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Kirstein, Roland; Voigt, Stefan

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The Violent and the Weak: When Dictators Care About Social Contracts

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The Violent and the Weak: When Dictators Care About Social Contracts

by Roland Kirstein* and Stefan Voigt **

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Abstract

This paper explores the conditions under which compliance with a social contract establishes an equilibrium in a society. It is assumed that society consists of two groups, one of which has a comparative advantage in using violence, whereas the other one has a comparative advantage in producing a private good. Violence can be used to produce security as well as to exploit the weaker group. Yet, exploitation is limited: it reduces the incentives of the exploited group to produce the private good and increases the chances of a revolution. A social contract consists of the exchange of security against a share of the private good, produced at a high level of effort. The model not only allows the derivation of conditions for either compliance or exploitation to occur, but also sheds light on the transition from one form of government to the other. Hence, it contributes to Positive Constitutional Economics, i.e., the research program that is interested in explaining the emergence and the change of constitutions.

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*Center for the Study of Law and Economics, Universität des Saarlandes, Bldg. 31, POBox 151 150, D-66041 Saarbrücken, Tel.++681-302-3582, fax ++681-302-3591, email rol@rz.uni-sb.de
**Institute for Advanced Study (Wissenschaftskolleg) Berlin, Wallotstr. 19, D-14193 Berlin, Tel. ++49-30-89001-270, fax ++49-30-89001-300, email: voigt@wiko-berlin.de. This paper was presented at the conferences of EALE (Castellanza/Italy), ALEA (New York), and at the EPC in Siena/Italy. We would like to thank Lorenzo Sacconi for a most valuable comment and we are grateful for further hints by Matthew Braham, Jürgen Eichberger, Henrik Lando, Alexander Neunzig, Rudolf Richter, Susan Rose-Ackerman, Eli Salzberger, Hans-Bernd Schäfer, Dieter Schmidtchen, and Michael Trebilcock.

1. Introduction

Many societies are governed by autocrats. Many other governments remain within the confines of social contracts. We observe that societies which have been governed by autocrats are able to depose them and install a government that does not make itself better off by exploiting its citizens. But we also observe that governments that had refrained from exploitation for a long time end up as autocracies. These observations and developments all deal with de facto constitutions, i.e., with the capacities and restrictions of governments as they factually apply and not as they are written down in solemn form in the documents usually called constitutions.

A comprehensive economic theory capable of explaining constitutional changes is not available yet. Public Choice is basically interested in explaining the working properties of political systems, assuming a given set of rules. Its explanatory focus is furthermore heavily tilted toward explaining the working properties of democratic systems. The economic analysis of autocracy is still in its infancy[1]. Hence, an economic theory

- that identifies the conditions under which autocracy is to be expected and those under which a social contract will be complied with

- and that furthermore explains the transition from one form of government to the other[2]

is not provided yet. It is the aim of this paper to make a step toward such a theory. To do so, we use non-cooperative game theory[3]. As in BUCHANAN (1975), we distinguish between a constitutional and a post-constitutional stage. However, we do not assume the constitutional stage to take place only once, followed by a sequence of post-constitutional interactions. We rather assume a sequence of games, each of which consists of a constitutional and a post-constitutional stage. We propose to analyze these games separately, thus disregarding the possibility of intertemporal decisions such as supergame strategies as well as reputational effects or learning. This modeling strategy is thus closer to Binmore's approach, which conceptualizes the "game of life" as taking place continuously in the state of nature[4]. It is in contrast to the notion of normative constitutional economics, according to which the actors are able to erect behavioral constraints in one constitutional stage that will effectively channel their behavior in all of the post-constitutional stages.

Since our focus is on the non-cooperative interaction in the post-constitutional stage, we take the result of the negotiations during the constitutional stage as exogenously given. The aim of the model is to show whether the parties have an incentive to comply with the constitutional agreement. If the equilibrium in the post-constitutional stage is

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[1] TULLOCK (1987) is one of the few monographs on the subject.

[2] VOIGT (1999) is a first sketch.

[3] See COOTER (forthcoming) for a comprehensive monograph on constitutional issues, drawing on game theory

[4] See BINMORE (1994).

compatible with this social contract, then, at least in the round under consideration, it will indeed become effective. If the parties have an incentive not to stick to their promises made during the constitutional stage, then the social contract is nothing but cheap talk.

We assume society to consist of two groups of individuals, one of which has a comparative advantage in producing security, whereas the other one has a comparative advantage in producing a private good[5]. In a number of papers, MANCUR OLSON has dealt with the incentives of groups that have a comparative advantage in the expropriation of others[6]. He has shown that "roving bandits" have an incentive to become stationary and to protect the property of a given population if that increases saving and investment and will enable the stationary bandits to get a higher sum total out of that group. Olson also shows that the optimal rate of extortion - or tax - is lower still if it is determined by majority decision. In this paper, we go beyond the Olson approach in that we model the strategic interaction between the two groups explicitly. In a social contract between these two groups, the weaker one promises to produce the private good at a high level, whereas the more violent group promises not to demand more than the agreed share of this output in exchange for providing security[7].

