Price volatility and the political economy of resource-rich nations

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Abstract

This paper attempts to understand how price volatility affects the political transition of a resource-rich nation. Two states reflect price volatility: 'high prices' and 'low prices'. We argue that whether or not political transition (i.e., a switch from one regime to another) will take place in a particular state depends critically on the kind of goods a country produces. If the main economic activity in a country is the extraction of "point-source" resources such as oil that demands capital-intensive production, the opportunity cost of switching the existing regime does not alter if the price of the resource changes but the benefit becomes more lucrative. Therefore, the incumbent group is most vulnerable during 'high prices'. If the main economic activity of the nations is the production of "diffused resources" that requires labor such as coffee, prices do affect the opportunity cost. Nations concentrating in these commodities, face acute political crisis during downturns.

JEL Codes: O13.

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1 Introduction

Common features of commodity-producing countries are the enormous price swings that lead to equally enormous swings in export revenues, leading to boom-and-bust cycles that tend to persist for several years at a time. Reviewing the long-runs data on the prices of three important African crops—cotton, coffee and cocoa—Deaton (1999, p. 27) made the very wise observation that: "what commodity prices lack in trend, they make up for in variance." Deaton's observation applies equally to the price of oil, the most widely tracked commodity price in the world. It is also observed that even though boom-and-bust periods last longer, the fiscal policy of resource-rich nations tends to be procyclical.

The present study attempts to understand how price volatility affects the political economy of a resource-rich nation. Our model is applicable to nations that are economically dependent upon revenues from selling natural resources in the international market where the price of this natural resource is subject to significant swings. Two states reflect price volatility: 'high prices' and 'low prices'. We consider two types of resources: point-source and diffused. To explore point-source resources, capital-intensive advanced technology is required. In contrast, diffused resources are explored by labor-intensive techniques.

In our framework, there are two groups: the rich (minority) and the poor (majority). The rich possess more of the diffused resources than the poor majority. The point-source resource is owned by the group that is in power. When the rich minority holds the power, the country is under autocracy and when the poor dominate, the country is under democracy. Redistribution takes place via a transfer of revenue earned from selling the point-source resource and an imposing tax on the diffused resource. The group in power redistributes in their own favor. Either group has the ability to force a switch to a regime in their favor.

In Acemoglu and Robinson (2009), the risk of revolution against autocrats (or the risk of coup against democracies) is highest in transitory economic downturns. This is because the opportunity cost of staging a revolution (or a coup) is lowest in these downturns. This theory found evidence, for example, in Brückner and Ciccone (2011). In contrast, we argue that the result above depends critically on the kind of goods a country produces.[1] When the main economic activity in a country is extraction of point resources such as oil, the opportunity cost does not alter if the price of the resource changes while the benefit from becoming the incumbent

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[1]We thank an anonymous reviewer for suggesting this argument.

is more lucrative. Therefore, there is strong risk of revolutions or coups when the price of the point-source commodity is high. If the main economic activity in a country is the production of diffused resources (which are labor intensive, and thus hard to expropriate, such as coffee), then Acemoglu and Robinson's result holds: opportunity cost of a revolution or coup is lowest when the price of the commodity is lowest. This is the main finding of our paper. Our other results can be summarized as follows.

In the case of point-source resources such as oil and natural gas:

- *What causes procyclical fiscal policy?* Fiscal procyclicality (commonly dubbed the boom–bust cycle) is defined as the ramping up of sometimes inefficient spending after positive revenue shocks, and abrupt expenditure reductions after adverse shocks (Ghura and Pattillo et al. 2012). More concretely, in boom years, the commodity export price is above the 75th percentile; in bust years, it is below the 25th percentile (see Kaminsky et al. 2005). We argue that when the price of lumpy resources such as oil is high, the incumbent government faces strong (political) pressure to redistribute wealth. As a result, spending increases. When the price of the commodity is low, such pressure is less intense and hence the spending does not have to match the previous high levels.

- *Does price volatility lead to political instability?* An increase in price volatility implies even higher prices during boom periods and an equally low price during bust periods. This fluctuation allows the incumbent group to redistribute the resource wealth to the non-incumbent group when the political pressure is most intense. This allows the incumbent to avert potential political crises. Therefore, political instability is avoided when the regime is under threat.

In the case of diffused resources such as coffee and cocoa, we ask:

- *When is the existing regime most vulnerable?* Unlike point-source resources, natural resources that are diffused, such as agricultural commodities (which are labor-intensive), may pose a challenge during a low-price state, as the opportunity cost of rebellion is low. Therefore, both rebellions and coups are more probable when the price is low.

- *Does price volatility lead to political instability?* Increased price volatility decreases the opportunity cost of a revolution during recessions in the case of diffused resources. Therefore, both coups and revolutions become more probable events and political instability

is enhanced. This, however, presupposes that regimes are under threat when prices are low. If regimes are under threat when prices are high, the reverse occurs where political instability is reduced, due to more fluctuations in prices.

1.1 Related Literature

In the context of political economy, political instability has been linked to price shocks (Alesina et al. 1996; Blattman and Miguel 2010). Two opposing views exist. The first view considers the rise in price as an increase in resource rents that induces the political non-incumbent to challenge the existing regime. The second view considers the impact of price shocks on the incentive of individuals to rebel. A decline in commodity prices lowers the opportunity cost and hence conflict becomes more probable.

Employing new and comprehensive price shock data, Bazzi and Blattman (2011) found that commodity price shocks have no discernible effect on the onset of new conflicts, but have some effect on ongoing conflict. Their results support the findings of Dube and Vargas (2013), who showed that price shocks affect conflict in opposite directions depending on the factor intensity of the commodity. Using a unique violence related data-set from Columbia, Dube and Vargas (2013) found that a fall in the price of coffee (which is labor-intensive) increases violence disproportionately in municipalities growing more coffee. However, a rise in the price of oil (which is capital-intensive) intensifies attacks disproportionately in municipalities that produce more oil.

Our paper does not focus upon the impact of a resource boom on an ongoing civil war but discusses whether or not a boom can cause political transition. We illustrate that a boom in point-source resources causes regime instability, while the increased price volatility can stabilise the regime through more redistribution when the political pressure is as its most intense. In the case of diffused resources, a boom in natural resources leads to more democratization, while increased price volatility leads to more political instability. This is because lower prices during recessions cause lower opportunity costs and more incentives for the rich to mount a coup and the poor to rebel.

The nature of fiscal policy during business cycles differs across nations. This behavior was first documented in the seminal work of Gavin and Perotti (1997). Numerous studies document how the cyclical nature of fiscal policy differs across countries belonging to different income brackets. For instance, in Kaminsky et al. (2005), the cyclical correlation between a country's

government spending and gross domestic product (GDP) over the 1960–2003 period ranged from –1 for Finland (denoting a strongly countercyclical policy) to +1 for Oman (denoting a strongly procyclical policy). In their analysis, the majority of the commodity-exporting countries exhibited procyclical spending, compared with advanced countries. This finding is corroborated by Akitoby et al. (2004), Alesina and Tabellini (2005), Talvi and Végh (2005), and Ilzetzki and Végh (2008), who found evidence of fiscal procyclicality in a large sample of developing countries.

In general, industrial countries with established democracies tend to pursue countercyclical policies, whereas developing countries with less consolidated political regimes (defined in the next section) pursue procyclical policies. For nations rich in point-source resources, in boom years, it is difficult for a government to resist the temptation (or avoid the political pressure) to spend proportionally, resulting in a large fiscal budget encompassing higher subsidies, more public sector employment, higher public sector wages and lucrative government contracts to local businesses.[2] However, once the world prices for exported commodity goods drop, most governments find it difficult to reverse their current expenditure (e.g., subsidies and wages) and rely more on cutting capital expenditure. In a panel study of 32 oil-producing countries over the 1992–2009 period, Arezki and Ismail (2012) found that current government spending increases in boom times, but is downward-sticky. Furthermore, the volatility of total spending is over 60 percent higher in resource-rich countries than in their non-resource counterparts (Ghura and Pattillo et al. 2012).

What is the underlying motive for pursuing procyclical fiscal policies in developing nations in general? The two most convincing explanations are:

1. Imperfections in credit markets (Gavin and Perotti 1997; Riascos and Végh 2003): Less access to credit markets during recessions forces the governments to cut expenditure during bad times when it is most needed.

2. Distorted political incentives (Tornell and Lane 1999; Talvi and Végh 2005): An increase in government receipts from taxes or mineral royalties during booms raises the political pressure to spend more. The present study belongs to this second group.

