Resistance to Outside Investment: A Rational Model of Surplus Destruction

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Abstract

If the government has the ability and willingness to redistribute the surplus created by an external investor, why do we still observe resistance to such investment, sometimes in the form of destruction of productive assets? And how does such destructive action affect a government’s “investor-friendliness”? In a simple model where different social groups have different and uncertain valuation of productive investment brought in from outside, we explain such surplus destruction as a credible signal sent to the government by an affected group of its low valuation. The information-constrained government values such a signal and uses it to implement a better redistribution scheme. Such destructive action is decreasing in the extent that the government cares for the affected group. Under full information, the government taxes the investor if the investor’s marginal valuation of the investment is higher than that of the society and subsidises the investor otherwise. Surplus destruction makes the government weaker in negotiating with the investor, i.e. more prone to providing subsidies to compensate for the investor’s loss due to destruction. If two governments compete to attract the same investor, we show that there is a “subsidy war”, and while the investor benefits from such competition at the cost of the societies, there may be an ex-post inefficiency, i.e. investment can move to the less profitable destination. Resistance to investment may have counterintuitive effects on a government’s negotiating power under competition.

1 Introduction

Over the last decade, local, provincial and national governments the world over have been increasingly relying on outside private investors to provide the impetus for growth in jobs and output (Balassa [1]; Corbo et al. [4]; Lal [7]; Khan and Reinhart [6]). Governments are actively pursuing private capital by providing incentives and otherwise creating conditions favorable for investment. Industry groups monitor the “investor-friendliness” of governments, and governments often compete with each other in wooing private capital (see a survey by Lim [8]). Concomitantly, there is a rising trend, especially in the
third world, of local communities resisting non-local private capital (see Bardhan [2] in the context of India; Rodrik [12], Stiglitz [13]). Some of this resistance has gone beyond protests and demonstrations and taken the form of actual destruction of productive assets, disruption of production, or in some other way creating conditions that lower the productive capacity of the investor. As globalization spreads deeper into the developing world, one can expect such occurrences only to grow in frequency and intensity.

What is puzzling about these protests is that local communities seem to be resisting precisely what is necessary to lift them out of the poverty trap. The simplistic explanation that globalization always leaves local communities impoverished is inconsistent with the idea that the government can redistribute surplus from productive investment. Theoretically, as long as there is a positive surplus created from investment, the government can ensure that it is distributed in such a way that makes everyone better off: thus, destructive activities that ultimately reduce the available surplus seem counterproductive.

In this paper, we posit a rational explanation of why we observe destruction of productive assets (or more broadly, activities that adversely affect the investment climate) by purported beneficiaries of the investment even when the government is willing and able to redistribute the surplus from investment, and is in no way interested in the benefit of the external investor.

In our theory, different social groups (skilled vs. unskilled labor, industry vs. agriculture) value investment differently, and when the government offers conditions to the investor there is considerable uncertainty about the actual benefits to different groups. These valuations are realized at the interim stage (actual number of jobs created, multiplier effect, etc.) by the respective groups, but the government cannot directly elicit this information through the democratic process. In this situation, the group with low marginal valuation of surplus uses such destruction as a credible signal of its valuation, and the government implements an appropriate redistribution scheme taking into account this information.¹ In this way, the destruction of some investment can be read as a last-resort way for those who lose from the project (relative to others) to demand redistribution or compensation from the government.²

Notice that such destructive means need to be resorted to only in absence of other channels of upward flow of information, which is a hallmark of underdeveloped political institutions and in presence of more extreme uncertainty about the effect of investments on different social groups, which is the case when markets are underdeveloped and there are large positive or negative externalities. This probably explains why the phenomenon of destructive resistance to private investment is common the developing world and not the developed world. Even within the developing economies, the extent and intensity of resistance seems to be higher in communities that are more marginalized within the society. Our model presents comparative static results that are consistent with this observation: ceteris paribus, the less the government cares about a particular social group, the higher will be the extent of the resistance mounted by the group.

In our model, while the government values the welfare of different social groups asymmetrically, it does not care directly about the profits of the external investor. We do not intend this as an assertion about reality that there is never any covert nexus between the government and the external investor.

¹Use of costly action to signal valuation in the context of redistribution is analyzed in Harstad [5]. In his paper, groups signal their valuation be delaying, thereby reducing the current value of the project.
²Models of costly political actions are not common in the positive political theory literature. Exceptions include Lohmann [9], [10] and [11].
investor. On the contrary, our intention in making this assumption is to demonstrate that we may have resistance to investment even in absence of such a nexus. Violent protests may arise due to informational constraints in the society even with the most benign of governments. In turn, an implication of our model is that a more representative government (a "people’s government") will not make the problem of resistance to investment vanish. We suggest that it is also necessary to address the rigidities and bottlenecks in the institutions of upward information flow in the society.

In addition, the fact that the government values the relationship with the investor only in terms of the possible gains to the groups internal to the society helps us endogenise the extent of "investor-friendliness" of the government. In particular, we analyze conditions under which the government should tax the investor and distribute profits within the society or offer a subsidy to lure the investor at the cost of the society. The tax or subsidy is used as an instrument to affect the scale of investment. If the investor’s marginal benefit from the scale of the project is lower than that of marginal benefit to the society, the government should subsidize the investor to induce higher investment, and tax the investor and redistribute the proceeds otherwise. The possibility of asset destruction suppresses the scale of investment: and thus the government has to compensate the investor from loss due to destruction. Thus, while the popular left deems resistance to private investors as a response to the government "selling out", we argue that there is a reverse causality too: the possibility of asset destruction weakens the government in its negotiations with the investor and forces it to make concessions that would be unnecessary in absence of the possibility. This presents the government with a trade-off: while asset destruction provides information regarding valuations of groups that help in setting a better redistributive scheme within the society, it comes at a social cost of muted incentives for the external investor who needs to be compensated.

In a later section, we develop a model of competition between governments in order to attract the same investor. In the spirit of Bertrand competition, there is a "subsidy war", and while the investor benefits from such competition at the cost of the societies, there may be an ex-post inefficiency, i.e., investment can move to the less profitable destination.

The paper is organized as follows. Section 2 discusses the related literature. In Section 3, we introduce the basic model where the investor considers only one destination for the proposed investment. Section 4 analyses the problem, discusses the trade-offs and solves the equilibrium. Section 5 discusses comparative static results of the basic model. Section 6 presents a model where two governments compete for the investor. Section 7 concludes.

2 Related Literature

Will be added later.

3 Basic Model

Consider a development project that benefits the local economy, but the government may not have the necessary resources (technical expertise, financial strength, human resources) for efficient implementation. The government, $G$, identifies an external investor, $I$, with such resources to implement the project. $G$ offers an investment tax $\tau \in R$ to the investor on the size of the investment. A negative value of $\tau$ implies a subsidy to the investor. $I$ decides on the size of the project $x \geq 0$, after observing $\tau$. For simplicity, we normalize $I$’s return from the project to $x$. But investment is costly and the
investment cost is given by $\frac{x^2}{2\tau}$, where $k > 0$. Therefore, $I$’s gross return from implementing the project is $x - \frac{x^2}{2\tau}$.