It is the aim of this paper to derive the conditions under which different types of equilibria can be predicted. Our model leads to three different types of equilibria:

- compliance with a social contract (also called *"cooperation"*)[8],

- exploitation that avoids a revolution and the risk of being overthrown (also called *"moderate exploitation"*),

- exploitation followed by a revolution, hence the risk of being overthrown is taken into account by the dictator (also called *"maximum exploitation"*).

The model allows us to identify parameter changes which cause transformations from one form of government to another. We proceed as follows: section two distinguishes our positive approach toward constitutional economics from the hitherto dominating

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[5]Following NORTH (1981).

[6]E.g. OLSON (1991), but also MCGUIRE/OLSON (1996).

[7]See SCHMIDT-TRENZ (1996, 27) for a systemtic analysis of models in which the provision of the public good faces the "contribution problem" and models where the "delegation problem" plays a role.

[8]See also GROSSMAN (forthcoming), who argues that a high survival probability of the state is a precondition for the state to credibly commit itself to non-expropriation. In other words: The higher the capability of the citizens to depose their government, the lower the chances that government will act as if it were an agent of the citizenry.

Concerning parliament as an organization that allows autocrats to credibly bind themselves, BARZEL (1997) argues that secure kings deliberately gave up some of the powers which enabled them to credibly commit themselves to their promises not to confiscate the property of their subjects, which in turn made the realization of additional gains from cooperation possible. His approach thus flatly contradicts the more conventional one that conceptualizes the emergence of parliament as the consequence of weak autocrats. Here, our focus is not so much on explaining the emergence of institutions that enable actors to make their promises credible, but to identify possible equilibria in an essentially institution-free environment.

normative one. Section three contains our model, and section four concludes the paper and reiterates some of the open questions.

2. Normative versus Positive Constitutional Economics

Until recently, constitutional economics has almost exclusively taken a normative approach. Although the most important representative of the program, JAMES M. BUCHA-NAN, denies this imbalance between legitimization and explanation[9], he also admits that *"(t)he purpose of the contractarian exercise is not explanatory in this sense. It is, by contrast, justificatory in that it offers a basis for normative evaluation"*[10]. When constitutional economists try to make a positive argument concerning the emergence of the state, they often draw on social contract theory[11]. They usually model individuals who are stuck with a prisoners' dilemma: all of them could be better off if they were able to commit themselves to cooperate. However, playing the non-cooperative strategy is dominant.

Suppose that the players establish a social contract to solve their dilemma. This is the attempt to overcome their inability to comply with a mutually beneficial (private) contract by entering into yet another (now social) contract. Compliance with the social contract, i.e. enforcement of the private contract, would make all parties better off. However, it is still dominant not to cooperate. The social contract needs to be enforced in order to be able to enforce the private contract. This would require yet another contract - and so forth, which leads into an infinite regress.

The notion of a third-party enforcer does not solve the problem: suppose that the parties who failed to solve the prisoners' dilemma enter into a social contract and found the state with the intention of establishing an impartial arbitrator and an enforcement agency. The parties to the private contract then disarm themselves and pay a fee to a third party for its services instead[12]. They endow this third-party enforcer with the monopoly on using force. However, what incentives does the third party then have to stick to its role of impartial arbitrator instead of expropriating the two parties who originally founded it? Again, the social contract between the parties of the private contract and the third party needs to be enforced, which again leads to an infinite regress.

We thus argue that, to explain the emergence of the state, this version of social contract theory is of little help. The same holds for the attempt to explain constitutional change. If constitutional rules are assumed to be the most basic layer of rules, they cannot be seen as a contract to be enforced, but rather need to be self-enforcing. This, however, does not mean that the notion of contract would become completely superfluous. Indeed, one can conceive of a give and take between a limited number of actors.

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[9]E.g. BUCHANAN (1990, 2).

[10]BUCHANAN (1987, 249).

[11]For a survey on Positive Constitutional Economics, see VOIGT (1997).

[12]KIRSTEIN/SCHMIDTCHEN (1997) provide an analysis of the impact that court costs and imperfect decision-making judges have on contracting parties in a trust game.

It is crucial, however, not to introduce an enforcement agency by fiat but to analyze whether the contracting parties have incentives to stick to the provisions of the contract in the post-constitutional stage. In our model, we therefore need only two players, and not a third one who is created by the original two players. As a consequence of the folk theorem[13], proponents of social contract theory could argue that they can also do without a third party as long as the game is repeated often enough. That is why we decided not to focus on repeated games but to ask whether various forms of government could also be explained by analyzing a one-shot game which might, however, be played repeatedly, yet without assuming intertemporal links.

