

Resource rent and conflict: A simple model of a complex relationship

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Abstract

Empirical studies demonstrate that rents from natural resources are an important source of conflict in society. However, the effect of rents on conflict is often found to be non-monotonic, with maximum risk of conflict caused by intermediate levels of rent. The present paper attempts to shed light on this complex relationship. The key mechanism that we emphasize is the effect on rents on the market structure of rent seeking. Higher rents may activate more interest groups in a power struggle. We demonstrate that the associated increased cost of conflict may in fact promote social stability. The peaceful solution is upheld by a self reinforcing transfer program, in the form of patronage employment. The chance of conflict in our model is highest for intermediate levels of resource rents, where the government cannot make credible commitments on patronage transfers to the opposition groups.

JEL classifications: P16, Q34

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1 Introduction

The empirical literature on conflicts shows that countries richly endowed with natural resources, and in particular oil, are more prone to conflict than resource poor countries (Collier and Hoeffler, 1998, 2004, Fearon and Laitin, 2003). Moreover, the relationship between natural resource endowment and outbreaks of civil war is often found to be non-monotonic, with maximum risk of conflict for intermediate levels of resource endowment. This relationship was established in early work by Collier and Hoeffler and has survived revisions and updates of their data (Collier, Hoeffler, Rohner, 2009). The risk of conflict is found to reach a maximum when primary commodity exports account for around 25 percent of GDP. By way of illustration, consider the relative stability of the oil rich Gulf-monarchies contrasted with the instability of many countries in Africa with more moderate resource endowments.¹

Surprisingly, there have been very few attempts at theoretical modelling of this non-monotonicity. The ambition of the present paper is to reduce this gap in the literature. We do so by proposing a very simple, yet, we believe, intuitively appealing, model. The core mechanism of the model relies on the assumption that an incumbent government cannot make binding commitments on transfers to the opposition (Fearon, 1995). An increase in resource rents may lend credibility to the transfer program by making it more costly for the government to renege on its promises. More precisely, an increase in resource rents induces more groups to enter a power struggle with the incumbent government. This makes conflict more costly, and by doing so makes it more likely that the transfer program will be honored. Knowing this, the opposition groups will be willing to abstain from challenging the government.

The mechanisms we highlight in this paper appear to have been relevant in promoting social cohesion in the Arabian peninsula. Herb (1999) shows that before oil, the Gulf monarchies were characterized by a relatively high degree of regional autonomy, each region led by a prince of the ruling family. Family ties did not prevent conflict; intrafamily wars often erupted on the death of a ruler. According to Herb, oil has transformed the states of Arabia from segmentary to unitary states. It has enabled the ruler to secure allegiances by bestowing special favors, such as positions in the state bureau-

¹Fearon (2005) argues that the empirical results of Collier and Hoeffler on the link between resource endowment and conflict are not very robust.

cracy, to influential individuals. Moreover, by increasing the value of power and stability, oil has stimulated cooperation among the members of the ruling families. Similarly, Karl (1997, page 101) point to the role of oil revenues in creating social cohesion in Latin America: "Petroleum rents underlay this new system of reconciling competing interests by turning all organized interests into subsidized clientele and thus permitting them to avoid the zero-sum economic games that have proved so detrimental to democracy in the rest of Latin America." On these so-called rentier state policies, see also Anderson (1987) and Beblawi and Luciani (1987).

To our knowledge, the only theoretical contribution which derives a non-monotonic relationship between resource rents and conflict is Caselli and Coleman II (2006). An increase in the size of "expropriable" rents in their model increases the rewards to power, and as such stimulates conflict. However, groups have the ability to switch teams *ex post*. The higher are rents, the more members of the losing group switch identity and join the winning group, thus reducing gains per capita and incentives for conflict by the dominant group. Anticipating this, the dominant group does not initiate conflict beyond a critical level of rents. The lower is the degree of heterogeneity in society, as captured by the level of switching costs, the easier it is to disguise as a member of the winning group, and hence the less attractive it is to initiate conflict. Although the outcome is similar, the mechanism highlighted in the present paper is completely different.