The society comprises of various groups, who derive utility from the project. Groups however, have different valuations of the project. Group $i$’s total valuation of the project is given by $v_ix$. We make two assumptions: While $v_A$ is assumed to be fixed, $v_B$ can be either $\underline{v}$ (with probability $p$) or $\overline{v}$ (with probability $1 - p$). We assume that $p \in (0, 1)$ and $\overline{v} > \underline{v}$. While the distribution of $v_B$ is commonly known, $v_B$ itself is realized after the investment is made and cost is incurred by the investor. The realization is observed only by members of group $B$. We assume that $B$ can take an action to signal its valuation to $G$. This action has a public cost. In particular, by taking an action of level $a \geq 0$, it effectively reduces the size of the investment by $ax$. Notice that the action reduces the value of investment both to the investor and to the two groups. Following an action of level $a$, group $i$’s payoff from the project becomes $v_ix(1 - a)$.

In order to increase the aggregate welfare, the government redistributes the benefits among groups. For simplicity, we consider two groups of citizens, $A$ and $B$. Group $i$’s total valuation of the project is given by $v_ix$, $i \in \{A, B\}$. We assume that $G$ distributes the benefits among the citizens. The benefits however, are realized only after the project is under way, and are private information to the respective groups.

For simplicity, we $G$ does not get any direct payoff from the project. It however cares for the social groups $(A$ and $B)$ who derive utility from the project. Groups have different valuations of the project. Group $i$’s total valuation of the project is given by $v_ix$ when the size of investment is $x$. While $v_A$ is assumed to be fixed, $v_B$ can be either $\underline{v}$ (with probability $p$) or $\overline{v}$ (with probability $1 - p$). We assume that $p \in (0, 1)$ and $\overline{v} > \underline{v}$. While the distribution of $v_B$ is commonly known, $v_B$ itself is realized after the investment is made and cost is incurred by the investor. The realization is observed only by members of group $B$. We assume that $B$ can take an action to signal its valuation to $G$. This action has a public cost. In particular, by taking an action of level $a \geq 0$, it effectively reduces the size of the investment by $ax$. Notice that the action reduces the value of investment both to the investor and to the two groups. Following an action of level $a$, group $i$’s payoff from the project becomes $v_ix(1 - a)$.

In our framework, $G$ decides on two different types redistributive transfer. First, because of investment tax, a redistribution of surplus takes place between the investor and the groups of citizens. If there is a positive investment tax (when $\tau > 0$), $G$ distributes the tax revenue among the citizens. Conversely, when offering a subsidy to $I$ (when $\tau < 0$), $G$ collects the subsidy from groups. Let $w_i, i = A, B$ denote group $i$’s surplus such that $w_A = v_Ax(1-a)+s\tau x$ and $w_B = v_Bx(1-a) + (1 - s)\tau x$, where $s$ is the proportion at which the tax/subsidy revenue is split between two groups. We will show in the analytical section, the choice of $s$ will not be a strategic consideration for $G$. We therefore assume that $s$ is fixed for simplicity. Next, at the final stage, after observing the size of the investment and any action, if taken by $B$, $G$ decides on a redistributive transfer between groups. Let $t \in \mathbb{R}$ denote the redistributive transfer from $A$ to $B$. Therefore, post-transfer surplus of groups $A$ and $B$ are given by

$$w_A - t = v_Ax(1-a) + s\tau x - t,$$ and

$$w_B + t = v_Bx(1-a) + (1-s)\tau x + t.$$ 

\(^3\)Our results hold for any strictly increasing and convex cost function. The assumption of quadratic cost function is taken for simplicity and tractability of our results.
Since group $B$’s marginal value is ex ante unknown, we shall sometime refer to group $B$’s surplus by $w_B = w_B(v)$ with $v$ denoting the realized valuation of $B$. Similarly, the total surplus can be expressed as a function of group $B$’s marginal valuation $v$ and level of action $a$, in the following way:

\[
S(v, a) = [(v_A + v)(1 - a) + \tau]x
\]  

There are other arguments in the expression for $S$, but we are suppressing them now. Notice that $S(v, a) - S(v, a) = (\nu - v)x(1 - a) \geq 0$.

We assume that $G$ cares for both groups’ utilities, and its payoff is given by

\[
W = \begin{cases} 
(w_A - t)^{1-\lambda}(w_B + t)^{\lambda} & \text{for some } \lambda \in (0, 1) \text{ if } \min(w_B + t, w_A - t) \geq 0 \\
-M - [t - (\lambda w_A - (1 - \lambda)w_B)]^2 & \text{for some large } M > 0 \text{ otherwise}
\end{cases}
\]

$G$’s payoff depends on $B$’s marginal valuation, $v$, the action, $a$, and the redistributive transfer, $t$. We therefore often express it as $W(v, a, t)$. When each group has weakly positive utility, $W(v, a, t)$ is given simply by the Cobb-Douglas form, with $\lambda \in (0, 1)$ being the weight assigned to the group under consideration. The function $(w_B + t)^{\lambda}(w_A - t)^{1-\lambda}$ will have problems of definition if any one of the utilities is negative. Hence, we choose $W(v, a, t)$ to have a large negative value when any one group has negative utility, suggesting that such a situation is very unpleasant for the government. However, for technical reasons we do not want $G$ to be indifferent between all values of $t$ conditional on a situation where some group has a negative utility for every value of $t$. Therefore, even when $W(v, a, t)$ has a large negative value, we assume some concavity.

The following condition is assumed throughout our analysis.

**Assumption 1** $v_A + v > 0$.

Assumption 1 guarantees that the project is large enough to implement so that it produces positive surplus for the groups in every state. By making this assumption, we move away from the ‘adverse selection’ problem of choosing bad projects, and focus only on the informational problem related to the redistribution of surplus.

The investor’s payoff is

\[
\pi = x(1 - a) - \frac{x^2}{2k} - \tau x.
\]

The sequence of events is described below:

1. Policy stage: $G$ decides the investment tax/subsidy $\tau$.
2. Investment stage: $I$ decides the size of investment $x$.
3. Signalling stage: $B$ observes $v_B$. Then $B$ takes an action $a \geq 0$ to signal its valuation $v_B$ to $G$.
4. Redistribution stage: $G$ decides a transfer $t \in \mathbb{R}$ from $A$ to $B$.

Figure ?? below describes the sequence of actions and revelation of information in the game.
3.1 Underlying assumptions

In the basic model, the government is the sole buyer of the investment. This can be the case if the particular investment opportunity may be unavailable anywhere else. A geographically specific investment opportunity (e.g. mining) may be a relevant example of this situation. In section 5, we extend the model to incorporate possibilities in which the investor can invest in one of the two locations, and governments in these two locations can compete to attract the investor.

3.1.1 Policy stage

The tax or subsidy, $\tau$, offered by the government captures the extent of investor friendliness of the government. It is set before the government knows the exact social valuation of the investment. We assume that the government commits not to renegotiate on the contract with the investor once the valuation to the social groups is known. Notice that the government also has the option not to offer any deal to the investor by setting $\tau = 0$.

