate the threshold on a_t as well. Therefore, if the politician decides to deviate in this way, his best option is to set $r_t = r^+$ followed by $a_t = \alpha$, which means that his expected lifetime payoff will be U^0. Thus, a necessary condition for the politician to respect the threshold on r is:

$$(11) \qquad U^1(\alpha,\bar{r}) \ \ge\ U^0 \qquad \Rightarrow \qquad (1-\bar{a})n(\bar{r}) \ \ge\ m \ \equiv \frac{(1-\delta)(1-\mu)(1-\alpha)n(r^+) - \mu b}{1-\delta(1-\mu)}.$$

Condition (11) can be referred to as the "Pricing Condition." The rearranged form on the right side of (11) shows that this condition is essentially a lower limit on $(1-\bar{a})n(\bar{r})$; that is, to comply with the price threshold demanded by the public, the politician in charge of the government must receive a minimum amount of rent, m, per period. Otherwise, he can do better by ignoring the public and by extracting rents until he is removed from office. The value of m depends on the expected maximum diverted revenues, $(1-\mu)(1-\alpha)n(r^+)$, net of the expected loss of "position capital," $\mu b/(1-\delta)$.

Note that if $m \le 0$, the Pricing Condition is always satisfied at $\bar{a} = 1$ for the entire relevant range of domestic prices, $(0,r^+)$, and the public can encourage the politician to comply with any price threshold of its choice. The intuition behind this observation is that when the position capital is large and can be taken away by the public with relative ease—i.e, when $\mu b/(1-\delta)$ exceeds $(1-\mu)(1-\alpha)n(r^+)$—it will not be worthwhile for the incumbent to bother with capturing the resource rents at the cost of angering voters. As a result, the public need not worry about the politician's pricing incentives. When the minimum incentive rent is positive, $m > 0$, the boundary of the Pricing Condition in the relevant range of the a-r space, $[0,1]\times[0,r^+]$, is an upward sloping curve, $\bar{a} = 1 - m/n(\bar{r})$. See Figure 2. This boundary is always to the left of $\bar{a} = 1$ and above $\bar{r} = r_0$ and becomes vertical when $\bar{r} = r^+$. If μ or b declines, m increases and shifts the boundary upward. When $\mu = 0$, the boundary goes through the politician's reservation point, (α, r^+). In that case, there would still be an area at the top left corner of the space that satisfies (11) as long as $\alpha > 0$ (see Figure 4). Unless $\alpha = 0$, the public can always encourage the politician to set a price less than r^+ in exchange for a share of the resource proceeds above $1-\alpha$.

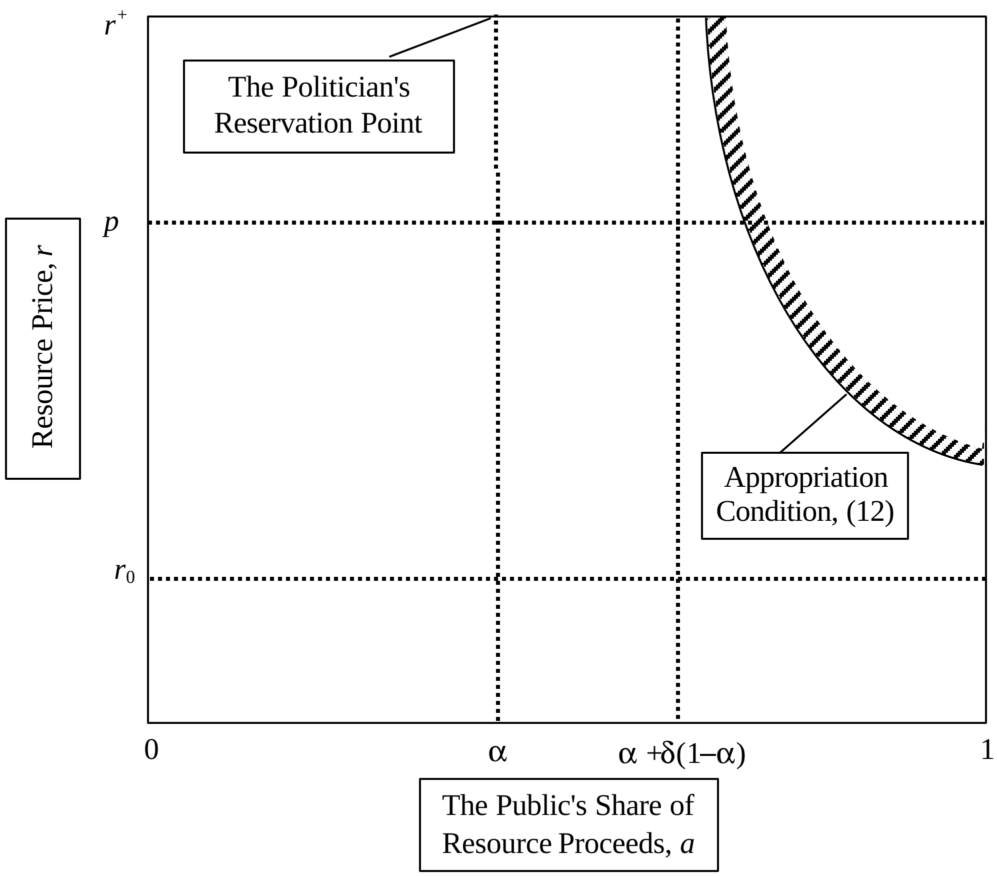
Figure 2. The Politician's Preferences and Incentive Constraints When *m* > 0



The second issue is that the politician should not be able to gain from ignoring the threshold on a_t when he has promised $r_t \leq \bar{r}$ and has received electoral support in the current period. This is, of course, a concern only when $n(\bar{r}) > 0$ and the public intends to keep its share above α. [Note that a_t is always equal 1 when $n(\bar{r}) < 0$ and the public's shares below α are automatically enforced.] If the politician intends to behave opportunistically when choosing a_t in this case, he will obtain his highest payoff when he sets $r_t = \bar{r}$ and $a_t = \alpha$. Therefore, to ensure compliance with the rent diversion threshold, we must have the following "Appropriation Condition":

$$(12) \qquad U^1(\alpha,\bar{r}) \geq b + (1-\alpha)n(\bar{r}) + \delta U^0 \qquad \Rightarrow \qquad \frac{1}{\delta}[\alpha + (1-\alpha)\delta - \bar{a}]n(\bar{r}) \geq m.$$

Figure 3. The Politician's Preferences and Incentive Constraints When $m < 0$



Note that the rearranged form of (12) has the same right-hand side as (11), but its left-hand side is smaller when $\bar{a} > \alpha$ and $\bar{r} > r_0$.[5] In fact, for all policy combinations with $\bar{a} > \alpha$, (12) is more stringent than (11). As Figure 2 shows, when $m > 0$, the boundary of the Appropriation Condition in the $[0,1]\times[0,r^+]$ range of the a-r space is a rising curve between $\bar{a} = \alpha$ and $\bar{a} = \alpha + (1-\alpha)\delta$. In that range, it lies above and to the left of the boundary of the Pricing Condition, with its lower limit at $\bar{a} = \alpha$ reaching the latter curve. Very low values of $\bar{r}$ that render $n(\bar{r}) < 0$ (and, therefore, $a_t = 1$) may also satisfy (12).

[5] This is because $[\alpha + (1-\alpha)\delta - \bar{a}]/\delta = 1 - \bar{a} - (\bar{a} - \alpha)(1-\delta)/\delta < 1 - \bar{a}$

But, such prices violate (11) and are not feasible as long as $m > 0$. When $m < 0$, the boundary of (12) becomes a downward sloping curve to the right of $\bar{a} = \alpha+(1-\alpha)\delta$ and above $\bar{r} = r_0$, as shown in Figure 3. The set of $(\bar{a}, \bar{r})$ combinations that meet the politician's incentive constraints in this case are all those below and to the left of the boundary of the Appropriation Condition. When $m = 0$, this boundary coincides with the vertical line above and the horizontal line to the right of the point $\bar{a} = \alpha+(1-\alpha)\delta$ and $\bar{r} = r_0$. In that case, all the points to the left of $\bar{a} = \alpha+(1-\alpha)\delta$ or below $\bar{r} = r_0$ satisfy both constraints.

For the challenger in each period, the consequential decision is the domestic price he will set if elected. Because the incentives of the challenger would be the same as the incumbent if he were elected, the public has the same concerns about the challenger. Therefore, he must select $r \le \bar{r}$. The only difference is that if the incumbent also complies with the same thresholds, the public would favor the incumbent in order to create long-term incentives for him. If the incumbent has violated the thresholds, the challenger may be elected, in which case he becomes the incumbent.