In terms of modelling strategy, our paper is related to Aslaksen and Torvik (2006), who consider the choice between war and peace in a society consisting of two interest groups. As in our study, they model peace as a self-reinforcing equilibrium, supported by a trigger strategy in case of deviation. War is modelled as a standard rent-seeking contest, exactly as in our study. Peace is modelled as democracy, with the outcome formulated as the equilibrium of probabilistic voting. A main finding is that higher resource rents reduce the chance of peace. This is in contrast to the main finding in our paper, namely that of a potentially non-monotonic relationship between resources and conflict.

The rest of the paper is organized as follows. Section 2 presents the model, starting with describing the conflict equilibrium and then moving on to cooperation. We then analyse the equilibrium outcome of the model. Section 3 adds extensions to the basic model. Section 4 concludes.

2 Model

There are three groups in society, a , b , and c . Group a is the incumbent, controlling the rents (R) and the transfer policy. The opposition can be involved in one out of three activities: private sector employment, which gives an income w , rent-seeking, with an expected income ρ , and unproductive, public sector employment, with a compensation determined by the government.² If the opposition chooses private sector employment, the incumbent is unchallenged, his periodic income given by the size of the rent, R . While private sector income is exogenously determined, expected income under conflict and public sector remuneration are endogenously determined. We start by defining expected income under conflict.

2.1 Conflict

If the opposition groups challenge the incumbent, there is conflict, modelled as a standard rent seeking contest à la Tullock (1980). The expected income in this case depends on whether one opposition group or both opposition groups challenge the incumbent. In case only one chooses to challenge (say group b), the expected income of each fighting party i is given by:

$$\rho_i^d = \frac{q_i}{q_a + q_b} R - q_i, \quad (1)$$

where q_i is the rent seeking effort by group $i = a, b$. If both opposition groups challenge, the expected income of each fighting group $i = a, b, c$ is given by:

$$\rho_i^d = \frac{q_i}{q_a + q_b + q_c} R - q_i. \quad (2)$$

Maximizing with respect to q_i , and using the symmetry of the groups, we find that each fighting group's rent-seeking effort in the duopoly is given by:

$$q^d = \frac{1}{4} R, \quad (3)$$

which, using $q_i = q^d$ in (1), results in an expected income in equilibrium:

²We abstract from simple cash transfers to the opposition, which would make the transfer program less costly and therefore more viable. Transfers in the form of public sector jobs can be motivated by an assumption that for practical or political reasons, these payments must be viewed as compensation for services provided, and not simply as a gift.

$$\rho^d = \frac{1}{4}R. \quad (4)$$

If both groups challenge, the equilibrium rent seeking effort is

$$q^t = \frac{2}{9}R, \quad (5)$$

which, using $q_i = q^t$ in (1), results in an expected income in the triopoly equilibrium:

$$\rho^t = \frac{1}{9}R. \quad (6)$$

Evidently, expected profits are lower under triopoly competition than under duopoly competition ($\rho^t < \rho^d$) for any given level of rents R . This has important implications for our analysis, since it implies that the market structure of conflict depends on the level of the resource rent. In particular, an opposition group will only be willing to challenge the incumbent if the expected payoff from conflict exceeds the private sector income w . We can distinguish between three cases, first the case of low rents relative to private sector income:

Definition 1 *Let $\rho^d > w \Leftrightarrow R < 4w$ denote the "low-rents" case, characterized by an unchallenged incumbent.*

Next, there is an intermediate level of oil rents where it is profitable for one, and only one, to challenge the government (duopoly conflict). Due to the symmetry of the groups, we will not be concerned with which group enters the conflict, and which stays outside:

Definition 2 *Let $\rho^d < w < \rho^t \Leftrightarrow R \in (4w, 9w)$ denote the "intermediate-rents" case, characterized by duopoly conflict.*

Finally, the case where both groups would find it profitable to challenge the incumbent (triopoly conflict):

Definition 3 *Let $\rho^t > w \Leftrightarrow R > 9w$ denote the "high-rents" case, characterized by triopoly conflict.*

Note that different rent-regimes defined above always consider rents relative to private sector income levels. Hence, a poor country can be a "high rent" country even if its resource rents in absolute terms are lower than in a more wealthy country, due to the lower level of w in the former.