3.1.2 Investment stage

The variable $x$ can be thought of interchangeably as the scale or size of investment or the level of output per unit time. While we realize that the former is a stock concept and the latter is a flow, we do not distinguish between the two as they are obviously positively correlated. The particular functional form of the payoff to the investor embodies certain underlying assumptions. First, the tax has to be paid on the entire scale of investment $x$ and the investor cannot claim immunity from paying tax on production (or productive capacity) lost due to popular resistance. Second, the term $x^2/k$ should be thought of as the cost of producing output $x$, and $k$ measures the productivity of the project. The parameter $k$ is specific to the location of investment, and captures the extent to which a location is attractive to the investor irrespective of the deal offered by the government. While $k$ does not play a strategic role in the benchmark case in which there is just one location under consideration, it acquires prime importance when two governments are competing for investment. The first term can be thought of as the "revenue" of the investor. Since an amount $ax$ of the output is destroyed due to resistance, the investor gets to "sell" only the effective output, i.e. $x(1-a)$. The price per unit of output sold is normalized to 1. Notice that the investor has the option of not to invest, i.e. choose $x = 0$, and then all parties receive a payoff of zero.
3.1.3 Signaling stage

Different groups in the society are affected in different ways by the proposed investment. New technology may compete away existing industries, displace land and livelihood and on the other hand benefit those engaged in ancillary industries. Jobs are created in the new entity and through a multiplier effect. Because of these externalities, the extent of the gains and the identity of the gainers and losers from such a change in the economic landscape may not be immediately obvious and are known only at an interim stage after the proposed investment is made. Also, the extent of gain or loss increases with the scale of the project. To capture the idea that destroyed surplus is a loss for everyone, the valuation depends only on the effective output that remains after destruction, i.e. $x(1-a)$. Since the marginal valuations play such an important role in determining the incentive for action, we hold the marginal valuations $v_i$ constant and treat them as parameters. Thus, the total valuation of group $i$ from the investment is $v_i x(1-a)$.

The government is interested in redistributing the total gains created in the economy according to some social welfare function which we shall presently discuss, but it is constrained by the fact that it cannot directly observe the benefits. In particular, attempts to elicit information by asking the respective groups will fail since the groups will overstate their losses and understate their gains so as to attract redistributive benefits. Under such a situation, a group with low (not necessarily negative) marginal valuation of the investment has an incentive to destroy some surplus to credibly signal its low valuation, and the government can use this information to implement the redistribution scheme. To capture the issue of redistribution, we need at least two groups, but it is enough to have uncertainty in the valuation of one group to analyze the credibility problem. We suppress the uncertainty in valuation of group $A$ for the sake of parsimony. One can also think of group $B$ as the "affected group".

3.1.4 Redistribution stage

The investor is truly external to the society in that the government does not care about protecting his profits. The government cares only about the groups in the society, but may discriminate between the two groups. The parameter $\lambda$ may capture a wide variety of things: extent of competitiveness in the political system (how far $\lambda$ is away from $\frac{1}{2}$), how fringe/marginal the "affected" group is (low $\lambda$), the size of the affected group (high $\lambda$), whether the party in power represents the affected group (high $\lambda$), number of "swing" voters in the affected group (high $\lambda$) Assuming that group $A$ is the one that has certain and positive benefit from investment, $(1-\lambda)$ may also be an exogenous proxy for investor-friendliness. At this stage, we simply note that the precise interpretation of $\lambda$ is irrelevant for the purpose of the model.

We shall see later that in a separating equilibrium, the optimal redistribution scheme is to divide the total social surplus in the ratio of weights of the groups. In particular, the value of $s$, i.e. the rule determining how the tax revenue from the investor would be distributed (or how the subsidy would be financed), does not matter. The group utilities are also given by their respective shares of surplus. Thus, it is in the interest of each group to maximize total surplus: the only rationale for surplus

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4 One assumption in our model is that the investor cannot undertake redistributive action. Therefore, we are not talking about strikes by worker’s unions or demonstrations by local communities aimed at forcing the investor to introduce redistributive or compensatory schemes. While at a very local level, some such schemes are clearly possible, the scope and importance of such actions are clearly limited compared to what the government can do.

5 It is possible to show that as long as the government’s utility function is $W(t) = f_A(u_A - t) + f_B(u_B + t)$, where
4 Analysis

4.1 Strategies, belief and equilibrium concept

We next describe strategies of different players of the game. The strategy of the investor $I$ is a mapping $x : \mathbb{R} \to \mathbb{R}$ such that $x(\tau) \in \mathbb{R}$ is the size of the investment, given an investment tax $\tau$. The marginal valuation of the project to Group $B$ is private information to $B$ only. $B$’s strategy is a mapping $a : \mathbb{R} \times \mathbb{R} \times \{\text{yes, no}\} \to \mathbb{R}_+$, such that $a(\tau, x, v_B)$ denote the level of action taken by $B$ after observing an investment tax $\tau$, the size of the project $x$ and the marginal valuation of the project $v_B$. $G$ chooses two different taxes. First, it decides on an investment tax that will be imposed on the investor. Finally, after observing the action taken by $B$, $G$ decides on a redistributive transfer between $A$ and $B$. Therefore, $G$’s strategy is given by a tuple $(\tau, t)$ such that $\tau \in \mathbb{R}$ is the investment tax and $t : \mathbb{R} \times \mathbb{R} \times \mathbb{R}_+ \to \mathbb{R}$ is a mapping such that $t(\tau, x, a)$ is the redistributive transfer from $A$ to $B$, given an investment tax $\tau$, size of investment $x$ and action level $a$. Let $\mu(\tau, x, a) \in [0, 1]$ denote $G$’s belief that group $B$ has low valuation for the project, after observing a feasible choice tuple $(\tau, x, a)$ in which $\tau$ is the tax rate chosen by $G$, $x$ is the size of the investment and $a$ is the action made by group $B$. We will look for the set of Perfect Bayesian equilibrium (PBE) that involves a strategy profile and a belief system such that the strategy profile is sequentially rational and beliefs are derived by Bayes’ rule when possible. The set of signalling equilibria is large because of broad flexibility permitted by PBE in specifying out-of-equilibrium beliefs. To get more tractability of our results, we restrict our attention only to the separating equilibria satisfying the Intuitive Criterion (Cho and Kreps [3]).

4.2 The benchmark case: When valuations are public information

As a point of comparison, it is useful to begin our analysis by looking at the problem without the signalling stage. Consider a situation in which groups’ valuation for the project are public information. or, alternately, we can assume that $G$ has a zero-cost mechanism to find out the true valuation of the project to each group. In our scenario, the value of $v_B$ will therefore be known to $G$ at the redistribution stage at zero cost. It is important to note that the realized value of $v_B$ will still be unknown at the policy stage and the investment stage, but will be known at the redistribution stage. The total surplus available to the government for redistribution within groups is then $S(v_B, 0) = (v_A + v_B + \tau)x$, given the investment tax $\tau$ and the size of investment $x$. At the redistribution stage, $G$ chooses $t \in \mathbb{R}$ to maximize $W(v_B, 0, t)$. From inspection of the first order condition, we see that the optimal group transfer is given by

$$t^* = \lambda w_A - (1 - \lambda) w_B,$$

and the payoffs of groups $A$ and $B$ are given by $(1 - \lambda) S(v_B, 0)$ and $\lambda S(v_B, 0)$ respectively. Since groups are not taking any action that is costly to the investor, it is easy to see that $I$’s choice of investment will be independent of the choice of optimal transfer $t^*$. $I$ chooses $x$ to maximize

$$x - \frac{x^2}{2k} - \tau x.\tag{19}$$

$f_i$’s are strictly increasing and concave, the optimal redistribution scheme is such that the final utility of each group depends only on the total surplus and it is in the interest of each group (and the government) to maximise the total surplus.
The optimal size of investment is given by
\[ x^o = k(1 - \tau). \]

Next we consider \( G \)'s expected payoff at the policy stage. Since the marginal valuation of the project to \( B \) is not known, the expected payoff will be given by
\[ (1 - \lambda)^{1-\lambda} \lambda^\lambda (v_B + \beta E_B + \tau) x^o. \]

where \( E_B \equiv (1-p)p_B \) is \( B \)'s expected marginal valuation for the project. The optimal choice of investment tax is a solution of the following optimization problem
\[ \tau^o = \arg \max_\tau (v_A + \beta E_B + \tau)k (1 - \tau) = \frac{1 - v_A - \beta E_B}{2}. \]

From the above analysis, we see that \( \tau^o \) is positive if and only if \( v_A + \beta E_B \) is less than 1. Therefore, if sum of groups’ expected marginal valuation is less than the investor’s marginal revenue from output, \( G \) will tax the investor. Otherwise, the investment will be subsidized. The following proposition summarizes this result.

