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REPEATED PROTECTION FOR SALE

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Abstract. This paper addresses whether the efficient equilibria characterized by Grossman and Helpman's one-shot protection-for-sale game are renegotiation-proof in an infinitely repeated setting. We propose a simple strategy profile that can support the efficient, truthful equilibrium in each period as a strongly renegotiation-proof subgame perfect equilibrium. This result provides another plausible reason to explain why the truthful equilibrium may be focal in the game of protection-for-sale. In addition, when the timing of the contributions is specified explicitly, the special interest groups should minimize the upfront payment to the government before policy implementation to reduce the possibility of the collapse of such relational contracts.

1. INTRODUCTION

Grossman and Helpman (1994) applied the menu auction advanced by Bernheim and Whinston (1986) to a situation where special interest groups (SIGs) bid for the trade protection provided by the government with their political contributions. Grossman and Helpman coined the term 'protection for sale' (PFS) to describe the situation.

Strictly speaking, the application may be problematic, in that contracts in the menu auction are court-enforceable whereas those in the PFS are not. Grossman and Helpman themselves fully recognized this problem. In an extended version, Grossman and Helpman (1996, footnote 9) note:

> In our one-shot game, the interest groups have an incentive to renege on their contribution offers once the platforms are announced. Similarly, the politicians have no incentive to pursue their announced positions on the pliable policies once the campaign contributions have been paid up. The keeping of promises could be motivated in a repeated game, where agents would be punished for failure to live up to their commitment.

A player's 'reservation payoff' is the largest payoff that he or she can guarantee receiving, no matter what the other players do. Payoffs that strictly exceed a player's reservation payoff for each player are individual rational payoffs. A result known as the folk theorem (Fudenberg and Maskin, 1986) tells us that if players are patient enough, then any feasible individual rational payoff in a one-shot game can be supported as the average continuation payoff of a subgame perfect equilibrium (SPE) in the corresponding infinitely repeated game. As such, even though contracts in the PFS game are not

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court-enforceable, they can be self-enforcing in the sense of subgame perfection if there is a repeated, open-ended relationship between SIGs and the government.

However, it has been known that subgame perfection may not embody a strong enough notion of credibility: players may renegotiate the agreed terms of contracts along the way and so destroy the punishment for failure to live up to their agreement. In this paper, we refine the SPE with Pareto perfection and ask if the equilibria characterized by Grossman and Helpman (1994) in their one-shot PFS game are renegotiation-proof in an infinitely repeated setting.[1]

Renegotiation-proofness is a realistic refinement of the equilibrium in our opinion because it is quite conceivable that players in politics start renegotiating when a bad political equilibrium is reached. Besides the possibility of renegotiation between players, we also intend to specify the timing of a contribution from a SIG, which is vague in the original PFS game. Grossman and Helpman state that the SIGs will contribute to the government according to the announced trade policies, but they do not mention when this payment is transferred. After determining the total contribution according to the announced trade policies, the payment may take place before and/or after the policies are implemented. Special interest groups usually give the politician an upfront payment in order to be granted an opportunity to discuss policies (offering contribution schedules), and they pay the politician something extra when a favourable policy is implemented. It is natural to think that the total contribution determined in the PFS game can be divided into the front and rear payments to the politician. We will proceed with the discussion by specifying the timing of the payment explicitly and then verify the renegotiation-proofness of the truthful equilibrium proposed by Grossman and Helpman.

Without a court to enforce a contract, any valid contract has to be self-enforced. This is usually referred to in the literature as a relational contract. To our knowledge, there are few published studies that discuss relational contracts with renegotiation-proofness. The exceptions are Baliga and Evans (2000) and Kranz and Ohlendorf (2010).[2] The former use a symmetric two-player environment showing that a strongly renegotiation-proof equilibrium exists if both players have transferable wealth and quasi-linear utility. The existence also requires that the players be patient enough and the endowments for transferring be large enough. The latter paper, in contrast, discusses

[1] Among the 35 OECD countries, 31 of them have a parliamentary political system. Political parties in these countries are the agenda setters and a member of parliament has no term limit. Even in the USA, a country with a presidential system, President Obama's recent defeat on the issue of gun control (http://www.nytimes.com/2013/04/18/us/politics/senate-obama-gun-control.html) showed that lobbies can also exert their influence through the Congress, in which the members have no term limit. Hence, we would say that SIGs have an open-ended relationship with the political parties or politicians in most well-established democracies.

[2] Ishihara (2014) discusses a similar issue to ours without incorporating the concept of renegotiation-proofness. He concludes that when the principals pay *after* observing the action taken by the common agent, a static menu auction contract can be replicated by a relational political contract if the monetary transfer has a cap on it.

different timings of renegotiation in a two-player environment when a stationary contract contains two different stages. A payment stage occurs before a specified two-player simultaneous-move game. The conditions for the renegotiation-proofness to hold are characterized both before and after the payment stage. Our study does not try to develop a general condition for the existence of a renegotiation-proof equilibrium, but instead attempts to provide a more attractive characteristic (renegotiation-proofness) to a stationary political equilibrium. Past studies cannot assist us to infer or even predict if Grossman and Helpman's truthful equilibrium is renegotiation-proof because more than two asymmetric players are involved and payment can only be transferred one-way.

The remainder of this paper is constructed as follows. In Section 2, we provide a modified PFS game with a specification of payment timing. The PFS game is then played repeatedly an infinite number of times. A strategy is proposed based on the truthful strategy to show its subgame perfection in Section 3. We refine the equilibrium developed in Section 3 based on the renegotiation-proofness defined by Farrell and Maskin (1989) and in Section 4 show how the proposed strategy needs to be adjusted. Section 5 concludes.

2. MODEL

2.1. *One-shot game*

There are SIGs and non-SIGs in an economy. SIGs bid for the government's provided trade protection with their political contributions. Non-SIGs do not make political contributions and so have to accept whatever policies may result from the PFS game between SIGs and the government.