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[2]This phenomenon of "petro-populism", where the incumbent government relies on excessive use of natural resource revenues to buy political support, is used to describe the regime and policy of Venezuela's Hugo Chávez (*sembrar el petróleo*—to sow the oil), Iran's Mahmoud Ahmadinejad election promise ("Put the oil money on everyone's dinner table") and the economic policy of Russia's Vladimir Putin as a "Petro-Czar". See Matsen et al. (2012) for further discussion.

In theory, commodity-exporting nations in particular have several ways to deal with the volatility of natural resource revenue. Frankel (2012), for example, offers a menu of choices which encompass risk diversification such as hedging export proceeds on option markets (as implemented by Mexico), countercyclical macroeconomic policies (such as the Chilean-style fiscal rules) and good governance institutions (like Botswana's "Pula Fund", which is not subject to political influence). However, in practice, fiscal policy tends to be procyclical in the majority of the commodity-exporting developing countries.

Though the concepts are related, expansionary or contractionary fiscal policies should be differentiated from policies that redistribute wealth from the incumbent group to the non-incumbent – the primary focus of our paper. Fiscal policies also include projects that transfer wealth within the incumbent group. Two nations may have expansionary fiscal policies to the same degree but a distinction can exist with regards to the identity of the beneficiary.

According to our paper, when a nation possesses a significant amount of point-source resources, the incumbent regime is under pressure during boom periods. Therefore, incumbents need to transfer wealth to the rest during these periods. Sometimes, the maximum possible transfer may not ensure the continuation of the regime and this will lead to a change in regimes. In the case of diffused resources, the regimes are under pressure when the price is low. The combination of democracy and diffused resources will lead to similar procyclical redistribution policies, as the poor can freely tax the rich. In contrast, autocracy and diffused resources will lead to a countercyclical policy with regards to redistribution. Therefore, more interesting variations are observed.

With commodity prices being the leading indicator of economic well-being in many resource-rich economies, the impact of commodity price volatility on economic growth has also been studied by economists at length. Although, in general, a negative link between commodity price volatility and growth performance has been observed, the actual extent of this relationship varies greatly from country to country. Differences among countries in terms of their level of financial development, their absorption capacity and the quality of their institutions, among others, play important roles in safeguarding the economy against volatility. These hypotheses are supported by recent empirical studies involving cross-country examination of commodity-exporting countries. For instance, van der Ploeg and Poelhekke (2009) observed that the direct positive effect of resources on growth is negated by the indirect negative effect of volatility. In an extensive survey of the literature, van der Ploeg (2011) gathered econometric evidence

supporting the notion that the volatility of resource windfalls is the quintessence of the resource curse, as well as the hypothesis that the negative effect on growth is lower in countries with well-developed financial systems. We do not focus upon economic development in this paper. However, we show that political instability can occur due to resource booms, which handicaps the development process.

Aside from price volatility, the dynamic nature of a political contest between rival factions competing for natural resource rents and the attendant commitment problems have been studied extensively in theory. For our present endeavor, the most relevant works are Acemoglu and Robinson (2009), and Dunning (2009). The framework built in Acemoglu and Robinson (2009) is equipped to analyze the stability of political regimes under volatility. Dunning (2009, ch. 3), using the same framework, derived conditions that allow one to investigate how the political equilibria vary as a function of changing levels of the resource rents, when the private (non-resource) economy is more non-egalitarian. According to Dunning (2009), when there is a deep division between rich and poor in a society, the existence of a resource ushers in a new source of redistribution, leading towards a democratic outcome.

The remainder of the paper is organized as follows. Section 2 lays out a simple theoretical framework for understanding how the price volatility of natural resources affects political outcomes. Sections 3 and 4 present the main results and comparative statics for point-source and diffused resources, respectively. Section 5 discusses the empirical implications of our results. Section 6 concludes the paper.

2 The Model

2.1 Environment

Income is obtained from two sources – point-source and diffused resources. Diffuse resource such as coffee is hard to expropriate, as they are labor-intensive; but point-source resource such as oil is easier to expropriate, as they are more capital-intensive and less labor-intensive. In our model, point-source resources do not require any labor and income is earned from pure transfers. Diffused resources are produced by individuals and labor endowment is dispersed differently across groups. The rich (the minority) possess y^r and the poor (the majority) have y^p of the diffused resources, where $y^r > y^p$. The rich are also less numerous (only $\theta < \frac{1}{2}$ of the population).

The price of each resource can vary. There are two states in each period: (a) high prices (P_H) with probability s and (b) low prices (P_L) with probability $(1 - s)$. The total income Y_t^i obtained by each agent includes: the nominal value of the diffused resource, taxes imposed on diffused resources and transfers from point-source resources. Each agent (who has an infinite lifetime) maximizes the discounted sum of his or her lifetime income (the same as utility):

$$U^i = E_0 \sum_{t=0}^{\infty} \beta^t Y_t^i$$

Initially (at period 0), the rich are in power or autocracy prevails, and the rich decide the transfers and taxes. If autocracy exists, the poor can rebel. In response, the rich can democratize, where the poor, being more numerous, win the election and the poor will decide the taxes and transfers. In a revolution, the poor redistribute the assets, which include both diffused and point-source resources, among themselves and the rich obtain nothing.[3] As everyone is equal afterwards, inter-group conflict no longer exists.

The game lasts for infinite number of periods. The game in each period is as follows:

1. Nature chooses the price $\{P_H, P_L\}$ with $Pr\,(P_H) = s$.

2. If a revolution has occurred in the past, the poor consume the income during the revolution. If the rich are in power (under autocracy), the rich select the transfer to the poor. If the poor are in power (under democracy), the poor select the transfer to the rich.

3. The poor decide whether to rebel or not at an initial cost of $(1 - \mu)$ of their income if the rich are in power. Under a democracy, the rich decide whether to restore autocracy by mounting a coup at a cost of $(1 - \phi)$ of their income.

4. When the poor decide to rebel, the rich can decide to extend the franchise by establishing democracy – this entails no cost. If the rich decide otherwise, revolution occurs. If democracy is offered by the rich, the poor decide whether or not to carry out the revolution.

5. Everyone consumes and the period ends.

Autocracy and democracy have three separate sub-categories:[4]

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[3]Democracy is a compromise between the poor and the rich that can be attained without cost. The rich do not suffer from the asset redistributions caused by a revolution and the poor benefits from increased taxation on the rich without incurring the cost of revolution. Therefore, when there is a potential threat of revolution, this compromise is an option for the rich to alleviate the threat.

[4]For a further description of the distinction between fully consolidated and semi-consolidated democracies, see Acemoglu and Robinson (2009, Ch. 7).

- Under *consolidated regimes*, the party in power (rich or poor) does not need to distribute any wealth to 'the others' (irrespective of whether the current state is P_H or P_L).

- Under *semi-consolidated regimes*, the party in power (rich or poor) needs to distribute some wealth to 'the others' to prevent usurpation of power by 'the others'.

- Under *unconsolidated regimes*, the party in power (rich or poor) cannot prevent 'the others' coming into power even after maximum possible redistribution.

2.2 Equilibrium

The poor and the rich can be treated as two separate agents that make the decision to mount a revolution or launch a coup. This game is a repeated game between the two groups. The equilibrium concept is that of Markov Perfect Equilibrium (MPE), where strategies depend only on the current state of the world and the prior actions taken within the same period. The state S is one of (P_j, A), (P_j, D) and (P_j, R), where A, D and R refers to autocracy, democracy and revolution, respectively.

The strategy of the rich is given by $\sigma^r(S|t^p)$. S is the state and t^p is the transfer decision taken by the poor when $S = (P_j, D)$. This strategy includes the actions of the rich, $\{\gamma, \varsigma, t^r\}$, where (i) $\gamma = 1$ implies the extension of the franchise (i.e., democratization), whereas $\gamma = 0$ implies no such action; (ii) $\varsigma = 1$ indicates that the rich have decided to launch a coup when $S = (P_j, D)$ and $\varsigma = 0$ indicates the rich have no such intention; (iii) finally, t^r is the redistribution set by the rich to the poor when $S = (P_i, A)$. The strategy of the poor is likewise denoted as $\sigma^p(S|\gamma, t^r)$, and depends on the state S and extension of the franchise in the case of autocracy. This leads to the strategy of the poor $\{\rho, t^p\}$: $\rho = 1$ indicates that there is a revolution and $\rho = 0$ implies that there is no revolution. If there is no revolution and the state is (P_j, D), the redistribution is set at t^p. If $\rho = 1$, a revolution has occurred and the state is (P_j, R). Transitions between the states are as follows: starting from (P_j, A), if there is a revolution or $\rho = 1$, the state is (P_j, R). After the revolution, the rich departs as a defeated group and resources are distributed equally among the poor. Since everyone has the same amount of resources, no conflict over distribution of resources can take place. If there is democatization or $\gamma = 1$, we arrive at (P_j, D). If we start from (P_j, D), mounting a coup or $\varsigma = 1$ will lead to (P_j, A).