Drawing on a well-established notion of constitutional economics, we want to distinguish between a constitutional and a post-constitutional stage. In the constitutional stage, the two actors would (implicitly) negotiate on the price of the provision of security. In return, the actor commanding an advantage in producing the private good would promise to choose a certain (high) effort level. We call this agreement a *"social contract"*. It differs from the usual notion of social contract in at least two aspects:

- No third party which could decide quarrels between the two contracting parties is introduced. The necessity of self-enforceability thus becomes apparent.

- The parties negotiating the constitutional agreement are perfectly aware of their identities, and thus know whether their comparative advantage is in producing the private good or in producing violence[14].

The process by which the negotiating parties bring the contract about is not modeled at all[15]. Instead, we focus on the post-constitutional stage, asking what conditions have to be fulfilled in order to make sustainable the agreement that was reached on the constitutional stage. A social contract that is not an equilibrium of the game that takes place during the constitutional stage is nothing but cheap talk. Put differently: the scope that the bargaining parties have on the constitutional stage is determined by the equilibrium of the post-constitutional stage. The idea that a simple sheet of paper could bind actors even against their own interest is thus done away with.

3. The choice between exploitation and cooperation

3.1 The model

Society consists of two groups of individuals, denoted V and W. Each group consists of a large number of individuals who are treated as homogeneous, because we are interested

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[13]See e.g. FUDENBERG/MASKIN (1986).

[14]For such an approach to constitutional contracts, see VOIGT (1999, chapter 6).

[15]NEUMÄRKER (1997) tries to put the strategic relation between these two groups into the framework of a Stackelberg game: The group that has the power to set the rules of the subsequent game has some advantage.

in the analysis of intergroup interaction and not in intragroup interaction. V has a comparative advantage in using violence, whereas W is able to produce a private good. V can use his force to produce transactional security, but also to exploit the other group. However, the difference between V and W in the capacity to produce violence is not unlimited: the higher the production of a private good, the more likely is a successful revolution[16].

V, commanding violence, has an interest that W works as hard as possible, thus producing a high social product, of which V would like to secure as large a share as possible. The weaker actor W has an interest in V providing security against external aggression for a price as low as possible. V and W are assumed to be risk-neutral. The subsequent analysis shows the conditions under which

- the social contract will be complied with,

- moderate exploitation occurs or

- maximum exploitation, followed by a revolution takes place.

We model the post-constitutional stage as a one-shot game, see figure 1. W moves first and decides on the effort level e, which can be either low or high: $e \in \{l; h\}$. The social product is a function of the effort level $Y = Y_e$ with $Y_l < Y_h$. The incremental costs W has to bear if he chooses $e = h$ are denoted as E.

After the input decision of W, his opponent V has to decide whether to demand only the agreed share of the private good ($q_e = q_0$) or a higher share ($q_e > q_0$). We take the level of the cooperative share as determined on the constitutional stage and thus as exogenously given in the post-constitutional game under consideration. To demand less than the cooperative share q_0 is a dominated move; hence the choice situation of V at his node can, for the moment, be described as $q_e = q_0$ versus $q_e \in]q_0, 1]$. $q_e, e \in \{l; h\}$ denotes V's different reactions on W's effort choice.
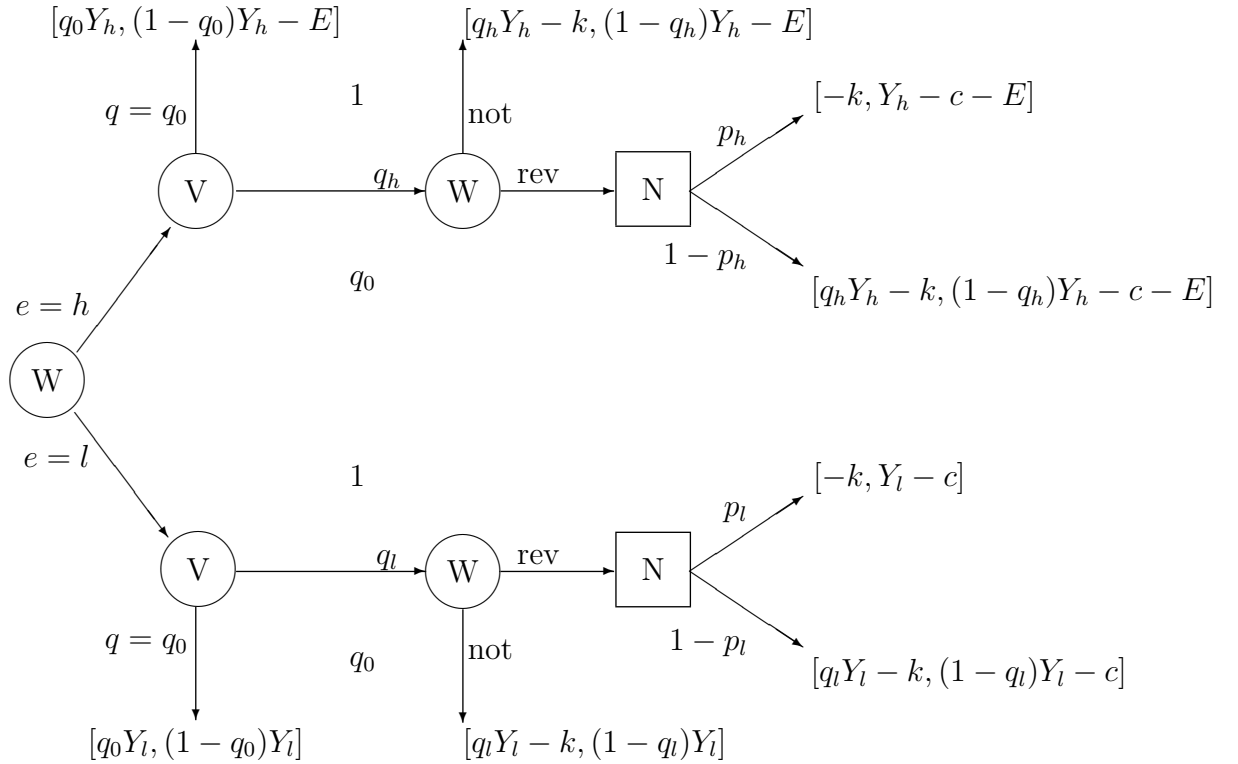
If V decides to exploit W at a rate that exceeds q_0 - this option $q_e \in]q_0, 1]$ is symbolized by triangles in figure 1 - he has to bear costs, denoted as $k > 0$. These costs are required to produce additional violence - if V chooses to exploit W, he not only has to protect the external borders of the economy, but also has to invest effort in oppression.