Given the above conditions for the compliance of the politician with the thresholds of r and a, the public's problem is to choose the thresholds such that its utility is maximized subject to (11), (12), and $0 \le \bar{a} \le 1$. The above analysis of the incentive constraints paves the way for characterizing the solution. As a preliminary result, observe that if (11) is the sole binding constraint, the domestic price must be efficient, $r_t = p$. [This can be verified by substituting $\bar{a}\, n(\bar{r})$ from the equality form of (11) into (3).] The reason is that when the public can adjust the politician's share of the rents without being concerned about additional diversion, then it can capture any marginal surplus beyond m and comes to prefer efficient pricing. Things are different when (12) is the only binding constraint. Maximizing v in that case yields the domestic price,

(13) $$r^{**} = r^*[\alpha+\delta(1-\alpha)] < p.$$

where $r^*(.)$ is defined in (4) above. The reason why in this case the public prefers a price below p is that it has difficulty ensuring that the politician distributes the funds collected by the government. Lowering the price allows the public to capture part of the resource rents early on and reduces the size of the funds that the politician can embezzle, hence making it easier to deal with his malfeasance problem.

The following proposition characterizes the equilibrium of the game and the corollaries that follow examine the comparative statics properties of the equilibrium when the parameters vary.

PROPOSITION 1. In the equilibrium of the model of resource policy,

(i) If $\frac{m}{1-\alpha} \le -(1-\delta)n(p)$, neither condition binds, $\bar{a} = 1$ and $\bar{r} = p$. If $\frac{m}{1-\alpha} > -(1-\delta)n(p)$, either (11) or (12) or both must bind.

(ii) When $\frac{m}{1-\alpha} > -(1-\delta)n(p)$, condition (12) binds, $\bar{a} = 1$, and $\bar{r} = n^{-1}\left(\frac{-\delta m}{(1-\delta)(1-\alpha)}\right)$ if $m < 0$ when $n(r^{**}) < 0$ or if $\frac{m}{1-\alpha} < -\frac{1-\delta}{\delta}n(r^{**})$ when $n(r^{**}) \geq 0$.

(iii) If $n(r^{**}) < 0 = m$, condition (12) binds and $\bar{a} \in [0,1]$ and $\bar{r} = r_0$.

(iv) If $n(r^{**}) \geq 0$ and $n(r^{**}) > \frac{m}{1-\alpha} \geq -\frac{1-\delta}{\delta}n(r^{**})$, condition (12) binds, $\bar{r} = r^{**}$, and $\bar{a} = \alpha + \delta(1-\alpha) - \frac{\delta m}{n(r^{**})}$.

(v) If $n(p) > \frac{m}{1-\alpha} > \max\{0, n(r^{**})\}$, both (11) and (12) bind, $\bar{a} = \alpha$ and $\bar{r} = n^{-1}\left(\frac{m}{1-\alpha}\right)$.

(vi) If $\frac{n(p)}{1-\alpha} \geq \frac{m}{1-\alpha} \geq n(p)$, condition (11) binds, $\bar{a} = 1 - m/n(p)$ and $\bar{r} = p$.

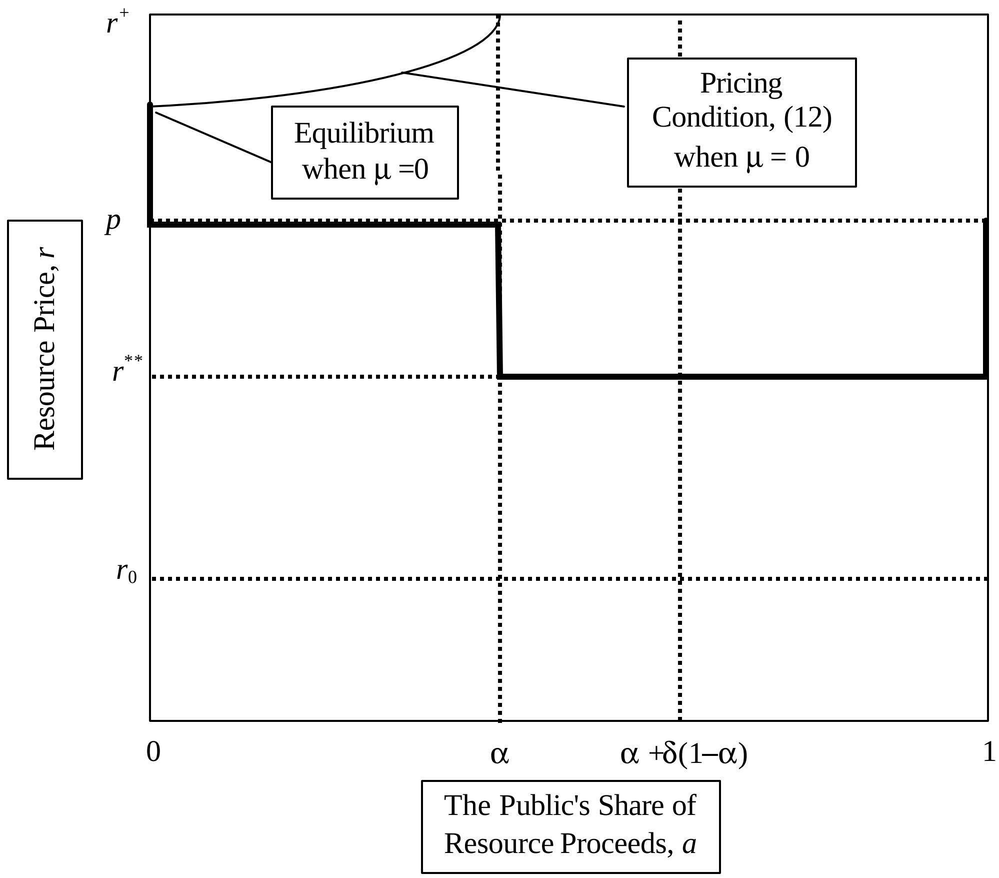
(vii) If $m > n(p)$, condition (11) binds, $\bar{a} = 0$, and $\bar{r} = n^{-1}(m)$.

PROOF. See Appendix.

COROLLARY 1. The equilibrium domestic price of the resource product is U-shaped in α, μ, δ, and *b* in the sense that the price is non-increasing in each of them when the parameter is at the low end of its range and is non-decreasing when the parameter is in the high end of its range, with a minimum reached within the range.

The claims in Corollary 1 follow the results of Proposition 1. Rather than presenting a formal proof of this Corollary, it is more illuminating to examine what happens when these parameters change. In the case of μ, let's start with a situation where the public has no chance of unseating the incumbent politician, $\mu = 0$. The politician can set the price at his preferred level, r^+, without fear of losing his position because of the choice. However, if there are some checks and balances that limit the amount that the politician can divert to himself, $\alpha > 0$, the public would benefit from allowing him to take more in exchange for lowering the price. In fact, this is always the case as long as the domestic price is above *p*. The reason is that when $\mu = 0$, only the Pricing Condition (12) can bind and the preferred price along the boundary of that condition is $\bar{r} = p$. If the other parameters are such that the boundary of the Pricing Condition crosses the $\bar{a} = 0$ line before it reaches $\bar{r} = p$, as depicted in Figure 4, then the equilibrium will be at $\bar{a} = 0$ and $\bar{r} = n^{-1}[(1-\alpha)n(r^+)] > p$. If the position of boundary is lower and $\bar{r} = p$ is reached at positive values of $\bar{a}$, then the equilibrium will be at $\bar{r} = p$ and $\bar{a} = 1 - (1-\alpha)n(r^+)/n(p)$. That is, when $\mu = 0$, the price will be at or above the opportunity cost of the product.