Let L denote the set of SIGs and $\mathbf{p}$ denote the trade policy (trade taxes or subsidies) chosen by the government. The welfare of SIG $i \in L$ is given by $W_i(\mathbf{p}) - C_i(\mathbf{p})$, where W_i is SIG i's gross-of contribution welfare and C_i is its contribution schedule. The welfare of non-SIG $i \notin L$ is given by $W_i(\mathbf{p})$. The government cares about both the SIGs' political contributions and the economy's aggregate well-being (including SIGs and non-SIGs). Grossman and Helpman summarize the government's objective by the linear function $G = \sum_{i \in L} C_i(\mathbf{p}) + aW(\mathbf{p})$, where $W(\mathbf{p}) = \sum_{i \in L} W_i(\mathbf{p}) + \sum_{i \notin L} W_i(\mathbf{p})$ and $a \geq 0$ is a weight the government attaches to the aggregate welfare, W.

The one-shot game in Grossman and Helpman (1994) consists of two stages: first, all SIGs simultaneously announce their contribution schedules; second, the government announces its trade policy. An equilibrium, as described by Grossman and Helpman, is a set of contribution schedules $\{C_i^0(\mathbf{p})\}_{i \in L}$, one for each SIG i, such that it maximizes $W_i(\mathbf{p}) - C_i(\mathbf{p})$ given the schedules set by other SIGs and the anticipated trade policy; and a trade policy $\mathbf{p}^0$ that maximizes the government's objective $\boldsymbol{G}$ taking the SIGs contribution schedules as given.

Let P denote the set of feasible trade policies. By applying lemma 2 of Bernheim and Whinston (1986), Grossman and Helpman characterize an equilibrium of the one-shot PFS game as follows:

Lemma 1. $\left(\{C_i^0\}_{i\in L}, \mathbf{p}^0\right)$ *is an equilibrium if and only if*

(i) C_i^0 *is feasible for all* $i \in L$;

(ii) $\mathbf{p}^0$ *maximizes* $\sum_{i\in L} C_i^0(\mathbf{p}) + aW(\mathbf{p})$ *on* P;

(iii) $\mathbf{p}^0$ *maximizes* $W_j(\mathbf{p}) - C_j^0(\mathbf{p}) + \sum_{i\in L} C_i^0(\mathbf{p}) + aW(\mathbf{p})$ *on* P *for every* $j \in L$;

(iv) *For every* $j \in L$, *there exists a* $\mathbf{p}^j \in$ P *that maximizes* $\sum_{i\in L} C_i^0(\mathbf{p}) + aW(\mathbf{p})$ *on* P *such that* $C_j^0(\mathbf{p}^j) = 0$

Conditions (i) and (ii) are obvious. Condition (iii) is the bilateral efficiency requirement between the government and each SIG. Condition (iv) implies that there exists a policy $\mathbf{p}^j$ to elicit $C_j^0(\mathbf{p}^j) = 0$ such that the government is indifferent between $\mathbf{p}^j$ and the equilibrium policy $\mathbf{p}^0$. Grossman and Helpman show that SIGs which contribute enjoy the government's trade protection in equilibrium, whereas non-SIGs which do not contribute suffer from it in equilibrium. Note that SIGs j de facto becomes a member of non-SIGs, once the government implements $\mathbf{p}^j$ as described in Lemma 1(iv).

Grossman and Helpman focus on the so-called 'truthful equilibrium', which arises when each SIG announces a contribution schedule that everywhere reflects its true preferences. Formally, a truthful contribution schedule of SIG i takes the form:

$C_i^T(\mathbf{p}) = max\{0, W_i(\mathbf{p}) - B_i\}$, where B_i is some base level of welfare for SIG i.

With truthful contribution schedules, Grossman and Helpman show that $\mathbf{p}^0 = \mathbf{p}^T \equiv argmax\left[\sum_{i\in L} C_i^T(\mathbf{p}) + aW(\mathbf{p})\right]$. That is, the one-shot equilibrium trade policy is the one that maximizes a social welfare function with SIGs receiving a weight of 1 + a while non-SIGs receive a weight of a. Grossman and Helpman then specify the composition of social welfare for each trade policy and develop a modified Ramsey rule of the equilibrium policies. Because we focus on the issue of the renegotiation-proofness of the equilibrium policies proposed by Grossman and Helpman, we do not state the components of social welfare for simplicity notation-wise. The equilibrium under investigation is the one developed by Grossman and Helpman and the trade policies follow the equilibrium characterized by their second proposition.

Bernheim and Whinston (1986) argue that truthful equilibria may be focal among the set of equilibria, because: (i) the set of best responses to any strategies played by other players includes a strategy that is truthful; and (ii) equilibria are coalition-proof if and only if they are truthful. Martimort (2006) observe that, due to a coordination problem, the one-shot PFS game may be plagued with inefficient equilibria; however, as a refinement of the equilibrium set, truthfulness ensures efficiency for SIGs' bidding.[3]

[3] If a SIG has an ability to produce, creating a trade-off between the production and lobbying may result in the disappearance of the truthful equilibrium. See Campante and Ferreira (2007).

Our period game is identical to Grossman and Helpman's one-shot game, except that we explicitly specify the timing of the SIGs' payment. Specifically, let SIGs pay a portion, $0 \leq r \leq 1$, of their promised contributions *before* the government implements its promised policies. This specification allows for the possibility that SIGs may not pay the rest of their promised contributions after the government has implemented its promised policies, or that the government may not implement its promised policies after it has received the portion r of the SIGs' promised contributions. r is an exogenous variable and it is not a decision variable chosen by the SIGs or the government.[4] We describe the stages within a period in Figure 1 and Proposition 0 identifies the SPE of this multi-stage game.