If V has chosen exploitation, then W decides whether to attempt a revolution or not. If the revolution is successful, which occurs with probability p_e, then V becomes incapable of demanding any of the social product. Whether the revolution is successful or not is modeled as a chance move of "Nature", which is denoted as N. We assume $p_h > p_l$: The more W has produced, the better are the odds when trying to overthrow V. In case of failure (with probability $1 - p_e$), W has to pay the share of the social product demanded by V, namely q_e. Successful or not, W has to bear the effort for attempting a revolution, which is denoted as c.

Figure 1 illustrates some of the driving forces of the model:

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[16]HENNING/LU (1999) model the probability of a successful revolution increasing with the tax rate.

Figure 1: The game in extensive form

Figure 1: The game in extensive form

$[q_0Y_h, (1-q_0)Y_h - E]$

$[q_hY_h - k, (1-q_h)Y_h - E]$

$[-k, Y_h - c - E]$

$q = q_0$ 1

not

p_h

V

q_h

W

rev

N

q_0

$1 - p_h$

$[q_hY_h - k, (1-q_h)Y_h - c - E]$

$e = h$

W

$e = l$

V

$q = q_0$

q_l

W

rev

N

1

p_l

$[-k, Y_l - c]$

q_0

not

$1 - p_l$

$[q_lY_l - k, (1-q_l)Y_l - c]$

$[q_0Y_l, (1-q_0)Y_l]$

$[q_lY_l - k, (1-q_l)Y_l]$

- Exploitation at a rate that exceeds the cooperative one (q_0) has, at a first glance, a beneficial impact on V's payoff. The same holds for a higher effort of W.

- However, the additional exploitation costs k can make exploitation harmful for V.

- The same holds for higher effort, which on the one hand makes exploitation more beneficial, yet on the other hand increases the probability of a successful revolution, p.

Hence, high effort by W is clearly beneficial for V as long as he avoids a revolution - or if V exploits at a rate that overcompensates for the risk of being overthrown. For the moment we simply assume that W does not choose to try to depose his opponent if V only demands the cooperative share; the analysis below will show that this assumption can also be derived as an endogenous result.

3.2 Backward induction

3.2.1 The revolution decision

First, we analyze W's decision whether to attempt a revolution (i.e., choosing the option rev) or not. Note that, when W has to make this decision, his effort choice and hence the effort costs are already sunk. Thus, we can neglect here the costs of high effort E. Moreover, we do not consider which effort W has chosen and present the subsequent analysis without specifying e.

Given that W has chosen his effort level and V has chosen to exploit W (at a rate q_e that exceeds q_0), then W receives $(1 - q_e)Y_e$ if he adapts to the exploitation. The revolution, on the other hand, yields

$$p_e[Y_e - c] + (1 - p_e)[(1 - q_e)Y_e - c]$$

for W. This equals $p_eY_e + (1 - q_e)Y_e - p_e(1 - q_e)Y_e - c$, which can be simplified to

$$(1 - q_e)Y_e + p_eq_eY_e - c$$

The expected payoff from attempting a revolution exceeds W's payoff from adapting to exploitation if, and only if:

$$(1 - q_e)Y_e + p_eq_eY_e - c > (1 - q_e)Y_e$$

This is equivalent to

$$p_eq_eY_e > c$$

We call this expression the *revolution condition*. If the revolution condition does not hold, i.e. if $c \geq p_eq_eY_e$, then it is beneficial for W not to attempt the revolution.

