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Abstract. This article analyzes a much debated clause in the 1996 coalition contract between SPD and F.D.P. in Rheinland-Pfalz. Two parties write a contract, based on which decisions under incomplete information have to be made at a later point in time. It is shown that a complex complete contract can achieve the first best outcome. However, a simple incomplete contract can implement the first best outcome only if use of seemingly inefficient randomization is made.

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1. Introduction

The German state Rheinland-Pfalz is governed by a coalition between the Social Democrats (SPD) and the Liberals (F.D.P.). When these two parties decided to form a coalition in 1996, they signed a contract. This contract contains one rather unusual clause, which has been the subject of many debates in Germany.[1] The clause under discussion says that if SPD and F.D.P. disagree about whether to vote for or against a law proposal in the federal council, the vote of Rheinland-Pfalz will be determined by throwing a coin.[2]

To be sure, this clause is only one paragraph in a contract which has a length of 89 pages. The major part of the contract describes common political goals, some of which are rather general (e.g., fight against unemployment) and some of which are quite concrete (e.g., approval of credit-point systems in universities). In any case, this major part of the contract is certainly incomplete in a literal sense, because it is too costly to specify detailed answers to all political questions which might potentially come up in the future. Therefore, a procedure must be specified which determines how to decide questions which are not already settled in the contract. The aim of this article is to show that in the presence of asymmetric information a procedure using a random device might well be optimal, if contracts are bound to be incomplete in an economic sense.[3]

Building a model for the problem described, we will make several simplifying assumptions in order to reduce technical difficulties and to allow for interpretations different from the example of a coalition between political parties. The following problem will be analyzed: There are two parties. Each party may consist of one or more individuals. The parties meet at an early date (ex ante) and write a contract. Since one can interpret the contract as the constitution of a coalition between the parties, we will call this stage the constitutional stage.[4] At a later date (ex post), the parties have to take a joint action. For simplicity, we assume that this action is binary, i.e. a 'yes' or 'no' decision has to be made. In our leading example 'yes' means a vote for a law proposal in the federal council, while 'no' means a vote against the proposal. This stage will be called the operational stage. In our model the ex post efficient decision is either 'yes' or 'no' with probability one. Since indifference thus occurs with probability zero only, randomization seems to make no sense, in accordance with the arguments brought forward by the critics of the aforementioned contract between SPD and F.D.P. in Rheinland-Pfalz.

Note that if the parties were symmetrically informed at the operational stage, bargaining would according to the Coase theorem always lead to an ex post efficient decision, no matter what the original contract looks like.[5] As is well known, in general this conclusion is no longer true if the parties possess private information. We will show in Section 2, that in our model the first best outcome can still be achieved, if the parties can write a complete contract. However, as has been pointed out by Hart and Holmstrom (1987), contracts in the real world are usually not as complex as theoretically optimal contracts. In Section 3 we thus analyze whether the first best outcome can also be achieved if only simple contracts can be written. If there were no contract at all, our model would be similar to the one analyzed by Myerson and Satterthwaite (1983). These authors have shown that ex post efficiency cannot be achieved if the decision problem is non-trivial and if there is two-sided asymmetric information. Our analysis will show that this inefficiency result implicitly assumes a deterministic default option, i.e. if bargaining between the parties breaks down, the decision taken is always 'no'. If, however, the contract specifies a random default option (i.e. in the case of disagreement, the decision is made by throwing a coin), the first best outcome can be achieved. Note that this means that randomization will never occur in equilibrium. It is nevertheless reasonable to include randomization as a threat in the contract.

We will further discuss our results in Section 4. Since the proofs are rather technical, they have been relegated to the appendix.

2. Complete contracts

Consider the following situation. Two risk-neutral parties can write a contract at date 0 (ex ante). At date 1 (interim) the necessity of a binary action to be taken by the two parties comes up, i.e. a 'yes' or 'no' decision has to be made. The parties learn the realizations of their valuations for an affirmative decision and negotiations can take place. Finally, the decision has to be made at date 2 (ex post).

