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CREDIBILITY OF MACROECONOMIC POLICY:
AN INTRODUCTION AND A BROAD SURVEY

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Abstract

This is a broad survey of the work on credibility of macroeconomic policy since the early 80's. I critically evaluate a first generation of work dealing with the basic credibility problem that arises when policy cannot be precommitted and when a desirable policy fails to be ex post optimal. Then, the desirable policy is not credible to the private sector. The work I discuss, deals with credibility problems in three different areas of macroeconomics (i) "anti-inflationary monetary policy", (ii) "macroeconomic public finance", and (iii) "policy coordination". The first generation of work leaves several issues unresolved, however, and a second generation of work dealing with these unresolved issues is currently developing. I also discuss this very recent work and make some suggestions for future research.

1. Introduction

Credibility of macroeconomic policy is something policy makers talk much about but traditional macroeconomics is able to say little about. Recent research in different areas of macroeconomics has made some progress in dealing with credibility problems, however. In this paper I give a broad but selective survey of this research.[1] I discuss credibility problems in three different contexts. I discuss monetary policy in the context of an inflation-employment trade-off (Section 2). I discuss fiscal and monetary policy in the context of "macroeconomic public finance" (Section 3). I discuss "policy coordination" in two contexts where there is more than one policy maker (Section 4). I try to draw general conclusions, mention unresolved issues and make a few suggestions for further research (Sections 1 and 5).

What distinguishes the recent work on credibility from previous macroeconomics--from traditional Keynesian to new classical rational expectations macroeconomics--is that government policy is not exogenous in the analysis. Policy is made endogenous by specifying a government objective function and assuming that the government maximizes its objective under the constraints imposed by private equilibrium behavior.

Although the specific policy contexts differ, the analyses share certain broad features. Basically, the credibility problem arises for the following reason: Ex ante, before some choices have been made by the private sector (and maybe by another policy maker), an optimal policy induces some response of private behavior. But ex post, after the choices have been made, the response

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[1] Barro (1986), Cuikerman (1986), Fischer (1986), Rogoff (1987), and Canzoneri and Henderson (1987) are among previous surveys of credibility problems in macroeconomics. Compared to this one, each of these surveys stresses a more narrow set of issues, but treats these issues in much more depth.

to policy may be very different from the ex ante response, which makes the government's ex post constraints different from the ex ante constraints. Present some imperfection--an externality, a distortion, or a lack of policy instruments--which makes the ex ante optimal policy a 2nd best rather than a 1st best outcome, there is an ex post incentive to deviate from the ex ante optimal policy.

If the government is able to make a binding precommitment to the ex ante optimal policy, the incentive to deviate ex post is immaterial. It is hard to think of situations where binding commitments can be enforced, however, because the government is by definition a sovereign decision maker. Therefore, those policies that would be optimal if binding commitments could be made, face a credibility problem because of the incentive for ex post deviations. Forward-looking rational agents only believe a policy announcement that will be optimal to carry out ex post. Imposing credibility--in the sense of ex post optimality--adds an additional constraint to the government's policy problem, which in general implies welfare losses (in terms of the government objective function) relative to the ex ante optimal policy. To put it in a catchy phrase: The temptation to push the economy towards the 1st best, drives the equilibrium away from the 2nd best to the 3rd best. In the literature, this result has become known as the "time-consistency problem".

The literature poses two major questions: First, how serious is the credibility problem? That is, how does the ex post optimal (credible, time-consistent) policy differ from the ex ante optimal policy (the optimal policy under commitment)? Second, can the welfare losses due to the government's credibility problem be avoided? That is, can the ex ante optimal policy be supported in the absence of binding commitments? These questions are best asked and answered in explicitly game-theoretic terms. Ex ante and ex

post optimality are (or could be) precisely defined by imposing appropriate equilibrium concepts from game theory.

Even though there are general similarities in how the credibility problem appears and in how it is analyzed in different contexts, there are specific differences. Notable differences concern the form of the government objective and its relation to private objectives; the choices that make ex ante and ex post constraints differ; the imperfection that prevents achieving the 1st best; the type of game theory and the precise equilibrium concept used.

2. Monetary Policy, Inflation and Employment

A large strand of work discusses the credibility problems of a low-inflation monetary policy. The starting point for much of this work is a model first suggested by Kydland and Prescott (1977) and popularized by Barro and Gordon (1983a). The government has an objective $V(\ell,\pi)$, increasing in employment ℓ up to some target level ℓ^* and decreasing in inflation π up from some target level π^*. The objective function has been interpreted as representing either "Pigovian" social welfare concerns or "Political" popularity concerns. The government controls π perfectly by setting the money supply--or the exchange rate, in a small open economy. The private sector includes firms with a neoclassical labor demand function and a number of forward-looking wage setters. The nominal wage is set for one period at a time so as to maximize some objective over the real wage and/or employment. Think of the wage as being set before the government sets π; if the wage and π are set simultaneously the results are the same.

