Signaling Commitment by Excessive Spending

Amihai Glazer
Department of Economics
University of California, Irvine
Irvine, California 92697
USA

Stef Proost
Katholieke Universiteit Leuven
Center for Economic Studies
Naamsestraat 69
B - 3000 Leuven
Belgium

February 11, 2008

Abstract

A policy is often more effective the more confident are economic agents that the current leader (or principal) will adopt the policy. This paper considers uncertainty about the principal's type, interpreted as uncertainty about the probability that he would adopt a project or policy. We show how a principal who highly values the project can signal that valuation by committing to spend a minimum on the project, even if canceling the program would entail waste, Indeed, the amount committed to spend may exceed the project's cost.

1 Introduction

Government projects or policies often exhibit two characteristics. First, the project is more likely to succeed if agents expect government to adopt the project. Second, the agents' imperfect information about the decision maker's preferences and about future economic conditions generate uncertainty about whether government will adopt the project. A government official (a principal) who strongly supports the project will benefit from signaling his preference. This paper explores one way to signal support—commit to spending in the future, even to the point of wasting resources. This approach may explain some of the excessive spending that is seen in government.[1]

An interpretation of such signaling, used in this paper, is earmarking of tax revenue to a particular project; earmarking can be taken as a commitment made in period 1 to spend a given minimum amount on the project in period 2. Such commitment has two effects. First, it reduces the marginal cost of adopting the project in period 2, and so increases the probability that the principal will adopt the project in period 2. Second, a principal will be more willing to commit to spending in period 1 the greater his confidence that he will favor the project in period 2. Commitment to spending can thus signal a principal's type, thereby increasing the agent's confidence that the project will be adopted and that an investment the agent makes in anticipation of it will prove profitable. The problem we discuss arises if agents must invest before the government implements its part of the program. An example of such timing issues arises in the construction of a sports stadium for a football team. The team owners must cancel their contracts with an existing stadium before they move to the new stadium, and before the stadium is even completed. For a city to begin negotiations with a team only after a new stadium is completed is both socially wasteful, and exposes itself to hold-up by the team owners. Note that sports stadiums are often financed by earmarked taxes, and so the commitment problem is partially addressed.

To give another example, consider subsidies to renewable energy sources such as wind turbines. Private investors may fear that after they designed the turbines and bought the land for them, concerns by local environmentalists or tourism interests may object to construction of the turbines, pressuring government to cancel the subsidies and deny operating permits. Indeed,

[1] Alesina and Tabellini (1988) offer a different explanation for high spending—it limits spending by a future government.

after reviewing the construction management literature and speaking with industry participants, Bajari and Tadelis (2001) find that both the buyer and the contractor share uncertainty about many important design changes that occur after the contract is signed and production begins, such as design failures, unanticipated site and environmental conditions, and changes in regulatory requirements. Moreover, uncertainty about what government will do can reduce investment. Altug, Demers, and Demers (2007) analyze the effects of risk of separation of Quebec from the Canadian federation, showing that political risk depresses investment even if the "bad" regime has never been observed in the sample.

An official who wants to demonstrate his commitment to a program may then want to commit to spending some source of funds to renewable energy. Similarly, a new convention center will succeed only if enough hotels are built next to it. A city may signal its commitment to the conventional center by earmarking some taxes (such as on car rentals or on hotel occupancy) to the convention center.

Though in the following we shall speak of a government and of a firm, the reasoning can apply far more broadly. For example, the federal government may want state governments to invest in highways. Or the Department of Commerce may want to promote tourism, but needs the cooperation of the Department of Homeland Security. Or the governor of California may want the University of California to help improve public schools. Here one governmental department can be viewed as a principal and another as an agent, with one department committing to a certain minimum budget with the aim of inducing another department to invest in the project. Nor is commitment limited to legislation that constrains the use of funds. We interpret it more broadly as a commitment to spend a certain amount. For example, an international treaty committing a national government to spend a billion dollars on research into global warming is a form of commitment or of earmarking.[2] Of course, the general problem we address can also appear appear entirely within the private sector. But for two reasons we think that commitment problems are less severe in the private sector than in the public sector. First, whereas firms can enter into binding contracts, which are enforceable by the courts, it is more difficult to sue a government for breach of contract. Second,

[2]The commitment can arise even when treaties are not legally enforceable. We can view a national government's action as private provision of a public good. A trigger strategy can then induce each government to make the investments to which it had agreed.

it is reasonable to suppose that a firm aims to maximize profits; an agent who knows a firm's objective therefore can reasonably estimate what actions it will find profitable. In contrast, the objective function, or preferences, of a public official may be less clear, and so predicting his actions may be more difficult.