2.2 Public sector employment

For low rents ($R < 4w$), the incumbent is unchallenged and a peaceful solution prevails. For rents above this level, the incumbent depends on transfers to avoid conflict. Since conflict is costly, in a first-best world the parties should always be able to find a peaceful solution through appropriate transfers. We introduce two deviations from the first-best which together imply that it is not necessarily possible for the parties to arrive at a peaceful solution. Following Fearon (1995), we assume that there are indivisibilities in the transfer program. We model the indivisibility of transfers as public sector patronage employment. Offering well-paid jobs in the bureaucracy or parastatals to obtain political support has been used extensively in developing (and developed) countries, see for instance Tangri (1999) on patronage policies in Africa. One reason why job-offerings is a common way of transferring resources could be that it makes it easier for the government to monitor the recipients, making sure that they don't conspire to challenge the government. In this way, by accepting public sector employment and thus coming under the scrutiny of the government, members of the opposition commit to a peaceful solution as long as they remain public sector employees.

In order to avoid conflict, the government must pay public sector employees a wage which matches their expected income from conflict. We shall assume that the public sector jobs are entirely unproductive, so that the entire wage must be finance by transfers from the government. In the intermeditate-rents case, the public sector wage offer must match the expected income of duopoly rent seeking, ρ^d . Note that even though there is only room for one opposition group in case of conflict, the government needs to set up patronage jobs to both groups, with ρ^d offered to each of them, in order to prevent entry. In the high-rents case, the patronage pay must equal ρ^t . Note that since $\rho^d > \rho^t$, public sector payments as a share of rents are in fact higher in the intermediate rents-scenario than in the high rents-scenario.

3 Analysis

We make the important, and we believe realistic, assumption that the government cannot make binding commitments regarding the transfer program (see also Fearon, 1995). It can promise lucrative positions in the bureaucracy or parastatals, but once the opposition has accepted these offers, the

government may have an incentive not to live up to its promises. Hence, to be effective as a means of pacifying the opposition, the patronage employment program must be self-reinforcing. Only if the short-term gains from deviation is dominated by the long term loss of conflict, will the transfers be credible and hence be able to promote peace. In the model, a government that reneges on its promised redistribution program unchallenged keeps all rents for one period, but automatically faces a rent seeking challenge in all subsequent periods (Garfinkle, 1990).

To determine whether it is in the interest of the incumbent to deviate from the announced transfer scheme or not, we need to investigate the cost of deviation, which in turn depends on the rent seeking market structure. Will deviation lead to a challenge from both opposition groups or only one group? As explained above, the answer to this question depends on the size of the rent relative to the income level in the private sector. For low rents, no transfers are needed, so we need only focus on the case of intermediate and high rents.

3.1 Intermediate rents

In this scenario, patronage employment must be rewarded at ρ^d . The ex ante benefit to the incumbent of transfers relative to fight is given by $R - 2\rho^d - \rho^d = \frac{1}{4}R$, where the first two terms are the incumbent's income net of transfer payment to the public sector and the third term is the incumbent's expected income from rent seeking (in the duopoly case). Clearly, the incumbent prefers transfers to fight. However, the transfer program is not necessarily credible.

To see this, note that the incumbent's expected income from renegeing on the promise, once the opposition groups have chosen public sector employment (and therefore cannot organize any opposition or, for that matter, carry out private sector work in that period), is R in the first period, and then the rent seeking payoff ρ^d in all remaining periods. The expected income to the incumbent from deviation is thus:

$$\pi_{dev}^d = R + \frac{\delta}{1 - \delta}\rho^d. \quad (7)$$

Adhering to the transfer program, in which each opposition group is given

a transfer of ρ^d for working in the public sector, gives an income of:

$$\pi^d = \frac{1}{1-\delta} (R - 2\rho^d). \quad (8)$$

We observe that:

$$\pi_{dev}^d = \pi^d \Leftrightarrow \delta = \frac{2}{3} \equiv \delta^d. \quad (9)$$

Only if the degree of patience exceeds the critical level δ^d will the incumbent choose to live up to its promise given by the compensation scheme ρ^d to each opposition party under patronage employment. For $\delta < \delta^d$, the redistribution program is not credible. It will then not be accepted by the opposition, the result being duopoly rent seeking in all periods. For $\delta \geq \delta^d$, the program is credible and will be accepted by the opposition.