**Proposition 1** Consider a situation groups’ marginal valuation of the project are public information. \( G \) will tax the investor if the sum of groups’ expected marginal valuations of output is less than the investor’s marginal revenue from output. Otherwise, \( G \) will subsidize the investment.

The above proposition outlines the optimal taxing rule for the government in absence of the informational problem. If the valuations were not private information, the government would tax (subsidize) the investor if the investor’s "price" obtained per unit of output is greater (less) than the sum of marginal valuations of the social groups\(^6\).

### 4.3 Equilibrium Analysis

In this section, we analyze the problem with possibility of signalling. We solve the game by backward induction.

First consider the redistribution stage. Assume that the investment tax \( \tau \), the size of investment \( x \) and the level of action \( a \) are known. In any separating equilibrium, group \( B \)'s true valuation will be revealed with certainty. We therefore, look at the optimal between-group transfer when \( G \) knows the realized value of \( v_B \).

For any belief \( \mu \in [0,1] \) over types, the optimal transfer is
\[ t(\mu, a) \in \arg \max_{t'} E_{\mu}W(a, t') \text{ where } E_{\mu}W(a, t') = \mu W(\mu, a, t) + (1-\mu)W(\pi, a, t) \quad \text{(2)} \]

When \( \mu = 0 \), \( t(\mu, a) \) is equal to \( t(\pi, a) \), and when \( \mu = 1 \), \( t(\mu, a) \) is equal to \( t(\pi, a) \). The following lemma shows that the equilibrium transfer for any belief falls in a bounded set.

\(^6\)In general, if the social valuation of investment is \( V_G(x) \) and that of the investor is \( V_I(x) \), and if \( V_I(x) \) is concave, the government essentially chooses \( x^opt \) such that
\[ \frac{MV_G(x^opt) + MV_I(x^opt)}{-MV_I(x^opt)} = x^opt \]
and sets \( \tau^* \) as \( MV_I(x^opt) = \tau^* \).
Lemma 1 For all $a \in [0,1]$, all values of $\sigma > \nu$ and all beliefs $\mu$, $t(\mu,a) \in [t(\sigma,a),t(\nu,a)]$, where $t(\nu,a)$ is given by equation

$$t(\nu,a) = \lambda w_A - (1 - \lambda) w_B(v,a)$$  \hspace{1cm} (3)$$

Proof. In appendix. $\blacksquare$

Next, consider the signaling stage. Assume that the investment tax $\tau$ and the size of investment $x > 0$ are known. We examine the separating equilibria of the signaling game. In a separating equilibrium, the two types take actions $\pi$ and $a$ respectively, with $\pi \neq a$, and beliefs satisfy $\mu(\pi) = 0$ and $\mu(a) = 1$.

The following lemma shows that if $B$ will take the costly action only if it has low valuation for the project. The key to this is showing that $B$ can always signal its high valuation by not taking any action in a separating equilibrium.

Lemma 2 Suppose $x > 0$ and Assumption 1 holds. In any separating equilibrium, we must have $\sigma = 0$.

Proof. In appendix. $\blacksquare$

The next lemma characterizes the level of action $B$ takes if it has low valuation of the project.

Lemma 3 Suppose $x > 0$ and Assumption 1 holds. Then, the set of separating equilibrium actions is given by $a \in [a_L, \min\{a_H, 1\}]$ and $\sigma = 0$, where

$$a_L = \frac{(1 - \lambda) (\sigma - \nu)}{(v_A + \sigma) - (1 - \lambda) (v_A + \nu)}, \text{ and } a_H = \frac{(1 - \lambda) (\sigma - \nu)}{\lambda(v_A + \nu)}.$$

Proof. In appendix. $\blacksquare$

Lemma 3 shows that there are infinitely many levels of action that can be supported in a separating equilibrium. For the purpose of tractability, we restrict our attention to the equilibria that satisfy the intuitive criterion. The following lemma shows that there is a unique separating equilibrium that survives the restriction.

Lemma 4 Suppose $x > 0$ and Assumption 1 holds. The only separating equilibrium that survives the Cho-Kreps intuitive criterion is $a = a^c = \frac{(1 - \lambda) (\sigma - \nu)}{(v_A + \sigma) - (1 - \lambda) (v_A + \nu)}$ and $\sigma = 0$.

Proof. In appendix $\blacksquare$

Given the unique equilibrium of the signaling game, we are now in a position to solve for the optimal size of investment and the investment tax at the preceding stages. To solve for the optimal size of investment, assume that the tax rate $\tau$ is given. $I$ chooses $x$ to maximize its expected return from investment

$$x^c = \arg \max_x (1 - p) x + p (1 - a^c) x - \frac{x^2}{2k} - \tau x$$

$$= \arg \max_x (1 - \tau - pa^c) x - \frac{x^2}{2k}$$

$$= k (1 - \tau - pa^c).$$  \hspace{1cm} (4)$$

Finally, at the policy stage, $G$ decides the optimal investment tax that maximizes its expected payoff. If $v_B$ is truthfully revealed, $G$’s payoff is

$$(1 - \lambda)^{1 - \lambda} \lambda^\lambda ((v_A + v_B)(1 - a^c) + \tau) x^c.$$
Therefore, in any separating equilibrium, $G$’s expected payoff at the policy stage is given by

\[
 EW = (1 - \lambda)^{1 - \lambda} \lambda^\lambda ((1 - p) (v_A + Ev_B) + p (v_A + \underline{v}) (1 - a^e) + \tau) x. \tag{5}
\]

The optimal investment tax is

\[
 \tau^e = \arg\max_{\tau} EW = \frac{pa^e (v_A + \underline{v} - 1) - (v_A + Ev_B - 1)}{2}. \tag{6}
\]

From Proposition 1, we can rewrite the expression 6 and show that the overall tax rate offered by the government involves two parts: an incentive part $\frac{1}{2} (1 - v_A - Ev_B)$ equal to $\tau^0$ and a compensation part $\frac{1}{2}pa^e (v_A + \underline{v} - 1)$.

\[
 \tau^e = \tau^0 + \frac{1}{2}pa^e (v_A + \underline{v} - 1)
\]

Notice that $\tau^e < \tau^0$ if and only if $v_A + \underline{v} < 1$. Thus, if the marginal social valuation in the bad state is lower than that of the investor, the government is forced to be softer in its negotiations with the investor. On the other hand, if even in the bad state the marginal social valuation is higher than the investor’s valuation, the possibility of political action toughens the government. In either case, the magnitude of compensation ($\tau^e < \tau^0$) is increasing in the extent of political action.

Below we provide a complete characterization of the unique PBE satisfying the intuitive criterion.