The problem we address builds on standard arguments that when an investment is a sunk cost, the principal can commit to an investment by making it. We go further by allowing for the possibility that the investment can be demolished. (For example, an area of a national park which was prepared for building a road can be returned to its initial state. Or a nuclear power plant may never be granted an operating license, and have its reactor encased in concrete.). In such cases, undertaking an investment may not suffice to commit to adoption of a project, and the principal may wish to signal his strong preference for the project by spending, or committing to spend, excessive amounts on it.

2 Literature

2.0.1 Electoral considerations

When people differ in their preferences, spending commitments that constrain future policy can increase political support for a policy. Anesi (2006) shows how a political party can use earmarking to remove an issue from an election, or how by not earmarking it can keep an issue alive, benefiting an incumbent with a popular position on that issue. A similar idea, though not discussing earmarking, is found in Glazer and Lohmann (1999).

Brett and Keen (2000) consider how a good politician can use earmarking to reveal his type by promising not to waste the tax revenue, even if this earmarking has an efficiency cost: a bad politician who wants to waste the money will never commit to earmarking. Our approach differs in several ways. First, we consider how spending commitments can affect the choice of the policy to which funds are committed in future periods; in contrast Brett and Keen (2000) consider only what will happen with the revenue. Second, they focus on the type of politician who will win a future election, with the incumbent attempting to limit his successor's flexibility. In contrast, we consider an incumbent who will remain in office in the following period, but who may want to persuade citizens that he has a certain type. Third, we view

citizens' expectations as crucial in determining the policy's success, an effect absent in Brett and Keen (2000). But, of course, their paper considers effects we ignore. The elements that we ignore include elections, and a comparison of citizen behavior when they possess perfect and imperfect information about the state of nature.

2.1 Commitment

We suppose the principal wants the agent to invest in period 1, but that such investment will benefit the agent only if the principal adopts the project in period 2. The principal may therefore gain by indicating that he is likely to adopt the project. The essential idea that policy may lack credibility appears in several areas, including trade protection (Staiger and Tabellini 1987, Matsuyama 1990, and Tornell 1991) and monetary policy (Kydland and Prescott 1977, Barro and Gordon 1983, and Persson 1988).

Related studies examine how expectations of a policy change may change behavior in a way that increases political support for the policy under consideration. Cassing and Hillman (1986) show that a declining industry may suddenly collapse when its small size reduces political support for protective tariffs. Obstfeld (1986) shows that a balance-of-payments crisis can be self-fulfilling when agents expect a speculative attack to set off an inflationary domestic-credit policy. Rodrik (1991) claims that trade liberalization will succeed if it induces the growth of firms that support such liberalization.

The legal literature on liquidated damages considers the incentives of one party to invest when the other party may not, thereby inducing one or both parties to invest less than the efficient level. This is the well-known holdup underinvestment problem (for seminal papers, see Klein et al. 1978, and Williamson 1985). To induce investment the parties may agree on a contract that commits the breaching party to pay damages to the other party.[3]

Our approach also differs from the commitment literature because spending in period 1 does not imply that the project will be carried out. The spending in the first period signals, but does not necessarily commit.

[3]See for example Che and Chung (1999); they consider alternative breach remedies, but do not consider signaling of types.

3 Assumptions

The model has one principal P and one agent a. For a project to generate benefits it must fulfill three conditions: (a) the principal invested at least K_P by the end of period 2; (b) the agent invested K_a in period 1; (c) for the type of principal in charge, the state of nature in period 2 favors the project. We elaborate below.