A pure strategy MPE is a strategy combination denoted by $\{\hat{\sigma}^r(S|t^p),\ \hat{\sigma}^p(S|\gamma, t^r)\}$, such

that $\widehat{\sigma}^r$ are the best responses to each other at all possible states. More formally, consider the following Bellman equations:

$$V^r(S) = \max_{\sigma^r} \left\{ C^r \left(\widehat{\sigma}^p \left(S|\gamma, t^r \right), \sigma^r, S \right) + \beta \int V^r(S') d\Gamma \left(\widehat{\sigma}^p \left(S'|\gamma, t^r \right), \sigma^r, S \right) \right\}$$

$$V^p(S) = \max_{\sigma^p} \left\{ C^p \left(\sigma^p, \widehat{\sigma}^r \left(S|t^p \right), S \right) + \beta \int V^p(S') d\Gamma \left(\sigma^p, \widehat{\sigma}^r \left(S|t^p \right), S \right) \right\}$$

where the consumption of agents are a function of the state and strategies. $\Gamma(\cdot)$ indicates the probability distribution function of transition from the state S to the state S'. A pure strategy MPE is a strategy combination such that $\widehat{\sigma}^r \left(S|t^p \right)$ solves the first equation and $\widehat{\sigma}^p \left(S|\gamma, t^r \right)$ solves the second equation simultaneously.

3 Point-Source Resources

We consider a lumpy kind of resource such as oil or minerals. Exploration for this kind of resource requires capital-intensive technology. During periods of high prices (P_H), the value of the point-source resource is $P_H W$; under low prices, the value is $P_L W$. The rich (the minority) obtain a higher income, y^r, than the poor (the majority), y^p, from diffused resources (such as land) that are not related to the aforementioned resource. The rich have more diffused resources than the poor and are less numerous (only $\theta < \frac{1}{2}$ of the population). In this section, we allow the price of a point-source resource to vary but the price of the diffused resource is constant at unity.

The wealth associated with point resources is distributed by the group in power. If the rich are in power (under autocracy), the rich select the transfer $(1 - \lambda_j), j \in \{H$ for P_H, L for $P_L\}$ to the poor from the point-source resource (oil wealth). If the poor are in power (under democracy), the poor select the transfer $\lambda_j, j \in \{H$ for P_H, L for $P_L\}$ to the rich from the oil wealth. There is no taxation in this game. The reason for this is two-fold. First, resource-rich countries have a very low level of taxation. Second, we intend to illustrate that there could be other reasons for democratization (when resources are unearthed) that are not related to taxation, complementing the analysis of Dunning (2009).

In sum, we distinguish between two sources of income: one related to diffused resources (y^i)

and the other from transfer of point-source resource wealth ($P_j W$):

$$
\begin{aligned}
Y_t^r &= y^r + (1 - \lambda_j) P_j W \\
Y_t^p &= y^p + \lambda_j P_j W.
\end{aligned}
$$

The net benefit for the rich and the poor to mount a coup and a revolution are respectively as follows:

$$
\begin{aligned}
V^r(Coup|P_j) &= y^r + P_j W + \left\{ \beta \int V^r(S') d\Gamma \left(\widehat{\sigma}^p \left(S'|\gamma, t^r \right), \widehat{\sigma}^r, S \right) \right\} - (1 - \phi) y^r \\
V^p(Rev|P_j) &= \overline{y} + P_j W + \frac{\beta}{1 - \beta} [s(\overline{y} + P_H W) + (1 - s)(\overline{y} + P_L W)] - (1 - \mu) y^p
\end{aligned}
$$

The first two terms in the above equations constitute the total benefits over time and the last term represents the cost. Note that in both cases the cost is independent of the level of prices but the benefit is positively related.

3.1 Analysis

The expected *ex-ante* benefits of consolidated regimes (when no transfer is provided to the non-incumbent group; (denoted by superscript c) are:

$$
\begin{aligned}
EV^p(A^c) &= \frac{y^p}{1 - \beta} & (1) \\
EV^r(A^c) &= \frac{1}{1 - \beta} \left[s \left(y^r + P_H W \right) + (1 - s) \left(y^r + P_L W \right) \right] & (2) \\
EV^p(D^c) &= \frac{1}{1 - \beta} \left[s \left(y^p + P_H W \right) + (1 - s) \left(y^p + P_L W \right) \right] & (3) \\
EV^r(D^c) &= \frac{y^r}{1 - \beta} & (4)
\end{aligned}
$$

where β denotes the discount factor. Equations (1) and (2) show the payoffs for the poor majority and rich minority, respectively, that would apply if the society remains non-democratic all the time (i.e., no revolution) and the rich never redistribute wealth to the citizens and vice versa. Equations (3) and (4) mirror the previous payoffs in the opposing way, respectively, for the poor and rich when the society remains in democracy, without any significant reversals in the process.

The payoff to the poor from a revolution is carried out in the previous period (the poor redistribute the assets that include resource and non-resource wealth among themselves and the

rich obtain nothing) is:

$$EV^p(R) = \frac{1}{1-\beta} \left[s \left(\overline{y} + P_H W \right) + (1-s) \left(\overline{y} + P_L W \right) \right]$$

where $\overline{y} = \frac{\theta y^r + (1-\theta) y^p}{(1-\theta)}$ is the amount of diffused resources obtained by the poor after complete redistribution following the revolution. The benefit of mounting a coup by the rich is high when the price is high because there is more benefit from oil wealth. For simplicity, we assume that there is no benefit in opting for a coup by the rich when the price is low. For the rich, the maximum benefit from a coup can be obtained when a consolidated autocracy (A^c) is established from a consolidated democracy (D^c). If this maximum benefit is not profitable under the low-price state (P_L) then a coup is not a threat under P_L. We have:

$$V^r(\text{Coup}|P_L) \leq V^r(D^c|P_L) \tag{5}$$

$$y^r + P_L W + \beta EV^r(A^c) - (1-\phi)y^r \leq y^r + \beta EV^r(D^c) \tag{6}$$

In particular, we have the following assumption:

Assumption 1 *(Point-source resource): Under P_L, a coup is not profitable.*

Similarly, the benefit of revolution by the poor is high when the price is high because there is more benefit from oil wealth or the point-source resource. As above, we assume that there is no benefit in opting for a revolution by the poor when the price is low. For the poor, the maximum benefit from revolution can be obtained when the regime is a consolidated autocracy (A^c). If this maximum benefit is not profitable under P_L, then a revolution is not a threat under P_L. We have:

$$V^p(\text{Rev}|P_L) \leq V^p(A^c|P_L) \tag{7}$$

$$\overline{y} + P_L W + \beta EV^p(Rev) - (1-\mu)y^p \leq y^p + \beta EV^p(A^c) \tag{8}$$

We shall make a similar assumption:

Assumption 2 *(Point-source resource): Under P_L, a revolution is not profitable.*

When a revolution has occurred, the political system has reached its final stage and the system cannot be reversed. Since we are interested in a regime's instability, we use revolution

as a credible threat to prompt the rich to democratize rather than as an option (i.e., we want to eliminate the possibility of a revolution occurring). The lowest possible payoff under democracy is an unconsolidated one (D^u) – a regime that alternates between democracy and autocracy. If revolution is not profitable at all, even at P_H, then all other forms of democracy (consolidated or semi-consolidated) are better than mounting a revolution. Hence, extending the franchise can restrain revolutionary fervor:

$$V^p(\text{Rev}|P_H) = \overline{y} + P_H W + \beta E V^p(Rev) - (1-\mu)y^p \leq V^p(D^u|P_H) \qquad (9)$$

This leads us to the following assumption:

Assumption 3 *(Point-source resource): Even under P_H, the poor prefer an unconsolidated democracy over a revolution.*

The assumption that existing regimes are *not* under threat during low prices is not required for our results. This simplifies our calculations. In the case of point-source resources, the opportunity cost of switching regimes does not alter due to price volatility but the benefit does. This is why when the price is high, the rich (under democracy) have an incentive to mount a coup and the poor (under autocracy) have an incentive to rebel. When prices are high, semi-consolidated regimes transfer wealth to the non-incumbents to avoid a regime switch. Such pressure is non-existent when the price is low. Competing explanations of such fiscal procyclicality have already been mentioned. Recently, Endegnanew (2012) showed that countries experience a procyclical fiscal policy mainly as a result of weak institutions in good times, and combination of weak institutions and a lack of financial integration in bad times. A more unfortunate scenario arises when even the maximum amount of transfer cannot prevent a coup or a revolution. During high prices, nations make a transition from one regime to another (i.e., unconsolidated regimes are formed).