3.2 High rents

In this scenario, public sector pay is given by ρ^t . The benefit to the incumbent of pacifying the opposition through patronage employment is now even larger than in the intermediate rent-case. The ex ante benefit to the incumbent of transfers relative to fight is given by $R - 2\rho^t - \rho^t = \frac{2}{3}R$. Recall that since rent seeking now involves all three parties, transfers as a share of rents are lower in the triopoly case than in the duopoly case; $\rho^t < \rho^d$. This fact, together with the lower expected income under conflict, increase the incentive of the incumbent to stick to the transfer program. Deviating from the promise now gives the incumbent an expected income:

$$\pi_{dev}^t = R + \frac{\delta}{1-\delta} \rho^t. \quad (10)$$

Adhering to the program gives the incumbent an income:

$$\pi^t = \frac{1}{1-\delta} (R - 2\rho^t). \quad (11)$$

It is straightforward to demonstrate that:

$$\pi_{dev}^t = \pi^t \Leftrightarrow \delta = \frac{1}{4} \equiv \delta^t. \quad (12)$$

Hence, for all $\delta \geq \delta^t$, the promise of patronage employment is credible, resulting in an equilibrium with social stability. For $\delta < \delta^t$, the program is not credible and will be rejected.

4 Conflict versus peace

We can distinguish between three cases: low levels of patience, given by $\delta < \delta^t$, intermediate levels of patience, given by $\delta \in (\delta^t, \delta^d)$, and high levels of patience, given by $\delta > \delta^d$. We main finding of our analysis can be stated as:

Proposition 1 *For intermediate levels of patience, i.e., $\delta \in (\delta^t, \delta^d)$, the relation between resource rents and conflict is non-linear. For low levels of rent, i.e., $R < 4w$, the incumbent is unchallenged, and there is peace. For intermediate levels of rents, i.e., for $R \in (4w, 9w)$, there is conflict. For high levels of oil rent, i.e., $R > 9w$, there is peace.*

We also observe that:

Corollary 1 *For high levels of patience ($\delta > \delta^d$), there is never conflict. For low levels of rent ($R < 4w$), the incumbent is unchallenged. For intermediate and high levels of rent ($R \geq 4w$), the incumbent pacifies the opposition with patronage employment.*

Finally we observe that:

Corollary 2 *For low levels of patience ($\delta < \delta^t$), there is always conflict for intermediate and high levels of rent ($R \geq 4w$). For low levels of rent ($R < 4w$), the incumbent is not challenged.*

Figure 1 illustrates the equilibria of the model, for $w = \frac{1}{4}$.

The most interesting feature of Figure 1 is the case of intermediate levels of patience, where an increase in oil rents starting from a low level leads to conflict as we move into the range of intermediate rents, and then to peace as we move into high rents.

According to this model, there are two reasons why the Gulf monarchies are so much more stable than the oil exporting countries in for instance Africa. First, they typically have far higher oil revenues, in absolute terms and relative to GDP per capita. Second, the ruling elite can reasonably be expected to have a longer time horizon, partly due to higher life expectancy.