Figure 4. The Locus of Equilibria as m Changes

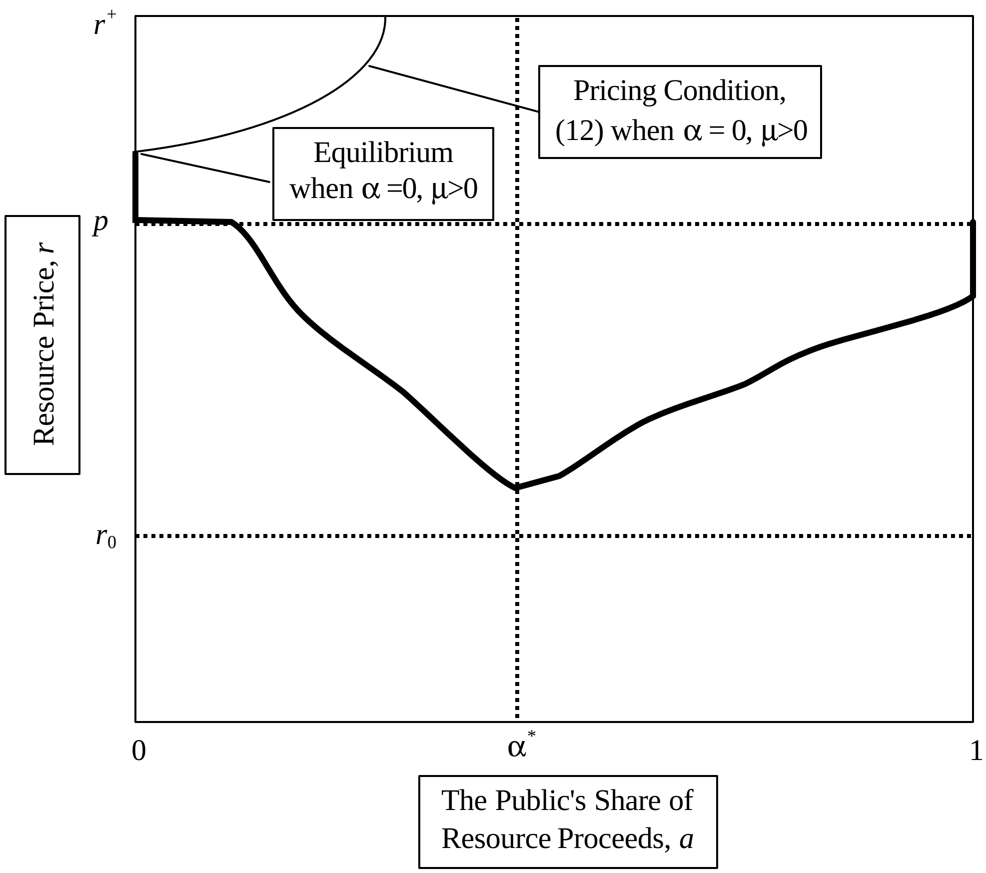


As the country' politics becomes competitive and μ increases, the Pricing Condition relaxes and its boundary shifts down because the public finds some opportunity to dislodge the politician and, therefore, it can reduce the rents that it allows the politician to take for himself. If the domestic price in the initial equilibrium is above p, then the price will go down. If the international price has already been reached, the equilibrium share of the politician in the revenues will decline. This process comes to an end when the share of the politician's reaches 1–α because the public cannot directly enforce diversion rates below 1–α. As a result, when in equilibrium $\bar{a}$ equals α, an increase in the public's voting power, μ, may only used for getting the politician to lower the domestic price along the $\bar{a} = \alpha$ line. In fact, this is the case as long as the equilibrium price is above r^{**} and r_0. In that situation, conditions (11) and (12) both bind and jointly determine the equilibrium price and revenue share.

When μ is large enough that the domestic price reaches the larger of r^{**} and r_0, the situation changes and lower price are no longer feasible. As μ rises beyond that point, the public does not benefit from lowering the domestic price any more and begins to use its electoral power to induce the incumbent to take a smaller share of resource proceeds. At this point, the Appropriation Condition becomes the main constraint and getting the politicians to set the price low becomes a secondary matter. If $r^{**} \geq r_0$—a case depicted in the Figure 4—the equilibrium price will remain at r^{**} while the public's share rises towards 1. If b is sufficiently large, at some high values of μ the public may be able to drive the politician's share to zero. Once $\bar{a} = 1$, the public may still have to keep the price low to limit the politician's temptation to divert funds. When μ gets close to 1 and the public's power to punish malfeasance nears perfection, the price can be raised toward the first best without fear of misappropriation. If $r^{**} < r_0$, the process is similar, but the lower part of the equilibrium locus is along $\bar{r} = r_0$ and represents the equilibrium only when $m = 0$.

Improvements in *ex ante* control mechanisms such as rule of law induce a similar trend (see Figure 5 for an example). When $\alpha = 1$, the public is assured that the government funds will be fully distributed. As a result, it demands the most efficient price. This is also true of a range of α in the neighborhood of 1. Formally, when α is sufficiently close to 1, $m/(1-\alpha)$ will be a large negative number that can fall $-(1-\delta)n(p)$, in which case part (i) of Proposition 1 would apply. But, for lower values of α, $m/(1-\alpha)$ rises to the point where part (ii) of the Proposition applies and the Appropriation Condition begins to bind. This means that to counteract with the politician's temptation to embezzle revenues, the public demands redistribution to itself through a lower price to leave less funds at the disposal of the politic ian. As α declines, if $n(r^{**})$ becomes negative when m reaches zero (r^{**} falls below r_0), then the equilibrium would be at $\bar{r} = r_0$ and $\bar{a} \in [0,1]$ and switches to $\bar{a} = \alpha$ and $\bar{r} = n^{-1}[m/(1-\alpha)]$ as α falls lower. On the other hand, if $n(r^{**})$ remains positive when $m = 0$, then there will be some value of α at which the equilibrium price reaches r^{**} along the $\bar{a} = 1$ line. After that, the equilibrium price declines along $r^{**} = r^{*}[\alpha + \delta(1-\alpha)]$ as α goes down. The share of distributed funds also falls below one according to part (v) of Proposition 1, as depicted in Figure 5. With the decline in α, the Appropriation Constraint tightens and the public responds by settling for a smaller share of the proceeds, while it tries to extract more rent through lower prices. In this situation, $\bar{a}$ is greater than α but declines faster than α and reaches it when α is such that $(1-\alpha)n(r^{**}) = m$. Let this value of α be denoted as α^{*}. Below this level, r^{**} continues to decline, but it is no longer feasible in equilibrium because the Pricing Condition binds and, according to part (v) of Proposition 1, the equilibrium price comes to be determined by $\bar{a} = \alpha$ and $\bar{r} = n^{-1}[m/(1-\alpha)]$. In this case, the trend in the equilibrium price reverses and $\bar{r}$ keeps rising as α declines (see Figure 5). The reason is that lower α's give more power to the politician to divert rents and strengthen his incentive to opt for short-term gains by violating the price threshold. This forces the public to accept a price that is high enough to elicit compliance and, thus, prevents the politician from opting for r^{+}. This trend may continue until α = 0 with $\bar{r} < p$. But, if $n(p) > m$ at α = 0, then there will be range of α, as in Figure 5, where the public accepts the efficient level of the resource price and lets $\bar{a}$ be determined by $(1-\bar{a})n(p) = m$, which makes $\bar{a}$ decline as α goes lower. This process ends after $\bar{a}$ reaches zero and $\bar{r}$ rises above p according to $\bar{r} = n^{-1}(m)$, with m being evaluated at α = 0.

Figure 5. The Locus of Equilibria as a **Changes**



The impact of two other parameters, b and δ, can be analyzed in the same fashion with similar results. In particular, the role of b is very similar to that of μ, as described above and depicted in Figure 4. When b is very small, the minimum incentive rent, m, is relatively high and the equilibrium is likely to be at low values of $\bar{a}$ with the price at or above the international one. The reason is that in this situation, the politician's utility comes mainly from capturing resource revenues and the electoral reactions do not impose much of a cost on the politician beyond the loss of resource revenues. As a result, the public has to yield him a sufficiently large share to elicit his compliance. As b rises, voters gain more power to discipline the incumbent, m goes down, and the public claims higher equilibrium revenue shares for itself. However, after reaching α, the public's power to use *ex ante* control mechanisms to guarantee its share exhausts and it has to use *ex post* electoral power to induce the politician to take a smaller share. In that situation, the public finds it worthwhile to ask for a lower resource price. When b grows sufficiently large, m becomes a large negative number and the equilibrium can be raised toward $\bar{r} = p$ with $\bar{a} = 1$.

High discounting by the politician (low δ) also raises m and yields lower equilibrium revenue shares for the public with the price in the neighborhood of the opportunity cost. Then, as δ rises and m declines, the price drops and the public's share rises. If μb is sufficiently large, at values of δ close to 1, $\bar{a}$ reaches 1 and after that the price rises toward $\bar{r} = p$. An important implication of this observation is the role of political turnover which can lower the discount factor, δ. In countries with very high or very low political turnover, resource prices should be higher relative to those in the middle of the spectrum.