To realize the project, by the end of period 2 the principal must have cumulatively invested $K_P < V_P$, where V_P is the gross benefit of the project for the principal. In period 1 the principal can signal his type by spending K on the project. If he adopts the project in period 2, the remaining cost is $max(K_P - K, 0)$. The investment in period 1 can also be called earmarking, as it can be viewed as a commitment in period 1 to spend at least K. Note that $K > 0$ implies waste with positive probability: if the project does not go through, these resources are lost. If $K > K_P$, we call this "outrageous" waste as, even if the project is carried out, the difference $K - K_P > 0$ is wasted.

At the start of period 2, all players know whether the conditions, as determined by nature, are favorable or not for the project. A necessary condition for success is that conditions are favorable. A successful project generates gross benefits V_P to the principal and gross benefits V_a to the agent. If the conditions are unfavorable, the project would generate a large loss and is not done.

The principal can be of two types: high (H) with prior probability h, or low (L) with prior probability $1 - h$. The principal knows his type but the agent does not. A high-valuing principal has a higher probability, π_H, that the conditions favor the project than does a low-valuing principal ($\pi_L < \pi_H$).

The timeline is as follows:

1. Nature determines the type of principal, H or L.
2. The principal commits to spend the amount K.
3. The agent observes the amount committed, and decides whether to invest K_a.
4. Nature determines the state of nature.
5. The principal observes the agent's investment and the state of nature.

6. The principal decides whether to spend $\max[K_P - K, 0]$ to complete the project.

7. The payoffs to the agent and to the principal are realized.

4 Commitment as a signal of the principal's type

4.1 No commitment

Consider first the incentives of the agent when no spending commitments are made. The agent invests if

$$-K_a + (h\pi_H + (1-h)\pi_L)\, V_a > 0. \tag{1}$$

To make things interesting, suppose this inequality is violated, so that with no commitment, the agent does not invest, and the project is not adopted. Notice that this condition is even more general, applying to any pooling equilibrium in which the agent is uncertain about the principal's type. That is, when this inequality is violated, any investment by the principal in period 1 which does not distinguish between the types of principal will not induce the agent to invest.

4.2 Separating equilibrium

A different possible equilibrium separates the types. This equilibrium has a high type commit to spend K_H in period 1, and spend $\max(K_p - K_H, 0)$ in period 2 if the state of nature is favorable. A low-type would make no spending commitment in period 1. The agent would invest in period 1 if and only if the principal committed K_H in period 1.

4.2.1 Commitment to spend less than the cost of the project

We shall first examine the choice when the amount committed is less than the total cost of the project to the principal, or where $K_H < K_P$. In this case the agent does not invest if he thinks the principal is a low-valuer, and the agent does invest if he thinks the principal is a high-valuer. Then these conditions are

$$-K_a + \pi_H V_a > 0 \tag{2}$$

and

$$-K_a + \pi_L V_a < 0. \tag{3}$$

Inequalities (2) and (3) are a subset of all cases where (1) is violated.

The condition for a high-type principal to prefer committing K_H over not committing is

$$-K_H + \pi_H(V_p - (K_P - K_H)) > 0. \tag{4}$$

Therefore, the maximum commitment the high-valuing principal would make is $K_H^{max} \equiv \frac{\pi_H(V_P - K_P)}{1-\pi_H}$.

In a separating equilibrium, an agent believes that a principal who commits zero is a low-valuing type, whereas an agent believes that a principal who commits to spend at least K_H is a high-valuing type. A low-valuing principal therefore prefers no commitment (which gives zero net benefits) over committing to spend at least K_H if

$$-K_H + \pi_L(V_P - (K_P - K_H)) < 0. \tag{5}$$

The last expression is satisfied as an equality if

$$K_H = K_L^{max} \equiv \frac{\pi_L(V_P - K_P)}{1 - \pi_L}. \tag{6}$$

In other words, if a high-valuing principal is expected to commit to spend K_L^{max} or more, then a low-valuing principal would not commit to spending, and therefore the equilibrium separates the two types. Moreover, since $K_H^{max} > K_L^{max}$ when $\pi_H > \pi_L$, a high-valuing principal would gain from committing to K_L^{max}.