Figure 2 visualizes the revolution condition: The horizontal line represents the revolution costs c, the diagonal line stands for $q_ep_eY_e$, the expected gain from revolution. The revolution condition allows us to derive a threshold value that we denote $\hat{q}_e$, with

$$\hat{q}_e = \frac{c}{p_eY_e}$$

To the left of this threshold, the revolution condition does not hold, hence (not) is the preferred option. To the right of $\hat{q}_e$, revolution is beneficial. The maximum value of $\hat{q}_e$ is one. $\hat{q}_e$ is greater than q_0 if, and only if, $c > q_0p_eY_e$ holds. In this case, V does not have to fear a revolution if he chooses $q_e \leq \hat{q}_e$, and in particular if he complies with the social contract.

Figure 2: The revolution condition
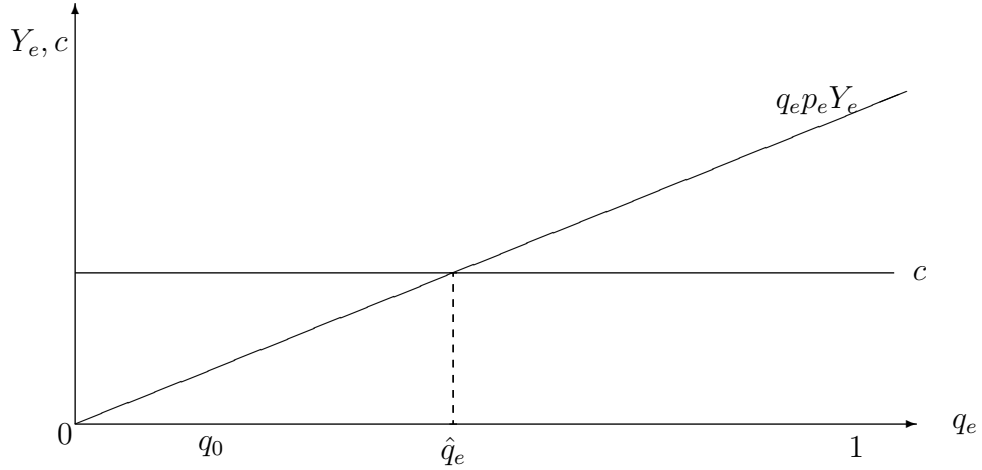
3.2.2   The exploitation decision

The analysis above shows that V triggers the subsequent behavior of W when demanding his share of the social product. If he chooses $q_e < \hat{q}_e$, then W will not attempt a revolution. Again, in this section, we can neglect the incremental costs of high effort, E, and derive the optimal reply of V to any effort choice e by player W.

If V chooses $q_e > \hat{q}_e$, then he faces the lottery of a revolution. His expected payoff then is $(1 - p_e)q_e Y_h - k$, because in case of a successful revolution, V receives no share of the social product and still has to bear the additional costs of violence. V now has to distinguish three cases:

- If he chooses $q_e = q_0$, his payoff is $q_0 Y_e$. This saves the exploitation costs k.

- If he wants to exploit W, yet avoid a revolution, he has to choose $q_e \in]q_0, \hat{q}_e]$. His payoff then is $q_e Y_e - k$.

- If he accepts the risk of being overthrown, then he chooses $q_e \in]\hat{q}_e, 1]$ and receives $(1 - p_e)q_e Y_e - k$ as the expected payoff.

Obviously, in all three cases, the (expected) payoff of V is monotonically increasing in q_e. Hence, only three of his options are relevant for V:

a) $q_e = q_0$, i.e. cooperation.

b) $q_e = \hat{q}_e$, i.e. moderate exploitation that avoids revolution.

c) $q_e = 1$, i.e. maximum exploitation, followed by a revolution.

Given an effort choice e, the option q_0 is optimal if the payoff $q_0 Y_e$ exceeds both $\hat{q}_e Y_e - k$ (from moderate exploitation) and $(1 - p_e)Y_e - k$ (from maximum exploitation with revolution). The first of these conditions is $q_0 Y_e > \hat{q}_e Y_e - k$, which can be expressed equivalently as $k > (\hat{q}_e - q_0)Y_e$ and then, making use of $\hat{q}_e = c/p_e Y_e$, as

$$k > c/p_e - q_0 Y_e \tag{1}$$

Cooperation is better than moderate exploitation if, and only if, condition (1) holds. The second condition $q_0 Y_e > (1 - p_e)Y_e - k$ can be restated equivalently as

$$k > (1 - p_e - q_0)Y_e \tag{2}$$

Cooperation is better than exploitation with revolution if, and only if, condition (2) holds. Finally, we consider the relation between moderate exploitation and exploitation with revolution. If $\hat{q}_e Y_e - k$ is greater than $(1 - p_e)Y_e - k$, then moderate exploitation is better for V. This condition is equivalent to

$$\hat{q}_e Y_e - k > (1 - p_e)Y_e - k \Leftrightarrow$$
$$\hat{q}_e > (1 - p_e) \Leftrightarrow$$
$$c > (1 - p_e)p_e Y_e \tag{3}$$

