International Journal of Development and Conflict
7(2017) 65–80

PRICE SHOCKS AND POLITICAL CONFLICT

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How would the recent decline in oil prices affect the political equilibrium in resource exporting countries? This paper investigates the impact of negative price shocks on the emergence of conflict or on maintaining a political bargain in these countries. Conflict is a threat of revolution conducted by ruled citizens against oppressing elites. The probability of a successful revolution depends on the revolution effort exerted by citizens and oppression effort exerted by elites. It is also affected by the level of income inequality. To avoid conflict, citizens and elites bargain to determine an optimal transfer rate from resource rents. Negative price shocks reduce the probability of conflict and increase the probability of a successful bargain between citizens and elites. It also reduces the cost of transfers from elites to citizens. Negative price shocks reduce citizens' welfare. Results of the empirical analysis support the findings of the model. Also, it supports the hypothesis that better institutional quality reduces the effect of price shocks.

Keywords: political conflict, rent sharing, natural resources, price shocks.

JEL Classification: D74; Q32.

1. Introduction

The theoretical literature on conflict in resource dependent economies does not address how external factors affect the emergence of conflict (Torvik 2002, Grossman and Mendoza 2003, van der Ploeg 2010). Meanwhile, several empirical studies pointed out the effect of external shocks on the emergence of violent and armed conflict (Collier and Hoeffler 1998, Miguel *et al.* 2004, Arezki and Brückner 2011). Other studies, however, suggest that these shocks may not have such effect (Fearon 2005, Dube and Vargas 2013, Bazzi and Blattman 2014). This begs the interesting question that has not been theoretically analyzed yet: what are the effects of price shocks on political conflicts? Do they induce a violent type of conflict or do they lead to a political settlement between conflicting parties? Addressing these questions is of growing interest given the recent downturn in oil prices and particularly given that most resource dependent economies are non-democracies and are prone to political conflict.

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The other interesting question is why does conflict take place in some countries and not others. The experience of conflict and civil revolutions is frequent in some resource rich countries in Africa such as Ivory Coast, Nigeria and more recently Libya and Iraq. In contrast, the Persian Gulf countries did not go through any episode of conflict in its recent history. This is potentially due to a different institutional setting and political landscape.[1] This suggests that there are two possible outcomes to resolve political conflict either through a costly armed conflict or through a process of bargaining and negotiations among political players.

This paper addresses how external price shocks affect internal transfer policies and probability of emergence of conflict in resource exporting countries. It particularly focuses on negative price shocks for two reasons. First, the fall in resource prices limits the ability of the state in maintaining its level of expenditure and handouts to it citizens.[2] Second, the current downward pressure on resource prices seems, in the view of diverse projections, to remain at the current historical lows.

The resource exporting economy is modeled as an economy where there are two groups of agents: elites and citizens. Elites have well defined and well enforced property rights over extraction of the resource good. Citizens, on the other hand, work in a non-resource sector and earn a fixed wage. Both sectors are not interdependent.[3] The first stage of the game starts with the two players simultaneously determining their optimal efforts in the case of conflict. Citizens determine the portion of their wage income that they would sacrifice in a revolution effort. Elites, on the other hand, determine the share of the resource rents that they would allocate as an oppression effort. The probability of citizens wining the conflict increases with the revolution effort and decreases with the oppression effort. The actual conflict does not take place during this stage. In the second stage, and given the choices made in the first stage, both players bargain over an optimal transfer rate from resource rents. The net amount of transfer that citizens would receive depends on the economy's institutional quality. The lower the quality of institutions is, the higher the amount of transfer leakage due to corruption or administrative cost. After that, each player determines whether to proceed with the peaceful bargain or to exert the optimal conflict choices determined in the first period. For the bargaining equilibrium to occur, the transfer rate and the corresponding income for each player must be higher than expected income in the case of conflict. In other words, this equilibrium would only be reached if it is incentive compatible for both citizens and elites. The equilibrium in this scenario is defined by the optimal transfer rate resulting from the Nash bargaining problem. If this is not the case, the conflict equilibrium would take place which is defined by the optimal choices of revolution and oppression efforts. The paper analyzes the effects of the price shocks on the incentive compatibility conditions for both parties.

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[1] Events in Bahrain during 2011 may be considered an exception to this statement. However, one may argue that the conflict there did not evolve in a full scale revolution or civil conflict as the other cases in Africa.

[2] Positive price shocks would have the opposite effect.

[3] This paper focuses exclusively on price shocks of natural resources such as oil and minerals not on price shocks of other commodities. In the latter case, there could be linkages between the two sectors and price shocks would affect the incomes of both types of players.