It follows from our model that increased rent may lead to lower aggregate income. To illustrate this, start at $R = 4w$, and assume the incumbent is

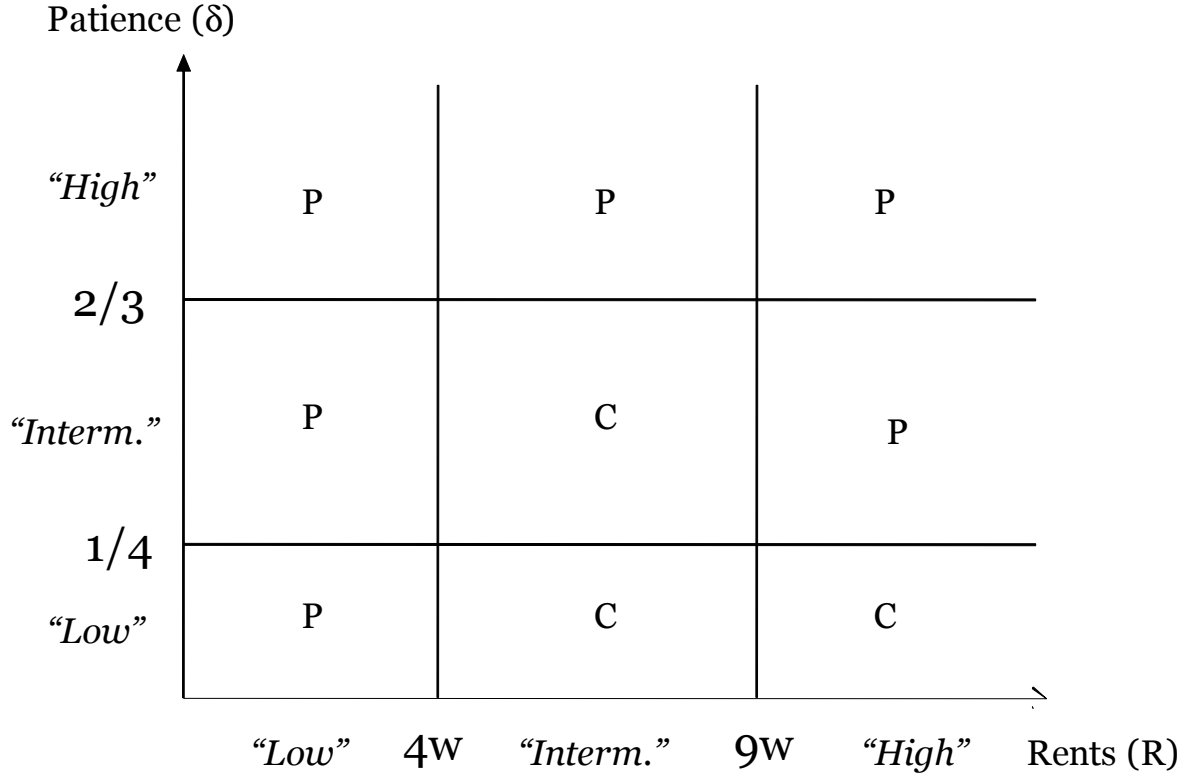


Figure 1: Rents, patience, conflict and peace

unchallenged. Government revenues are given by the size of the resource rent, $R = 4w$, while each opposition group earn private sector income w . Hence, aggregate income is $6w$. For $\delta < 2/3$, we know that a small increase in rent moves the equilibrium to rent seeking duopoly. The two conflicting groups now each make $\rho^d = \frac{1}{4}R$, while the opposition group not involved in conflict earns the private sector income w . Evaluated at $R = 4w$, the income is then $3w$. Hence, we observe that a marginal increase in oil rents in this case has cut aggregate income in two, from $6w$ to $3w$. Similarly, compare $R = 4w$, which gives the maximal aggregate income in the low-rent case (which we above found to be $6w$), with $R = 9w$, which gives the maximal level of income in the intermediate-rent case. In the latter case, income is given by $\frac{1}{4}9w$ for each of the two fighting groups and w for the opposition

group not involved in the fight, in total $5.5w$. Hence, income is higher in the low-rent case, the difference being $\frac{1}{2}w$. Increasing the rent marginally at the point $R = 9w$ leads to a positive jump in aggregate income, as conflict is replaced by a stable political situation. Since the opposition groups are now employed in the (unproductive) public sector, aggregate income is given by R . Figure 2 illustrates, with $w = 1$.