PROPOSITION 0. *The unique SPE in the five-stage period game is that where the government implements the free-trade policies with zero contribution from each SIG.*

The proof is omitted. Intuitively, after describing the timing of the modified period game, one notices instantly that if the game is only played for one period, everything will be unravelled from stage 5 and the unique SPE is the free-trade policies with zero contribution. Without the court to enforce the 'contracts', both SIGs and the government have incentives to renege on their agreed terms, once the government's promised policies have been implemented or the SIGs promised contributions have been (at least partly) paid up. However, as Grossman and Helpman have noted and as an application of the folk theorem, these contracts can be self-enforcing in the sense of subgame perfection if there is a repeated, open-ended relationship between SIGs and the government. In what follows, we extend the modified Grossman and Helpman one-shot game to an infinitely repeated setting.

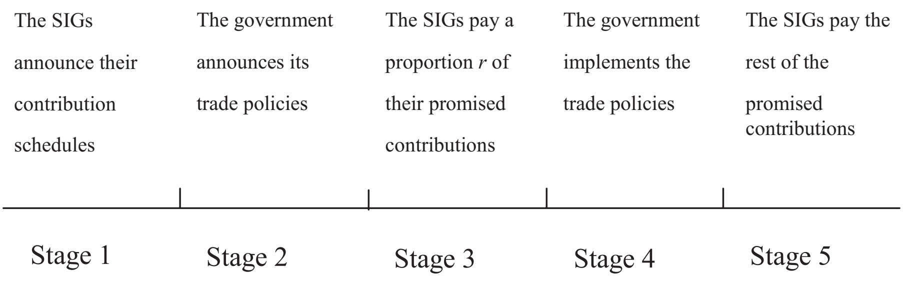

Figure 1. The timing of the period game

[4] One can consider that this portion of the contribution is required by the government to show that a SIG really has the intention to pay. It will be clear in Section 3 that the result stays the same even though r is different for each SIG and is endogenously determined.

2.2. *Repeated game*

Our purpose is to investigate whether a sequence of Grossman and Helpman's (1994) truthful equilibrium, in which $\mathbf{p}^0 = \mathbf{p}^T$ and $\{C_i^0\}_{i \in L} = \{C_i^T\}_{i \in L}$ in each period, can be supported as a renegotiation-proof SPE of the repeated game. By focusing on truthful equilibria, Grossman and Helpman (examples 1 and 3 in Section IV) show that if the set of SIGs is a singleton, or SIGs are highly concentrated and account for a negligible fraction of the total population, then SIGs will capture all of the surplus from the PFS game. This outcome arises because of the lack of competition between SIGs. Grossman and Helpman (example 2 in Section IV) also show that if the set of non-SIGs is empty, competition between SIGs will be most intense; as a result, the government will capture all of the surplus from the PFS game. In these special cases, some players receive their reservation payoffs and, hence, punishment to deter these players' deviation from the truthful contract, $\left(\{C_i^T\}_{i \in L}, \mathbf{p}^T\right)$, will be ineffective. In view of this, we exclude these special cases in our analysis below. In other words, we are confined to considering the situation where the truthful contract gives rise to the payoffs that strictly *exceed* a player's reservation payoff for each player.

From our modified period game, the SIGs still decide on the contribution schedules as in the original PFS game. The exogenous r simply refers to the timing of the contribution and the total payment is the same as what is determined by the contribution schedule in the original PFS game. Hence, each SIG's strategy in the repeated game is a mapping from the past actions taken by the government (*implemented* policies) and all the SIGs (actual total payment) to its presently offered contribution schedule. Similarly, the government also decides on the trade policies according to the past actions taken by the SIGs and itself. Finally, both SIGs and the government have the same discount factor, $0 \leq \delta \leq 1$.

3. SUBGAME PERFECTION

As in Fudenberg and Maskin (1986) and Abreu (1988), we adopt the Nash concept that defines equilibrium in terms of unilateral rather than coalitional deviations; that is, we restrict attention to a single player's deviation and, hence, we can just as well presume that every player ignores simultaneous deviations by several players. Furthermore, we focus on the free-trade punishment against the potential deviation from the government. This is the most direct and intuitive punishment to hold the government to its reservation payoff. We will verify its subgame perfection in this section and study its renegotiation-proofness in the next section. Before introducing the proposed strategy profile, recall that, potentially, a SIG has an incentive to deviate in stage 5 of a period game and the government has an incentive to deviate in stage 4 of a period game.[5]

[5] One may wonder whether the contributions from SIGs are observable so that the punishment can be triggered correctly. The data are usually available through the Internet in well-established

Denote the truthful contract $\left(\{C_i^T\}_{i\in L}, \mathbf{p}^T\right)$ by s. Following Fudenberg and Maskin (1986) and Abreu (1988), consider a simple strategy profile, denoted by σ^*, as described below with a given r. The simple strategy profile contains three phases:

Phase (A): all players play s.

Phase (B): every SIG i stops contributing to the government in stage 5 of period $t-1$; all SIGs stop contributing for the next $n > 0$ periods with the government choosing $\mathbf{p}^F$, which is the free trade policy.

Phase (C): the government implements $\mathbf{p}^j$ as stated in Lemma 1(iv) for $n_j > 0$ periods with SIG j contributing zero and SIG $j' \neq j$, contributing $C_{j'}^T\left(\mathbf{p}^j\right)$ for all j'.

Then the simple strategy profile, σ^*, can be described as follows:

In period 1:

The government and SIGs begin their repeated, open-ended relationship by choosing s (phase (A)).