We assume that the economy begins with autocracy. However, depending on the cost of revolutions and coups, this may change. As mentioned earlier, it is during boom periods that the incumbent regime faces political challenge. Therefore, the subsequent analysis focuses upon periods when the price of natural resources is high.

Let $V^r(D^s|P_H)$ denote the payoff of the rich under a semi-consolidated democracy, where the rich can appropriate the resource only when the price is high. Let $V^r(A^c|P_H)$ be the payoff when the rich are in power and no redistribution takes place in favor of the poor. When

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$V^r(D^s|P_H) < V^r(A^c|P_H)$, the poor cannot prevent the rich from mounting a coup. We can calculate $\overline{\phi}$, the threshold where the poor can prevent a coup, by selecting $\lambda_H = 1, \lambda_L = 0$:

$$V^r(D^s|P_H) = y^r + P_H W + \frac{\beta}{1-\beta}[s(y^r + P_H W) + (1-s)y^r]$$

$$V^r(Coup|P_H) = y^r + P_H W + \frac{\beta}{1-\beta}[s(y^r + P_H W) + (1-s)(y^r + P_L W)] - (1-\overline{\phi})y^r$$

Solving the equality $V^r(D^s|P_H) = V^r(Coup|P_H)$ gives the threshold value $\overline{\phi}$ as:

$$\overline{\phi} = 1 - \frac{\beta}{1-\beta}\frac{(1-s)P_L W}{y^r} \tag{10}$$

For $\phi > \overline{\phi}$, the possibility of unconsolidated regimes arises, since the poor cannot prevent a coup even after the maximum level of redistribution.

Similarly, let $V^r(D^c|P_H)$ and $V^r(A^c|P_H)$ denote the payoffs of the rich under a consolidated democracy and a consolidated autocracy respectively, which also represent the lowest and highest possible payoffs for the rich. If a coup to switch from a consolidated democracy to a consolidated autocracy is not worthwhile, the threat of a coup is not binding. We can find the threshold $\widehat{\phi}$, where the poor can prevent a coup, by selecting $\lambda_H = 0, \lambda_L = 0$:

$$V^r(D^c|P_H) = y^r + \frac{\beta}{1-\beta}[s(y^r) + (1-s)y^r]$$

$$V^r(Coup|P_H) = y^r + P_H W + \frac{\beta}{1-\beta}[s(y^r + P_H W) + (1-s)(y^r + P_L W)] - (1-\widehat{\phi})y^r$$

Using $V^r(D^c|P_H) = V^r(Coup|P_H)$, we can determine $\widehat{\phi}$ such that:

$$\widehat{\phi} = 1 - \frac{P_H W}{y^r} - \frac{\beta}{1-\beta}\frac{\{sP_H + (1-s)P_L\}W}{y^r} \tag{11}$$

For $\phi < \widehat{\phi}$, the possibility of consolidated democracy is possible, since the threat of a coup is not working, even when there is no wealth being distributed to the rich.

Let $V^p(A^s|P_H)$ denote the payoff when the elite are in power but the resource wealth is consumed by the poor when the price is high. This is the best possible outcome for the poor under an autocracy. However, if this payoff is not enough, even though all of the resource has been distributed to the poor during boom periods, the threat of a revolution is still credible and democracy is inevitable. We can find the threshold $\overline{\mu}$, beyond which the rich cannot prevent a

revolution, by selecting the maximum possible redistribution, $1 - \lambda_H = 1, 1 - \lambda_L = 0$:

$$
\begin{aligned}
V^p(A^s|P_H) &= y^p + P_H W + \frac{\beta}{1-\beta}[s(y^p + P_H W) + (1-s)y^p] \\
V^p(Rev|P_H) &= \overline{y} + P_H W + \frac{\beta}{1-\beta}[s(\overline{y} + P_H W) + (1-s)(\overline{y} + P_L W)] - (1-\overline{\mu})y^p
\end{aligned}
$$

Setting $V^p(A^s|P_H) = V^p(Rev|P_H)$, we can calculate the value of $\overline{\mu}$:

$$
\overline{\mu} = 1 - \frac{1}{1-\beta}\frac{\overline{y} - y^p}{y^p} - \frac{\beta}{1-\beta}\frac{(1-s)P_L W}{y^p} \tag{12}
$$

For $\mu > \overline{\mu}$, the possibility of democratic regimes arises, since the poor cannot be prevented from revolting even after the maximum level of redistribution.

Finally, let $V^p(A^c|P_H)$ denote the lowest possible payoff for the poor, since no resource wealth is being redistributed to them. Therefore, when the outcome of the revolution $V^p(Rev|P_H)$ is less than the payoff under the consolidated autocracy $V^p(A^c|P_H)$, revolution is no longer a credible threat. We can find the threshold $\widehat{\mu}$, where the rich can prevent a revolution, by selecting $1 - \lambda_H = 0, 1 - \lambda_L = 0$:

$$
\begin{aligned}
V^p(Rev|P_H) &= \overline{y} + P_H W + \frac{\beta}{1-\beta}[s(\overline{y} + P_H W) + (1-s)(\overline{y} + P_L W)] - (1-\widehat{\mu})y^p \\
V^p(A^c|P_H) &= y^p + \frac{\beta}{1-\beta}y^p
\end{aligned}
$$

To derive the critical value of $\widehat{\mu}$, we use $V^p(Rev|P_H) = V^p(A^c|P_H)$:

$$
\widehat{\mu} = 1 - \frac{1}{1-\beta}\frac{\overline{y} - y^p}{y^p} - \frac{P_H W}{y^p} - \frac{\beta}{1-\beta}\frac{sP_H W + (1-s)P_L W}{y^p} \tag{13}
$$

For $\mu < \widehat{\mu}$, the possibility of a consolidated autocracy is possible, since the threat of revolution is not working, even when there is no wealth being distributed to the poor. The discussion above establishes the following proposition:

Proposition 1 *If the society starts with autocracy, (i) for $\mu \leq \widehat{\mu}$, it is A^c and (ii) for $\widehat{\mu} < \mu \leq \overline{\mu}$, it is A^s. If $\mu > \overline{\mu}$, (iii) for $\phi \leq \widehat{\phi}$, it is D^c; (iv) for $\widehat{\phi} < \phi \leq \overline{\phi}$, it is D^s and (v) for $\overline{\phi} < \phi$, it is D^u, A^u.*

The results are described in Figure 1. Proposition 1 states that for $\mu \leq \widehat{\mu}$, the cost of revolting is too high for the poor and hence dictatorship or non-democracy remains, even if

the rich do not distribute any wealth. This is consolidated autocracy (A^c). When the cost of revolution declines further or $\widehat{\mu} < \mu \leq \overline{\mu}$, the rich can still be in control but need to distribute the wealth from point-source resources to the poor. This is semi-consolidated autocracy (A^s).

Figure 1: Political regimes
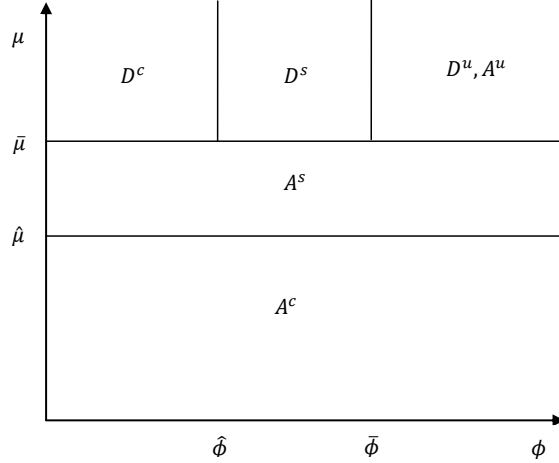
When $\mu > \overline{\mu}$, the threat of revolution is binding, and hence the rich must concede to democracy. For $\phi \leq \widehat{\phi}$, the option of a coup is too costly for the rich and the poor are not under threat at any time, even if the poor do not distribute any wealth to the rich, leading towards consolidated democracy (D^c). When the cost of mounting a coup declines further or $\widehat{\phi} < \phi \leq \overline{\phi}$, the poor need to distribute point-source resource wealth when the price is high. But in this case, the poor can avoid going back to a dictatorship by distributing oil revenue when the price is high, so that the rich do not find it profitable to mount a coup. This is semi-consolidated democracy (D^s).