The model suggests three main results. First, negative price shocks play an important role in maintaining the bargaining equilibrium through different channels. Negative price shocks reduce income inequality because they reduce resource rents that are exclusively appropriated to the ruling elites. The decrease in inequality effects the incentives of both elites and citizens. For the elites, the cost of sharing resource rents is lessened due to the decrease in the optimal transfer rate and the increase of the oppression effort. For citizens, the benefit of conflict, its probability of success and its expected prize are all reduced. Second, the model suggests that institutional quality influences how price shocks affect political equilibrium. A good institutional setting does not generate any leakage in the transfers from elites to citizens. Hence, it maximizes the benefits that citizens receive from the bargaining process with elites. This renders conflict less attractive. On the other hand, substantial leakage in transfer due to low institutional quality reduces the changes of a successful bargain and renders conflict more attractive. At the extreme case, an institutional setting that leaks all transfers would result in conflict regardless of the external effects.[4] The empirical analysis using oil price shocks and institutional quality indices as explanatory variables for conflict supports these two results. Negative price shocks reduce the chances of an onset of conflict. Higher institutional quality reduces the effect of price shocks on the emergence of conflict.

Lastly, citizens are worse off due to a negative price shocks. In the case of the successful bargain, a negative price shock reduces the transfer rate from elites to citizens and reduces the resource rents. In the case of conflict, the shock reduces the citizens efforts into the conflict and thereby reducing the probability of a successful revolution. This leads to lower income in both cases.

The paper contributes to the literature on conflict in resource dependent economies by introducing three new elements. The first is the notion that distribution of property rights do affect the emergence of conflict. Models that studied the impact of resource good price shocks on the emergence of conflict used weakly enforced or imperfectly specified property rights as the primary motive for conflict. However, the existence of well enforced and well defined property rights is not a sufficient condition to make an economy immune from conflict. In many resource dependent economies, property rights are well defined and enforced to a certain group within the economy. It is also typical that this group is either well tied to the ruling class or holding political power. The prime question in these models was whether gains of trade would increase or decrease the cost of conflict. Also, whether gains of trade are sufficient to overcome the costly conflict and its impact on national welfare. On one hand, trade activities increase the incentive for conflict due to a bigger prize. Alternatively, trade would increase the benefits of peace hence reducing conflict activities. Welfare implications are indeed different depending on which effect prevails and depending on the price level of the contested resource (Skaperdas and Syropoulos 2002, Garfinkel *et al.* 2008, Garfinkel and Syropoulos 2015).[5] In this paper, conflict arises

[4] This finding is in line with the literature on the institutional setting in resource endowed economies (Kimenyi and Mbaku 1993, Mehlum *et al.* 2006, Hodler 2006, Torvik 2009).

[5.] A close model is that of Garfinkel and Syropoulos (2015) whereby the already armed groups in conflict negotiate a settle-

due to asymmetry in property rights. Precisely, one group has secured property rights over resource rents while the other group is completely or partially excluded from these rents. This perspective affects how the mechanism of conflict is initiated and its possible outcomes.

This idea is comparable to the model initially introduced by Tornell where a leader appropriates property rights over capital and exclude other following groups from using capital leading to a rent seeking type of institutions (Tornell 1997). It is also similar to the literature on endogenous property rights where a certain group appropriates some or all the resources of the economy. The ability of one group to grab the economy resources has numerous implications such as lower economic growth. This also has implications on the evolution of the property rights regime. Some models use a conflict over fiscal transfers from the center such as Tornell and Lane (1999).[6] This causes economic activity to move to a less efficient informal sector to escape the higher taxation due to the voracity effect. An improvement in the rate of return in the formal sector leads to an increase in rent seeking behavior and reduces efficient and productive activities.

Second, this paper contributes to the literature on the effect of inequality on conflict (Collier and Hoeffler 1998, 2004, Bjorvatn and Naghavi 2011).[7] In the model, two groups in conflict derive their income from two different sectors. One sector generates high rents while the other does not. This will affect the relationship between resource rents and the probability of conflict emergence as each source of income is independent from the other.

The third contribution is introducing a conflict production function that maps both revolution and oppression efforts into the probability of winning the conflict. It is also affected indirectly by the level of inequality. The concentration of income enables elites to oppress citizen and reduces the probability of a successful revolution. In other words, inequality increases the ability of the oppression effort to reduce the probability of successful revolution. This new approach binds two approaches previously used in the literature. In the first approach, conflicts were modeled as a production function that transforms a certain input into a probability of winning the conflict. The earliest forms of "technologies of conflict" were developed by Tullock (1980) and Hirshleifer (1989). The basic premise is that the probability of winning an exogenous prize for a group is an increasing function of the relative weight of its exogenous effort.[8] An alternative technology includes the opportunity cost of an alternative economic activity (producing butter) that

ment whereby resources are shared. This paper's model is different as it assumes asymmetric property rights among the conflicting parties. Here, the threat of revolution and conflict acts as a benchmark for a peaceful political resolution through bargaining.