4.2.2 Committing to spend more than the cost of the project

Consider next an equilibrium in which a high-valuing principal may commit to spend more than the project's cost, or $K_H > K_P$. Such commitment is outrageously wasteful, involving perhaps gold-plating, where the size of the investment exceeds the level justified by a conventional cost-benefit analysis.

A high-valuing principal will commit to spend at least $K_H > K_P$ if three conditions hold: (a) $K_L^{Max} > K_P$ (which is equivalent to $\pi_L V_P > K_P$), or the expected return to an investment by a low-valuing principal is especially high; (b) $-K_H + \pi_H V_p > 0$, or the high-valuing principal prefers to commit over having no project; (c) $-K_H + \pi_L V_p < 0$, or a low-valuing principal

prefers no commitment. When these conditions are met, gold plating can appear: the high-valuing principal then has to spend (waste) much more to convince the agent of his type.

5 Extensions

Our model highlighted commitment to signal a principal's type and thereby induce the agent to invest, to the benefit of the principal. Of course, commitment can have additional effects. An important one is to reduce the marginal cost of adopting the project in period 2. If such a decline increases the probability that the principal will adopt the project in period 2, the agent may be more willing to invest in period 1, and so increase the principal's expected benefits.

This effect can be considered with a small modification of our model. The assumptions on the low-valuer are the same as before—with probability π_L such a principal would find it worthwhile to complete the project if the agent had invested. And we keep the same meaning of π_H. But now, let a high valuer value the project at $V_M < K_P$ with probability π_{MH}. This means that if the high valuer commits to $K < K_P - V_M$, and he is known to be a high-valuer, and the agent invests, then the high-valuer will complete the project with probability π_H. But if the high-valuer commits to $K > K_P - V_M$, then the corresponding probability is $\pi_H + \pi_{MH}$. Since $\pi_H + \pi_{MH} > \pi_H$, the principal who commits can give the agent greater confidence that the agent's investment will pay off, and so earmarking can also benefit the principal.

Our model can also be extended, and the effects strengthened, if principals can differ in their valuations of the project. Suppose a high-valuer places a value of V_H and a low-valuer places a value of V_L, with $V_H > V_L$.

It is useful to distinguish two cases.

Case 1: $V_H > V_L > K_P$. Both a high-valuing principal and low-valuing principal would adopt the project, the agent knows that, and spending commitments yield no benefit.

Case 2: $V_L < K$ and $V_H > K$. Here a separating equilibrium exists. Any earmarking $0 < K < K_P$ by the high-valuing principal will signal his type to the agent. The agent will invest if and only if the principal commits to spending.

6 Conclusion

This paper offered a novel explanation for why a government agency (or indeed voters who can determine policy) may favor committing to spend a certain sum even if the project to which funds are committed is never completed. Though funds may sometimes be wasted, if the agent who must invest does not reap the full social benefits of the project, the investment which commitment induces can raise expected social welfare.

Relatedly, we showed how a principal may want to commit to spend more than necessary for him to complete the project. He may do so to generate a separating equilibrium which signals that the principal is likely to complete the project. In short, we see that in the presence of imperfect information, commitment to spend can both appear and be socially useful. This view differs from the standard approach which sees waste or excessive spending as appearing when government is a Leviathan aiming to enlarge itself[4]

Our analysis went beyond discussion of earmarking as a form commitment—not all earmarking is effective. Consider financing of roads. One form of earmarking has the toll revenues on the road be dedicated to paying interest on bond financing for the roads. Another form of earmarking has a gasoline or a sales tax be used to finance the road. Tolls offer no signaling value, since if the road is not built, no money is raised or spent. Therefore, plans for a toll road may not induce residential or commercial investment near the road which would make the road a worthwhile investment. In contrast, a gasoline tax or a sales tax earmarked to road construction signals that the voters (or the policymakers) may build roads even if objections arise from environmentalists and other groups.

[4]See, for example, Niskanen 1971 and Romer and Rosenthal 1979.