In any period $t > 1$:

1 *For SIGs, play $\{C_i^T\}_{i\in L}$ as long as s is played in period $t-1$; if the government fails to implement $\mathbf{p}^T$ in period $t-1$, enter (B). After (B), enter (A) thereafter.*
2 *For the government, play $\mathbf{p}^T$ as long as s is played in period $t-1$; if SIG j fails to pay the total contributions determined by $C_j^T\left(\mathbf{p}^T\right)$ in period $t-1$, enter (C). After (C), enter (A) thereafter.*
3 *If SIG k deviates in (B), begin (C) with $j = k$ and then (A) thereafter; if the government deviates in (B), restart (B) and then (A) thereafter. If SIG k deviates in (C), begin (C) with $j = k$ and then (A) thereafter; if the government deviates in (C), begin (B) and then (A) thereafter.*
4 *If more than one SIG deviates in period t, the multilateral deviation is ignored and every player returns to play s from period $t+1$ and on.*

Regarding the punishment against the SIG, when a SIG pursues a one-shot deviation gain and stops political contributions, it de facto becomes a non-SIG and so must passively accept whatever policies may result from the PFS game. In this sense, the government implementing $\mathbf{p}^j$ in phase (C) of σ^* involves holding SIG j to its reservation payoff in the stage game. Regarding the punishment against the government, the government is forced to choose the *free-trade* policy and receives a zero surplus from the PFS game when all SIGs stop political contributions. Thus, the SIGs' implementation of phase (B) of σ^* involves holding the government to its reservation payoff in the stage game. Then, we can establish the following lemma:

Lemma 2. *When δ is large enough, the simple strategy σ^* is a SPE in the game of infinitely repeated protection-for-sale with $r \in [0,1]$.*

democratic countries. For instance, http://www.fec.gov/disclosure.shtml in the USA, http://www.electoralcommission.org.uk/party-finance in the UK and http://www.elections.ca in Canada.

The proof is in the Appendix. The strategy profile σ^* features the free-trade policies as the punishment against the government. The result shows that σ^* is subgame-perfect with each $r \in [0,1]$, in that it can support $\left(\left\{C_i^T\right\}_{i \in L}, \mathbf{p}^T\right)$ in each period as a SPE if the discount factor δ is sufficiently high. However, because r is exogenously determined, one may wonder about the robustness of the result if r can be chosen as a strategic variable of a SIG. The following lemma shows that when SIG i's strategy is $\left\{C_i^T, r_i\right\}$ instead of just $\left\{C_i^T\right\}$, the truthful contract can still be sustained as the SPE by σ^* with every $r \in [0,1]$.

Lemma 3. *When SIG i can not only decide the contribution schedule C_i but also the portion of the front payment, r_i, the truthful contract $\left(\left\{C_i^T, r_i\right\}_{i \in L}, \mathbf{p}^T\right)$ can be sustained as an SPE by σ^*regardless of the choice of r_i.*

The proof is in the Appendix. Lemma 3 states that even if a SIG can choose the portion of the contribution paid before or after the policy implementation, it does not alter our result. Intuitively, even though we include r as a strategic variable of a SIG, it does not have a strategic characteristic in our model setting. A SIG's equilibrium payoff depends on the *total* contribution to the government and the policies implemented. A different r does not change a SIG's equilibrium payoff and it merely represents the timing of the contribution. Hence, the total contribution remains the same with different r's. With the results of Lemmas 2 and 3, no matter how the portion r is determined, either by the SIGs or the government, the strategy profile σ^* is still an SPE.

Although r seems to bear no significance in our equilibrium analysis according to Lemmas 2 and 3, it does affect the incentive to deviate of the government. The following proposition describes this finding:

Proposition 1. *(a) A smaller r deters the government with less patience from deviating. (b) When the total monetary contributions, $\sum_{i \in L} C_i^T\left(\mathbf{p}^T\right)$, from the SIGs are closer to the weighted utility difference between implementing $\mathbf{p}^F$ and $\mathbf{p}^T$, $a[W(\mathbf{p}^F) - W(\mathbf{p}^T)]$, the government needs to be more patient to sustain the infinitely repeated protection-for-sale contract.*

The proof is in the Appendix. This proposition shows that the SIGs should reduce the upfront payment to the government if the government only has a small benefit by playing the PFS game. We can also interpret this result from another angle. When the incumbent government is in the last term or is expected to lose the election in the near future, the SIG should not pay the front contributions because otherwise a deviation from the government is highly likely due to a small δ.

The SPE result in this section is not surprising in light of Fudenberg and Maskin's (1986) folk theorem. Our question is whether σ^* is also renegotiation-proof. We will tackle this issue in the next section.

4. RENEGOTIATION-PROOFNESS

The following definition about being renegotiation-proof is directly obtained from Farrell and Maskin (1989).[6]

Definition 1. *An SPE σ is weakly renegotiation-proof (WRP) if there do not exist continuation equilibria σ^1, σ^2 of σ such that σ^1 strictly Pareto-dominates σ^2. A WRP equilibrium is strongly renegotiation-proof (SRP) if none of its continuation equilibria is strictly Pareto-dominated by another WRP equilibrium.*

Farrell and Maskin (1989) observe that a WRP equilibrium always exists; however, an SRP equilibrium may not exist. Notice that the concepts of WRP and SRP provided by Farrell and Maskin are established with strict Pareto domination. Hence, weak Pareto domination will not be discussed in the paper. We now analyse σ^* to see if it satisfies the definition of WRP and SRP.

The continuation equilibria of σ^* can be grouped into three classes: (i) starting with the cooperative choice s, denoted by $\sigma^{*(1)}$, when all players followed s in the previous period, or the punishment phases (B) or (C) just ended; (ii) starting with the punishment phase (B), denoted by $\sigma^{*(2)}$, after the government deviated from $\mathbf{p}^T$ in the previous period so that all SIGs stop contributions; and (iii) starting with the punishment phase (C), denoted by $\sigma^{*(3)}$, after a SIG $j \in L$ deviated from $C_j^T(\mathbf{p}^T)$ in the previous period so that the government implements $\mathbf{p}^j$ as stated in Lemma 1(iv). Hence, there are three kinds of continuation equilibria in σ^*.[7]

Lemma 4. *The SPE, σ^*, is not weakly renegotiation-proof.*

The proof is in the Appendix. Intuitively, the government will be forced to choose the free-trade policy if all SIGs stop political contributions. Each and every player participating in the PFS game receives some positive surplus from implementing the contract $s = \left(\{C_i^T\}_{i \in L}, \mathbf{p}^T\right)$, whereas all players receive a zero surplus from the free-trade policy. As a result, players will have a joint incentive to switch from $\sigma^{*(2)}$ to $\sigma^{*(1)}$ even though players agree ex ante to play $\sigma^{*(2)}$ according to σ^*. In other words, $\sigma^{*(1)}$ strictly Pareto-dominates $\sigma^{*(2)}$ and so σ^* is not WRP.