Using these *exploitation conditions* (1) to (3), we can derive the following

> **Proposition 1:** *Given a social contract (q_0, h) and W's effort choice $e \in \{h; l\}$, then the optimal action of V is*
>
> - *$q_e = q_0$ if, and only if, (1) and (2) hold*
> - *$q_e = \hat{q}_e$ if, and only if, (3) and not (1) hold*
> - *$q_e = 1$ if, and only if, neither (2) nor (3) hold.*

The exploitation conditions and this proposition are diagrammed in figure 3. For all of the possible combinations of k and c, the figure shows V's optimal reaction q_e to the effort e chosen by W, with $q_e \in \{q_0; \hat{q}; 1\}$. Condition (1) is represented by the area above the diagonal line, which intersects the horizontal axis at $c = q_0 p_e Y_e$. Above the horizontal line, condition (2) is fulfilled. The vertical line represents condition (3), which holds for combinations to the right of this line.

In the upper left trapezoid (above the horizontal and the diagonal line), exploitation costs are high, whereas revolution costs are relatively low. In this area, conditions (1) and (2) hold, hence $q_e = q_0$ is optimal, as stated in Proposition 1.

With low exploitation costs and relatively high revolution costs, as in the trapezoid below the diagonal and to the right of the vertical line, condition (3) holds, but not (1). Hence, $q_e = \hat{q}_e$ is V's optimal choice. And finally, if both revolution costs and exploitation costs are low (below the horizontal and to the left of the vertical line), exploitation with revolution is V's best action: $q_e = 1$.

Figure 3: The exploitation conditions
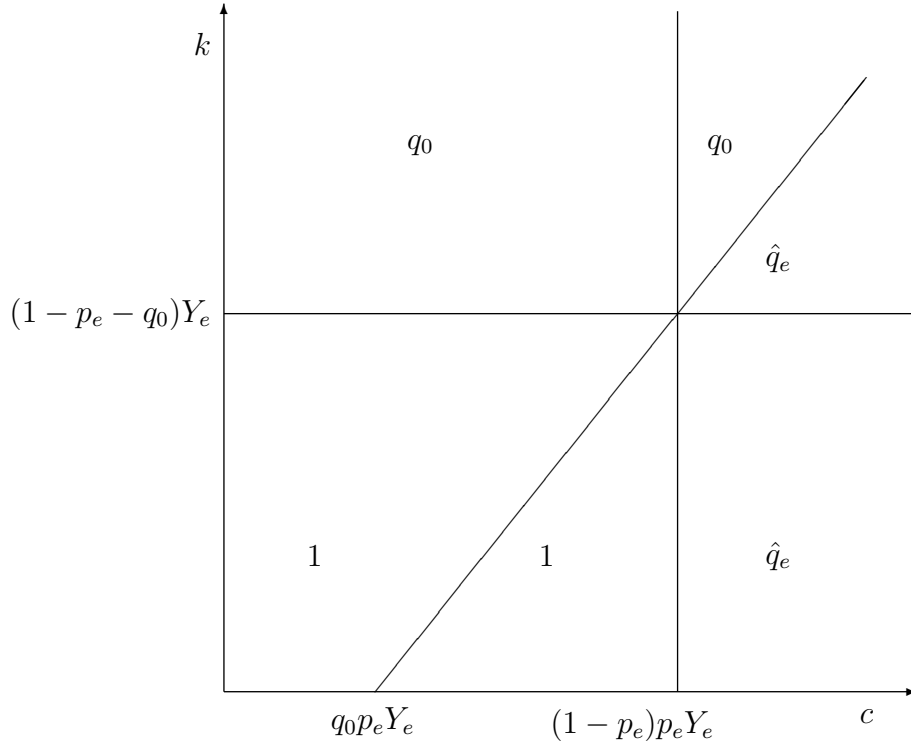
3.2.3 The effort decision

Our last step of the backward induction analysis is to derive the parameter settings for the optimal effort choice of W. Now the incremental costs of high effort, denoted E, become relevant for the analysis. In this paper, we are not interested in a complete equilibrium analysis. Our focus here is on the conditions for stable cooperation (compliance with a social contract) and stable (or moderate) exploitation. Hence, we derive only the conditions for the following two equilibrium paths:

1. $(e = h, q_h = q_0)$, i.e., compliance with the social contract.

2. $(e = l, q_l = \hat{q}_l, not)$, i.e., stable exploitation.

According to Proposition 1, the parameters k, c, p_e, Y_e and q_0 determine whether $q_0, \hat{q}_e$ or 1 is the optimal reaction of V on a particular effort choice. Since W can choose his effort level e from $\{h; l\}$, there exist nine possible combinations of optimal reactions q_h and q_l. For each of these nine cases, a condition can easily be derived under which V prefers the high effort.