**Actions**: $t^e = \begin{cases} v_Ax^e (1 - a^e) + sa^e x^e - \lambda S (\tau^e, x^e, a^e) & \text{if } a = a^e \\ v_Ax^e + sa^e x^e - \lambda S (\tau^e, x^e, 0) & \text{otherwise} \end{cases}$

\[
 a^e = \frac{(1 - \lambda) (\tau - \underline{\tau})}{((v_A + \underline{\tau}) - (1 - \lambda) (v_A + \underline{\tau}))}, \quad \tau^e = \frac{pa^e (v_A + \underline{v} - 1) - (v_A + Ev_B - 1)}{2}, \quad x^e = k (1 - \tau^e - pa^e)
\]

**Belief**: $\mu (\underline{\tau}) = \begin{cases} 1 & \text{if } a = a^e \\ 0 & \text{otherwise} \end{cases}$

**Expected Payoffs**: $EW = \frac{(1 - \lambda)^{1 - \lambda} \lambda^\lambda k}{4} [(v_A + Ev_B + 1) - pa^e (v_A + \underline{v} + 1)]^2$

\[
 E\pi = \frac{k}{8} [(v_A + Ev_B + 1) - pa^e (v_A + \underline{v} + 1)]^2
\]

For Group A $\rightarrow \frac{(1 - \lambda) k}{4} [(v_A + Ev_B + 1) - pa^e (v_A + \underline{v} + 1)]^2$

For Group B $\rightarrow \frac{\lambda k}{4} [(v_A + Ev_B + 1) - pa^e (v_A + \underline{v} + 1)]^2$

The following proposition identifies the set of projects for which the information-constrained government will tax the investor.

**Proposition 2** $G$ will tax the investor if

\[
 v^A + Ev^B - 1 < pa^e (v^A + \underline{v} - 1) < 0.
\]

Otherwise, $G$ will subsidize the investment.
Proof. If \((v^A + \bar{v} - 1) \geq 0\), we have \((v^A + E v^B - 1) > (v^A + \bar{v} - 1) > p a^e (v^A + \bar{v} - 1)\). Hence, \(\tau^e < 0\). If \((v^A + \bar{v} - 1) < 0\), there are two possibilities, depending on the values of \(p\) and \(a^e\) - either \((v^A + \bar{v} - 1) < p a^e (v^A + \bar{v} - 1) < v^A + E v^B - 1\), in which case \(\tau^e < 0\), or, \((v^A + \bar{v} - 1) < v^A + E v^B - 1 < p a^e (v^A + \bar{v} - 1) < 0\), in which case, \(\tau^e > 0\).

Comparing the above result with Proposition 1, we see that the set of projects for which the government taxes the investor under costly signaling is a subset of the set for which the government would tax the investor under the first best condition (i.e. with no information constraint). In particular, if the following condition holds, \(G\) would subsidize the investment under costly signalling but would not have done so otherwise:

\[
p a^e (v^A + \bar{v} - 1) < v^A + E v^B - 1 < 0.
\]

5 Comparative statics

Certain conclusions are obvious from the set-up. We do not observe resistance to all investment, resistance occurs only when some affected group considers the valuation of the investment to be low, and uses destructive means to demand more compensation. Second, since \(a^e\) is independent of the scale of investment, the total destruction \(a^e x\) is strictly increasing in the scale of investment (for example, due to an increase in productivity \(k\)). Thus, bigger projects face bigger resistance. Also, since higher subsidies are associated with larger scale projects, one can see that there will more destruction of total output will be seen to occur when the volume of subsidies is high, seemingly "explaining" increased resistance to "investor-friendliness" of governments.

5.1 Destruction of output

The following proposition tells us how the share of output destroyed, \(a^e\), is dependent on the nature of the investment project and the political structure of the society.

Proposition 3 As the relative welfare weight \(\lambda\) for group \(B\) increases from 0 to 1, the optimal action \(a^e\) by the group decreases monotonically from 1 to 0. Ceteris paribus, \(a^e\) is strictly decreasing in \(v_A\) and \(\bar{v}\). If \(\bar{v} > v_A\), then \(a^e\) is strictly decreasing in \(\bar{v}\), while if \(\bar{v} < v_A\), then \(a^e\) is strictly increasing in \(\bar{v}\).

The proof follows from simple algebra. Notice that \(a^e\) is that level of action where the high type is indifferent between taking the action and not doing so. The comparative static effect of \(\lambda\), \(\bar{v}\) and \(v_A\) can simply be seen from the fact that the gain in transfer \(\Delta t(a)\) for a certain level of action (for either type) is decreasing in each of those parameters, while the high type’s cost of misrepresentation \(\tau a x\) is left unaffected.

The first part of the proposition shows that the more politically marginalised the affected group is, the more destructive action it undertakes. The higher weight a group has in the government’s welfare function, the higher share of surplus it gets in each state, and this creates an incentive not to destroy too much of output, since such destruction eventually hurts the total amount of transfer. In particular, for a very marginalized group (if \(\lambda \to 0\)), it is optimal to destroy almost all output \((a^e \to 1)\), and for a group that is favoured almost completely, (if \(\lambda \to 1\)), hardly any surplus is destroyed \((a^e \to 0)\).

The optimal action \(a^e\) decreases in \(v_A\) and \(\bar{v}\) because an increase in these parameters increases the marginal valuation of output in each state, creating an incentive to "save" output. Thus, given the political structure, the worse affected a group is in case of a bad outcome, the higher is the resistance.
The intuition for the comparative static in $\pi$ is a little more subtle. Notice that $a^e$ is determined by equating the gain in transfer from action $\Delta t(a)$ and the high type’s cost of taking action. While an increase in $\pi$ leads to a larger transfer $\Delta t(a)$, it also increases the cost of misrepresentation to the high type. The comparative static can go either way depending on whether $\pi$ is greater or less than $\pi^*.$

5.2 Investor-friendliness

The political structure of the society as encapsulated by $\lambda$ may have a significant impact on the deal offered to a foreign investor and consequently, the scale of investment. Proposition 2 tells us that the condition for taxation by the government is

$$v_A + \bar{\nu} < 1 \quad \text{and} \quad pa^e < \frac{v_A + E v_B - 1}{v_A + \bar{\nu} + 1}.$$  

If $a^e$ is $a^e(\lambda)$, it is easy to see that a decrease in $\lambda$ will raise the level of optimal political action, and this may push the government from a tax regime to a subsidy regime. It is also important to note that the difference between the first best tax rate and the optimal tax $|\pi^* - \pi^0|$ is increasing in the extent of political action, which is decreasing in $\lambda$.

5.3 Social Welfare

First, notice that given $\lambda$, each player’s equilibrium welfare is a constant times the government’s equilibrium welfare. Define $V(a)$ as

$$V(a) \equiv [(v_A + E v_B + 1) - pa(v_A + \bar{\nu} + 1)] = (1 - p)(v_A + \bar{\nu} + 1) + p(v_A + \bar{\nu} + 1)(1 - a)$$

Given a level of action, $V(a)$ measures the ex-ante combined expected marginal valuation of output by the two social groups and the investor. Notice also that $V(a)$ is completely determined by the project under consideration, i.e. distribution of $(v_A, v_B)$. Each player’s equilibrium welfare is a constant times the square of $V(a)$, with the constant depending only on productivity $k$ and the political structure $\lambda$. By Assumption 1, destructive resistance is harmful for everyone. The reason such action is still undertaken is its informational value, without which we would have worse redistributive performance in each state. Since $a^e$ is decreasing in $v_A$ and $\bar{\nu}$, the welfare of each player increases if $v_A$ and $\bar{\nu}$ go up. So is the case with $\pi$, provided $\pi > v_A.$ As $\lambda$ increases, the total surplus increases and so does the share of surplus for group $B$. So, as group $B$ becomes more politically powerful, its welfare increases. The investor also is better off with lower destructive action due to the increased political weight of the affected group. But the effect of $\lambda$ on the welfare of the government and that of group $A$ is ambiguous.

So far, we have considered a situation where a government has a monopoly power to tax the investor. In the next section we consider a case where two governments are competing to attract the same investor.