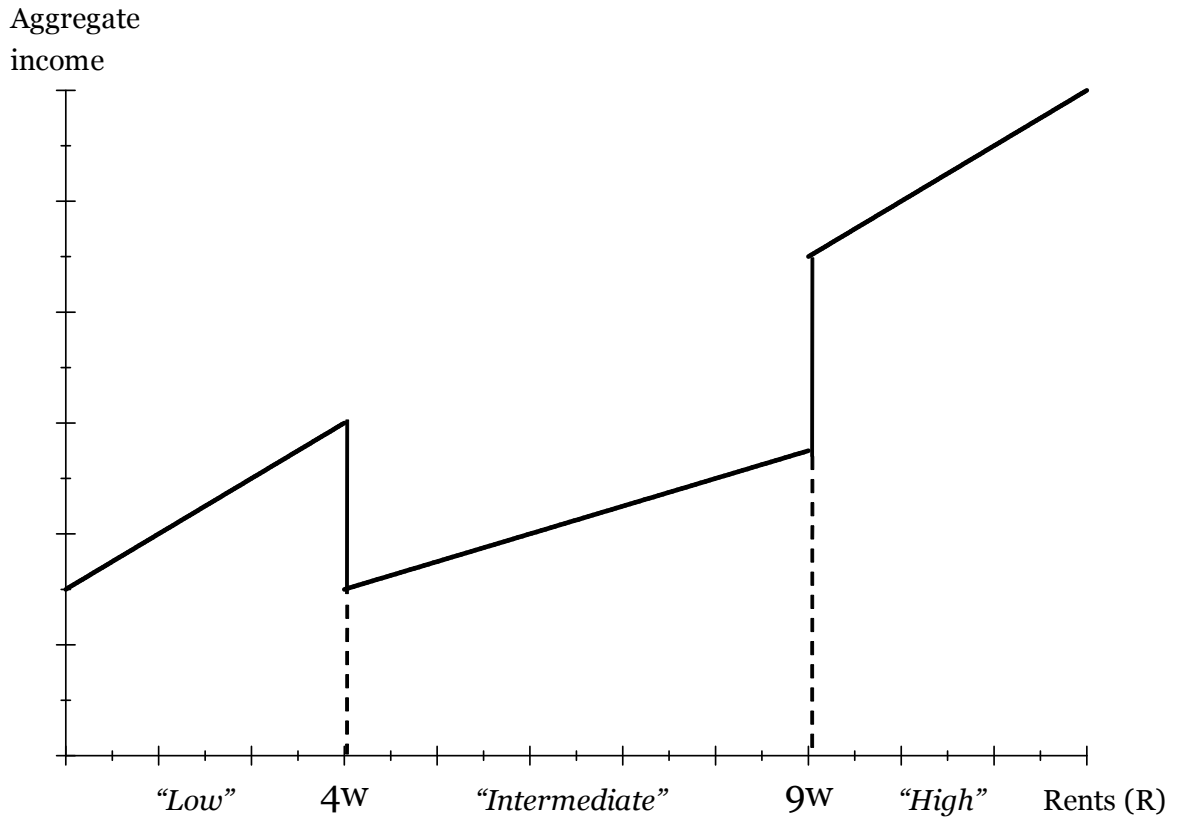


Figure 2: Rents and aggregate income

The fall in income due to conflict is an example of the resource curse (Sachs and Warner, 2001). The main point of the present paper, however, is to show that resources can be as much a blessing as a curse: By giving credibility to a transfer program, increased rents can prevent rent seeking and thereby increase aggregate income in society, as shown by the move

from the intermediate-rents to the high-rents regime.

5 Extensions

5.1 Polarization

So far, we have assumed that the interest groups care only about income. But the literature on conflict also points to social tensions, based on ethno-linguistic or religious differences, as sources of conflict. The empirical evidence is mixed. For instance, while Collier and Hoeffler in earlier work found a hump shaped relationship between fractionalization and the risk of conflict, in their newer work (Collier, Hoeffler, Rohner, 2008) they find the effect of fractionalization on conflict to be monotonically increasing. However, Fearon and Laitin (2002) argue that factors such as poverty and political instability rather than ethnicity explain civil war .