As explained, we limit our view to one of the nine possible cases, namely the one where $(q_l = \hat{q}_l, q_h = q_0)$ reflects the optimal behavior of V. It is necessary and sufficient that

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the following four conditions are fulfilled:

$$k > (1 - p_h - q_0)Y_h \tag{4}$$
$$k > c/p_h - q_0 Y_h \tag{5}$$
$$c > (1 - p_l)p_l Y_l \tag{6}$$
$$k < c/p_l - q_0 Y_l 0 \tag{7}$$

The first two of these conditions refer to V's reply to W's choice of high effort: $e = h$. Condition (4) is derived from condition (2) above, condition (5) is derived from (1). If conditions (4) and (5) hold, then (1) and (2) are fulfilled, hence $q_h = q_0$ is the optimal reaction of V, according to Proposition 1. Conditions (6) and (7) provide that $\hat{q}_l$ is V's optimal reaction to $e = l$: condition (6) represents condition (3), and condition (7) is similar to "not (1)".

Now we can derive the optimal effort choice of W, given that conditions (4) through (7) are fulfilled. W receives $(1 - q_0)Y_h - E$ if he chooses $e = h$, and $(1 - \hat{q}_e)Y_l$ in case of $e = l$. Thus, he prefers high effort over low if, and only if,

$$E < (1 - q_0)Y_h - (1 - \hat{q}_l)Y_l \tag{8}$$

This leads to our second proposition:

> **Proposition 2:** *Given a social contract (q_0, h). If conditions (4) through (8) hold, the equilibrium path of the game is $(e = h, q_h = q_0)$. If, on the other hand, conditions (4) through (7), and not (8) hold, then the equilibrium path is $(e = l, q_l = \hat{q}_l, not)$.*

Note that this proposition states sufficient (but not necessary) conditions for the two equilibrium paths that we analyze here. If either of the conditions (4) through (7) is violated, the equilibrium behavior of V would differ from $q_l = hatg_l$ and $q_h = q_0$. This would have an impact on the payoffs W had to take into consideration when making his effort decision. His decision is governed by condition (8) if conditions (4) through (7) hold.

3.3 The impact of parameter changes

In this section, we will systematically analyze the impact of changes in the parameters Y_h, Y_l, p_h, p_l, c, k and E on conditions (4) through (8). In doing so, the social contract parameters (h, q_0) are of special interest.

- Condition (4) is equivalent to $k - (1 - p_h - q_0)Y_h > 0$. The left hand side of this expression increases in k, p_h and q_0. The effect of the parameter Y_h is ambiguous,

since it depends on p_h and q_0: if $1 - p_h < q_0$ then the left hand side increases in Y_h, otherwise it decreases. Violation of condition (4) means that exploitation with revolution would be better than cooperation for V, given W has chosen high effort.

- Condition (5) is equivalent to $k - c/p_h - q_0 Y_h > 0$. The left hand side of this expression increases in k and p_h. It decreases in c, q_0 and Y_h. If (5) were violated, then in the case of high effort by W moderate exploitation would be more attractive than cooperation for V.

- Condition (6) is equivalent to $c - (1 - p_l)p_l Y_l > 0$. The left hand side of this expression increases in c and $p_l > 1/2$. It decreases in Y_l and $p_l < 1/2$. Violation of (6) would make cooperation the best reply of V to low effort of W.

- Condition (7) is equivalent to $c/p_l - q_0 Y_l - k > 0$. The left hand side of this expression increases in c and decreases in p_l, q_0, Y_l and k. If (7) is violated, then exploitation with revolution would be more attractive than moderate exploitation fow V as a reply to low effort choice by W.

- And finally, condition (8) is equivalent to $c/p_l - q_0 Y_l - k > 0$. The left hand side of this expression increases in Y_h and c. It decreases in q_0, Y_l, p_l and E. If condition (8) did not hold, low effort would be the best choice for W.

Table 1: The impact of the parameters on the equilibrium conditions

Parameter	Impact on condition				
	(4)	(5)	(6)	(7)	(8)
k	+	+		−	
c		−	+	+	+
p_h	+	+			
p_l			?	−	−
E					−
Y_l			−	−	−
Y_h	?	−			+
q_0	+	−			−

These results, as summarized in table 1,[17] allow for the following interpretation: A society can be expected to comply with a social contract if exploitation costs k and revolution costs c are high, as long as conditions (5) and (7) still hold.

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[17] A plus sign means a positive impact of the parameter on the left hand side of the condition under consideration: the higher the parameter value, the more likely that the condition holds. A minus sign represents a negative impact, a blank indicates neutrality, and a question mark stands for an ambiguous effect.

Cooperation is more likely to be the equilibrium path if the probability of a successful revolution is high in case of high effort in producing the private good (p_h) and low if the effort was low (p_l).