Let $q \in [0,1]$ denote the probability of a 'yes' decision. In case of a 'no' decision the gross utility of each party is normalized to be zero. The willingness-to-pay for an affirmative decision is denoted by v for party 1 and by w for party 2. We assume that v and w are random variables which are uniformly distributed on the interval $[-a,b]$, where $a>0$ and $b>0$. The assumption of uniformly distributed valuations is made mainly for technical convenience. It could also be argued that the uniform distribution comes closest to the idea of complete ignorance in a Bayesian framework, i.e. the parties only know that the valuations will be drawn from a certain 'reasonable' interval, but they cannot yet attach different probabilities to different subsets of that interval as long as they are of equal length.[6]

At date 1, party 1 learns the realization of v and party 2 learns the realization of w. Given a transfer z from party 2 to party 1, the utility of party 1 is thus given by $qv+z$ and the utility of party 2 is given by $qw-z$.[7]

The ex post efficient decision is 'yes' if $v+w \geqslant 0$, and 'no' otherwise.[8] We call this decision the first best outcome. The following proposition says that the parties can write a contract at the constitutional stage which implements the ex post efficient decision.

Proposition 1. The following complete contract implements the first best outcome. Both parties voluntary sign this contract at the constitutional stage.

Complete Contract:

At date 1, we will simultaneously announce our valuations. Let $\tilde{v}$ denote the report of party 1 and let $\tilde{w}$ denote the report of party 2. We will make the decision $q(\tilde{v},\tilde{w}) = 1$ if $\tilde{v}+\tilde{w} \geqslant 0$, and $q(\tilde{v},\tilde{w}) = 0$ otherwise. Moreover, party 2 must make a transfer $z(\tilde{v},\tilde{w}) = \frac{1}{2(a+b)} t(\tilde{v},\tilde{w})$ to party 1, where

$$t(\tilde{v},\tilde{w}) = \begin{cases} \tilde{w}^2 - \tilde{v}^2 & \text{if} \quad \tilde{v} \in [-a,a),\ \tilde{w} \in [-a,a) \\ a^2 - \tilde{v}^2 & \text{if} \quad \tilde{v} \in [-a,a),\ \tilde{w} \in [a,b] \\ \tilde{w}^2 - a^2 & \text{if} \quad \tilde{v} \in [a,b],\ \tilde{w} \in [-a,a) \\ 0 & \text{otherwise} \end{cases}$$

in the case $b \geqslant a$ and

$$t(\tilde{v},\tilde{w}) = \begin{cases} \tilde{w}^2 - \tilde{v}^2 & \text{if} \quad \tilde{v} \in (-b,b],\ \tilde{w} \in (-b,b] \\ b^2 - \tilde{v}^2 & \text{if} \quad \tilde{v} \in (-b,b],\ \tilde{w} \in [-a,-b] \\ \tilde{w}^2 - b^2 & \text{if} \quad \tilde{v} \in [-a,-b],\ \tilde{w} \in (-b,b] \\ 0 & \text{otherwise} \end{cases}$$

in the case $a > b$.

Signatures

The proof is given in Appendix A. Note that the transfer can be positive or negative, depending on the reports. The basic intuition for the result is as follows. The contract is constructed in a way which gives each party incentives to tell the truth. This is achieved by choosing the transfer rule so that on the margin each party wants to maximize the total surplus. If both parties tell the truth, the ex post efficient decision results due to the definition of $q(\cdot,\cdot)$. The contract thus works in the same way as the well known mechanism for the provision of public goods invented by d'Aspremont and Gerard-Varet (1979) and Arrow (1979). Indeed, the decision q can obviously be interpreted as a public good, since both parties must 'consume' the same amount.

3. Incomplete contracts

As has been repeatedly pointed out in the literature on contract theory, real world contracts often do not look like the theoretically optimal complete contracts.[9] In reality, contracts typically do not specify detailed procedures such as the one described in Section 2. Instead, parties will usually bargain over a decision when the respective issue actually comes up. If the decision is left to future negotiations, the contract must nevertheless specify what happens in the case of disagreement, i.e. if bargaining breaks down. If even such a clause were missing, the contract would be literally incomplete. Literal incompleteness can hardly be explained if parties are rational (cf. Hermalin and Katz, 1993). We will therefore focus on economically incomplete contracts, i.e. simple contracts which specify a decision without making use of message games. Given such an incomplete contract, inefficient decisions may result, since renegotiation takes place under asymmetric information.

In order to model bargaining under incomplete information we follow Myerson and Satterthwaite (1983). We thus assume that there is a benevolent mediator who makes an offer to the two parties, which they can accept or reject. If at least one party rejects the offer, we say that negotiations break down. Note that the existence of the benevolent mediator need not be taken literally. We can think of the mediator as part of a thought experiment in which we look for the best bargaining outcome that the parties themselves could achieve. Furthermore, note that due to the revelation principle (cf. Myerson, 1979) we can without loss of generality confine our attention to incentive compatible, direct mechanisms.