[6] Similar models that design endogenous property rights are Tornell and Velasco (1992) and (Leonard and Long 2012). In the first paper, presence of less productive option yet with private property rights would reduces the appropriation on a common resource. The second paper designs an overlapping generation model where property rights regime is endogenously determined by comparing the costs of establishing legal and political institutions and the benefit of rent seeking.

[7] De Luca and Sekeris (2012) address the impact of inequality within one group in the conflict. Their findings also suggest a non-monotonous relationship between conflict intensity and land inequality. Alternatively, the geographical distribution of the resource has an impact on the intensity of conflict (Wick and Bulte 2006).

[8] The model in this literature are usually classified as "rent seeking models". For a comprehensive review of rent seeking literature and how it is different from conflict literature, see (Neary 1997, Hausken 2005, Tollison 2012).

must be forgone to produce guns. However, these models lack an important aspect that affects conflict and its chances of success which is the degree of income inequality. In the second approach, Acemoglu and Robinson introduced the impact of inequality on political outcomes. They used income inequality as a variable that affected the costs and benefits of political transitions. At low levels of inequality, it is less costly for ruling elites to extend the franchise to ruled citizens. Similarly, it would be very costly for citizens to conduct a revolution (Acemoglu and Robinson 2001, Acemoglu and Robinson 2006). However, their models did not include how inequality affected the probability of success of the citizens revolution. In this model, inequality affects the conflict dynamics through its effect on the "productivity" of the oppression effort.

The paper is organized as follows: the following section describes the bargaining and conflict scenarios. The third section discusses the impact of a negative price shock on the optimal transfer rate and the optimal revolution effort. The results of the empirical analysis are presented in the fourth section. The last section concludes.

2. Model

There are two types of agents in the resource exporting country: elites and citizens. Elites earn resource rents, π, and citizens earn a constant exogenous income, w, from a manufacturing sector. Citizens income is independent from extraction in the resource sector. This assumption builds on the premise that, on the macro level, the negative effects of price shocks affect citizens more through the transfer rather their wage income (Dube and Vargas 2013, Bazzi and Blattman 2014).

To avoid conflict, elites and the citizens could negotiate on a transfer rate τ that elites would give to citizens out of the resource rents. In the bargaining equilibrium, citizens income, Y_c^B, would be:

$$Y_c^B = w + (1-\gamma)\tau\pi \tag{1}$$

where γ is the institutional cost of the transfer such that $0 < \gamma < 1$. This corresponds to the leakage that could take place due to poor management or corruption. For the purpose of this model, γ is an exogenous parameter that does not depend on the level of τ. The corresponding income of elites would be:

$$Y_c^B = w + (1-\gamma)\tau\pi \tag{2}$$

In the case of conflict, the probability of the success of the revolution is q and the probability of its failure is $1 - q$. If the revolution is successful, citizens will appropriate the resource stock and its rents. Either way, they will have to sacrifice a portion ψ of their wage income at time t; this is referred to as the revolution effort. Additionally, the resource stock is sufficiently large such resource rents are sufficiently bigger than the citizens wage income:

$$I = \frac{\pi}{w} > 1$$

Such that I is a measure of the income inequality in the economy. The expected income of citizens in the case of revolution, Y_c^R, is expressed as follows:

$$Y_c^R = q\left[(1-\psi)w+\pi\right]+(1-q)(1-\psi)w \tag{3}$$

$$Y_c^R = q\pi+(1-\psi)w \tag{4}$$

On the other hand, elites receive no income in the case of a successful revolution. They do, however, sacrifice part of the resource rents, ε, in oppression effort. Consequently, the expected income for elites, Y_e^R, is:

$$Y_e^R = (1-q)(1-\varepsilon)\pi \tag{5}$$

Revolution and oppression efforts and the corresponding probability of successful revolution are treated as exogenous variables in this section. Their optimal values will be derived in the next section. The bargaining solution would be beneficial for citizens over conflict if:

$$Y_c^B > Y_c^R$$

Substituting from equations and , the above condition becomes:

$$\tau > \frac{q}{1-\gamma} - \frac{\psi}{(1-\gamma)I} \tag{6}$$

The right hand side of the above inequality is the minimum transfer rate, τ_{min}, that citizen would accept to avoid conflict. This minimum threshold decreases as the probability of success and the resource rents decrease; and as revolution effort increases. It is expected, however, that the effect of the first two would be stronger than the effect of change in revolution effort because $\pi > w$. The institutional quality is pivotal in determining if the bargaining scenario is incentive compatible for citizens because they do account for the leakage in the minimum transfer rate. The lower the quality of institutions, the higher the minimum threshold would be. If the institutions are very weak and all the transfer is leaked ($\gamma = 1$), citizens would not accept any bargain and they would prefer conflict unambiguously. On the other hand, bargaining would be beneficial for the elites if:

$$Y_e^B > Y_e^R$$

Substituting from equation s a nd, the above condition becomes:

$$\tau < q(1-\varepsilon)+\varepsilon \tag{7}$$

The right hand side of the above inequality is the maximum transfer rate, τ_{max}, that elites would be willing to give. This maximum threshold increases as q and ε increase. The bargaining equilibrium would only hold if the above two conditions are met: bargaining outcome is incentive compatible for citizens (Equat ion) and for elites (Equa tion). These two conditions can be rearranged into the following inequality:

$$\frac{q}{1-\gamma} - \frac{\psi}{(1-\gamma)I} < q(1-\varepsilon)+\varepsilon$$

The effect of an external factor such as a resource price shock would affect both sides of the above inequality leading to conditions that could favor one equilibrium over the other. Also, an increase in the wage income of citizens makes the bargain more likely to be achieved; holding everything else constant. The equilibrium in the bargaining scenario is defined by the optimal transfer rate resulting from the Nash bargaining problem and the corresponding income of citizens and elites.

2.1 Optimal Conflict Efforts

Citizens optimally choose the revolution effort, ψ, which increases their expected income in the case of conflict (Equation). The revolution production function, q, depends on the level of effort of citizens, ψ and the level of oppression effort by elites, ε. Formally:

$$q = q(\psi, \varepsilon) \tag{9}$$

such that q is an increasing function in ψ such that $\frac{\partial q}{\partial \psi} > 0$ and $\frac{\partial^2 q}{\partial \psi^2} < 0$; and a decreasing function in ε, such that $\frac{\partial q}{\partial \varepsilon} < 0$. Also, to ensure an interior solution, the following conditions are assumed to hold: $q = 0$ and $\frac{\partial q}{\partial \psi} > 0$ when $\psi = 0$; $q < 1$when $\psi = 1$; and $q > 0$ when $\varepsilon = 0$ and $\psi \neq 0$. The level of income inequality, $I = \frac{\pi}{w}$, has also an indirect impact on q. High inequality and the associated concentration of income increases the ability of elites to oppress thus increasing the effect of ε on q. In other words, inequality has an increasing effect on $\frac{\partial q}{\partial \varepsilon}$ such that $\frac{\partial^2 q}{\partial \varepsilon \partial I}$ is positive and very large. Meanwhile, the oppression effort does not influence on the rate at which ψ increases q, such that $\frac{\partial^2 q}{\partial \psi \partial \varepsilon} = 0$.

The optimal revolution effort is the effort that maximizes This can be found by deriving the first order condition of Equation with respect to ψ and subject to the constraint $0 \leq \psi \leq 1$:

$$q_\psi(\psi^*, \varepsilon) = \frac{1}{I} \tag{10}$$

Such that $\frac{\partial q}{\partial \psi} = q_\psi(\psi, \varepsilon)$. On the other hand, elites choose the optimal level of oppression by maximizing Equation such that:

$$\varepsilon^* = 1 + \frac{(1-q)}{q_\varepsilon} \tag{11}$$

Since $q_\varepsilon = \frac{\partial q}{\partial \varepsilon} < 0$, then ε would be less than 1.

2.2 Optimal Transfer Rate

To solve for the equilibrium transfer rate, the condition in Equation is assumed to hold. In each period, the Nash bargaining equilibrium is the solution of the maximization of the following Nash product:

$$N \equiv \left[Y_e^B - Y_e^R\right]^{\lambda}\left[Y_c^B - Y_c^R\right]^{1-\lambda}$$

where $\frac{\lambda}{1-\lambda}$ is the relative bargaining power of elites such that $0 < \lambda < 1$. Substituting for income of both elites and citizens:

$$N \equiv \left[\left((1-\tau)-(1-q)(1-\varepsilon)\right)\pi\right]^{\lambda}\left[\left((1-\gamma)\tau - q\right)\pi + \psi w\right]^{1-\lambda}$$

The first order condition with respect to τ is:

$$-\lambda\pi\left[\left((1-\gamma)\tau - q\right)\pi + \psi w\right] + (1-\lambda)(1-\gamma)\left[\left((1-\tau)-(1-q)(1-\varepsilon)\right)\pi\right] = 0$$

Solving for τ^*:

$$\tau^* = \lambda\left[\frac{q-\psi w}{(1-\gamma)\pi}\right] + (1-\lambda)\left[\varepsilon + q(1-\varepsilon)\right] \tag{12}$$

The optimal transfer rate depends on q, the efficiency of the transfer γ, and the level of inequality π/w. Equation is valid for all values of $\gamma \neq 1$. When $\gamma = 1$, optimal transfer rate equals zero: $\tau = 0$. In this case, bargaining would be beneficial only for elites as the condition in Equation would be violated and the conflict scenario would prevail. Therefore, a successful bargain requires that $\gamma < 1$ in addition to the condition in Equation. Alternatively, if the transfer system is perfectly efficient ($\gamma = 0$), the minimum level of transfer rate accepted by citizens could be lower than the maximum that elites are willing to pay. It could be therefore incentive compatible for both.