Note that the continuation equilibrium $\sigma^{*(3)}$ of σ^* is not strictly Pareto-dominated by $\sigma^{*(1)}$. This is because the government is indifferent between $\mathbf{p}^T$ (associated with $\sigma^{*(1)}$) and $\mathbf{p}^j$ (associated with $\sigma^{*(3)}$) according to Lemma 1(iv). Thus, the key to non-WRP σ^* lies in that its continuation equilibrium $\sigma^{*(2)}$ is strictly Pareto-dominated by another continuation equilibrium $\sigma^{*(1)}$. However,

[6] See also Chapter 4, Section 6 in Mailath and Samuelson (2006).

[7] Kranz and Ohlendorf (2010) discuss the within period renegotiation-proofness. In our model, players (SIGs and the government) do not move simultaneously in any stage of the period game. Whether to start a punishment depends on the total payoff received by each player in a period. Hence, the players' payoffs are not separable as in Kranz and Ohlendorf (2010) within a period and renegotiation in different stages is not a valid issue in our setting.

the punishment associated with $\sigma^{*(2)}$ may be implausible, in that to punish the government for its defection, the punishment itself punishes the punishers, all SIGs, too. This is true because all SIGs de facto drop out of the PFS game and receive a zero surplus if abiding by $\sigma^{*(2)}$. It is thus not surprising that players have a joint incentive to switch from $\sigma^{*(2)}$ to $\sigma^{*(1)}$ even though they agree ex ante to play $\sigma^{*(2)}$ according to σ^{*}. To sum up, a strategy profile featuring the free-trade, no contribution punishment against the government, is not renegotiation-proof.

4.1. *Weakly renegotiation-proof*

Does there exist a strategy profile in support of the truthful contract s in each period in the sense of subgame perfection and, at the same time, the strategy profile is WRP? Our answer is positive.

Consider the strategy profile, denoted by σ^{**}, which is identical to σ^{*}, except that the continuation equilibrium $\sigma^{*(2)}$ of σ^{*} is replaced by the $\sigma^{**(2)}$. The difference is that the punishment against the government, (B), is replaced with the following phase (D):

Phase (D): a single SIG, say, h, keeps contributing according to $C_h^T(\cdot)$ and the rest of the SIGs stop contributing from stage 5 in period $t-1$ and thereafter. Plainly speaking, if the government fails to implement $\mathbf{p}^T$ in period $t-1$, enter (D). Hence, $\sigma^{**(2)}$ is a continuation equilibrium of σ^{**} starting with the punishment phase (D).

Proposition 2. *The simple strategy σ^{**} is a weakly renegotiation-proof SPE in the infinitely repeated protection-for-sale game.*

The proof is in the Appendix. Intuitively, if the set of SIGs is a singleton and contributes according to its truthful contribution schedule, then the government de facto receives the same payoff as it would have achieved by allowing for free trade and 'selling' nil protection. In other words, the single SIG captures all of the surplus from its political relationship with the government. The intuition behind this result, as explained by Grossman and Helpman, is due to the single SIG facing no opposition from competing interests.[8] The resulting payoff for the single SIG is clearly the largest possible payoff that could be achieved by a SIG in the PFS period game.

Then, with the grim-trigger strategy in $\sigma^{**(2)}$, the largest possible payoff for the single SIG in the stage game becomes a constant sequence in the continuation equilibrium if the government should choose to deviate from implementing s. This implies that, unlike $\sigma^{*(2)}$ of σ^{*}, $\sigma^{**(2)}$ of σ^{**} being strictly Pareto-dominated by $\sigma^{*(1)}$ is impossible and σ^{**} is WRP.

[8] See example 1 on p. 845 of Grossman and Helpman (1994).

4.2. *Strongly renegotiation-proof*

Although σ^{**} is WRP, there may be another WRP equilibrium that strictly Pareto-dominates it. Is σ^{**} also SRP? We address this question below.

The continuation equilibrium $\sigma^{*(1)}$ of σ^{**} is obviously ex post efficient, because it is associated with the truthful contract s. The continuation equilibrium $\sigma^{**(2)}$ of σ^{**} is also ex post efficient, because the associated punishment makes a single SIG capture all of the surplus from the PFS period game and it is a constant sequence because it is grim-triggered. Thus, neither $\sigma^{*(1)}$ nor $\sigma^{**(2)}$ can be strictly Pareto-dominated by another WRP equilibrium.

How about the continuation equilibrium $\sigma^{*(3)}$ of σ^{**}? We argue below that although $\sigma^{*(3)}$ of σ^{**} may not be ex post efficient as $\sigma^{*(1)}$ or $\sigma^{**(2)}$ of σ^{**}, there exists no WRP equilibrium that strictly Pareto-dominates it under truthful strategies.

A key to the possibility of renegotiation between the parties involved is that the punisher implements a Pareto-dominated equilibrium in the punishment phase, thereby also punishing the punisher himself. This Pareto-dominated feature creates a joint incentive for the parties involved to let bygones be bygones and switch from the punishment phase back to the cooperative phase. However, note that the government (the punisher) in the continuation equilibrium $\sigma^{*(3)}$ of σ^{**} enjoys the exact same payoff as that in the cooperative phase $\sigma^{*(1)}$ of σ^{**}. That is, the government receives the exact same payoff if it adopts $\mathbf{p}^T$ according to the truthful contract $s = \left(\left\{C_i^T\right\}_{i \in L}, \mathbf{p}^T\right)$ in the cooperative phase or it adopts $\mathbf{p}^j$ according to Lemma 1(iv) in the punishment phase. This exact same payoff enjoyed by the government (the punisher), regardless of whether it is in the cooperative or punishment phases, is maximal because every SIG uses truthful strategies and this rules out the possibility of renegotiation between $\sigma^{*(3)}$ and any other WRP equilibrium with truthful strategies. As a result, there cannot be another WRP equilibrium that strictly Pareto-dominates $\sigma^{*(3)}$ of σ^{**} under truthful strategies. We conclude that σ^{**} is SRP as well as WRP if the SIGs all adopt the truthful strategies. The following proposition summarizes the result:

Proposition 3. *The simple strategy profile σ^{**} is SRP in the repeated protection-for-sale game under truthful strategies.*

Our result provides another reason regarding why the truthful equilibrium is focal. When, as Martimort (2006) notes, the inefficient period equilibrium emerges in the stationary PFS game, such an equilibrium may never be strongly renegotiation-proof. Due to the inefficiency, all the SIGs and the government can renegotiate to arrive at a new continuation equilibrium which benefits everyone with a proper side payment schedule (which may not be truthful). This can never happen when every SIG uses truthful strategies because collective efficiency is reached on the equilibrium path. This also practically eliminates the possibility that free trade policies are SRP because the truthful equilibrium stated by Grossman and Helpman (1994) Pareto-dominates free trade policies when SIGs and non-SIGs coexist. It implies, in special interest politics, that free trade is very difficult to achieve and such a conclusion coincides with the history of trade policies in every country.

5. CONCLUSION

Grossman and Helpman (1994) apply the menu auction advanced by Bernheim and Whinston (1986) to a situation where SIGs bid for the government's trade protection with their political contributions. Although contracts in the PFS game are not court-enforceable, Grossman and Helpman argue that they can be self-enforcing in the sense of subgame perfection as long as there is a repeated, open-ended relationship between SIGs and the government. However, subgame perfection may not embody a strong enough notion of credibility: players may reason that bygones are bygones and renegotiate the agreed terms of contracts along the way. This paper refines subgame perfection with Pareto perfection and addresses whether the truthful equilibria characterized by Grossman and Helpman in their one-shot PFS game are renegotiation-proof in an infinitely repeated setting. We propose a simple strategy profile that can support the truthful equilibrium in each period as a weakly renegotiation-proof subgame-perfect equilibrium. We also show that this simple strategy profile is a strongly renegotiation-proof subgame-perfect equilibrium in support of the truthful equilibrium in each period.

In real world politics, the contact between a SIG and the government is frequent and it is difficult not to imagine that the SIGs and the government decide to renegotiate away from a Pareto-inferior phase. This makes many potential credible punishments implausible. Hence, the menu-auction contracts among SIGs and the government are more conceivable if they are (strongly) renegotiation-proof SPE. Playing truthful strategies helps the SIGs not only to reach the collective efficiency on the equilibrium path, but also provides credible and renegotiation-proof threats to any potential deviator. We state in our paper that inefficient equilibria on the path may not survive the renegotiation process. However, we do not attempt to discuss the possibility of renegotiation-proofness regarding other efficient equilibria and this issue is left for future research.

Finally, the original Grossman and Helpman period game provides no clear description regarding the timing of payment when the promised contributions of SIGs are determined through the contribution schedules given the implemented policies. In our extension, the political contribution is divided into two parts: before and after the policies are implemented. Note that when the SIGs pay all the contributions before the policies are implemented, the incentives of the SIGs to cheat vanish. In the meantime, the government faces a very strong incentive to deviate from the promised policies. Hence, this suggests that when the incumbent government is more short-lived than a regular special interest group, making the front payment as small as possible can prevent the government from making 'mistakes' (i.e. implementing the free-trade policies, and not the announced policies) even if it does not value the future much.

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APPENDIX

Proof of Lemma 2. If both the government and SIGs abide by the truthful contract $\left(\{C_i^T\}_{i\in L}, \mathbf{p}^T\right)$, the one-period payoffs for them are $\sum_{i\in L} C_i^T\left(\mathbf{p}^T\right) + aW\left(\mathbf{p}^T\right)$ and $W_i\left(\mathbf{p}^T\right) - C_i^T\left(\mathbf{p}^T\right)$, $i \in L$, respectively.

Given r, if the government wants to break the contract, the largest one-shot gain that it can muster is to deviate to the free-trade policy $\mathbf{p}^F \equiv argmax\ W(\mathbf{p})$ after the SIGs' front payments are delivered and so receives the period payoff $r\sum_{i\in L} C_i^T\left(\mathbf{p}^T\right) + aW\left(\mathbf{p}^F\right)$. Given r, if a SIG wants to break the contract, the largest one-shot gain it can muster is to save the political contributions, $(1-r)C_i^T\left(\mathbf{p}^T\right)$, $i \in L$, which is the rear payment, and so receives the period payoff $W_i\left(\mathbf{p}^T\right) - rC_i^T\left(\mathbf{p}^T\right)$, $i \in L$.

Given r and the truthful contract $\left(\{C_i^T\}_{i\in L}, \mathbf{p}^T\right)$, it then follows that the government may have incentives to break the contract if $a\left[W\left(\mathbf{p}^F\right) - W\left(\mathbf{p}^T\right)\right] > (1-r)\sum_{i\in L} C_i^T\left(\mathbf{p}^T\right)$ (the gain from a deviation to free trade is larger than the SIGs' promised political contributions that have not yet been paid up); this condition also implies that if $a = 0$, the government has no incentive to deviate from $\mathbf{p}^T$ because playing the PFS game is better than just implementing $\mathbf{p}^F$. A SIG may have incentives to break the contract if $r < 1$. (No SIG pays the contributions fully before the implementation of the government's promised policy).