The thrust of the above observations is that the domestic price of the resource follows a U-shape path as the institutional parameters of the model go from one end of their range to another. Changes in the resource supply, x, have a more monotonic effect on the price. Specifically, $\bar{r}$ is non-increasing in x. The following corollary examines the comparative statics with respect to x proves this claim.

COROLLARY 2. (i) When there is no domestic resource, $x = 0$, in equilibrium $\bar{r} = r_0 = p$ except when $\bar{a} = 0$, in which case $\bar{r} > p$. (ii) As x rises, the equilibrium domestic price declines when $\bar{a} = 0$ and $\bar{r} > p$ or when $\bar{a} \geq \alpha$, $m \geq -(1-\delta)(1-\alpha)n(p)$, and $r_0 > r^{**}$. (iii) When x is sufficiently large such that $r_0 \leq r^{**}$, the price declines only when $\bar{a} = 0$ with $\bar{r} > p$, when $\bar{a} = \alpha$ with $\bar{r} > r^{**}$, or when $\bar{a} = 1$ with $m \geq -(1-\delta)(1-\alpha)n(p)$ and $\bar{r} > r^{**}$. (iv) The public's share of the proceeds decreases as a result of an increase in x when

$$(14) \qquad \bar{a} > \alpha + \frac{\delta\mu(1-\alpha)}{1-\delta(1-\mu)},$$

except when $\bar{r} > \max(r^{**}, r_0)$, in which case $\bar{a}$ remains equal to 1. The public's share increases when (14) is reversed except when $\bar{r} > p$, in which case $\bar{a}$ remains equal to 0, or when $p \geq \bar{r} > r^{**}$, in which case $\bar{a}$ remains equal to α.

PROOF. See Appendix.

Although the main purpose of developing Corollary 2 is to demonstrate the inverse relationship between the resource supply and the domestic prices, it is interesting to observe the behavior of the equilibrium share of the public. The Corollary shows that this share tends to decline when it is above the level specified on the right-hand side of (14) and to rise if it is below that level. The reason for this result is simple: When the resource supply rises, there is more rent to be lost in case the public votes against the incumbent. As a result, the politician shows more willingness to concede to the public when his share of the revenues is relatively large. This results in either a lower price or a higher share for the public. The relationships change when the politician is being motivated by an electoral *ex post* mechanism to take a much smaller share than he can capture by acting opportunistically. When the resource rent increases and $\bar{a}$ is large, the politician can gain a lot by using his option to violate the share threshold and, thus, going all the way to 1–α. Consequently, the public has to either demand a lower domestic price *ex ante* to cut the size of funds available to the politician or to lower its claim on the funds to make it worthwhile for him to comply with the thresholds. So, the price may go down or the public's share may decline, or both. This tends to happen when α, μ, δ, and *b* are sufficiently high such that the equilibrium occurs at high shares for the public that satisfy (14).

The result that the domestic price is inversely related to resource supply is interesting because it offers a new explanation for the inverse relationship that one observes between energy prices and oil production (see Table 1). The common perception about this observation is that it is caused by declining marginal revenues in export markets (and rising supply costs in the case of oil importers), which make it rational for the government to set a lower price in domestic markets when the domestic production capacity is higher. This effect may be true, but it is unlikely to be very large because oil is easily tradable and, besides, it can be kept in the ground and sold later without driving the current marginal revenue down. The effect may be relevant in the case of OPEC countries, which as a group can have a large effect on the market. But, for most countries, domestic supply and demand are a small fraction of the world market and the foreign demand curve (or the foreign supply curve in the case of importers) is likely to be quite elastic.

Another implication of Corollary 2 is that the U-shaped effects of institutional parameters on the domestic price are conditional on the size of domestic resource supply. When $x = 0$, the equilibrium price remains essentially flat except when α, μ, δ, and *b* are so low that the politician ends up capturing all the rent. As x rises, r_0—which acts as a floor on the domestic price—goes down and permits the price to decline when $\bar{a} \in [\alpha,1]$. As a result, the U-shape of equilibrium loci takes form and becomes pronounced as x increases. This is important for the empirical analysis because it implies that the size of resource supply must be interacted with the institutional parameters. As we will in the next section, this prediction is supported by the data.

3. Empirical Evidence from the Fuel Market

The Data and Empirical Specification

This section applies the above model to fuel price policies across countries in 1998. The variables to be explained are average pump prices for super gasoline and diesel fuel, which are available in terms of

US dollar per liter from the World Bank's *World Development Indicators* (WDI) data set. The key implications of the above model are that these prices should have U-shaped relationships with the measures of the public's ability to control the ruling politicians and that the relationships should be conditioned on the size of domestic oil supply.

As a measure of the public's capability to ensure that government revenues are not diverted by the politicians (depicted in the model through the parameter α), one can use the index of "rule of law" from the *International Country Risk Guide* (ICRG) dataset popularized by Keefer and Knack (1995). This index is a ranking of countries from 1 to 6 based on surveys of experts dealing with various countries. It reflects the degree to which the institutional processes for making laws and implementing them are well established and widely accepted. High scores are associated with sound political institutions and a strong court system. Low scores indicate a lack of clear rules in dispute settlement, political succession, and policymaking. ICRG also provides another similar index for gauging "corruption," or the degree of "improper practices" in the government. This index also seems relevant for measuring α and, in fact, it performs similar to the rule of law in the regressions when it is the sole institutional variable on the right-hand side. But, it shows less significance in the presence of other variables. For this reason, the focus here will be on the rule of law, which is a broader measure.

For μ, or the ease with which the public can punish the ruling politicians, a natural indicator is the "democracy" score from the Polity IV data set. This indicator is designed to reflect the openness and competitiveness of the political system (Marshall and Jaggers, 2001). It should be noted that the rule of law indicator also partially reflects the ability of the public to discipline the politicians through elections. But, the democracy score is a more direct measure of this effect and using it jointly with the rule of law indicator should allow the latter to pick up mainly the effects of institutions that limit malfeasance in the process of policymaking, as opposed to *ex post* discipline mechanisms.

The other parameters of the model are more difficult to gauge. However, a variable that is likely to be associated with in the discount factor, δ, across countries is the expected rate of turnover in political leadership. When political leaders can easily lose their positions even when they have acted in the interest of the public, the weight that they place on the long-term consequences of their policies goes down. Randomness in turnover happens because polities may be voting based on noisy information or the selection of political leaders may not follow established processes. In countries where such effects are stronger, political turnover is likely to be higher and the politicians may discount the future payoffs of their policy decisions more heavily. For measuring turnover, a reasonable proxy is the percent of veto holders who *drop* from the government in any given year. The Database of Political Institutions (Beck et al., 1999) provides four different measures for this variable, depending on the definition of veto holders.

The results are not very sensitive to the choice of these measures. The indicator that I use in the reported regressions is the 1990-1997 average of the measure that defines veto holders as the chief executive, the largest government party, and one or two other largest parties that may be present in the government.[6] This indicator is treated as a proxy for the discount rate. Therefore, I used 1/(1+turnover rate) as the proxy for the discount factor, δ.

For measuring resource supply, a natural variable is per capita oil production (including liquid gas), which is available from the Energy Information Administration's web pages at eia.doe.gov for a large number of countries.[7] One can also use indicators of broader resource supplies—such as total energy production—to take account of possible cross-subsidization. But, indirect transfers from other sources have costs of their own and are likely to be less important in determining fuel prices. In fact, running the regressions with the total per capita energy production as the resource supply yields results somewhat weaker than, though essentially similar to, those reported here. Another consideration regarding oil production is that it may be endogenously determined with the domestic price. To deal with this issue I instrument for oil production with proven reserves of oil and gas, which much less likely to be endogenous. Using lagged values of these variables or lagged oil production as instruments does not change the results.

Besides the variables identified in the model, there are other factors that may cause variation in fuel prices across countries. Considering such factors is important because it can diminish concerns over the missing variables bias in the regressions. It can also place the effects explained by the model in better perspective in terms of magnitude and relative significance. One notable factor of this kind is the variation in the local processing and distribution costs of fuel in different countries. These costs are a sizable component of retail prices and should explain at least part of the variation in domestic fuel prices. To capture this effect, I used the real exchange rate for 1998 reported in WDI. Higher real exchange rates mean higher relative prices for the local goods and services and, thus, should be associated with higher domestic fuel prices.