Substituting from Equations and into Equation gives:

$$\tau = \lambda\tau_{\min} + (1-\lambda)\tau_{\max} \tag{13}$$

3. Price Shocks Effects

A negative price shock, θ, is a price shock due to a lower mean price of the resource. Such a price shock decreases the resources rents and the inequality in the economy for a given wage in the non-resource sector:

$$\frac{\partial\pi}{\partial\theta} < 0 \tag{14}$$

$$\frac{\partial I}{\partial\theta} < 0 \tag{15}$$

It is important to note that this holds even if the wage w is not constant. It is only based on the assumption that the wage income is independent from resource rents and from the resource sector. The next step is to look at the effect of the price shock on the optimal revolution effort, optimal oppression effort and the corresponding probability of revolution success. Also, the effect of the shock on the optimal transfer rate, the condition of a successful bargain.

3.1 Effects on optimal conflict efforts

The derivatives of the optimal values of the revolution and oppression eff orts , Equations (10) and (11), with respect to I are:

$$\frac{\partial^2 q}{\partial\psi\partial I}=\frac{\partial^2 q}{\partial\psi^2}\frac{\partial\psi^*}{\partial I}+\frac{\partial^2 q}{\partial\psi\partial\varepsilon}\frac{\partial\varepsilon}{\partial I}=-\frac{1}{I^2} \tag{16}$$

$$\frac{\partial\varepsilon^*}{\partial I}=-\left(\frac{(1-q)}{\left(\frac{\partial q}{\partial\varepsilon}\right)^2}\frac{\partial^2 q}{\partial\varepsilon\partial I}+\frac{\frac{\partial q}{\partial I}}{\frac{\partial q}{\partial\varepsilon}}\right) \tag{17}$$

The above is simplified to:

$$\frac{\partial\psi^*}{\partial I}=-\frac{1}{I^2\frac{\partial^2 q}{\partial\psi^2}} \tag{18}$$

$$\frac{\partial\varepsilon^*}{\partial I}=-\frac{1}{2}\left(\frac{(1-q)}{\left(\frac{\partial q}{\partial\varepsilon}\right)^2}\frac{\partial^2 q}{\partial\varepsilon\partial I}+\frac{\frac{\partial q}{\partial\psi}\frac{\partial\psi}{\partial I}}{\frac{\partial q}{\partial\varepsilon}}\right) \tag{19}$$

Substituting for $\frac{\partial\psi^*}{\partial I}$ in Equation gives:

$$\frac{\partial\varepsilon^*}{\partial I}=\frac{\frac{\partial q}{\partial\psi}}{2I^2\frac{\partial q}{\partial\varepsilon}\frac{\partial^2 q}{\partial\psi^2}}-\frac{(1-q)}{2\left(\frac{\partial q}{\partial\varepsilon}\right)^2}\frac{\partial^2 q}{\partial\varepsilon\partial I} \tag{20}$$

Proposition 1. *A negative price shock reduces the optimal revolution effort of citizens.*

*Pr oof :*From Equation, when $\frac{\partial^2 q}{\partial\psi^2}<0,$ it must be that $\frac{\partial\psi}{\partial I}>0.$ It follows that $\frac{\partial\psi}{\partial\theta}=\frac{\partial\psi}{\partial I}\frac{\partial I}{\partial\theta}<0.$

The intuition behind the above result is that the price shocks reduced the size of the prize that citizens will capture in the case of their success. It is therefore rationale to reduce the costly effort.

Proposition 2. *A negative price shock increases the optimal oppression effort of elites when* $\frac{\partial^2 q}{\partial\varepsilon\partial I}>\frac{\frac{\partial q}{\partial\psi}\frac{\partial q}{\partial\varepsilon}}{(1-q)\frac{\partial^2 q}{\partial\psi^2}I^2}.$

Proof: The first part in the right hand side of Equation () is positive because $\frac{\partial q}{\partial\psi}$ is positive and because $\frac{\partial q}{\partial\varepsilon}$ and $\frac{\partial^2 q}{\partial\psi^2}$ are negative. However, the second part is also positive $\frac{\partial^2 q}{\partial\varepsilon\partial I}>0.$

The second part is larger when $\frac{\partial^2 q}{\partial\varepsilon\partial I}>\frac{\frac{\partial q}{\partial\psi}\frac{\partial q}{\partial\varepsilon}}{(1-q)\frac{\partial^2 q}{\partial\psi^2}I^2}$; which in turn makes $\frac{\partial\varepsilon}{\partial I}<0.$ It then follows that $\frac{\partial\varepsilon}{\partial\theta}=\frac{\partial\varepsilon}{\partial I}\frac{\partial I}{\partial\theta}>0.$