If $\overline{\phi} < \phi$ and $\mu > \overline{\mu}$, the society is under the threat of coup (revolution) even if the poor (the rich) redistribute all the resource wealth to the rich (the poor). Thus, a coup (revolution) is unavoidable. During periods of recession, the incumbent regime is maintained; during booms, the regimes are switched: these are unconsolidated democracy (D^u) and unconsolidated autocracy (A^u). In a nutshell, the regimes are unstable and instability is caused by the low cost of coups and revolutions.

3.2 Comparative Statics

The previous section showed that the moment when the poor cannot (can) prevent the rich from mounting a coup depends on the threshold value $\overline{\phi}$ ($\widehat{\phi}$), and the moment when the rich cannot (can) prevent the poor from mounting a revolution depends on the threshold value $\overline{\mu}$ ($\widehat{\mu}$). We

now consider the comparative statics of political regimes with respect to wealth, inequality and price volatility.

3.2.1 The effect of resource wealth

Partially differentiating Equations (10)–(13) with respect to wealth (W) yields the following lemma:

Lemma 1 *An increase in W reduces $\overline{\phi}$, $\widehat{\phi}$, $\overline{\mu}$ and $\widehat{\mu}$.*

If $\widehat{\mu}$ declines, the possibility of maintaining a consolidated autocracy where the poor can be kept in check without any redistribution goes down. These regimes are more likely to become semi-consolidated ones. The possibility of semi-consolidated autocracy may rise or fall as both $\overline{\mu}$ and $\widehat{\mu}$ decline. Semi-consolidated autocracies are more likely to survive than consolidated ones, since there is more to redistribute with increased oil wealth (depicted in Figure 2).

Figure 2: The effect of an increase in point-source resources
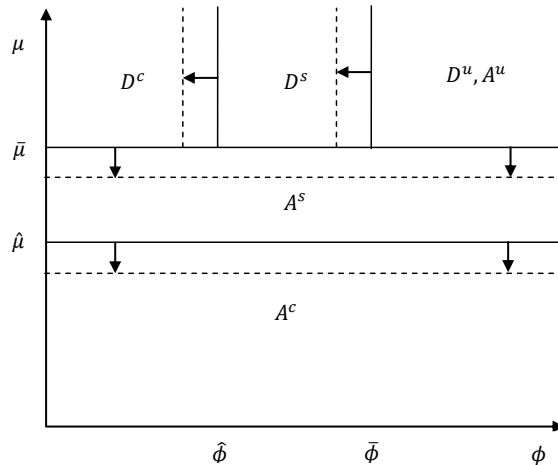
The effect on consolidated democracy is ambiguous, since both $\overline{\mu}$ and $\widehat{\phi}$ go down. With more oil wealth, both the poor and the rich are more likely to opt for a revolution or a coup. Thus, the possibility of democratizing increases but the stability of this cannot be ensured. The impact on semi-consolidated democracy remains ambiguous.

In summary, some of the regimes that were previously consolidated are forced to transfer wealth to the non-incumbents due to a resource boom. The instability of regimes increases unambiguously due to a fall in $\overline{\mu}$ and $\overline{\phi}$. An increase in wealth raises the benefit of both revolutions and coups. During low prices, no redistribution takes place, so both groups want to alter the regimes to capture this.

3.2.2 The effect of inequality

Inequality is captured by the term $\frac{\overline{y}-y^p}{y^p}$, where an increase in the numerator reflects greater income disparity between the rich and the poor. Partially differentiating Equations (12)–(13) with respect to the inequality term, we obtain the following lemma:

Lemma 2 *An increase in income inequality, $\frac{\overline{y}-y^p}{y^p}$, reduces $\overline{\mu}$ and $\widehat{\mu}$.*

An increase in the inequality of diffused resources produces more benefit from a revolution. Thus a nation is more likely to democratize. Both oil wealth and inequality in diffused resources can lead to a higher possibility of democracy. However, a more equal distribution will not have this impact on autocracy. We differ from Dunning (2009) in the sense that the main impact of Dunning came from taxation; here, there are no taxes. The beneficial impact comes from the increased revolutionary pressure from the poor to possess oil wealth and to capture more wealth from diffused resources (due to increased inequality). In the work of Dunning (2009), the mitigation of redistributive conflict dominates the elite's incentive to stage coups against democracy, where there is a high inequality in diffused resources.
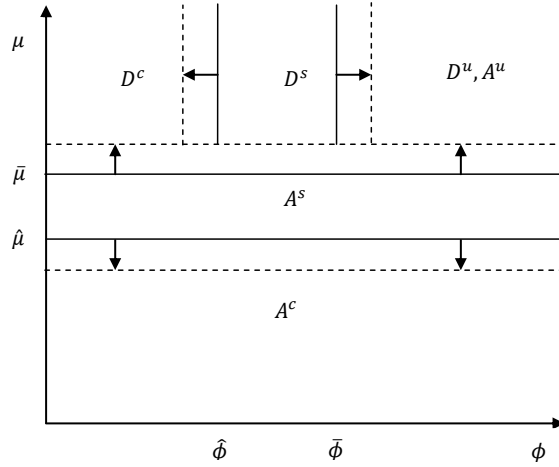
3.2.3 The effect of price volatility

Let $P_H = 1 + \nabla, P_L = 1 - \nabla$.

Lemma 3 *An increase in ∇ increases $\overline{\phi}$ and $\overline{\mu}$, but the effect on $\widehat{\phi}$ and $\widehat{\mu}$ is ambiguous.*

Proof. From Equation (10), we get $\frac{\partial \overline{\phi}}{\partial \nabla} = \frac{\beta}{1-\beta}\frac{(1-s)W}{y^r} > 0$. From Equation (12), we get $\frac{\partial \overline{\mu}}{\partial \nabla} = \frac{\beta}{1-\beta}\frac{(1-s)W}{y^p} > 0$. From Equation (11), we get $\frac{\partial \widehat{\phi}}{\partial \nabla} = -\frac{W}{y^r} - \frac{\beta W}{1-\beta}\frac{\{2s-1\}}{y^r} \gtrless 0$. From Equation (13), we get $\frac{\partial \widehat{\mu}}{\partial \nabla} = -\frac{W}{y^p} - \frac{\beta W}{1-\beta}\frac{\{2s-1\}}{y^p} \gtrless 0$. ∎

Volatility implies higher prices during good times and lower prices during bad times. The non-incumbent group at this threshold level receives the maximum amount of transfer from the incumbent group. By mounting a coup or a revolution, the main benefit is acquiring resources during times of low prices. As the price declines further during a recession, this benefit diminishes as well. This is reflected by a rise in $\overline{\phi}$ and $\overline{\mu}$ (i.e., the incumbents are more likely to continue through redistribution). Therefore, semi-consolidated regimes are likely to rise with an increase in volatility and we have the situation shown in Figure 3.

Figure 3: The effect of an increase in price volatility

For consolidated regimes, the effect of price volatility depends critically on the value of s, the frequency of high prices. If high price periods are frequent (high s) and there is no redistribution (consolidated regimes), the benefit of revolutions by the poor and coups by the rich increases (since the *ex-ante* benefits $W^r(A^c)$ and $W^p(D^c)$ are greater). When the high price state is less frequent (low s), the benefit is less (as $W^r(A^c)$ and $W^p(D^c)$ are lower).

For $s \geq 0.5$, $\frac{\partial \widehat{\phi}}{\partial \bigtriangledown} < 0$ and $\frac{\partial \widehat{\mu}}{\partial \bigtriangledown} < 0$, implying that an increase in volatility challenges the stability of consolidated regimes. Hence, these regimes are forced to transfer wealth to the non-incumbent. Threats occur mainly during periods with high prices and, thanks to higher volatility, when the incumbent group has more resources to redistribute. Hence, semi-consolidated regimes become more numerous and the number of consolidated ones declines. Under a consolidated regime, there is never any effective coup threat, whereas semi-consolidated regimes live under the shadow of a coup. A semi-consolidated regime can prevent this threat by changing the level of redistribution among its citizens.