Two other notable factors are the pollution externalities of burning fueland possible variations in the elasticity of fuel demand. The externality effect may differ from place to place and may lead to differential opportunity costs of fuel consumption across countries. The demand elasticity may vary depending on the structure of production and consumption. To capture the two effects, I considered

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[6] In the Database of Political Institutions, this variable is named STABNS2.

[7] Using total oil supply, instead of the per capita measure, produces similar results, but the fit of the regressions is not as good. As pointed out in the introduction, total oil supply is much less correlated with domestic fuel prices than the per capita supply.

variables such as the share of industry in GDP, population density, and the urbanization rate (share of urban residents in total population). One expects these variables to be associated with lower demand elasticity and higher pollution externality of fuel consumption, hence positively affecting fuel prices in the domestic markets. Per capita GDP may also affect the demand elasticity or the valuation of pollution costs. In the regressions, these variables displayed the expected signs, but only the urbanization rate proved statistically significant. Below, only the regressions with the urbanization rate are reported. This variable is available from WDI. To complement this variable and pick up other possible geographical or cultural factors, I included several regional dummies in the regressions.[8] Finally, as noted earlier, membership in OPEC may drive a wedge between the opportunity costs of oil and the marginal revenue from exports. This effect was handled by a dummy for OPEC members.

To test the U-shaped relationships, a straightforward approach is to introduce the institutional variables on the right-hand side of the regressions as quadratic expressions. In addition, as the model suggests, the institutional variables must be interacted with the resource supply indicator and possible among themselves. The interactions among the institutional variables proved insignificant and are not reported here.[9] Also, some of the regressions showed signs of heteroskedasticity. To deal with the problem, the *p*-values were calculated based on Newey-West heteroskedasticity-consistent standard errors. In the rest of this section, I first present the regressions for each institutional variable and then discuss the consequences of combining them. Summary statistics for the variables used in the regressions are given in the Appendix.

Empirical Results

Table 2 shows the regressions for the logs of the two fuel prices with only one institutional variable considered along with the oil production, the log of the real exchange rate, and the urbanization rate. The latter variable has been entered in quadratic form to account for possible decreasing or increasing effects. For the sake of comparability, the samples are the same as the one available for the regressions combining all these variables.[10] These preliminary estimates show that the quadratic expressions for the institutional variables are highly significant when they appear as interactions with oil supply, but not when entered directly. This is in line with the prediction of the model about the effects of

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[8] The dummies identified the following regions: Sub-Saharan Africa, Latin America, North America, East Asia, South Asia, Eastern Europe, and Western Europe. All these were compared to the Middle East and North Africa.

[9] Some of these interactive terms were significant when the basic quadratic expressions interacting with the resource supply were omitted. But, the Schwartz criterion indicated that the latter expressions should be selected over the expressions interacting different institutional variables.

[10] Using maximum samples for each institutional variable produce similar results.

institutions being conditioned on resource availability, except perhaps for a limited range of institutional variables at the lower end of the spectrum. Also, note that the quadratic expressions have the correct signs in the sense that they indicate declining prices when the institutional variables rise from low levels and rising prices when those variables reach high levels. Based on the interactive terms, for the rule of law the minimum price is reached when the index is 5. The corresponding figure for the democracy score is also between 4 and 5 and for the turnover factor is 0.93. All these values are inside the actual ranges of these variables (see Table A1), implying that the positive coefficients of the quadratic terms are not just diminishing effects for the linear ones.

Tables 3 and 4 show the results of including all three institutional variables in the fuel price regressions. The non-interactive quadratic expressions for the institutional variables are insignificant and have been omitted to focus attention on the relevant parts. The first columns of Tables 3 and 4 show the estimates without any other variable in regression. They show that all the terms interacting with the oil production are significant with the expected signs. Inclusion of the real exchange and urbanization variables in the second columns of the two tables clearly strengthens the results.

Adding the OPEC dummy to the regression (as shown in the third columns of Tables 3 and 4) yields highly significant negative coefficients for that dummy and increases the adjusted R^2 of the regression. The coefficients of the institutional variables decline somewhat, but remain highly significant, except in the case of the turnover variable in the diesel fuel variable, where the significance level declines somewhat. After combining the three variables in the same regression and taking account of OPEC membership, the minimum price points for the rule of law and democracy scores remain essentially unchanged, but the corresponding point for the turnover factor declines to around 0.90.

Experimenting with the regional dummies resulted in consistently significant coefficients for Eastern and Western Europe and for North America (US and Canada), but not for other regions. Moreover, the coefficients of Eastern and Western Europe dummies were both positive, very similar in magnitude, and statistically indistinguishable. For the sake of parsimony, these two were merged into a single European dummy. The end result is reported in the fourth columns of Tables 3 and 4. Inclusion of North American and European dummies has a non-negligible adverse effect on the significance levels of some institutional variables, especially the turnover variable. The reason is that the European dummy is correlated with the institutional indicators and exacerbates some multicollinearity that already exists among them. Eliminating any one of the three institutional variables renders the other two highly significant even in the presence of the European dummy. The last columns of Tables 3 and 4 show examples of such regressions, with the turnover expression left out.

Table 2. Fuel Price Regressions with Single Institutional Variables

(Resource Supply: Oil and Liquid Gas Production, Instrumented by Proven and Gas Reserves)

(p-Values Given in Italics Below Each Coefficient. Bold Figures are Significant at the 5% Level.)

(p-Values Are Based on Newey-West Heteroskedasticity-Consistent Standard Errors.)

	Dependent Variable:					
	Log(Gasoline Price, US$/Liter)			Log(Diesel Fuel Price, US$/Liter)		
	Institutional Variables:			Institutional Variables:		
Explanatory Variables:	**Rule of Law**	**Democracy**	$\frac{1}{1+\text{Turnover}}$	**Rule of Law**	**Democracy**	$\frac{1}{1+\text{Turnover}}$
Constant	–0.069 *0.903*	0.283 *0.219*	5.399 *0.364*	–0.153 *0.810*	0.016 *0.967*	–7.206 *0.409*
Log(Real Exch. Rate)	**0.639** ***0.000***	**0.551** ***0.000***	**0.549** ***0.000***	**0.738** ***0.003***	**0.608** ***0.001***	**0.709** ***0.000***
Urbanization Rate	**-2.147** ***0.038***	–0.821 *0.298*	**-2.086** ***0.015***	–2.199 *0.094*	–1.078 *0.286*	**-2.219** ***0.049***
(Urbanization Rate)^2	**1.513** ***0.068***	0.758 *0.268*	**1.846** ***0.013***	1.198 *0.238*	0.664 *0.436*	1.612 *0.096*
Log(1+Oil Prod.)	**2.146** ***0.042***	**-0.363** ***0.000***	**12.642** ***0.006***	2.142 *0.083*	**-0.308** ***0.000***	**15.672** ***0.012***
Institutional Variable	0.260 *0.424*	0.002 *0.971*	–11.833 *0.408*	0.153 *0.654*	–0.006 *0.935*	17.656 *0.388*
(Institutional Variable)^2	–0.022 *0.572*	–0.003 *0.601*	6.957 *0.413*	–0.004 *0.913*	–0.001 *0.943*	–10.251 *0.394*
Institutional Variable × Log(1+Oil Prod.)	**-1.060** ***0.030***	**-0.212** ***0.011***	**-28.007** ***0.008***	**-1.083** ***0.050***	**-0.301** ***0.002***	**-34.894** ***0.017***
(Institutional Variable)^2 × Log(1+Oil Prod.)	**0.110** ***0.046***	**0.025** ***0.005***	**15.006** ***0.014***	**0.116** ***0.053***	**0.034** ***0.001***	**18.897** ***0.023***
R^2	0.469	0.577	0.559	0.447	0.578	0.475
Adjusted R^2	0.424	0.541	0.521	0.400	0.543	0.431
Number of Obs.	103	103	103	103	103	103

Table 3. Explaining Cross-Country Variations in Gasoline Prices
(Resource Supply: Oil and Liquid Gas Production, Instrumented by Proven and Gas Reserves)
(*p-Values Based on Newey-West HC Standard Errors Given in Italics Below Each Coefficient Estimate*.)