In the case of the elites, there are two opposing factors. The first factor is to reduce the oppression effort due to the reduction in resource rents. The other factor is to increase the oppression effort in order to reduce the probability of success revolution and hence increase the elites expected income Y_e^R. The prevalence of one factor over the other depends mainly on how big is the effect of inequality on $\frac{\partial q}{\partial \varepsilon}$ and how high the level of inequality is. At high levels $\frac{\partial^2 q}{\partial \varepsilon \partial I}$ and I, elites can reduce substantially the probability of success by increasing their oppression effort. If, however, inequality has little or no effect on $\frac{\partial q}{\partial \varepsilon}$, elites will be inclined to reduce the oppression effort. At the extreme case, when $\frac{\partial^2 q}{\partial \varepsilon \partial I} = 0$, $\frac{\partial \varepsilon}{\partial I}$ will be unambiguously positive and consequently $\frac{\partial \varepsilon}{\partial \theta} < 0$.

Proposition 3. *A negative price shock reduces the probability of a successful revolution.*

Proof: Since $\frac{\partial q}{\partial \theta} = \frac{\partial q}{\partial \psi}\frac{\partial \psi}{\partial \theta} + \frac{\partial q}{\partial \varepsilon}\frac{\partial \varepsilon}{\partial \theta}$ and since $\frac{\partial q}{\partial \psi} > 0$, $\frac{\partial q}{\partial \varepsilon} < 0$ and $\frac{\partial \psi}{\partial \theta} < 0$, $\frac{\partial \varepsilon}{\partial \theta} > 0$, it must be that $\frac{\partial q}{\partial \theta} < 0$.

The above proposition is expected since the negative shock reduces optimal revolution effort and increases optimal oppression effort (under the conditions expressed in Proposition 2, the corresponding probability must also decrease.

3.2 Effects on Bargaining Condition

Additionally, the effect of a price shock on the conditions of a successful bargain for citizens is found by taking the first derivative with respect to I for the minimum acceptable transfer by citizens, $\tau_{\min}$ (the right hand side of Equation):

$$\frac{\partial \tau_{\min}}{\partial I} = \frac{\psi}{I^2(1-\gamma)} + \frac{1}{1-\gamma}\frac{\partial q}{\partial I} - \frac{1}{I(1-\gamma)}\frac{\partial \psi}{\partial I} \tag{21}$$

The first term in the right hand side captures the direct effect due to a change in resource rents. This effect is positive as citizens expect a higher transfer rate when rents increase. The second term captures the effect of a change in the probability of success of the revolution. Again, this effect is also positive as the probability of success increases, citizens are expecting a higher transfer rate as a compensation for a higher plausible return in the conflict scenario. Lastly, the third effect is the effect of a change in the revolution effort. This effect is negative because higher effort reduces the income from the non-resource sector in the conflict scenario. Hence, citizens would settle for a lower transfer rate. The total effect of price shock on the minimum acceptable level of transfer is not unambiguous. It will depend on the relative magnitude of $\frac{\partial q}{\partial I}$ and $\frac{\partial \psi}{\partial I}$ since they both have the same sign. However, the first two effects are bigger than the third effect since $\pi > w$.

Proposition 4. *Negative price shocks reduce the minimum acceptable transfer.*

Proof: From Equation, when $\frac{\psi}{I^2} + \frac{\partial q}{\partial I} > \frac{1}{I}\frac{\partial \psi}{\partial I}$, $\frac{\partial \tau_{\min}}{\partial I} > 0$. It follows that $\frac{\partial \tau_{\min}}{\partial \theta} = \frac{\partial \tau_{\min}}{\partial I}\frac{\partial I}{\partial \theta} < 0$.

At this stage, it is very important to note that a higher institutional quality reduces the effect of price shocks on the minimum acceptable transfer rate. As for elites, the effect of changes in I on the maximum allowed transfer rate, $\tau_{\max}$ can be found by taking the first derivative of Equation :

$$\frac{\partial \tau_{\max}}{\partial I} = (1-\varepsilon)\frac{\partial q}{\partial I} + (1-q)\frac{\partial \varepsilon}{\partial I} \tag{22}$$

Here, also, there is some ambiguity about the net effect of changes in q and ε on $\tau_{\max}$ since $\frac{\partial q}{\partial I}$ is positive and $\frac{\partial \varepsilon}{\partial I}$ is negative. This is due to two conflicting effects. A decrease in q increases the expected income of elites in case of conflict; which reduces their tolerance for a higher transfer rate in the bargaining scenario. On the other hand, an increase in ε has the exact opposite effect.

Proposition 5. *A negative price shock increases the maximin allowed transfer rate when* $\frac{\partial}{\partial} < -1$.