Another factor that stimulates compliance with the social contract is the productivity of the input into the production of the private good: If Y_l is low and the effort E that is necessary to produce Y_h instead of Y_l is low as well, this triggers cooperation. The same holds if Y_h is high, as long as condition (5) is fulfilled. If $q_0 < 1 - p_h$, then Y_h also needs to fulfill condition (4).

A decisive factor for compliance with the social contract is the share of the social product the violent group receives according to the social contract: the lower q_0, the more likely is cooperation. However, condition (4) must hold, hence the share for the more violent group must not be too small.

4. Conclusions and outlook

In this paper, we have derived the conditions which determine the various possible equilibria concerning the effort level chosen by W and the exploitation level chosen by V. Section 3.3 served to derive the unique equilibrium that is predicted under each of the possible parameter constellations via backward induction. Three types of equlibria are possible in the game we presented: cooperation, stable exploitation and exploitation with revolution. We were especially interested in the conditions for the first and the second type. In section 3.4, the results derived in 3.3 were interpreted by asking what effects changes in the parameter settings would bring about.

The social contract under consideration concerns a promise by player W to exert a high effort level in producing a private good and by player V to constrain taxation to a predetermined level. The self-enforceability of a social contract was shown to increase with the productivity of the additional effort player W has to invest to produce a high output instead of a low one. It seems worth noting that this result obtains although we analyze only a one-shot game; it is thus not due to intertemporal threats from W to produce less in the next period if V does not stick to the agreed taxation level.

Similarly, it was shown that the chance of self-enforceability is promoted by high exploitation costs. This result is in accordance with our intuitions: the more costly it is for the group producing violence to take away some of the wealth of the other group, the less attractive this option becomes. Formulated the other way round: the more costly it becomes, the more incentives this group has to stick to the implicitly agreed taxation level. Finally, it was shown that chances of self-enforceability increase with low revolution costs. This result is also in accordance with our intuitions: the less costly it is to kick off a revolution, the more careful V will be not to renege upon the the social contract.

It is tempting to think up an empirical test of this theory. Rather than carrying it out here, some of the problems to be solved will simply be spelled out. To group empirically observable cases into one of the possible equilibrium paths, one would have to be able

to agree on their specific situation. Going even one step further back, one would look at the conditions that were derived in 3.3 for a "fair" taxation level to materialize. Unequivocal agreement on when these conditions are fulfilled will hardly ever be possible. One of the central insights of this theory, however, is that high productivity increases the chances of self-enforceability. One test-strategy could therefore consist in estimating the productivity of a given effort-level at different times and different places. This estimate could then be compared with income and taxation levels of those societies. One could proceed similarly with exploitation and revolution costs.

Confronting the insights of the model with empirically observable constitutional agreements, a number of questions remain open. It can be observed that constitutional arrangements which - due to the specific parameter settings - do not have a real chance of becoming enforced are still concluded and solemnly presented in public. What are the incentives of the actors to invest time and effort into negotiating these documents if their ability to constrain politicians - and other actors - is rather small?

Deviating from the approach usually chosen in constitutional economics, we decided not to model the constitutional stage explicitly but to identify the parameters which determine whether an agreement reached on the constitutional level is enforceable or not. For a sequel paper, endogenizing the bargaining process taking place on the constitutional stage rather than assuming the contract as exogenously determined seems a logical step. Closely related is another deviation from conventional constitutional economics that was chosen here: we do away with the concept of a third party who would somehow enforce social contracts; instead we insist on the self-enforceability of such contracts.

The particular novelty of our approach is that we also deviate from well-established concepts of self-enforceability such as those of TELSER (1980), KLEIN (1985), or AXELROD (1984), which are based on repeated games. In our model, the costs of exploitation and revolution provide the main incentives for compliance with the social contract. That is not to say that repetition will not have any effects. A sequel paper could thus deal with the intertemporal effects that arise as a consequence of repetition. One possible aspect is that W could make a specific investment to enhance its productivity, which could lead to modifications in the conditions for equilibria.

It seems worth noting that the analyses presented in 3.3 are concerned with comparative statics, which means that we do not deal with the origin of changes in our exogenous variables. If one is interested in the path from one equilibrium to another, i.e. in a dynamic model, this will certainly become an issue. This, too, is a possible topic of a future paper. In this paper, we assume that each of the two conflicting groups consists of homogenous actors. Hence, we represent these groups by two players V and W. In future papers, some modifications would seem to be worthwhile:

- to give up the assumption that the groups are perfectly organized. In other words, one could introduce latent interest groups that would have to overcome the free-rider problems inherent in collective action in the first instance.

- to allow for a larger number of groups that make up a uniform W in our model.

This would bring to the fore the issue of coalition-building among them.

Obviously, the research program of Positive Constitutional Economics is still in its infancy. Much theoretical and empirical work remains to be done to explain the emergence and the modification of self-enforcing, i.e. *de facto* social contracts.

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