Let us therefore assume that the mediator proposes a direct revelation mechanism to the parties. If at least one party does not participate, renegotiation breaks down and the decision specified in the coalition contract is implemented. This decision is called the default option and denoted by $q_0 \in [0,1]$. Note that the default option can either be deterministic ($q_0=0$ or $q_0=1$) or stochastic ($0 < q_0 < 1$).

Proposition 2. The first best outcome cannot be achieved if the default option is deterministic.

The proof of Propositions 2 and 3 is given in Appendix B. Note that for $q_0 = 0$ Proposition 2 just restates the well-known result of Myerson and Satterthwaite (1983) within the framework of our model. The intuition is that in order to give the parties the appropriate incentives and to make them participate in bargaining, each party must expect to get the whole surplus. This, however, is impossible without outside subsidies (cf. Bulow and Roberts, 1989). Thus, the fact that the first best outcome is unattainable for $q_0=0$ should be no surprise.[10]

Now consider the case $b > a$. We know that at the operational stage either 'yes' or 'no' is efficient (randomization is efficient only if $v+w=0$, which happens with probability zero). One could guess that it would be optimal for the parties to choose $q_0 = 1$ at the constitutional stage, because (since $b > a$) 'yes' will be efficient with a higher probability than 'no', so that renegotiation would not too often be necessary. However, it will turn out that this guess is wrong. The following proposition shows that it is optimal to choose q_0 such that $0 < q_0 < 1$.

Proposition 3. Choose

$$q_0 \in \left[\frac{1}{a+b}\left(b - \sqrt{(a^2 b - \tfrac{1}{3}a^3) / (a+b)}\right), \frac{1}{a+b}\left(b + \sqrt{(a^2 b - \tfrac{1}{3}a^3) / (a+b)}\right) \right]$$

in the case $b \geq a$ and

$$q_0 \in \left[\frac{1}{a+b}\left(b - \sqrt{(ab^2 - \tfrac{1}{3}b^3) / (a+b)}\right), \frac{1}{a+b}\left(b + \sqrt{(ab^2 - \tfrac{1}{3}b^3) / (a+b)}\right) \right]$$

in the case $a > b$.

Then the first best outcome can be achieved by the following simple, incomplete contract.

Incomplete Contract:

We will bargain over the decision at date 1. If no agreement is reached, the decision is 'yes' with probability q_0, and 'no' otherwise.

Signatures

Note that this contract is much simpler than the complete contract described in Section 2. Moreover, for $q_0 = .5$ the contract closely resembles the one actually chosen by SPD and F.D.P. in Rheinland-Pfalz. Furthermore, note that the intervals are centered around $\overline{q}_0 = \frac{b}{a+b}$ which equals the probability that a party has a positive valuation.[11]

The basic intuition behind Proposition 3 is that the stochastic default option relaxes the participation constraints at the operational stage. The impossibility result of Myerson and Satterthwaite (1983) and Proposition 2 above were characterized by the fact that non-participation of one party lead to a certain decision. Now non-participation leads to a decision which is uncertain. Assume $q_0=\overline{q}_0$. From the point of view of party 1, the decision will be 'yes' with the same probability, with which party 2 has a positive valuation. This means that given the perspective of party 1, non-participation in bargaining is equivalent to let party 2 alone make the decision. Therefore, it is always better to participate.

The possibility result stated in Proposition 3 is to the best of our knowledge new. It is however related to results in McAfee (1991) and Cramton, Gibbons and Klemperer (1987). While the decision in our model has the character of a public good, these authors analyze trade relationships with private goods in the tradition of Myerson and Satterthwaite (1983). Moreover, randomization does not occur in these models. Cramton, Gibbons and Klemperer (1987) analyze partnerships, in which n agents jointly own an asset. They show that the partnership can be resolved efficiently despite private information about the valuations, if ownership is distributed in a certain way. In a related model, McAfee (1991) shows that the impossibility result of Myerson and Satterthwaite (1983) does not hold, if ex ante it is not known, who will finally be in the position of the seller and who will be in the position of the buyer.[12]

The set of admissible values of q_0 characterized by Proposition 3 is illustrated in Figure 1. Let us take a fixed $a > 0$ and look at the corresponding cut through the three-dimensional figure. We see that there is a corridor in which the admissible values of q_0 lie. If b converges to zero, both the upper and the lower margin of the corridor converge to zero. This makes sense, because for $b \to 0$, the probability that 'no' is the ex post efficient decision converges to one (since $-a<0$). If b grows, the margins also grow. This is reasonable, because the probability that 'yes' is the efficient decision grows. Similar observations can be made for a fixed $b > 0$.