According to σ^*, all SIGs stop contributing after the government's deviation for n periods. After n periods, all players play s again. This leads to the following continuation payoff of the government after its deviation:

$$r\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^F) + \frac{\delta a W(\mathbf{p}^F)(1-\delta^n)}{1-\delta} + \frac{(\delta^{n+1})\left[\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T)\right]}{1-\delta}.$$

If the government stays with s, the continuation payoff is $\frac{\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T)}{1-\delta}$. Hence, we need the following condition to deter the government from deviating:

$$(1-r)\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F) + \frac{\delta(1-\delta^n)\left[\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F)\right]}{1-\delta} \geq 0.$$

When n is very large, the condition changes to

$$(1-\delta)\left[(1-r)\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F)\right] + \delta\left[\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F)\right] \geq 0. \tag{A1}$$

We know that if the government has an incentive to deviate from s, $(1-r)\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F) < 0$. Hence, if equation A1 needs to be satisfied with δ close to 1, we only need to make sure $\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F) > 0$. Because $\mathbf{p}^T$ is the truthful equilibrium in the period game, it maximizes $\sum_{i\in L} C_i^T(\mathbf{p}) + aW(\mathbf{p})$ on P according to Lemma 1(ii). In addition, we exclude the case of $|L| = 1$ and this prevents the government from receiving the same period payoff in the PFS game as under the free trade prices. Then, $\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F) > 0$.

The government may face the other incentive to deviate when it implements $\mathbf{p}^j$ to punish the deviating SIG j. However, because the government receives the same payoff by implementing $\mathbf{p}^j$ as implementing $\mathbf{p}^T$ according to Lemma 1(iv), $\sum_{i\in L} C_i^T(\mathbf{p}^T) + aW(\mathbf{p}^T) - aW(\mathbf{p}^F) > 0$ is sufficient to deter the government from deviating.

If SIG j decides to deviate, the continuation payoff is

$$W_j(\mathbf{p}^T) - rC_j^T(\mathbf{p}^T) + \frac{\delta[W_j(\mathbf{p}^j)](1-\delta^{n_j})}{1-\delta} + \frac{(\delta^{n_j+1})[W_j(\mathbf{p}^T) - C_j^T(\mathbf{p}^T)]}{1-\delta}.$$

Hence, the condition for SIG j not to deviate from s is

$$(1-\delta)(r-1)C_j^T(\mathbf{p}^T) + \delta(1-\delta^{n_j})[W_j(\mathbf{p}^T) - C_j^T(\mathbf{p}^T) - W_j(\mathbf{p}^j)] \geq 0. \qquad \text{(A2)}$$

When $n_j \to \infty$, and δ is very close to 1, we need to have $W_j(\mathbf{p}^T) - C_j^T(\mathbf{p}^T) - W_j(\mathbf{p}^j) > 0$ to satisfy equation A2 because $(r-1)C_j^T(\mathbf{p}^T) < 0$. According to Lemma 1(iv), $\mathbf{P}^j$ induces SIG j to contribute zero. Hence, based on the definition of $C_i^T(\mathbf{p})$, $W_j(\mathbf{p}^j) - B_j \leq 0$. Because we assume that *not* every industry is represented by a SIG, the contribution from a SIG according to s is strictly positive and every SIG receives a payoff that is larger than the one received under $\mathbf{p}^F$. Hence, $W_j(\mathbf{p}^T) - C_j^T(\mathbf{p}^T) = B_j > 0$ and $B_j > W_j(\mathbf{p}^F) > W_j(\mathbf{p}^j)$. Then, we have $W_j(\mathbf{p}^T) - C_j^T(\mathbf{p}^T) - W_j(\mathbf{p}^j) > 0$.

The other incentive to deviate that a SIG may face is when the government is punished. If SIG k should choose to break away from (B) of the proposed strategy, its continuation payoff is

$$W_k(\mathbf{p}') - C_k^T(\mathbf{p}') + \frac{\delta[W_k(\mathbf{p}^k)](1-\delta^{n_k})}{1-\delta} + \frac{(\delta^{n_k+1})[W_k(\mathbf{p}^T) - C_k^T(\mathbf{p}^T)]}{1-\delta},$$

where $\mathbf{p}' = argmax\ [W_k(\mathbf{p}) + aW(\mathbf{p})]$ because now k is the only active SIG. Hence, the condition for SIG k not to deviate in the government's punishment phase is:

When $n \geq n_k + 1$,

$$\begin{aligned} &W_k(\mathbf{p}^F) + C_k^T(\mathbf{p}') - W_k(\mathbf{p}') + \frac{\delta[W_k(\mathbf{p}^F) - W_k(\mathbf{p}^k)](1-\delta^{n_k})}{1-\delta} \\ &+ \frac{(\delta^{n_k+1})[W_k(\mathbf{p}^F) - W_k(\mathbf{p}^T) + C_k^T(\mathbf{p}^T)](1-\delta^{n-n_k})}{1-\delta} \geq 0. \end{aligned} \qquad \text{(A3)}$$

When $n < n_k + 1$,

$$\begin{aligned} &W_k(\mathbf{p}^F) + C_k^T(\mathbf{p}') - W_k(\mathbf{p}') + \frac{\delta[W_k(\mathbf{p}^F) - W_k(\mathbf{p}^k)](1-\delta^{n-1})}{1-\delta} \\ &+ \frac{(\delta^{n})[W_k(\mathbf{p}^T) - W_k(\mathbf{p}^k) + C_k^T(\mathbf{p}^T)](1-\delta^{n_k+1-n})}{1-\delta} \geq 0. \end{aligned} \qquad \text{(A4)}$$

When n_k is large enough and δ is close to 1, $1-\delta^{n-n_k}$ is close to zero. So, as long as $W_k(\mathbf{p}^F) - W_k(\mathbf{p}^k) > 0$, equation A3 is satisfied. Because $\mathbf{p}^k$ induces k to contribute zero and the other SIGs to contribute positively, $W_k(\mathbf{p}^F) > W_k(\mathbf{p}^k)$. In equation A4, when n_k is large enough and δ is close to 1, $\delta^{n_k+1-n} \to 0$. Hence, as long as $W_k(\mathbf{p}^T)-W_k(\mathbf{p}^k)+C_k^T(\mathbf{p}^T)>0$, SIG k has no incentive to deviate. This condition has been shown previously. Finally, notice that our result does not depend on the value of r, and it can extend to any value of $r \in [0,1]$. So, σ^* is an SPE in the game of infinitely repeated protection-for-sale. ■

Proof of Lemma 3. The proof is similar to the proof of Lemma 2. We only need to change r to r_i and the conditions for the government and SIG j not to deviate from s are very similar to equations A1 and A2 and they are stated below.