6 Competition between Governments

Suppose there are two "societies" 1 and 2. Each society $i$ is composed of a government $G_i$, two social groups $(A_i, B_i)$ and an investment opportunity. An investment opportunity is denoted by a distribution of valuations $(v_{A_i}, p_i, \underline{\nu}_i, \bar{\nu}_i)$ and a productivity parameter $k_i$ just as in section 2. Suppose that the investor, due to reasons of resource indivisibility, is able to invest in only one of the two
societies. The two governments simultaneously make offers to the investor\(^7\). The sequence of the game is now as follows:

1. Policy stage: Each \(G_i\) decides the investment tax/subsidy \(\tau_i\), simultaneously.
2. Investment stage: \(I\) observes the offer profile \(\tau = (\tau_1, \tau_2)\) and decides the size of investment \(x_1\) and \(x_2\), subject to \(x_1 x_2 = 0\).
3. Signalling stage: \(B_i, i = 1, 2\) observes its own marginal valuation \(v_{B_i}\) and takes an action \(a_i \geq 0\) to signal its valuation \(v_{B_i}\) to \(G_i\).
4. Redistribution stage: \(G_i\) decides a transfer \(t_i \in \mathbb{R}\) from \(A_i\) to \(B_i\).

The investor’s strategy is \(x_1(\tau)\) and \(x_2(\tau)\), and other strategies are duly modified in natural ways. For the society \(j\) where the investor chooses not to invest, i.e. set \(x_j = 0\), the social groups and the government get a payoff of zero. We assume that strategic variables take their natural trivial values, i.e. \(a_j = 0\) and \(t_j = 0\), although other, equally trivial but possibly less natural values are possible in equilibria.

The investor accepts whichever offer leads to higher profits. Given that \(I\) invests in region \(i\), the expected profit, as a function of the investment tax, is

\[
E\pi_i(\tau_i) = \left(1 - p_i a^c - \tau_i - \frac{x_i^c(\tau_i)}{2k_i}\right) x_i^c(\tau_i)
= \frac{k_i}{2} \left(1 - p_i a^c - \tau_i\right)^2. \tag{7}
\]

Since the expected profit is decreasing in \(\tau_i\), we have a Bertrand Competition (i.e. a subsidy war) between the two governments. We measure the "economic strength" of a government by the maximum profit it can offer the investor, which is given by the minimum tax (maximum subsidy) it can offer. Assuming that \(EW_i(\tau_i^m) > 0\) for the monopoly \(\tau^m\), as \(EW_i(\tau)\) is strictly concave, the minimum rate that the government \(i\) will be willing to offer is the unique \(\tau_i < \tau_i^m\) where \(EW_i(\tau_i) = 0\). It is given by

\[
\tau_i = -(V_i + Evi + p_i \alpha_i (V_i + \psi)) \tag{8}
\]

The investor’s payoff is \(E\pi_i(\tau_i) = [1 - p_i \alpha_i - \tau_i]^2 \left(\frac{k_i}{2}\right)\). Substituting \(\tau_i\) from (8) and after rearranging terms, we get that

\[
E\pi_i(\tau_i) = \frac{k_i}{2} \left[1 - p_i \alpha_i + (v_{A_i} + Ev_{B_i}) - p_i a^c (v_{A_i} + \psi)\right]^2
= \frac{k_i}{2} \left[(v_{A_i} + Ev_{B_i} + 1) - p_i a^c (v_{A_i} + \psi + 1)\right]^2.
\]

Comparing the above with the investor’s equilibrium payoff when there is no competition, we see that

\[
E\pi_i(\tau_i^m) = 4E\pi_i(\tau_i^m). \tag{9}
\]

The competition between societies 1 and 2 induces a subsidy war and provides the investor with additional bargaining power so that he may gain some additional profit. Who wins the investment

\(^7\)While a sequential offer game may have interesting dynamics of its own, we stick to the more basic simultaneous offer auction-type framework.
depends on the competitive strength of two societies and the condition is determined by comparing $E\pi_1(\tau_1)$ with $E\pi_2(\tau_2)$.

Without loss of generality, we assume that society 1 has the competitive advantage such that

$$E\pi_1(\tau_1) > E\pi_2(\tau_2).$$

(Condition A)

It is easy to see that $G_1$ wins the investment because of the nature of Bertrand competition in offering subsidy. The following condition will be useful to determine the equilibrium tax/subsidy rate.

$$E\pi_1(\tau_1^*) < E\pi_2(\tau_2).$$

(Condition B)

If Condition B is violated, then $G_1$ offers $\tau_1^*$ in equilibrium. To see this consider the expected payoff of $G_1$, which is concave in $\tau_1$ and is maximized at $\tau_1^*$. If $G_1$ offers $\tau_1^*$, it can also get the investment because of Condition B. Therefore, $\tau_1^*$ is the equilibrium rate offered by $G_1$, and society 1 gets the project. If Condition A is violated, we say that society 2 is not a potential competitor to society 1 (defined when society 1 is assumed to have the competitive advantage).

When Condition B is satisfied, the following notation will be useful to characterize the optimal tax/subsidy rate. Let $\tau_1^*$ be the investment tax rate charged by $G_1$ such that

$$E\pi_1(\tau_1^*) = E\pi_2(\tau_2)$$

or,

$$\frac{k_1}{2}[1-p_1a^e - \tau_1^*]^2 = \frac{k_2}{2}[1-p_2a^e - \tau_2]^2$$

(10)

The left side of (10) is the investor’s expected payoff if it invests in society 1 when investment tax is $\tau_1^*$. The right side of (10) is the investor’s payoff if it invests in society 2 given an investment tax $\tau_2$. If Condition B is satisfied, we claim that the $G_1$ offers $\tau_1^*$ and $G_2$ offers $\tau_2$ in equilibrium and the investor invests in society 1. To see this, note that $\tau_2$ denotes the minimum possible tax rate that $G_2$ can offer such that it gets a positive surplus. From (10), we see that $G_1$ can make the investor indifferent between investing in 1 and 2 by offering $\tau_1^*$. By offering a tax rate marginally lower than $\tau_1^*$, $G_1$ can win the investment with probability 1. In limit, the equilibrium outcome would be charging $\tau_1^*$ by $G_1$ and charging $\tau_2$ by $G_2$ and I investing in 1.

The above findings are summarized in the following proposition.

**Proposition 4** Assume that society 1 has competitive advantage so that Condition A is satisfied. Then I invests in society 1 in equilibrium. The equilibrium investment tax charged by $G_1$ is given as

$$\tau^e = \begin{cases} \tau_1^* & \text{if Condition B is satisfied} \\ \tau_1^* & \text{Otherwise} \end{cases}$$

(11)

Notice that Condition B reflects a situation when competition between two regions affects the winning society’s payoff. To get more insight on how actions in the losing society may create external impact on the winning society’s payoff, consider equation (10) that determines the equilibrium tax rate in such a situation. After expanding terms, we get

$$\frac{k_1}{2}[1-p_1a^e - \tau_1^*]^2 = \frac{k_2}{2}[(v_{A_2} + Ev_{B_2} + 1) - p_2a^e (v_{A_2} + v_2 + 1)]^2.$$  

(12)

Consider a situation when $(v_{A_2} + v_2 + 1)$ is positive (negative). The right side of (12) is decreasing (increasing) in $a_2^e$. Since the left side of (12) is always decreasing in $\tau_1^*$, an increase in $a_2^e$ can be matched with a increase (decrease) in $\tau_1^*$. Such a change in $\tau_1$ will be welfare-improving (welfare-reducing) for society 1 as $\tau_1^* < \tau_1^*$ (and $G_1$ ’s expected payoff is concave in $\tau$). We therefore get the following proposition.
Proposition 5 Assume that society 1 has competitive advantage and society 2 is a potential competitor to 1 (both Condition A and Condition B are satisfied). The winning society’s payoff increases as the losing society becomes more action-prone.