Summarizing this analysis, we have:

Proposition 2 *In economies that are rich in natural resources:*

(i) Resource booms lead to more procyclical transfers and regime instability;

(ii) More unequal nations have greater pressure for democratization;

(iii) Increased price volatility leads to an increase in semi-consolidated regimes.

When a significant amount of the point-source resource is extracted, the incumbent regime is under pressure if the price is high. Therefore, incumbents need to transfer wealth during these periods. Sometimes, the maximum possible transfer may not ensure the continuation of

the regime. Thus instability ensues. Inequality in the non-resource sector makes the benefit of revolution more desirable, since complete redistribution will yield more than the mere one-time redistribution via transfers. That is why more inequality inevitably leads to greater pressure for democratization.

It is important to analyze the effect of the co-existence of natural resource wealth and price volatility. Resource-rich nations have high W, which enhances political instability by inducing a revolution or a coup. On the other hand, if there is a concomitant increase in ∇ or price volatility, the incumbent group is able to maintain the current political regime through redistribution. In short, because of increased price volatility, we observe the prevalence of semi-consolidated regimes in resource-rich nations.

Nations that are more unequal in diffused resource wealth (or the societies that were unequal before the resource was discovered) are more likely to make a democratic transition after the point-source resource is discovered. The existence of a natural resource gives an additional incentive for the poor to mount a revolution. The rich are less likely to contain this motive through redistribution. Unlike Dunning (2009), we observe this phenomenon in our model without the existence of tax.

Increased price volatility in an unequal society with an abundance of natural resources, on the other hand, can prevent the transition towards democracy from autocracy, as the incumbent group is more likely to stay in power through effective redistribution. Therefore, we witness a rise in semi-consolidated regimes.

4 Diffused Resource

Unlike natural resources such as oil, discussed in the previous section, diffused resources (e.g, agricultural commodities) require *labor-intensive technology* to appropriate their production. Commodities such as coffee and cocoa fall into this category. In this section, we examine the role of exogenous movements in the world prices of diffused resources on the political economy of nations that are rich in these resources.

The resource wealth of the poor and the rich entirely depends upon diffused resources, as there is no point-source resource in this model. The price level of the diffused resource varies $\{P_h, P_l\}$ and the rich possess more of the resource than the poor ($y^r > y^p$). The case of diffused resources differs from that of point-source resources in two important ways in our context:

- Redistribution from one group to the other takes place via distortionary taxes on income as opposed to pure transfers from the resource wealth as in point-source resources. Under autocracy, the rich select the tax $\tau_j, j \in \{h \text{ for } P_h, l \text{ for } P_l\}$; under democracy, the poor set the tax rate on income, $\tau_j, j \in \{h \text{ for } P_h, l \text{ for } P_l\}$.

- Unlike point-source resources, the opportunity cost of mounting a coup ($[1 - \phi]P_j y^r$) or revolution ($[1 - \mu]P_j y^p$) depends on prices of the resource itself. We maintain the assumption that democracy can be attained without cost.

Assume the distortionary effect of tax to be $c(\tau)$. Individuals, regardless of their income, face the same tax rate and receive the same lump-sum transfer. Because of this, the most preferred tax rate for the rich is 0 while the maximum possible tax for the poor is determined as follows:

$$\tau_m = \text{argmax} \left\{(1-\tau)y^p + (\tau - c(\tau))y^a\right\} \tag{14}$$

$$c'(\tau_m) = \frac{y^a - y^p}{y^a} = 1 - \frac{y^p}{y^a} \tag{15}$$

where m denotes the median, as the median person is a poor individual and a denotes the average.

The poor is the net gainer while the rich is the net loser. Hence, the rich prefer a lower tax burden and the poor prefer the opposite. $\delta(\tau)y^p$ and $-\lambda(\tau))y^r$ are the net transfers received by the poor and the rich at the tax rate τ. The incomes of the two groups after taxes and transfers are:

$$Y^p = (1 + \delta(\tau_j))P_j \ y^p \tag{16}$$

$$Y^r = (1 - \lambda(\tau_j))P_j y^r \tag{17}$$

The net benefit for the rich and the poor to mount a coup and a revolution are respectively as follows:

$$V^r(Coup|P_j) = (1 - \lambda(\widehat{\tau}^r)) P_j y^r + \left\{\beta \int V^r(S')d\Gamma\left(\widehat{\sigma}^p\left(S'|\gamma, t^r\right), \widehat{\sigma}^r, S\right)\right\} - (1 - \phi)P_j y^{r5}$$

$$V^p(Rev|P_j) = P_j \bar{y} + \frac{\beta}{1-\beta}\bar{y}\left[sP_h + (1-s)P_l\right] - (1 - \mu)P_j y^p$$

The first two terms in the above equations constitute the total benefits over time and the last

term represents the cost. Note that in both cases, unlike the previous case, the cost and the benefit depend on the price level.

When the cost of switching regime is high for both groups, regimes cannot be switched if prices are high, as the opportunity cost is also high. This will happen when the maximum benefit under P_h does not induce the rich to mount a coup:

$$
\begin{aligned}
V^r(\text{Coup}|P_h) &= P_h y^r + \beta EV^r(A^c) - (1 - \phi)P_h y^r \leq \\
V^r(D^c|P_h) &= (1 - \lambda(\tau_m))\, P_h y^r + \beta EV^r(D^c)
\end{aligned}
$$

Similarly, the situation when the maximum benefit under P_h is not as profitable for the poor as rebelling under P_h is:

$$
\begin{aligned}
V^p(\text{Rev}|P_h) &= P_h \overline{y} + \beta EV^p(R) - (1 - \mu)P_h y^p \leq \\
V^p(A^c|P_h) &= P_h y^p + \beta EV^p(A^c)
\end{aligned}
$$

This will occur when $(1 - \phi)$ and $(1 - \mu)$ are sufficiently high. Otherwise, coups and revolutions could be profitable when prices are high. We can state the same conditions above when the price is low. The following proposition summarizes this discussion:

Proposition 3 *Under diffused resources:*
(i) Regimes are under pressure when prices are low if the cost of switching regimes is high.
(ii) Regimes are under pressure when prices are high if the cost of switching regimes is low.

Under diffused resources, higher prices benefit the poor directly, as their income goes up. Thus the opportunity cost of revolution also increases. When the cost of a revolution (coup) is very high or μ (ϕ for the rich) is very low, the threat from the poor (rich) is more likely when prices are lower. That is why prevailing regimes become under pressure when prices are *low* not high. For regimes that are semi-consolidated, transfers to the non-incumbent group are likely when prices are lower. For unconsolidated regimes, turmoil will start at low prices not high prices. On the other hand, if the costs of switching regimes are low (for high values of μ or ϕ), the net benefit from switching regimes is high when prices are higher.

Unlike point-source resources, in the case of diffused resources, the prevailing regime could be under threat during low prices. With point-source resources, the increase in price raises the benefit but does not affect the cost of switching regimes. This finding agrees with the

empirical findings of Dube and Vargas (2013), who showed that price shocks affect conflict in opposite directions depending on the factor intensity of the commodity. Using a unique violence-related data-set from Colombia, Dube and Vargas (2013) found that a *fall* in the price of coffee (which is labor-intensive) increases violence disproportionately in municipalities growing more coffee. However, a *rise* in the price of oil (which is capital-intensive) intensifies attacks disproportionately in municipalities that produce more of these natural resources.

4.1 Analysis

The game is the same as before, except tax is used as a transfer mechanism. The expected *ex-ante* benefits of consolidated regimes are:

$$EV^p(A^c) = \frac{y^p \left[sP_h + (1-s)P_l\right]}{1-\beta} \tag{18}$$

$$EV^r(A^c) = \frac{y^r \left[sP_h + (1-s)P_l\right]}{1-\beta} \tag{19}$$

$$EV^p(D^c) = \frac{(1+\delta\left(\tau_m\right))y^p \left[sP_h + (1-s)P_l\right]}{1-\beta} \tag{20}$$

$$EV^r(D^c) = \frac{(1-\lambda\left(\tau_m\right))y^r \left[sP_h + (1-s)P_l\right]}{1-\beta} \tag{21}$$

The benefit after a revolution has been carried out in the previous period is:

$$EV^p(R) = \frac{\overline{y}\left[sP_h + (1-s)P_l\right]}{1-\beta} \tag{22}$$

$$\overline{y} = \frac{\theta y^r + (1-\theta)y^p}{1-\theta} \tag{23}$$

Following Acemoglu and Robinson (2009), we assume that costs of revolutions and coups to obey the following properties:

- Under P_h, a coup is not profitable.