	Dependent Variable: Log(Gasoline Price, US$/Liter)				
Explanatory Variables:	**Basic Model**	**Real Exch. & Urbanization**	**Adding OPEC Dum.**	**Adding Regional Dum.**	**Dropping Turnover**
Constant	–0.499 *0.000*	0.329 *0.238*	0.277 *0.302*	0.131 *0.596*	0.129 *0.595*
Log(Real Exch. Rate)		0.501 *0.000*	0.464 *0.000*	0.305 *0.002*	0.311 *0.003*
Urbanization Rate		–1.878 *0.024*	–1.864 *0.021*	–2.086 *0.004*	–2.023 *0.004*
(Urbanization Rate)^2		1.721 *0.021*	1.722 *0.020*	1.791 *0.004*	1.729 *0.004*
Log(1+Oil Prod.) ×					
×Constant	9.012 *0.027*	14.259 *0.000*	11.714 *0.000*	3.302 *0.207*	1.132 *0.000*
×Rule of Law	–0.627 *0.009*	–0.706 *0.002*	–0.578 *0.000*	–0.560 *0.000*	–0.497 *0.000*
×(Rule of Law)^2	0.068 *0.018*	0.072 *0.006*	0.058 *0.002*	0.055 *0.003*	0.047 *0.000*
×Democracy	–0.250 *0.002*	–0.173 *0.017*	–0.146 *0.004*	–0.168 *0.001*	–0.186 *0.000*
× (Democracy)^2	0.029 *0.001*	0.019 *0.017*	0.015 *0.006*	0.018 *0.001*	0.020 *0.000*
×1/(1+Turnover)	–18.556 *0.039*	–28.734 *0.001*	–23.126 *0.000*	–4.765 *0.397*	
×1/(1+Turnover)^2	10.739 *0.034*	15.845 *0.001*	12.609 *0.000*	2.721 *0.382*	
OPEC Dummy			–0.609 *0.000*	–0.751 *0.000*	–0.761 *0.000*
North Amer. Dummy				–0.565 *0.005*	–0.756 *0.001*
Europe Dummy				0.374 *0.000*	0.364 *0.000*
R^2	0.418	0.626	0.670	0.728	0.727
Adjusted R^2	0.375	0.586	0.630	0.688	0.694
Number of Obs.	103	103	103	103	103

Table 4. Explaining Cross-Country Variations in Diesel Fuel Prices

(Resource Supply: Oil and Liquid Gas Production, Instrumented by Proven and Gas Reserves)

(*p-Values Based on Newey-West HC Standard Errors Given in Italics Below Each Coefficient Estimate.*)

	Dependent Variable: Log(Diesel Fuel Price, US$/Liter)				
Explanatory Variables:	**Basic Model**	**Real Exch. & Urbanization**	**Adding OPEC Dum.**	**Adding Regional Dum.**	**Dropping Turnover**
Constant	–0.897 *0.000*	0.092 *0.820*	0.030 *0.940*	–0.198 *0.632*	–0.155 *0.694*
Log(Real Exch. Rate)		0.614 *0.000*	0.563 *0.000*	0.340 *0.032*	0.348 *0.018*
Urbanization Rate		–1.750 *0.106*	–1.749 *0.105*	–1.957 *0.055*	–2.178 *0.027*
(Urbanization Rate)^2		1.287 *0.163*	1.318 *0.154*	1.279 *0.110*	1.574 *0.039*
Log(1+Oil Prod.) ×					
×Constant	7.793 *0.070*	11.347 *0.002*	7.023 *0.032*	–4.401 *0.306*	1.096 *0.000*
×Rule of Law	–0.708 *0.007*	–0.791 *0.001*	–0.622 *0.001*	–0.516 *0.011*	–0.489 *0.000*
×(Rule of Law)^2	0.080 *0.008*	0.084 *0.002*	0.066 *0.004*	0.054 *0.021*	0.050 *0.000*
×Democracy	–0.342 *0.001*	–0.263 *0.005*	–0.229 *0.001*	–0.249 *0.000*	–0.230 *0.000*
× (Democracy)^2	0.039 *0.001*	0.029 *0.003*	0.025 *0.001*	0.028 *0.000*	0.025 *0.000*
×1/(1+Turnover)	–15.826 *0.097*	–22.326 *0.005*	–12.973 *0.068*	11.578 *0.211*	
×1/(1+Turnover)^2	9.349 *0.083*	12.489 *0.006*	7.166 *0.074*	–6.003 *0.236*	
OPEC Dummy			–0.656 *0.023*	–1.018 *0.000*	–0.921 *0.000*
North Amer. Dummy				–0.753 *0.002*	–0.339 *0.266*
Europe Dummy				0.513 *0.000*	0.491 *0.000*
R^2	0.444	0.601	0.642	0.700	0.702
Adjusted R^2	0.403	0.557	0.599	0.657	0.666
Number of Obs.	103	103	103	103	103

The upshot of the regressions in Tables 3 and 4 is that fuel prices have the predicted quadratic relationships with the institutional variables representing the public's capability to control the politicians. Moreover, these relationships are conditioned on the size of oil supply, again as predicted by the model. Running the regressions for countries with no oil production and entering the non-interactive quadratic expressions for the institutional variables on the right-hand side yields little significance for the coefficients of these variables, while the coefficients of the real exchange, urbanization, and the Europe dummy remain stable and highly significant. This confirms the model's other prediction that in the absence of domestic resource supply, the price is generally independent of the institutional factors that matter for rent distribution when the resource supply is positive (see Corollary 2).

The results imply that the institutional factors matter quite a bit for domestic pricing in countries endowed with oil. By themselves, the institutional variables in interaction with the resource supply measure explain well over 40 percent of the variations in fuel prices. Another way of looking at the role of these variables is to control for the real exchange rate, urbanization, and per capita oil production and examine the predicted prices as the institutions vary. Fixing these variables at the median of the sample of countries that produce any oil and letting the OPEC dummy be equal to zero, the predicted per liter prices based on the regression in third columns of Table 3 and 4 range between $0.42 and $0.87 for gasoline and $0.25 and $0.50 for diesel fuel.[11] If the regressions in the fourth and fifth columns are used with the regional dummies set equal 0, these ranges turn out to be approximately $0.38-$0.63 and $0.21-$0.38, respectively. In either case, the ranges are quite wide and show that the institutional elements can play important roles in the formation of fuel prices. The types of countries at the two ends of these ranges are also interesting. Whether regional dummies are used or not, at the low end are countries such as Iran, Malaysia, Paraguay, and Guyana with rule of law indices and democracy scores close to the minimum price points (about 4 to 6) and turnover factors of about 0.88-0.96. At the other end is a colorful mixture of countries with either very high or very low ranks for rule of law and democracy, but generally with low turnover factors. This includes many European countries with high rule of law and democracy scores (6 and 10, respectively) such as Italy, Greece, and Norway as well as African countries with very low institutional scores (2 or less for both indicators) such as Niger and Kenya. It also includes countries with high democracy scores but low ranks in terms of rule of law such as India and Guatemala.

The oil supply effect on the domestic price is negative for most countries. Of course, this effect varies according to country institutions. But, Wald tests of the expression interacting with the oil supply

[11] The sample medians are as follows: real exchange rate = 0.51, urbanization rate = 0.72, and per capita oil production = 0.74 percent of barrel per day.

in both fuel price regressions specified with the OPEC dummy and with or without regional dummies show that the oil supply effect is negative and different from zero at the 5% level for the institutional characteristics representing about 73% of the sample countries that not at the two ends of the institutional spectrum. For the regressions without the regional dummies, the median value of this expression is –0.25 for gasoline and –0.23 for diesel fuel. Given that the dependent variable is in log form, this means that in the median country, one standard deviation increase in the oil supply (an increase of 1.18 in the log of one plus per capita oil production) reduces the gasoline price by about 26% and the diesel fuel price by about 24%. For countries with democracy and turnover characteristics closer to the points that minimize the expression, this effect is much stronger, while for countries away from the middle it is weaker. An interesting case that illustrates this effect well is that of Iran, whose characteristics yield the lowest values in the sample for the expression interacting with the oil supply, –0.68 and –0.81 for gasoline and diesel fuel, respectively. Iran also has the lowest prices in the regression sample for the two products; US$0.05 and US$0.02 per liter, respectively. The estimates for the multiplier expression imply that if Iran's per capita oil supply had been one standard deviation lower, its gasoline and diesel fuel prices would have been $0.09 and $0.06 higher, respectively. This would have meant near doubling of the observed gasoline price and almost tripling of the observed diesel fuel price. Given the coefficient of the OPEC dummy, not being an OPEC member would have had another round of similar effects and would have raised Iran's domestic fuel prices close to those prevailing in Malaysia ($0.28 and $0.17, respectively), whose characteristics are similar to Iran, but produces less oil and is not an OPEC member.