Proof: From Equation, since $\frac{\partial}{\partial}$ and $\frac{\partial \varepsilon}{\partial I} < 0$, $\frac{\partial \tau_{\max}}{\partial I}$ is negative when $\varepsilon > q$. From Equation, $\varepsilon > q$ when $\frac{\partial q}{\partial \varepsilon} < -1$. It follows that $\frac{\partial \tau_{\max}}{\partial \theta} = \frac{\partial \tau_{\max}}{\partial I}\frac{\partial I}{\partial \theta} > 0$.

The last two propositions suggest that, under certain conditions related to the behavior of the probability function q, a negative price shocks improves the conditions for a bargaining equilibrium (Equation) by reducing the minimum acceptable transfer rate and increasing the maximum allowed transfer rate. These conditions improve the ability of elites of reducing the probability of success of revolution. The first one has to do with the "productivity" of oppression effort and its relation to inequality while the second has to do with how oppression effort reduces the probability q. In other words, the stronger these two effects, the better ability of elites to reduce the probability of citizens success in the conflict scenario. Meanwhile, citizens lower acceptable rate is also reduced due to lower revolution effort and lower resource rents.

3.3 Effects on Welfare

The last step in the analysis is to investigate the impact of the price shock on the welfare of both citizens and elites.

Proposition 6. *A negative price shock reduces optimal transfer rate when* $\lambda > \frac{1}{2}$.

Proof: From Equation, since $\frac{\partial \tau_{\min}}{\partial I} > 0$ and $\frac{\partial \tau_{\max}}{\partial I} < 0$, $\frac{\partial \tau^*}{\partial I}$ is negative when $\lambda > \frac{1}{2}$. It follows that $\frac{\partial \tau^*}{\partial \theta} = \frac{\partial \tau^*}{\partial I}\frac{\partial I}{\partial \theta} < 0$.

Proposition 7. *Citizens are worse off due to the negative price shock either in both scenarios when* $\lambda > \frac{1}{2}$.

Proof: From Equation, $\frac{\partial Y_c^B}{\partial \theta} = (1-\gamma)\left(\pi \frac{\partial \tau^*}{\partial \theta} + \frac{1}{w}\frac{\partial I}{\partial \theta}\right)$ is negative when $\frac{\partial \tau^*}{\partial \theta} < 0$ which is when

$\lambda > \frac{1}{2}$. Also, from Equation, $\frac{\partial Y_C^R}{\partial \theta} = \pi \frac{\partial q}{\partial \theta} + \frac{q}{w}\frac{\partial I}{\partial \theta} - w\frac{\partial \psi}{\partial \theta}$ is also negative because $\pi > w$.

The intuition behind this result is that the negative price shock reduces both τ and q which worsen the income of citizens in the case of successful bargain and conflict respectively. From a welfare standpoint, citizens are better in the absence of negative price shocks. The welfare implications for elites are less obvious. In the bargaining equilibrium, negative price shock, on one hand, reduces resource rents but on the other hand it reduces the transfer rate to citizens (Equation). Similarly, in the case of conflict, the price shock effect on the expected income of elites is ambiguous because it reduces π and q while it increases ε (Equation).

4. Empirical Analysis

The model suggests that, if a country is in a bargaining equilibrium, a negative price shock would not generate a conflict. It would maintain the bargaining equilibrium. Alternatively, if a country is already in a conflict equilibrium, the negative price shock could restore it to a bargaining equilibrium. Additionally, the model suggests that higher institutional quality reduces the effect of a given price shock. It, therefore, reduces the chances of conflict.
To test the above two hypotheses empirically, the following general specification is used:

$$\text{conflict}_{it} = \alpha_0 + \alpha_1 \text{shock}_{it} + \alpha_2 \text{shock}_{it} * \text{institutions}_{it} + \alpha_4 \mu_i + \alpha_5 \eta_t + v_{it} \qquad (23)$$

The dependent variable is the incidence of conflict in country i at time t. The first explanatory variable is the magnitude of a price shock in country i at time t. The second explanatory variable captures the interaction between institutional quality and the price shock. According to the model, the estimate of α_1 should be positive such that a negative price shock reduces the incidence of conflict. Additionally, the estimate of α_2 should be negative such that better institutional quality reduces the effect of a price shock. One potential source of endogeneity in the above analysis is omitted variables that affect both the magnitude of the price shock and the emergence of conflict. To overcome this, country fixed effects, μ_i, are added. Lastly, η_t is a time fixed effect variable.

4.2 Data

Incidence of conflict data are from the Uppsala Conflict Data Program/Peace Research Institute Oslo (UCDP/PRIO) used in Bazzi and Blattman (2014). The dependent variable takes value of 1 if there has been an incidence of any type of conflict in the given year and 0 otherwise.