- Under P_h, a revolution is not profitable.

- Even under P_h, the poor prefer unconsolidated democracy over revolution.

A very important difference from the lumpy kind of resource is that the threat of changing the regime exists during low prices when the opportunity cost of doing so is low. In the case of point-source resources, the increase in price raises the benefit but does not affect the cost of switching regimes.

We can fine $\overline{\phi}$, where the poor can prevent a coup by selecting $\tau_h = \tau_m, \tau_l = 0$. We get the following expression:

$$\overline{\phi} = 1 - \frac{\beta s \lambda(\tau_m)}{1 - \beta} \frac{P_h}{P_l}. \tag{24}$$

For $\phi > \overline{\phi}$, the possibility of unconsolidated regimes arises since the poor cannot prevent a coup even after the maximum level of redistribution.

We can also find $\widehat{\phi}$, where the poor can prevent a coup by selecting $\tau_h = \tau_m = \tau_l$. We get the following expression:

$$\widehat{\phi} = 1 - \lambda(\tau_m) - \frac{\beta}{1 - \beta} \frac{\{sP_h + (1 - s)P_l\}\lambda(\tau_m)}{P_l} \tag{25}$$

For $\phi < \widehat{\phi}$, the possibility of consolidated democracy is possible, since the coup threat is not working even when no wealth is distributed to the rich.

Likewise we can find $\overline{\mu}$, where the rich can prevent a revolution by selecting $\tau_m = \tau_l$. We get the following expression:

$$\overline{\mu} = 2 - \frac{\overline{y}}{y^p} - \frac{\beta}{1 - \beta} \frac{[\{sP_h + (1 - s)P_l\}(\overline{y} - y^p) - (1 - s)P_l\delta(\tau_m) y^p]}{P_l y^p} \tag{26}$$

For $\mu > \overline{\mu}$, the possibility of democratic regimes arises since the poor cannot be prevented from revolting even after the maximum level of redistribution.

We can also find $\widehat{\mu}$, where the rich can prevent a revolution by selecting $\tau_l = 0$. We get the following expression:

$$\widehat{\mu} = 2 - \frac{\overline{y}}{y^p} - \frac{\beta}{1 - \beta} \frac{\overline{y} - y^p}{y^p} \frac{[sP_h + (1 - s)P_l]}{P_l} \tag{27}$$

For $\mu < \widehat{\mu}$, the possibility of consolidated autocracy is possible since, the threat of a revolution is not working even when no wealth is distributed to the poor.

4.2 Comparative Statics

4.2.1 The effect of a resource boom

Suppose that output yield of both the rich and the poor goes up by a certain percentage such that the tax rate remains constant:

$$c'(\tau_m) = \frac{y^a - y^p}{y^a} = 1 - \frac{y^p}{y^a} \tag{28}$$

Lemma 4 *An increase in resources has no impact on $\overline{\overline{\phi}}, \widehat{\phi}, \overline{\mu}$ and $\widehat{\mu}$.*

A resource boom has no impact on the rich and provides no incentives for the poor to opt for a revolution. A rise in output raises the opportunity cost for the rich as well. Therefore, the rich decide whether to opt for a coup or not based on the tax rate only, not the absolute level of income. As long as the tax rate remains the same, the incentive for a coup does not alter. The poor also cannot get more out of a revolution with redistribution, since the opportunity cost has gone up as well. For the poor, the opportunity cost measured in $\frac{\overline{y}}{y^p}$ is the same. Unlike point-source resources, this kind of resource boom affects the opportunity cost as well. For the rich and the poor, a resource boom (proportionately) affects both the cost and benefit by the same extent and hence there is no net impact.

4.2.2 The effect of inequality

When inequality goes up, the income of the poor becomes even lower than the national average; y^p/y^a goes down for a given y^a. The maximum possible tax rate goes up, since:

$$c'(\tau_m) = \frac{y^a - y^p}{y^a} = 1 - \frac{y^p}{y^a}; \ \frac{\partial \tau_m}{\partial \frac{y^p}{y^a}} = -\frac{1}{c''(\tau_m)} < 0 \tag{29}$$

Lemma 5 *An increase in inequality reduces $\overline{\overline{\phi}}, \ \widehat{\phi}, \ \overline{\mu}$ and $\widehat{\mu}$.*

Inequality indirectly reduces $\overline{\overline{\phi}}$ and $\widehat{\phi}$ by increasing the maximum possible tax rate. With a rise in inequality, the rich have to redistribute if there is a democracy. Thus, the rich are more eager to prevent it. There are three ways $\overline{\mu}$ can be affected. First of all, there is more to gain because the rich have more assets. Secondly, the poor have a lower opportunity cost of revolution, since y^p has gone down. Both these effects lower the value of $\overline{\mu}$, creating more revolutionary pressure. However, an increase in inequality leads to a rise in τ_m or tax returns for the poor $\delta(\tau_m)$. This last effect negates the other two to some extent. The effect on $\widehat{\mu}$ is straightforward: it goes down as the poor gain from more redistribution and a lower opportunity cost of revolution. In short, this will lead to instability.

### 4.2.3 The effect of price volatility

Assume that $P_h = 1 + \nabla, \ P_l = 1 - \nabla$.

Lemma 6 *Price volatility reduces $\overline{\overline{\phi}}, \ \widehat{\phi}, \ \overline{\mu}$ and $\widehat{\mu}$.*

Proof: From Equation (24), we get $\frac{\partial \overline{\phi}}{\partial \nabla} = -\frac{\beta s \tau_m}{1-\beta} \frac{2}{(1-\nabla)^2} < 0$. From Equation (25), we get $\frac{\partial \widehat{\phi}}{\partial \nabla} = -\frac{\beta s \tau_m}{1-\beta} \frac{2}{(1-\nabla)^2} < 0$. From Equation (26), we get $\frac{\partial \overline{\mu}}{\partial \nabla} = -\frac{\beta s}{1-\beta} \frac{\overline{y}-y^p}{y^p} \frac{2}{(1-\nabla)^2} < 0$. From Equation (27), we get $\frac{\partial \widehat{\mu}}{\partial \nabla} = -\frac{\beta s}{1-\beta} \frac{\overline{y}-y^p}{y^p} \frac{2}{(1-\nabla)^2} < 0$. ∎

Price volatility reduces the opportunity cost of revolution when the price is low but increases it when the price is high. This impact does not exist in the case of lumpy resources where the cost of a regime change is invariant with prices. Since both revolutions and coups are carried out during low prices, they become more likely events under volatility. Furthermore, during low prices, the group in power does not redistribute, since the threats are not at work. With high volatility, this benefit increases. Thus the benefit of capturing power during low prices also increases. The effects of both price volatility and of inequality are the same; these are shown in Figure 4.

Figure 4: The effect of price volatility and inequality in the case of diffused resources
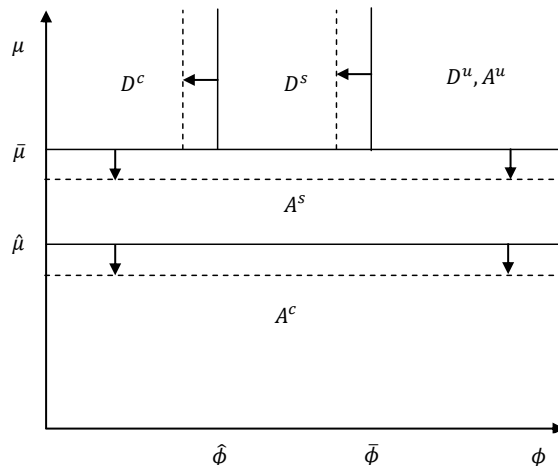
What is the net impact? Unconsolidated regimes rise, as the threshold level for the threat of revolutions and coups have increased. The impact on semi-consolidated regimes is nil, as the thresholds of semi-consolidated and unconsolidated regimes increase at the same rate. Consolidated regimes are therefore less likely and overall political instability increases.

Summarizing this analysis, we have:

Proposition 4 *In economies that are rich in diffused resources:*

(i) Resource booms do not increase instability;

(ii) More unequal nations face more political instability; and

(iii) Increased price volatility leads to an increase in unconsolidated regimes.