The considerable size of the coefficient estimated for the OPEC dummy is interesting in itself. The doubling effect on the domestic fuel prices as a result of leaving the organization may be somewhat of an overestimation because once the country does not have to coordinate with other OPEC members, its production may rise and may cancel out part of the price increase. It is also possible that the OPEC dummy is picking up the effects of some country characteristics that matter for the domestic price of oil, but are not included in the regressions. However, it is not clear whether the net effect of such biases, if they exist, is positive or negative. In any event, the substantial effect captured by the dummy makes it difficult to dismiss the argument that in OPEC countries, the marginal revenue from oil must be lower than the price in the international market.

The significant effects of the European and North American dummies are also notable. The coefficient estimates for the North American dummy indicates that fuel prices in the US and Canada are about 50% below the levels predicted for them based on their institutional and economic characteristics. On the other hand, the coefficient of the European dummy implies that, controlling for other factors included in the regressions, the average gasoline and diesel fuel prices in Europe are, respectively, about

45 percent and 65 percent higher than in the rest of the world. These observations mean that there must be major common factors among European countries on the one hand and the US and Canada on the other hand that distinguish each region from the rest of the world. These could be geographical, cultural, or some neighborhood effects. They could also be the same institutional factors identified by the present model, but imperfectly captured by the particular variables used in the regressions. However, it is likely that some parts of the effects picked up by these dummies are associated with institutional factors that affect fuel prices mostly through the cost of local goods and services, but are not fully captured by the real exchange rate variable. This conjecture is supported by the sharp reduction in the coefficient of the real exchange rate variable once regional dummies are added to the regression (compare the third and fourth columns in Tables 3 and 4). The view is particularly plausible in the case of Europe, where restrictive regulatory practices have raised the local prices of goods substantially above those the rest of the world. In any event, whatever the nature of the regional effects, their magnitude warrants further study.

The real exchange rate effect estimated in the regressions indicates the elasticity of the retail fuel price with respect to the real exchange rate is about 0.3-0.6. This appears reasonable because the share of refining, marketing, distribution, and retailing in the pretax cost of fuel is about 0.4-0.6 (Energy Information Administration website, eia.doe.gov). Thus, the real exchange rate seems to be playing its role as the proxy for country difference in local component of fuel costs. It is a particularly helpful variable in explaining the price differences between developing and developed countries, where the real exchange rate differences are enormous. For example, the real exchange rate in Western Europe is about three times that in Eastern Europe. This makes the log difference in the real exchange rates 1.06. Taking the price elasticity with respect to the real exchange rate as approximately 0.4, this means that fuel prices in Western Europe must be about 50 percent above those in the East only because of this effect alone. In contrast, real exchange rate differences explain only about 5 percent of the gap in the average gasoline price between Western Europe ($1.04 per liter) and North America ($0.33 per liter).

Finally, the estimates for the urbanization expression point to important effects. Entering urbanization as a linear term does not produce a very significant coefficient in most regressions. But, as a quadratic expression, it ends up with better levels of significance, especially in the gasoline regression. The fact that gasoline is used more often for transportation in urban areas may account for this notable difference. The magnitudes and the opposite signs of the linear and squared terms in the expression imply that when the urbanization rate is high, fuel prices are in fact rapidly increasing in it. But, at the low rates, the opposite is true. The minimum price is reached around the urbanization rates of about 0.56 for gasoline and 0.70 for diesel fuel. This finding suggests that while pollution and other negative externalities of fuel use may be raising its price at high rates of urbanization, at the other end of the spectrum other factors such as changes in demand elasticity or political capabilities associated with urbanization tend to push the price downward. The rapid rise in the quadratic term for the urbanization rates above 0.7 means that differences in externality effects of fuel use are not trivial. For example, the expression implies that the difference in the urbanization rate of North America (0.77) and Western Europe (0.89) explains about 15 percent of the difference between gasoline prices in the two regions.

4. Conclusion

The theoretical and empirical work in this paper suggests that institutional developments may not have monotone effects on the efficiency of economic policy. As the evidence from fuel pricing shows, improvements in the rule of law and democracy may initially enable the public to increase its share of the economy's rents through distortionary policies that transfer the rents in-kind and limit the funds that the politicians can divert toward their private interests. In later stages, when politics becomes competitive and checks and balances grow strong, the public can be more assured of receiving the benefits of marginal government funds and prefers more efficient policies. The magnitudes of such effects seem substantial and the gains from institutional and policy designs that can mitigate the commitment problems between the public and the politicians can be large.

The perspective developed in this paper on the relationship between institutional development and economic policy can have other wide-ranging implications. It offers an explanation for the widely observed phenomenon that the proliferation of distortionary policies in developing countries over the past several decades were often associated with political developments that gave the public in those countries more say in politics. The causes of this association have been explored in the literature on economic populism. But, the mechanisms that bring it about have not been well understood and that literature has largely remained at the level of blaming the politicians or the public for misguided ideas. The concrete mechanism demonstrated in this paper suggests that there may not have been any villains, only individual and institutional frailty.

Appendix

PROOF OF PROPOSITION 1.

(i) When $m \leq -(1-\alpha)(1-\delta)n(p)$, the public's unconstrained first best choice, $\bar{a} = 1$ and $\bar{r} = p$, satisfies all constraints and, therefore, it will be selected and the politician will not have any incentive to deviate from those limits. When $m > -(1-\alpha)(1-\delta)n(p)$, any point with $\bar{a} = 1$ and $\bar{r} \geq p$ would violate (12). For other points, if neither (11) nor (12) binds, the public will be able to gain by raising $\bar{a}$ until either one of those constraints binds or $\bar{a}$ reaches 1. In the latter case, the public can gain by raising $\bar{r}$ as close to p as possible until (12) binds.

(ii) If $m < 0$, (11) cannot bind. Therefore, when $0 > m > -(1-\alpha)(1-\delta)n(p)$, (12) must bind. If $n(r^{**}) < 0$, (12) cannot be the only binding constraint because the optimal point when it is the sole constraint is not feasible. Since in that situation all points with $\bar{a} = 0$ violate (12), we must have $\bar{a} = 1$. Then, $\bar{r}$ must be determined by the boundary of (12) at $\bar{a} = 1$, which is $n^{-1}\left(\frac{-\delta m}{(1-\delta)(1-\alpha)}\right)$. If $n(r^{**}) \geq 0$ and $m < -\frac{1-\delta}{\delta}(1-\alpha)n(r^{**})$, the set of points that satisfy (12) lies above $\bar{r} = r^{**}$. In that case, the point on (12) where $\bar{a} = 1$ dominates any other point on that boundary. This is because, after substitution from (12), the public's utility becomes $y + [\alpha + (1-\alpha)]n(r) + s(r) - \delta m$, which is decreasing in r for all $r > r^{**}$ and the lowest feasible point is reached when $\bar{a} = 1$.

(iii) When $m = 0$, the boundary of (12) coincides with the vertical line above and the horizontal line to the right of the point $\bar{a} = \alpha + (1-\alpha)\delta$ and $\bar{r} = r_0$. If $n(r^{**}) < 0$, the public's utility on that boundary increases as r declines. Therefore, the solution will be at the lowest end of that range, $\bar{r} = r_0$. Since at that point revenues are zero, all value of $\bar{a}$ can serve as equilibrium points.

(iv) When $n(r^{**}) \geq 0$ and $n(r^{**}) > \frac{m}{1-\alpha} > -\frac{1-\delta}{\delta}n(r^{**})$, condition (12) is more stringent than (11) in the $\bar{a} > \alpha$ range. In that range the public can maximize its utility subject to (12) alone and the interior point $\bar{r} = r^{**}$, and $\bar{a} = \alpha + (1-\alpha) - \frac{\delta m}{n(r^{**})}$. This point is the solution to the public's problem because it dominates all points in the $\bar{a} < \alpha$ range as well. The latter point is true because the proposed solution dominates the lower limit of constraint (12) at $\bar{a} = \alpha$, which is also on the boundary of (11) and in turn dominates all other points on that boundary in the $\bar{a} < \alpha$ range. Because (11) would bind in the $\bar{a} < \alpha$ range if the solution is on that side, the proposed solution dominates all feasible points.

(v) When $n(p) > \frac{m}{1-\alpha}$, condition (11) cannot be the sole binding constraint because in that case the equilibrium would be at $\bar{a} = 1 - m/n(p) > \alpha$, which violates (12). But, when $\frac{m}{1-\alpha} > 0 > n(r^{**})$ or $\frac{m}{1-\alpha} > n(r^{**}) > 0$, (12) cannot be the sole binding constraint either because $\bar{r} = r^{**}$ is infeasible. Therefore, both constraints must bind jointly, which means $\bar{a} = \alpha$ and $\bar{r} = n^{-1}\left(\frac{m}{1-\alpha}\right)$.