Price shock data are also taken from Bazzi and Blattman (2014). It is the log difference of a yearly oil price index weighted by the ratio of oil exports to GDP. The oil price index is normalized to 1 for year 2000 and is deflated by the US consumer price index corresponding to each year. The level of the shock therefore depends on how important oil exports are to the economy.[9]

[9]A detailed methodology can be found in the online appendix of Bazzi and Blattman (2014)

Two of the World Bank's Worldwide Governance Indicators (Government Effectiveness Indicator and the Control of Corruption Indicator) are used to capture the institutional quality. These data cover 118 countries for the years 1996, 1998, 2000 and from 2002 to 2007(Kaufmann *et al.* 2011). In addition to these two indicators, the Corruption Perception Index is also used. Its dataset covers 117 countries over 13 years from 1995 to 2007. Higher values of the three indices reflect better institutional quality.

To control for country fixed effects, the absolute value of the country's distance from the Equator is used (Brunnschweiler and Bulte 2009). Lastly, to control for fixed time effects, a variable capturing oil price shock in the global market at each year. This is just the log difference of the price index from one year to the other and is not country specific.

4.2 Results

The above empirical specification was run using OLS. The corresponding level of clustering is 118 which is the number of countries. The first set of results is shown in Table (1). The dependent variable is whether there has been an onset of conflict in time *t*. The Country Price Shock variable captures the effect of the price shock on each country depending on how important oil is to its exports. The Global Price Shock variable captures the changes in the international oil price and is used as a fixed time effect. Also, the distance from equator captures country fixed effects.

Table 1: Oil, Shocks, Institutions and Onset of Conflict

	Corruption Control	**Gov Effectiveness**	**CPI**
Country Price Shock	0.570**	0.558**	0.231**
	(−2.59)	(−2.34)	(−1.99)
Global Price Shock	−0.012	−0.01	0.019
	(−0.57)	(−0.50)	(−1.64)
Distance to Equator	−0.001	−0.001	−0.001
	(−1.27)	(−1.31)	(−1.22)
shocks*Corruption Control	−0.206***		
	(−2.88)		
shocks*Gov Effectiveness		−0.205**	
		(−2.50)	
shocks*CPI			−0.068***
			(−3.15)
Constant	0.065***	0.065***	0.047***
	−3.38	−3.38	−2.64
N	779	779	631

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Each column in the table represents a run of the empirical model using a different measure of institutional quality as indicated in the table. In all three regressions, the estimate for the price shock is, as expected, positive and significant. This supports the hypothesis of the model; a negative price shock would reduce the likelihood of conflict. Additionally,

the estimate of the interaction variable between the price shock and the institutional quality is, as expected, negative and significant. Institutional quality reduces the impact of a price shock on the onset of conflict. As the institutional quality increases, the impact of a price shock decreases. These results are robust to the three different measures of institutional quality.

The second set of results is shown in Table (2) and replicates the regressions in Table (1) with a different dependent variable. The dependent variable takes the value of 1 if there has been any type of conflict in the given year *t* even if it was not initiated at time *t*. In other words, the onset of conflict could be in a time period prior to time *t*. Price shocks are also positively correlated and significant as the results in Table (1) except when the institutional quality variable is Government Effectiveness. Similarly, the coefficient of the interaction term is negative in the three regressions.

Table 2: Oil Shocks, Institutions and any Conflict

	Corruption Control	Gov Effectiveness	CPI
Country Price Shock	0.665*	0.686	0.509*
	(−1.74)	(−1.55)	(−1.86)
Global Price Shock	−0.041*	−0.039	0.002
	(−1.73)	(−1.65)	(−0.08)
Distance to Equator	−0.004	−0.004	−0.003
	(−1.39)	(−1.42)	(−1.04)
shocks*Corruption Control	−0.303**		
	(−2.22)		
shocks*Gov Effectiveness		−0.316*	
		(−1.91)	
shocks*CPI			−0.200***
			(−3.25)
Constant	0.283***	0.283***	0.263***
	−4.67	−4.68	−3.23
N	980	980	781

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Another source of endogeneity is due to reverse causality. Weak institutions lead to conflict and vice-versa conflict could weaken institutions. To check the robustness of the results, the above regressions were repeated with the initial and lagged values of institutional quality. The results were similar.

5. Conclusion

This paper contributes to the literature on conflict and political economy of resource dependent economies. The first important finding is that changes in the resource markets such as price shocks do have an impact on the political equilibrium in resource exporting

countries. The direct effect of a negative price shock is that it can reduce the chances of conflict and increase the chances of a successful bargain between citizens and elites. Such shock has implications on transfers between elites to citizens. It renders the transfers less costly to elites through two channels. The first channel is by reducing the resource rents directly. The second one is through reducing the citizens revolution effort and the probability of successful revolution. This indirect effect reduces the transfer rate threshold which is conducive to a successful bargain.

Acknowledgments

Special thanks Ngo Van Long for his comments while writing this paper. I benefited from the comments of the participants in Montreal Natural Resources and Environmental Economics Workshop and in the Canadian Economic Association Annual Conference. I also would like to thank Adham Girat Alla for research assistance.

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