A proportionate boom in diffused resources does not intensify the pressure of revolution. The incentive for the rich to mount a coup does not change either. Therefore, a resource boom does not affect either democracies or autocracies. Inequality in diffused resources attract both revolutions and coups. The poor want more redistribution and the threat of revolution is more likely to be binding. The rich, on the other hand, are opposed to redistribution, as the burden of taxation would increase. These conflicting incentives lead to political instability.

Increased price volatility decreases the opportunity cost of a revolution during recessions. Therefore, both coups and revolutions become more probable events and political instability is enhanced. This, however, presupposes that regimes are under threat when prices are low. If regimes are under threat when prices are high, the reverse occurs where political instability is reduced, due to more fluctuations in prices.

In democracy, when prices are high, the poor or the incumbent group redistribute wealth as much as possible. During low prices, as the threat of a coup is credible, less redistribution takes place under semi-consolidated democracy. Under semi-consolidated autocracy, the reverse happens. Hence both pro-cyclical and counter-cyclical policies are plausible, depending on the political regime.

Unconsolidated democracies witness the maximum possible redistribution during boom periods when the poor are in power but bust periods lead to the rich being in power and less redistribution incurs, and we witness procyclical fiscal policy. Unconsolidated autocracies observe the complete opposite and less redistribution is expected during boom periods in our model.

5 Empirical Implications

Two opposing views exist regarding political instability and price shocks. The first argument considers the rise in price to be an increase in resource rents that induces the political non-incumbent to challenge the existing regime. In other words, political transition takes place when the price is high. The first model (i.e., point-source resources) represents this perspective, as the opportunity cost does not change but the benefit of capturing resource rents increases in boom periods. The second view considers the impact of price shocks on the incentive of individuals to rebel. In the case of diffused resources, a decline in commodity prices lowers the opportunity cost and hence conflict becomes more probable. In the second model (i.e., diffused

resources), when the cost of switching the existing regime is high, the effect of opportunity cost becomes more prominent than that of resource rents, and political transition is likely during bust periods – this corroborates with the second view.

According to the first model, if the dependent variable is political stability, the impact of a resource boom in point-source resources will be negative and that of price volatility is positive, as more semi-consolidated regimes emerge. This prediction is consistent with the empirical evidence of high fiscal volatility in these economies. During boom periods, public expenditure rises due to popular demand, while it falls when the bust period enters into the picture.

Most oil-rich nations in the Middle East are autocratic regimes. Chaudhry (1997) discusses how the discovery of oil led to a dramatic shift in the political landscape in the case of Saudi Arabia. According to Ross (2001, 2004), this characteristic is not exclusive to this region and extends to other mineral-rich nations as well. Even though our model does not predict the prevalence of autocracy specifically, our model predicts that the present incumbent can survive via redistributing wealth to the non-incumbent during boom periods when the political pressure is most intense. Indeed, when grassroots protests broke out across the Arab region in early 2011 (the so-called "Arab Spring"), the Gulf Arab monarchies ramped up spending on salaries, housing and other targeted public services to avoid potential social unrest at home.[6] Therefore, if the initial regime is autocracy, we will witness the prevalence of semi-consolidated autocracies.

The existence of greater inequality (prior to the discovery of point-source resources) induces democratization, as the benefit of a revolution increases. Despite the overwhelming evidence of autocratic regimes in mineral-rich nations, the existence of oil has led to democratization in Latin America (Dunning, 2009). In contrast to the Middle East, Latin American countries are characterized by widespread inequality.[7] This phenomenon is predicted by the present framework. More importantly, democratization occurs when the price is high. In Venezuela, increased oil revenues established democracy in 1958; while during the 1973–74 OPEC crisis, this democratization was consolidated. In the late 1970s, when the oil price was at its peak, also witnessed the democratization of two other Latin American nations rich in oil: Bolivia

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[6]See Gause (2013) for a helpful discussion on the monarchial longevity of the Gulf Arab states in the wake of the Arab Spring revolt.

[7]In fact, it is the high inequality in the Latin America that has helped the region to experience democracy in periods of high oil rents. As Latin American countries are far less dependent on natural resources compared with many states in the Middle East, the pressure on the rich for the redistribution of non-resource income may have tipped the balance in favor of the democratizing effect of natural resource rents. See Sinnott et al. (2010, p. 35–36) for further discussion.

and Ecuador (Dunning, 2009). This transition is consistent with our framework, where the incumbent groups is most vulnerable during boom periods.

Most developing nations export commodities and income is related to price shocks (Deaton, 1999). Developing countries also experience more volatility than industrialized countries (Talvi and Végh, 2005). In this context, the second model can be more broadly interpreted to represent nations that experience enormous price shocks and where revenue is diffused across the society and is not appropriated by the state (i.e., these nations do not have a large amount of point-source resources). Low prices reflect bust periods, while high prices refer to boom periods. In the diffused resources model, political instability is positively related to both price volatility and income inequality.

In these nations, according to our framework, political transition is expected to take place during bust periods where the opportunity cost of mounting a coup or opting for a rebellion is lower. Haggard and Kaufman (1995) have shown that many transitions to democracy in Latin America happened during economic downturns. In particular, Argentina, Brazil, Peru, Uruguay and the Philippines experienced democratic transitions following severe recessions. Unfavorable economic conditions mobilized opposition movements in these economies (Haggard and Kaufman, 1995), a prediction that is broadly consistent with the opportunity cost thesis presented in our second model. Likewise, many coups also occur during recessions according to Gasiorowski (1995) and Cheibub et al. (1996).

In the current set-up, for nations rich in diffused resources, the only form of fiscal expenditure is the redistribution of wealth from the rich to the poor. Given this framework, it is expected that fiscal expenditure will rise during boom periods under a democracy and expenditure will fall under a autocracy. Due to severe frosts in Brazil, the major coffee producer, the coffee price in the international market rose during 1976–78. This boom had an enormous impact on the other coffee-producing nations: Cameroon, Colombia, Costa Rica, Cote d'Ivoire and Kenya. Except for Colombia, where most of the gain accrued to the producers, the governments in these nations experienced a surge in revenue. Even though fiscal policies differed somewhat across nations (Little et al. 1993), the prevalence of autocracy and democracy did not make a difference.[8] Future work should incorporate other aspects of fiscal policy to explain the differences.

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[8]Colombia and Costa Rica were democracies while the rest were autocracies. In Cameroon and Colombia, the prevalent governments were more prudent in public spending than those in Costa Rica and Cote d'Ivoire. In Kenya, the proceeds accrued mostly to private producers but the government revenue boomed as well and public consumption increased more than private consumption.

Our paper only focuses upon MPE strategies. This particular equilibrium dictates that both the incumbent and the non-incumbent rely upon myopic strategies or take actions based on the current state of the world. Instead, if the players adopt more forward-looking strategies or base their decisions not only on the current state but also on history, the outcomes will be different. In particular, more political stability and less fiscal volatility are expected. Countries such as Botswana, where fiscal policy is less affected by such price swings, are examples of such an equilibrium.

Revolutions and coups inflict a significant cost in our analysis. Therefore, neither coups nor revolutions are profitable in bust (boom) periods in the case of point-source (diffused) resources. In reality, coups and revolutions could be relatively costless. If coups are relatively costless, the threat of a coup will be maintained regardless of the economic circumstances. Under these circumstances, if revolutions are profitable only in boom (bust) periods, the democratic transition will take place during boom (bust) periods, while bust (boom) periods will witness autocracy. Likewise, if coups are prohibitively costly under certain economic circumstances, whereas revolutions are always feasible, the nation will oscillate between democracy and autocracy.

6 Conclusions

In this paper, we investigate the interplay between various political equilibria and commodity price volatility in resource-rich countries. We develop a simple model that suggests that when a boom in mineral-based resources occurs, fiscal transfers tend to be procyclical and the prevailing political system faces increasing pressure from opponents. As resource wealth is held by the politically powerful rich, higher income inequality creates incentives for the rich to resist the introduction of democracy by the poor. Furthermore, higher price volatility leads to more semi-consolidated regimes, which live under the shadow of a coup. The extended version of our theoretical model allows us to study the political consequences of resource booms and busts under alternative types of resources. Thus, unlike point-source mineral resources (which are capital-intensive), societies with diffused resources (which are labor-intensive) face more political instability when the world prices of commodities (e.g., coffee) are low rather than when prices are high. This is because when the export prices of diffused commodities are low, the poor majority have a low opportunity cost of mounting a revolution against the incumbent elite.

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