One reason why the empirical evidence is not clear on this issue could be that ethno-linguistic or religious diversity under some conditions promote conflict and under other conditions discourages conflict. It is straightforward to demonstrate that this is a likely outcome of incorporating social tensions in the present model. Assume that groups experience a disutility from being ruled, based on, say, social or cultural policies carried out by the incumbent, which do not harmonize with the ideals of the opposition groups. Assume that the disutility is symmetric across groups, and given by γ . The higher is γ , the more polarized is society. The group in power implements its preferred policy and experiences a zero policy-loss.

Groups now fight not only for the ability to control the rents, but also to control policies. The expected payoff from duopoly rent seeking is modified to $\hat{\rho}^d = \frac{1}{4}(R + \gamma)$, implying that for $w > \hat{\rho}^d \Rightarrow R < 4w - \gamma$, the incumbent faces no opposition. Similarly, triopoly rent seeking gives expected payoff $\hat{\rho}^t = \frac{1}{9}(R + \gamma)$, with $w < \hat{\rho}^t \Rightarrow R < 9w - \gamma$. In Figure 1, introducing $\gamma > 0$ implies a leftward shift in the two vertical lines, from $R = 4w$ to $R = 4w - \gamma$, and from $R = 9w$ to $R = 9w - \gamma$. Interestingly, we observe that the effect of polarization on conflict depends on the level of resource rents. For low levels of rent, increased polarization increases the likelihood of conflict. This is because the added social tensions makes it more attractive for the opposition groups to challenge the incumbent. And since the incumbent cannot offer a credible patronage employment program to pacify the opposi-

tion, duopoly rent seeking will result. For higher levels of rent, on the other hand, increased polarization has the opposite effect, reducing the likelihood of conflict. It does so by making triopoly rent seeking sustainable for lower levels of resource rents. From the discussion above we know that the harsher punishment of breaking the agreement, together with the relatively lower transfers needed, makes the transfer program credible, which can sustain a peaceful equilibrium.

5.2 Fractionalization

So far, we have considered a situation with two opposition groups. What happens if there are more than two opposition groups in society? We can interpret an increase in the number of groups as increased fractionalization. Let n be the number of groups. Clearly, the more opposition groups, the more expensive is the patronage employment scheme for the incumbent. For instance, when the relevant rent seeking market structure duopoly, i.e., for $\rho^t < w < \rho^d$, the incumbent has to make total transfers of $(n - 1) \rho^d$ to prevent conflict. The critical level of δ above which the transfer program is credible is now:

$$\pi_{dev}^d = \pi^d(n) \Leftrightarrow \delta = \frac{1}{3}(n - 1) \equiv \delta^d(n), \quad (13)$$

which reduces to δ^d in (9) for $n = 3$. Note that $\delta^d(n)$ is increasing in n : The more groups in society, the more likely is conflict in equilibrium. Indeed, $n = 4 \Rightarrow \delta^d(n) = 1$, implying that there will be conflict even in the absence of discounting. The same logic applies for the case of triopoly rent seeking, etc. Still, while fractionalization makes conflict more likely, the core mechanism highlighted in this paper survives: An increase in rents such that the market structure of conflict changes, may change the equilibrium from conflict to peace by making the transfer program credible.

6 Conclusion

We have shown that resource rents can have complex effects on conflict in society. Increasing rents starting at a low level can change the scenario from an unchallenged dictatorship to conflict, as the rent seeking market structure changes from monopoly to duopoly. While the incumbent would like to

prevent conflict, the patronage employment transfer program that would pacify the opposition is not self sustained, and hence not effective. Increased rents given this market structure intensifies the rent seeking contest. This may change radically as the increase in rent changes the rent seeking market structure. At some point, increased rents will attract more rent seekers. By making conflict more costly to the incumbent, and by reducing the share of rents needed for transfers required to pacify the opposition, the transfer program could now be self sustained, ensuring a peaceful solution. In this way, increased rents, starting from a higher level, may promote peace.

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