Proposition 5 gives important insight in understanding how costly action in a society may create externalities on another society’s terms of bargaining with the investor. The need of taking a costly action in our framework is only to solve the local informational problem when the government cares about both groups’ utilities. More costly action in society 2 would actually make the investor increasingly lenient towards society 1, and therefore, the bargaining power of $G_1$ would increase.

Before we conclude, an observation on equilibrium allocation of the project is worth noting. In our framework, the society with competitive advantage wins the project. However, the society with competitive advantage is not necessarily the one where total surplus would have been maximized, if implemented in absence of competition. To see this, suppose 1 has competitive advantage such that $E\pi_1(\tau_1) > E\pi_2(\tau_2)$. If 2 would have implemented the project in absence of competition, $G_2$’s payoff would be $EW_2(\tau_2^2)$. We have

$$EW_2(\tau_2^2) = 2\lambda_2^2 (1 - \lambda_2) E\pi_2(\tau_2^2) \text{ by (??)}$$

$$= \lambda_2^2 (1 - \lambda_2)^{1-\lambda_2} E\pi_2(\tau_2) \text{ by (9)}$$

Similarly, we get that $EW_1(\tau_1^1) = \frac{\lambda_1^2 (1 - \lambda_1)^{1-\lambda_1}}{2} E\pi_1(\tau_1)$, Comparing $EW_1(\tau_1^1)$ with $EW_2(\tau_2^2)$, we see that $EW_1(\tau_1^1)$ can be less than $EW_2(\tau_2^2)$, depending on the values of $\lambda_1$ and $\lambda_2$, even if society 1 has competitive advantage.

7 Conclusion

In our paper, we constructed a framework of interaction between the government, affected groups and the investor to analyze the extent of destructive action and investor-friendliness of governments. We show that destructive action may have informational value especially in a less-developed society where the bottom-up channels of information may not work very well. The government may indeed want not to ban or enforce strictures on such destructive actions. According to our framework, rather than legally protect the investor from asset destruction, the government should rather financially compensate the investor through appropriate subsidies. We also take the position that the government’s “investor-friendliness” should be determined by a comparison of the marginal valuation of the investment by the investor and that by the society. We recognize however that in dealing with an investor, governments may face severe external constraints in the form of competing governments. Not only does this competition mean that the investor benefits at the cost of both societies, it may often lead to economic inefficiencies as the investor might want to locate in a less action-prone destination rather than a more productive destination. It is a challenge for governments in less developed economies to solve this problem by coordinating with each other. A possible solution would be for the more productive society to get the investment and arrange some side-payments with the other society. We look into such alternative solutions in our further research.

8 Appendix

Proof of Lemma 1. The proof proceeds by examining three possible cases.
Case 0: \( x = 0 \) (or \( a = 1 \) and \( \tau = 0 \)) : Here, \( S(v, a) = 0 \) for \( v \in \{ \overline{v}, \underline{v} \} \), or \( w_B(v, a) = w_A = 0 \). Then \( t(\mu, a) = 0 \) for all \( \mu \in [0, 1] \). For any other \( t \), \( E_\mu W(a, t) \leq -B \).

Case 1: \( S(\overline{v}, a) = 0, S(\overline{v}, a) < 0 \) : Here, \( w_B(\overline{v}, a) + w_A = 0 \). For \( t = -w_B(\overline{v}, a) = w_A, W(\overline{v}, a, t) = 0 \). For all other values of \( t \), \( W(\overline{v}, a, t) \leq -B \). Also, for all values of \( t \), \( W(\overline{v}, a, t) \leq -B \). It is easy to show that there is some \( \mu_1(B) \in (0, 1) \) for all \( B \), but increasing in \( B \) such that

\[
t(\mu, a) = \begin{cases} 
  w_A = t(\overline{v}, a) & \text{for } \mu \leq \mu_1(B) \\
  \mu t(\overline{v}, a) + (1 - \mu) t(\overline{v}, a) & \text{for } \mu > \mu_1(B)
\end{cases}
\]

Case 2: \( S(\overline{v}, a) = 0, S(\overline{v}, a) > 0 \). In this case, \( w_B(\overline{v}, a) + w_A = 0 \). For \( t = -w_B(\overline{v}, a) = w_A \), \( W(\overline{v}, a, t) = 0 \). For all other values of \( t \), \( W(\overline{v}, a, t) \leq -B \). On the other hand, for \( t \in [w_B(\overline{v}, a), w_B(\overline{v}, a)] \), \( W(\overline{v}, a, t) \geq 0 \), and for \( t \notin [w_B(\overline{v}, a), w_B(\overline{v}, a)] \), \( W(\overline{v}, a, t) \leq B \). Notice that \( w_B(\overline{v}, a) = -w_A \).

Again, it is possible to show that there is a cutoff \( \mu_2(B) \in (0, 1) \) for all \( B \), and decreasing in \( B \) and a function \( h(\mu) \in (0, 1) \) that is increasing in \( \mu \) such that

\[
t(\mu, a) = \begin{cases} 
  w_A = t(\overline{v}, a) & \text{for } \mu \geq \mu_2(B) \\
  h(\mu) t(\overline{v}, a) + (1 - h(\mu)) t(\overline{v}, a) & \text{for } \mu < \mu_2(B)
\end{cases}
\]

There are two subcases: (i) \( w_A < w_B(\overline{v}, a) \) and (ii) \( w_A > w_B(\overline{v}, a) \). Notice that case (ii) arises only if \( w_B(\overline{v}, a) < 0 \).

In case (i), for \( t = w_A, w_B(\overline{v}, a) - t = w_B(\overline{v}, a) - w_A > 0 \), and thus \( W(\overline{v}, a, t) = 0 \). In this case, the \( E_{\mu} W(a, t(\mu, a)) \geq 0 \) for all \( \mu \in [0, 1] \).

In case (ii), for \( t = w_A, w_B(\overline{v}, a) - t = w_B(\overline{v}, a) - w_A < 0 \), and thus \( W(\overline{v}, a, t) \leq B \). In this case, the expected welfare may well be negative for high values of \( \mu \).

Case 3: \( S(\overline{v}, a) > 0 \). This implies that \( S(v, a) > 0 \) for \( v \in \{ \overline{v}, \overline{v} \} \). Note also that since \( -w_B(\overline{v}, a) < -w_B(\overline{v}, a), \), we have \( [-w_B(\overline{v}, a), w_A] \subset [-w_B(\overline{v}, a), w_A] \). Thus, the range of \( t \) for which \( W(\overline{v}, a, t) \geq 0 \), is a subset of the range for which \( W(\overline{v}, a, t) \geq 0 \). In this case, we will have \( t(\mu, a) \) such that \( W(v, a, t(\mu, a)) > 0 \) for \( v \in \{ \overline{v}, \overline{v} \} \). By inequality ??, \( t(\overline{v}, a) < t(\overline{v}, a) \). There are again, however, two different cases: (i) \( t(\overline{v}, a) < -w_B(\overline{v}, a) \) and (ii) \( t(\overline{v}, a) \geq -w_B(\overline{v}, a) \).