As can easily be calculated, if $b \geqslant a$ the efficient decision is 'yes' with the probability $\text{Prob}\{v+w \geqslant 0\} = 1 - \frac{2a^2}{(a+b)^2}$. Assume for example $b=2a$. In this case the probability that 'yes' is the efficient decision is given by 77.8%. According to Proposition 3, the first best can be achieved in this case if q_0 is larger than 41.8% and smaller than 91.5%. The middle point of that interval is given by $\overline{q}_0 =$ 66.7%. Note that in our example the decision 'yes' is efficient with a higher probability than the decision 'no'. In this case it makes sense to choose a default option with a bias towards 'yes'. However, q_0 must not be larger than 91.5%. The parties could not achieve the first best outcome, if the contract specified the deterministic default option q_0 = 100%. If at the constitutional stage the veil of ignorance is nearly perfect, such that $a \approx b$, it thus seems reasonable to contractually specify the throw of a fair coin (q_0=50%). Therefore, the contract written by SPD and F.D.P. in Rheinland-Pfalz may well make sense after all.

4. Conclusion

We have considered a model in which a 'yes' or 'no' decision has to be made. Although randomization between 'yes' and 'no' is ex post efficient with probability zero only, the optimal incomplete contract specifies such randomization. The reason is that this threat allows the decision specified in the contract to be renegotiated, so that ex post efficiency can be achieved. Note that we can make a clear prediction as far as the coalition between SPD and F.D.P. in Rheinland-Pfalz is concerned. According to our model, the parties will actually never need to throw a coin. The much debated clause in their contract might only serve as a threat point in order to make them participate in negotiations over the right decision.

The idea that it can make sense to write seemingly inefficient contracts in the presence of renegotiation is well known in the literature on incomplete contracts (cf. Huberman and Kahn, 1988). Note that we do not claim to have offered a proper foundation for the assumed incompleteness of the coalition contract. Indeed, most contributions to the literature on incomplete contracts simply assume the contractual incompleteness.[13] It is still an unsettled question whether a theoretically satisfying foundation for incomplete contracts can be found without modelling bounded rationality.[14]

Appendix A

Proof of Proposition 1.

It is straightforward to check that $z(\tilde{v},\tilde{w})$ has been defined such that $z(\tilde{v},\tilde{w}) = E_w\{w\,q(\tilde{v},w)\} - E_v\{v\,q(v,\tilde{w})\}$. Suppose that party 2 tells the truth, $\tilde{w}=w$. If party 1 announces $\tilde{v}$ while her true type is v, her interim expected utility is given by $U_1(\tilde{v}\,|\,v) = E_w\{(v+w)\,q(\tilde{v},w) - E_v[v\,q(v,w)]\}$. Obviously the second term does not depend on $\tilde{v}$. Given the definition of $q(\tilde{v},\tilde{w})$, the first term is maximized, if party 1 reports $\tilde{v}=v$. Therefore, given that party 2 tells the truth, party 1 will also tell the truth. A symmetric argument holds for party 2. Given both parties reveal their true valuations and given the definition of $q(\tilde{v},\tilde{w})$, the ex post efficient decision results. Because of symmetry, each party gets 50% of the joint surplus in expectation. Thus, ex ante both parties are willing to sign the contract. QED

Appendix B

In order to prove Propositions 2 and 3, we first introduce some notation and shortly restate some facts which are well known from the mechanism design literature. We then prove a somewhat technical lemma which facilitates the proof of the propositions.