7 Notation

h Prior probability that principal is a high valuer

K_a Investment required of agent

K_H^{max} Maximum commitment to spend the high-valuing principal would be prepared to make, namely $\frac{\pi_H(V_P - K_P}{1-\pi_H}$

K_L^{max} Maximum commitment to spend the low-valuing principal would be prepared to make, namely $\frac{\pi_L(V_P - K_P)}{1-\pi_L}$

K_P Investment required of principal

K Amount the principal commits to spend

π_H Probability a high-valuing principal will want project completed

π_L Probability a low-valuing principal will want project completed

References

[1] Alesina, Alberto and Guido Tabellini (1988) "Credibility and politics." *European Economic Review*, 32: 542-550.

[2] Altug, Sumru G., Fanny S. Demers, and Michel Demers (2007) "Political risk and irreversible investment." *CESifo Economic Studies*, 53(3): 430-465.

[3] Anesi, Vincent (2006) "Earmarked taxation and political competition." *Journal of Public Economics*, 90: 679-701.

[4] Bajari, P. and S. Tadelis (2001) "Incentives versus transaction costs: A theory of procurement contracts." *Rand Journal of Economics*, 32(3): 387-407.

[5] Barro, Robert and David Gordon (1983) "A positive theory of monetary policy in a natural rate model." *Journal of Political Economy*, 91: 589-610.

[6] Brett Craig and Michael Keen (2000) "Political uncertainty and the earmarking of environmental taxes." *Journal of Public Economics*, 75(3): 315-340.

[7] Cassing, James H. and Arye H. Hillman (1986) "Shifting comparative advantage and senescent industry collapse." *American Economic Review*, 76(3): 516-523.

[8] Che, Yeon-Koo and Tai-Yeong Chung (1999) "Contract damages and cooperative investments." *RAND Journal of Economics*, 30(1): 84-105.

[9] Glazer, Amihai (1989) "Politics and the choice of durability." *American Economic Review*, 79(5): 1207-1213.

[10] Klein, B., R. Crawford, and A. Alchian (1978) "Vertical integration, appropriable rents, and the competitive contracting process." *Journal of Law and Economics*, 21: 279-326.

[11] Kydland, Finn E. and Edward C. Prescott (1977) "Rules rather than discretion: The inconsistency of optimal plans." *Journal of Political Economy*, 85(3): 473-491.

[12] Matsuyama, Kiminori (1990) "Perfect equilibrium in a trade liberalization game." *American Economic Review*, 80: 480-492.

[13] Niskanen, William A. Jr. (1971) *Bureaucracy and Representative Government*, Chicago: Aldine Atherton.

[14] Obstfeld, Maurice (1986) "Rational and self-fulfilling balance-of-payments crises." *American Economic Review*, 76(1): 73-81.

[15] Persson, Torsten (1988) "Credibility of macroeconomic policy: An introduction and a broad survey." *European Economic Review*, 32: 519-32.

[16] Phelps, Edmund S. and Robert A. Pollak (1968) "On second-best saving and game-equilibrium growth." *Review of Economic Studies*, 35: 185-200.

[17] Rodrik, Dani (1991) "Policy uncertainty and private investment in developing countries." *Journal of Development Economics*, 36(2): 229-242.

[18] Romer, Thomas and Howard Rosenthal (1979) "Bureaucrats versus voters: On the political economy of resource allocation by direct democracy." *Quarterly Journal of Economics*, 93(4): 563-587.

[19] Staiger, Robert W. and Guido Tabellini (1987) "Discretionary trade policy and excessive protection." *American Economic Review*, 77: 823-837.

[20] Strotz, Robert (1955-56) "Myopia and inconsistency in dynamic utility maximization." *Review of Economic Studies*, 23(3): 165-180.

[21] Tabellini, Guido and Alberto Alesina (1990) "Voting on the budget deficit." *American Economic Review*, 80(1): 37-49.

[22] Tornell, Aaron (1991) "Time inconsistency of protection programs." *Quarterly Journal of Economics*, 963-974.

[23] Williamson, Oliver (1985) *The Economic Institutions of Free Capitalism.* Free Press.