In case (i), it is possible to show that there exists a function \( g(\mu) \in [0, 1] \) that is weakly increasing in \( \mu \) (and involving a discontinuity) such that

\[
t(\mu, a) = g(\mu) t(\overline{v}, a) + (1 - g(\mu)) t(\overline{v}, a)
\]

In case (ii), from equations ?? and 2, \( t(\mu, a) \) must satisfy

\[
\mu W(\overline{v}, a, t) \left\{ \frac{\lambda}{w_B(\overline{v}, a) + t} - \frac{1 - \lambda}{w_A - t} \right\} + (1 - \mu) W(\overline{v}, a, t) \left\{ \frac{\lambda}{w_B(\overline{v}, a) + t} - \frac{1 - \lambda}{w_A - t} \right\} = 0
\]

Concavity of \( W(v, a, t) \) implies that there exists a strictly increasing function \( f(\mu) \in [0, 1] \) such that

\[
t(\mu, a) = f(\mu) t(\overline{v}, a) + (1 - f(\mu)) t(\overline{v}, a)
\]

Notice that in either subcase, since there exists some \( t \) for which \( W(v, a, t) > 0 \), we must have \( E_{\mu} W(a, t(\mu, a)) > 0 \) for all \( \mu \in [0, 1] \).

Proof of Lemma 2. First consider \( \overline{v} + v_A > 0 \), and suppose \( \overline{v} > 0 \). The utility of the high type is \( \lambda[(\overline{v} + v_A)(1 - \overline{v}) + \tau]x \). By deviating to \( a = 0 \), the transfer is \( t(\mu(0), 0) \geq t(\overline{v}, 0) \), by Lemma 1. The resulting payoff from deviation is

\[
\overline{v}x + t(\mu(0), 0) + s\tau x \geq \overline{v}x + t(\overline{v}, 0) + s\tau x = \lambda[(\overline{v} + v_A) + \tau]x > \lambda[(\overline{v} + v_A)(1 - \overline{v}) + \tau]x
\]
Now, consider \(\tau + v_A < 0\), and suppose \(\pi < 1\). Note that at \(a = 1\), \(W(v, a, t)\) is independent of \(v\) for all \(t\). Thus, \(t(\mu, 1) = \lambda(1 - s)\tau x - (1 - \lambda)s\tau x = (\lambda - s)\tau x\) for all \(\mu \in [0, 1]\). By deviating to \(a = 1\), the resulting payoff is \(t(\mu, 1) + s\tau x = \lambda\tau x > \lambda((\pi + v_A)(1 - a) + \tau) x\). Note that Assumption 1 ensures that \(\pi + v_A > 0\) since \(\tau > v\). Therefore under Assumption 1, it follows that \(\pi = 0\).  

**Proof of Lemma 3.** By Lemma 2, in any separating equilibrium, we must have \(\pi = 0\). A necessary condition that the optimal level of actions \((a, 0)\) would have to satisfy is that neither type would gain by misrepresenting its own type. Let \(w_B(a, t)\) denote group \(B\)'s payoff given its true marginal valuation \(v\), a redistributive transfer \(t\), and an action \(a\). The no-lying constraint for the high type is

\[
w_B(0, t(\pi, 0)|\pi) \geq w_B(a, t(v, a)|\pi)
\]

And the no-lying constraint for the low type is

\[
w_B(a, t(v, a)|v) > w_B(0, t(\pi, 0)|v)
\]

By rearranging terms, we see that inequalities (13) can be summarised as (14),

\[\pi x \geq \Delta t(a) \geq \pi x,\] where \(\Delta t(a) = t(v, a) - t(\pi, 0)\)

The gain in transfer \(\Delta t(a)\) from representing oneself as of having low valuation by taking an action of level \(a\) is given by

\[\Delta t(a) = x[(1 - \lambda)(\pi - v) + a((1 - \lambda)\pi - \lambda v_A)].\]

After rearranging terms, we see that in any separating equilibrium,

\[
\frac{(1 - \lambda)(\pi - v)}{(v_A + \tau) - (1 - \lambda)(v_A + v)} \leq a \leq \frac{(1 - \lambda)(\pi - v)}{\lambda(v_A + v)}.
\]

where the upper bound comes from condition 13 and the lower bound from condition 14. Condition 15 is only necessary for there to be a separating equilibrium. We now show that any \(a \in [a_L, a_H]\) will be an equilibrium, given beliefs

\[
\mu(a) = \begin{cases} 0 & \text{if } a \in [0, a] \cup (a, 1] \\ 1 & \text{if } a = a \end{cases}
\]

For the high type, the utility from taking any action \(a\) rather than 0 is

\[
w_B(a, t(\mu, a)|\pi) = \begin{cases} \lambda((\pi + v_A)(1 - a) + \tau)x & \text{if } a \in [0, a] \cup (a, 1] \\ w_B(a, t(v, a)|\pi) & \text{if } a = a \end{cases}
\]

\(w_B(0, t(\pi, 0)|\pi) = \lambda((\pi + v_A) + \tau)x > \lambda((\pi + v_A)(1 - a) + \tau)x\) since \(\pi + v_A > 0\) and \(w_B(0, t(\pi, 0)|\pi) \geq w_B(a, t(v, a)|\pi)\) by the no-lying constraint 13. Thus, the high type has no profitable deviation. For the low type, the utility from taking any other action \(a\) rather than \(a\) is \(w_B(a, t(\pi, a)|\pi)\), which is weakly lower than \(w_B(a, t(\mu, a)|\pi)\) by the no-lying constraint of the low type, i.e. inequality 14.

When does a separating equilibrium exist? It does, only if \([a_L, \min\{a_H, 1\}]\) is a non-empty interval. By inspection, it is easy to see that if \(\pi + v_A > 0\), \(a_L \in (0, 1)\). Also, after a little algebra, we see that

\[
a_H - a_L = \frac{(1 - \lambda)(\pi - v)^2}{(v_A + \tau) - (1 - \lambda)(v_A + v)} \frac{\lambda(v_A + v)}{\lambda(v_A + v) - v_A + x}.
\]
and thus $a_H > a_L$ if and only if $(v_A + v) \geq 0$, which holds true given Assumption 1.

**Proof of Lemma 4.** Consider any separating equilibrium with $a > a_L$, and $\pi = 0$. That there exists such an $a$ is guaranteed by that fact that since $\pi - v > 0$, we will never have 0 in the right hand side of equation 16. Consider the action $a' = \frac{1}{2}(a + a_L)$. For any belief $\mu \in [0,1],$

$$w_B(a', t(\mu, a')|\pi) = vx(1 - a') + t(\mu, a') + stx \leq vx(1 - a') + t(\pi, a') + stx$$

$$= \lambda((\pi + v_A)(1 - a') + \tau)x < \lambda((\pi + v_A) + \tau)x = w_B(0, t(\pi, 0)|\pi).$$

Therefore, for all possible beliefs $\mu$ arising from action $a'$, the high type would get a lower utility from playing $a'$ that it does in equilibrium. Thus, $a'$ is equilibrium dominated for the high type, and hence we must have $\mu(a') = 1$. If $\mu(a') = 1$, then the payoff of the high type from playing action $a'$ is

$$w_B(a', t(\mu, a')|\pi) = \lambda((v + v_A)(1 - a') + \tau)x > \lambda((v + v_A)(1 - a') + \tau)x = w_B(0, t(\pi, 0)|\pi).$$

Therefore, the low type has a deviation yielding a higher payoff than the equilibrium payoff. Thus, the separating equilibrium with $a > a_L$, and $\pi = 0$ does not survive the intuitive criterion.

**References**