Let $q(\tilde{v},\tilde{w}) = 1$ if $\tilde{v}+\tilde{w} \geq 0$, and $q(\tilde{v},\tilde{w}) = 0$ otherwise. For every $r \in [-a,b]$ define $Q(r) := E_v[q(v,r)] = \text{Prob}\{v \geq -r\}$. Because of symmetry, Q(r) is thus the expected decision from the point of view of one party, given that the valuation of this party is r. Using the fact that the valuations are uniformly distributed, one can easily show that

$$Q(r) = \begin{cases} \frac{b+r}{a+b} & \text{if} \quad -a \leq r \leq a \\ 1 & \text{if} \quad a < r \leq b \end{cases}$$

in the case $b \geq a$ and

$$Q(r) = \begin{cases} 0 & \text{if} \quad -a \leqslant r \leqslant -b \\ \frac{b+r}{a+b} & \text{if} \quad -b < r \leqslant b \end{cases}$$

in the case $a > b$.

Let $U_1(\tilde{v}\,|\,v) := E_w\left(vq(\tilde{v},w) + z(\tilde{v},w)\right) = vQ(\tilde{v}) + E_w z(\tilde{v},w)$ denote the interim expected utility of party 1 if she beliefs that party 2 tells the truth and given that v is her true type while $\tilde{v}$ is her report. Let $U_2(\tilde{w}\,|\,w) := E_v\left(wq(v,\tilde{w}) - z(v,\tilde{w})\right) = wQ(\tilde{w}) - E_v z(v,\tilde{w})$ denote the interim expected utility of party 2. In order to simplify the notation we define $U_1(v) := U_1(v\,|\,v)$ and $U_2(w) := U_2(w\,|\,w)$.

The incentive compatibility constraint for party 1 is given by $U_1(v) \geqslant U_1(\tilde{v}\,|\,v)$ for all v and $\tilde{v} \in [-a,b]$. The constraint can be rewritten as $U_1(v) \geqslant U_1(\tilde{v}) + (v-\tilde{v})Q(\tilde{v})$, or (by exchange of $\tilde{v}$ and v) as $U_1(\tilde{v}) \geqslant U_1(v) - (v-\tilde{v})Q(v)$. This is equivalent to $(v-\tilde{v})\,Q(\tilde{v}) \leqslant U_1(v) - U_1(\tilde{v}) \leqslant (v-\tilde{v})\,Q(v)$. Note that $Q(\cdot)$ must be weakly increasing, which here is always the case because of the above definition of $q(\cdot,\cdot)$. Divide by $(v-\tilde{v})$ and let $\tilde{v}$ converge to v in order to see that $U_1'(v) = Q(v)$ must hold. In a similar way $U_2'(w) = Q(w)$ follows. These constraints completely characterize incentive compatibility (cf. Myerson, 1981).

If at least one party chooses not to participate, the default option q_o is implemented. If party 1 believes that party 2 participates, participation is individual rational for party 1 if $U_1(v) \geqslant q_o v$ for all $v \in [-a,b]$. Obviously it is sufficient for individual rationality if the constraint is satisfied by $v_o \in [-a,b]$ which minimizes $U_1(v) - q_o v$.

The derivative of the latter function is given by $Q(v) - q_o$, thus v_o can be determined depending on q_o by

$$v_o = \begin{cases} -a & \text{if} \quad 0 \leqslant q_o \leqslant \frac{b-a}{a+b} \\ (a+b)q_o - b & \text{otherwise} \end{cases}$$

in the case $b \geqslant a$ and by

$$v_o = \begin{cases} (a+b)q_o - b & \text{if} \quad 0 \leqslant q_o \leqslant \frac{2b}{a+b} \\ b & \text{otherwise} \end{cases}$$

in the case $a < b$. Similar arguments show that the individual rationality constraint for party 2 can be written as $U_2(v_o) \geqslant q_o v_o$.

Lemma. The allocation rule $q(\cdot,\cdot)$ can be paired with a transfer rule $z(\cdot,\cdot)$ to form an incentive compatible, individual rational mechanism if and only if

$$S_o := E_v\left\{(2v+a)\,Q(v)\right\} - \int_{v_o}^{b} Q(r)\,dr \;\geqslant\; q_o v_o .$$