(vi) When $\frac{n(p)}{1-\alpha} \geq \frac{m}{1-\alpha} \geq n(p)$, the point $\bar{a} = 1 - m/n(p)$ and $\bar{r} = p$ where condition (11) is the sole binding constrain is feasible and dominates the limiting point of (12) at $\bar{a} = \alpha$ where the public reaches the highest utility on the feasible points of (12). Therefore, (11) must binds $\bar{a} = 1 - m/n(p)$ and $\bar{r} = p$ must be the solution.

(vii) When $m > n(p)$, the boundary of (11) lies entirely above the $r = p$ line and the points that maximize the public's utility subject to (11) or (12) are not feasible. Therefore, either both constrain must bind or $0 \leq \bar{a} \leq 1$ must be binding. $\bar{a} = 1$ violates (11) and the point where $\bar{a} = 0$ and $\bar{r} = n^{-1}(m)$ dominates any other point in the feasible set of (11) because on the boundary of (11) above the $r = p$ line, the public's utility, $y + n(r) + s(r)$, is decreasing in r. Q.E.D.

PROOF OF COROLLARY 2.

(i) When $x = 0$, we have $n(p) = 0$, $r_0 = p$, and $n(r^{**}) < 0$ for all $\alpha < 1$. Therefore, only parts (i), (iii), (vi), and (vii) of Proposition 1 apply. When (vii) applies, $\bar{a} = 0$ and $\bar{r} > p$. In the rest of cases, $\bar{r} = r_0 = p$.

(ii) Note that the value of the resource product per period, px, is an additive term in $n(r_t)$. Therefore, as x rises both sides of (11) and (12) rise. Condition (11) tightens as x rises if

(A1) $$\bar{a} > \alpha + \frac{\mu(1-\alpha)}{1-\delta(1-\mu)}.$$

If (A1) is reversed, condition (11) will weaken. Because in equilibrium condition (11) binds only when $\bar{a} \leq \alpha$, relationship (A1) is reversed whenever (11) is a binding constraint. Thus, an increase in x weakens the limitations that (11) imposes on the public's choice of policy thresholds in equilibrium. This leads to a reduction in the equilibrium price if $\bar{a} = 0$ and $\bar{r} = n^{-1}(m) > p$ (see part (vii) of Proposition 1). If $\bar{a} < \alpha$, then according to part (vi) of Proposition 1, $\bar{r} = p$ and only $\bar{a}$ increases. Condition (12) also weakens as a result of a rise in x as long as (14) is reversed in equilibrium, but the opposite is true when (14) holds. This leads to a reduction in $\bar{r}$ when $\bar{a} = \alpha$ and part (v) of Proposition 1 applies. If $\alpha < \bar{a} < 1$, $\bar{r}$ equals r_0

and must decline with it as x increases as long as $r_0 > r^{**}$. The price also declines when $\bar{a}=1$, but not if $m < -(1-\delta)(1-\alpha)n(p)$ and part (i) of Proposition 1 applies.

(iii) When $r_0 \leq r^{**}$, all of the above results apply, except that $\bar{r} = r^{**}$ when $1 > \bar{a} > \alpha$ and in that range the domestic price does no longer decline with x. But, the weakening of (11) and (12) at $\bar{a} = 0$ and $\bar{a} = \alpha$ and tightening of (12) when $\bar{a} = 1$ imply that the price may continue to decline in such equilibria. This happens at $\bar{a} = 0$ when $\bar{r} > p$, at $\bar{a} = \alpha$ when $\bar{r} > r^{**}$, and at $\bar{a} = 1$ when $m \geq -(1-\delta)(1-\alpha)n(p)$ and $\bar{r} > r^{**}$.

(iv) When (14) holds, the tightening of condition (12) with a rise in x implies that the price or the public's share must decline. When $\bar{r} > \max(r^{**}, r_0)$ at $\bar{a} = 1$, only the price declines. In other equilibria that satisfy (14), $\bar{r} = r^{**}$ is constant and the share must decline. When (14) is reversed, the weakening of conditions (11) and (12) with a rise in x implies that the price must decline or the public's share must rise. When $\bar{r} > p$ at $\bar{a} = 0$ or when $p \geq \bar{r} > r^{**}$ at $\bar{a} = \alpha$, only the price declines. In the other equilibria where (14) is reversed, $\bar{r}$ is constant and the share must rise. Q.E.D.

Table A1. Summary Statistics of Variables Used in the Regressions
(For the 103-Observation Common Sample)

Variable	Mean	Minimum	Maximum	Standard Deviation
Log(Gasoline Price, US$/Liter, 1998)	–0.649	–2.996	0.191	0.572
Log(Diesel Fuel Price, US$/Liter, 1998)	–1.056	–3.912	0.104	0.661
Log(1+ Percent of a Barrel of Oil Produced per Capita per Day, 1998)	0.667	0.000	4.970	1.179
Log(1+ Million BTUs of Daily Energy Production per Capita, 1998)	0.257	0.000	2.532	0.476
Urbanization Rate (1998)	0.583	0.060	1.000	0.236
Log(Real Exchange Rate, 1998)	–0.694	–1.750	0.336	0.562
Rule of Law (1998)	4.272	2.000	6.000	1.277
Democracy Score (1998)	5.961	0.000	10.000	3.880
1/(1+Average Political Turnover Rate, 1990-1997)	0.884	0.644	1.000	0.094

References

Acemoglu, Daron, and James A. Robinson. 2000. "Inefficient Redistribution," manuscript.

Beck, Thorsten, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh. 1999. "New Tools and New Tests in Comparative Political Economy: The Database of Political Institutions," manuscript. The World Bank.

Becker, Gary S. 1983. "A Theory of Competition among Pressure Groups for Political Influence," *Quarterly Journal of Economics*, 98: 371-400.

Becker, Gary S. 1985. "Public Policies, Pressure Groups, and Dead Weight Costs," Journal of Public Economics, 28: 329-347.

Becker, Gary S., and Casey B. Mulligan. 1998. "Deadweight Costs and the Size of Government," NBER Working Paper No.6789.

Besley, Timothy, and Stephen Coate. 1991. "Public Provision of Private Goods and the Redistribution of Income," *American Economic Review*, 81.4: 979-984.

Blomquist, Soren, and Vidar Christiansen. 1999. "The Political Economy of Publicly Provided Private Goods," *Journal of Public Economics*, 73: 31-54.

Coate, Stephen, and Stephen Morris. 1995. "On the Form of Transfers to Special Interests," *Journal of Political Economy*, 103.6: 1210-1235.

Cremer, Helmuth, and Firouz Gahvari. 1997. "In-Kind Transfers, Self-Selection and Optimal Tax Policy," *European Economic Review*, 41: 97-114.

Guesnerie, R., and K. Roberts. 1984. "Effective Policy Tools and Quantity Controls," *Econometrica* 52.1: 59-86.

Knack, Stephen, and Philip Keefer. 1995. "Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures," *Economics and Politics*, 7.3: 207-227.

Meltzer, Allan H., and S.F. Richard, 1985. "A Positive Theory of In-Kind Transfers and the Negative Income Tax," *Public Choice*, 47.1: 231-265.

Marshall, Monty G., and Keith Jaggers. 2001. "Polity IV Project: Political Regime Characteristics and Transitions, 1800-1999," University of Maryland website, www.bsos.umd.edu/cidcm/polity.

Nugent, Jeffrey B. 1989. "Collective Action in Tunisia's Producer Organizations: Some Variations on the Olsonian Theme," in Mustafa K. Nabli and Jeffrey B. Nugent, eds., *The New Institutional Economics and Development*, Amsterdam: North-Holland.

Rodrik, Dani. 1986. "Tariffs, Subsidies and Welfare with Endogenous Policy," *Journal of International Economics*, 21: 285-299.

Stigler, George J. 1971. "The Theory of Economic Regulation." *Bell Journal of Economics and Management Science*, 2: 3-21.

Tullock, Gordom. 1983. *The Economics of Income Redistribution*, Boston MA: Kluwer-Nijhoff.

Wilson, J.D. 1990. "Are Efficiency Improvements in Government Transfer Policies Self-Defeating in Political Equilibrium," *Economics and Politics*, 2: 241-258.