For the government:

$$\begin{aligned}(1-\delta)&\left[\sum_{i\in L}(1-r_i)C_i^T(\mathbf{p}^T)+aW(\mathbf{p}^T)-aW(\mathbf{p}^F)\right]\\&+\delta\left[\sum_{i\in L}C_i^T(\mathbf{p}^T)+aW(\mathbf{p}^T)-aW(\mathbf{p}^F)\right]\geq 0.\end{aligned} \tag{A5}$$

For SIG j:

$$(1-\delta)(r_j-1)C_j^T(\mathbf{p}^T)+\delta(1-\delta^{n_j})[W_j(\mathbf{p}^T)-C_j^T(\mathbf{p}^T)-W_j(\mathbf{p}^j)]\geq 0. \tag{A6}$$

In equation A5, if the government has an incentive to deviate from s, $\sum_{i\in L}(1-r_i)C_i^T(\mathbf{p}^T)+aW(\mathbf{p}^T)-aW(\mathbf{p}^F)<0$. Hence, just as in equation A1, we only need to make sure that $\sum_{i\in L}C_i^T(\mathbf{p}^T)+aW(\mathbf{p}^T)-aW(\mathbf{p}^F)>0$ when $\delta \to 1$ to eliminate the incentive to deviate. Therefore, r_i plays no role in the equilibrium condition and every argument is the same as in the proof of Lemma 2. The same logic goes through equation A6. The effect of r_j wanes when δ approaches 1, which is shown in equation A6. Hence, if SIG i has the right to choose r_i when interacting with the government, the SPE emerges with every possible r_i as long as the total period contribution is paid according to C_i^T and the players are patient enough. ■

Proof of Proposition 1. By rearranging equation A1, we have

$$\delta \geq \frac{a[W(\mathbf{p}^F)-W(\mathbf{p}^T)]}{r\sum_{i\in L}C_i^T(\mathbf{p}^T)}-\frac{1}{r}+1. \tag{A7}$$

Taking the first derivative with respect to r on the right-hand side of equation A7, we have $\frac{1}{r^2}\left(1-\frac{a[W(\mathbf{p}^F)-W(\mathbf{p}^T)]}{\sum_{i\in L}C_i^T(\mathbf{p}^T)}\right)$. Because $a[W(\mathbf{p}^F)-W(\mathbf{p}^T)]>\sum_{i\in L}C_i^T(\mathbf{p}^T)$ means that playing the PFS game is worse than the free-trade situation for the government, we consider the case when

$a\left[W\left(\mathbf{p}^{F}\right)-W\left(\mathbf{p}^{T}\right)\right]<\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)$. If such a case is satisfied, then it is clear, according to the result from the first derivation, that decreasing r makes equation A7 easier to sustain.

Because $a\left[W\left(\mathbf{p}^{F}\right)-W\left(\mathbf{p}^{T}\right)\right]<\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)$, the value on the right-hand side of equation A7 increases and approaches one if $\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)-a\left[W\left(\mathbf{p}^{F}\right)-W\left(\mathbf{p}^{T}\right)\right]\to 0$. Then we have the second result. ■

Proof of Lemma 4. According to the definition of the weakly renegotiation-proofness, if we can find that a continuation equilibrium is strictly Pareto-dominated by another continuation equilibrium within an SPE, this SPE is not WRP. Let us take $\sigma^{*(1)}$ and $\sigma^{*(2)}$ to compare. In $\sigma^{*(1)}$, each SIG i receives $W_{i}\left(\mathbf{p}^{T}\right)-C_{i}^{T}\left(\mathbf{p}^{T}\right)$ and the government receives $\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)+aW\left(\mathbf{p}^{T}\right)$ in every period. In $\sigma^{*(2)}$, we only need to consider the payoffs within n periods of the punishment against the government because the continuation payoffs are the same after that. Regarding the government, it receives $aW(\mathbf{p}^{F})$ during the punishment and it has been shown in the proof of Lemma 2, $\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)+aW\left(\mathbf{p}^{T}\right)>aW\left(\mathbf{p}^{F}\right)$. Hence, the government has an incentive to renegotiate back to $\sigma^{*(1)}$. Regarding the SIG, any SIG k receives $W_{k}(\mathbf{p}^{F})$ during the punishment against the government and according to the proof of Lemma 2, $W_{k}\left(\mathbf{p}^{F}\right)<W_{k}\left(\mathbf{p}^{T}\right)-C_{k}^{T}\left(\mathbf{p}^{T}\right)$. Therefore, each SIG also has an incentive to renegotiate back to $\sigma^{*(1)}$. Then, we have that σ^{*} is not a weakly renegotiation-proof SPE. ■

Proof of Proposition 2. We first show that σ^{**} is an SPE and then it is WRP. Most of the results in Lemma 2 can be carried here. We only need to show that the revised punishment against the government is severe enough to eliminate the incentive to deviate. In (D), where there is only one SIG that is active, the maximal period payoff of the government is $aW(\mathbf{p}^{F})$ according to Lemma 1(iv). Because we have shown in the proof of Lemma 2 that $\sum_{i\in L}C_{i}^{T}\left(\mathbf{p}^{T}\right)+aW\left(\mathbf{p}^{T}\right)-aW\left(\mathbf{p}^{F}\right)>0$, the punishment is severe enough. Hence, σ^{**} is an SPE. Second, because $aW(\mathbf{p}^{F})$ is the maximal payoff for the government in (D), the induced equilibrium trade policies which maximize $W_{h}(\mathbf{p}) + aW(\mathbf{p})$ according to Lemma 1(iii) maximize the period payoff of the only active SIG, h. Notice that the strategy defined in (D) is a grim-trigger strategy, and so SIG h receives the largest continuation payoff in σ^{**}. Then, this only active SIG h has no incentive to renegotiate back to $\sigma^{*(1)}$. ■