Proof. Because of incentive compatibility, the expected utility of party 1 can (with the help of partial integration) for every $s \in [-a,b]$ be written as

$$E_v U_1(v) = U_1(s) + E_v \int_s^v Q(r)\,dr$$

$$= U_1(s) + \int_s^b Q(r)\,dr - E_v\left\{(v+a)\,Q(v)\right\}.$$

This is equivalent to

$$U_1(s) = E_v\Big((2v+a)\,Q(v) + E_w z(v,w)\Big) - \int_s^b Q(r)\,dr.$$

Similar arguments hold for party 2, thus

$$U_1(s) + U_2(s) = 2E_vE_w[(2v+a)\,q(v,w)] - 2\int_s^b Q(r)\,dr.$$

Since $U_1(v_o) + U_2(v_o) \geqslant 2\,q_o v_o$ must be satisfied due to individual rationality, $2S_o \geqslant 2q_o v_o$ follows, which proves the first direction. In order to prove the other direction, define

$$z(\tilde{v},\tilde{w}) = \tilde{w}\,Q(\tilde{w}) - \tilde{v}\,Q(\tilde{v}) + \int_{\tilde{w}}^{\tilde{v}} Q(r)\,dr.$$

Obviously $U_1(v) - U_1(s) = \int_s^v Q(r)\,dr$ follows.

Thus, incentive compatibility is satisfied for party 1. Moreover, using partial integration it is straightforward to check

$$U_1(v_o) = E_w[wQ(w)] + E_w \int_w^{v_o} Q(r)\,dr$$

$$= \int_{v_0}^{b} Q(r)\,dr + E_w\left\{(2w+a)Q(w)\right\} = S_o \geq q_o v_o.$$

Thus, the constraint of individual rationality is also satisfied for party 1. Similar arguments hold for party 2. QED

Proof of Propositions 2 and 3.

Proposition 2 follows directly from the Lemma with $q_o=0$ and $q_o=1$. We now prove Proposition 3. In what follows, we consider the case $b \geq a$ only. The case $a < b$ can be handled in a similar way.

Substitution for $Q(v)$ and integration yields

$$E_v\left\{(2v+a)Q(v)\right\} = \frac{1}{(a+b)^2}\left(b^3 + 2ab^2 + a^2 b - \frac{2}{3}a^3\right).$$

Noting that $v_o<a$ must always hold, it follows that

$$\int_{v_0}^{b} Q(r)\,dr = \frac{1}{a+b}\left(\frac{1}{2}a^2 + ab - bv_o - \frac{1}{2}v_o^2\right) + b - a.$$

We can now apply the Lemma.

Consider first the case $q_o < \frac{b-a}{a+b}$, which means that $v_o=-a$. It follows that $S_o = \frac{a}{(a+b)^2}\left(\frac{1}{3}a^2 - b^2\right) < -aq_o$, because $b>a$ was assumed. Thus, the first best outcome cannot be achieved.

Consider next the case $q_o \geq \frac{b-a}{a+b}$, which means that $v_o=(a+b)q_o - b$. It can now easily be shown that $S_o \leq q_o v_o$ is satisfied for exactly those values of q_o which are specified in Proposition 3. QED

Notes

1. See Der Spiegel (1996, Vol. 20, p. 97) or Focus (1996, Vol. 21, p. 45).

2. See "Vereinbarung zur Zusammenarbeit in einer Regierungskoalition für die 13. Wahlperiode des rheinland-pfälzischen Landtags 1996-2001" (SPD und F.D.P., Landesverbände Rheinland-Pfalz), p. 87. We will not discuss the details of the clause. We will focus on the fact that a random device is being used, because this has been the reason for the debates.

3. Different forms of contractual incompleteness will be discussed in section 3. Cf. also the remarks in section 4 and Hermalin and Katz (1993).

4. As is suggested by the wording, there are parallels with Schweizer's (1990) formalization of Buchanan and Tullock's (1962) 'Calculus of Consent'.

5. The Coase Theorem is discussed in Schweizer (1988).

6. Note that the restriction to uniformly distributed valuations strongly parallels the assumption of linear demand functions which is often made in the industrial organization literature. This follows immediately from the analogy between the mechanism design approach and the traditional analysis of price discrimination which has been highlighted by Bulow and Roberts (1989).

7. We assume that there is a transferable good ('money'). Within the context of our leading example, this is not to be taken too literally, since political parties usually do not solve disputes by directly transferring money between them. However, if one party has to persuade the other party to agree to a certain decision, somehow compensation must take place. In a more general model, one could imagine that there are several decisions, so that some form of barter could occur. For simplicity we assume that compensation takes place through the exchange of money. Note that our model could also be applied to other contexts concerning private parties in which case the assumption would be completely innocent.

8. Efficiency is thus defined with respect to the contractual parties. We do not consider external effects on third parties.

9. See Hart and Holmstrom (1987), Tirole (1994) and Hart (1995).

10. Cf. also Güth and Hellwig (1986) who prove a result similar to the impossibility theorem of Myerson and Satterthwaite (1983) in a public good context.

11. Note that as far as the assumption of uniformly distributed valuations is concerned, Propositions 1 and 2 could be generalized along the lines of d'Aspremont and Gerard-Varet (1979) and Myerson and Satterthwaite (1983). Further research is needed in order to fully characterize the distributions which allow the first best outcome to be achieved in the sense of Proposition 3. However, note that the intuition offered does not depend on the uniform distribution and that the fact that a whole range of values of q_0 is admissible adds a certain robustness to the result.

12. What these possibility results have in common is the fact that there is an instance of 'countervailing incentives' in the sense of Lewis and Sappington (1989). In the original model of Myerson and Satterthwaite (1983), the seller had always an incentive to overstate his costs and the buyer had an incentive to understate his valuation. This is no longer the case, if ex ante it is unclear who will be in what role. In this case, incentives to overstate and to understate might be balanced.

13. Cf. Grossman and Hart (1986), Hart and Moore (1990), or Aghion and Tirole (1994). See also Ewerhart and Schmitz (1997).

14. See Hart and Moore (1988), Tirole (1994) and Segal (1995). Cf. also the non-technical discussion in Ewerhart and Schmitz (1996).

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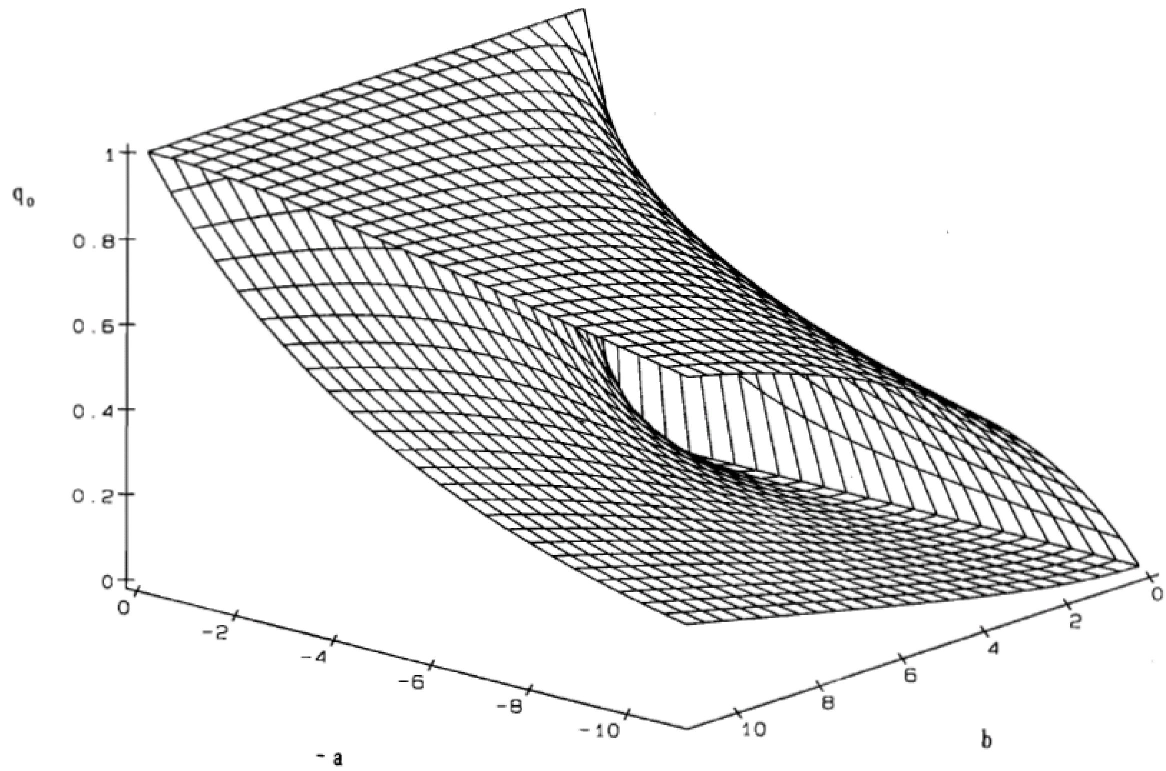

Figure 1. Set of $q_o \in [0,1]$ which allow achievement of the first best outcome, depending on -a and b.