With a known government objective, equilibrium and expected inflation must coincide. Without surprises, equilibrium employment must be at the privately desired level $\hat{\ell}$. Ex ante--that is, before the wage has been set--it

is optimal to set inflation at π^*. If $\ell^* = \hat{\ell}$, this policy achieves a 1st best outcome and there is no credibility problem. But if $\ell^* > \hat{\ell}$, due to a labor market imperfection (arising from taxes or union power), the policy only achieves a 2nd best outcome and there is a credibility problem. Private employment ex post--after the wage has been set--is a function of the actual real wage and differs from $\hat{\ell}$ (only) if there is surprise inflation. But then it is not credible to announce a policy $\pi < \hat{\pi}$, with $\hat{\pi}$ defined by $V_1(\hat{\ell},\hat{\pi})d\ell/d\pi + V_2(\hat{\ell},\hat{\pi}) = 0$, because for any nominal wage associated with $\pi^e < \hat{\pi}$ there is an incentive to deviate from the announcement ex post to increase employment by surprise inflation. The only credible policy is $\pi = \hat{\pi}$. Clearly, the smaller weight the government puts on inflation, the higher is the credible inflation rate $\hat{\pi}$ relative to the desired rate π^*.

This is a well-defined one-shot game between the government and the private sector. Suppose the game is repeated a finite number of times. The ex ante optimal low-inflation policy π^* would be a Nash equilibrium if the government could (hypothetically) play first in each period. But when the government plays last, the ex post optimal policy $\hat{\pi}$ is the only Subgame Perfect Nash Equilibrium. Choosing Nash Equilibrium as the equlibrium concept requires private expectations to be satisfied in equilibrium. Imposing the further refinement of Subgame Perfection requires expectation formation to be rational, in the wide sense that expectations are satisfied also outside of equilibrium.

If the game is repeated without a certain endpoint--infinitely, or with a constant probability that each period is the final period--there are many rather than a unique equilibrium. As first suggested by Barro and Gordon (1983b), the government may now be believed announcing $\pi < \hat{\pi}$.[2] If the private

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[2] The multiplicity of equilibria and the possibility of superior outcomes when a single game with a unique equilibrium is repeated without a certain endpoint is known as (part of) the "Folk Theorem" in game theory; see

sector expects current deviations from a low-inflation rate to be followed by future deviations and sets wages accordingly, a "reputational" trade-off is introduced into the government's ex post decision.[3] The benefit of current surprise inflation is counterbalanced by a cost of future higher expected inflation.[4] Unless the future is discounted very heavily, the costs exceed the benefits from some $\bar{\pi}$ up to $\hat{\pi}$. Inflation rates below $\hat{\pi}$ and down to $\tilde{\pi}$ therefore become credible. Depending on how long the government loses its "reputation" when deviating, how highly it discounts the future, and how much weight it puts on inflation, $\tilde{\pi}$ may be equal to or above π^*. "Reputation" may thus, fully or partly, substitute for formal precommitments, and lower or eliminate the costs of the credibility problem.

It may be unrealistic to assume that wage setters know the government objective with certainty, especially if there is a succession of different policy makers. When the objective is uncertain, the private sector may learn only gradually about the government's type as it observes policy. Such learning gives a richer role for reputation in policy making. As shown by Backus and Driffill (1985a), a finite-horizon government concerned with inflation and employment may credibly avoid the excessive inflation rate $\hat{\pi}$ for some time if it mimics the policy of an "ultraconservative" government; a government only concerned with inflation. Conversely, as discussed by Vickers (1986), a new government more concerned with inflation than its predecessors

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Fudenberg and Maskin (1986)

[3] The wage setting cum formation of inflationary expectations is often modeled as a "Trigger strategy" along the lines of Friedman (1971).

[4] This mechanism does not work with a certain endpoint. In the last period there is no future to worry about and hence any attempt to foster favorable inflationary expectations in the next to last period is in vain. But then the same is true for the 2nd to last period, and so on; the whole game unravels backwards.

may try to establish credibility at an early stage in its incumbency, by signalling its intentions of low inflation by a recessionary monetary policy. These and subsequent papers rely heavily on recent work on games under imcomplete information. Driffill (1987) discusses the scope of this approach to modelling credibility issues in macroeconomic policy further and gives references to the game-theory literature.

The basic model can be extended to allow for stochastic shocks in the economy. The credibility problem is conceptually the same, as long as monetary policy can be perfectly monitored. But if policy cannot be perfectly monitored, the incentive structure changes, because the government may blame a high inflation outcome on, say, a bad shock to money demand. As shown by Canzoneri (1985), there may then be temporary reversions to "excessive inflation" which do not reflect a loss of credibility. Instead, the reversions are part of a reputational equilibrium. Also here, recent work in game theory--on games with imperfect information--has been an important inspiration; see Driffill (1987) for further discussion.

The basic model assumes that the individual(s) executing monetary policy passively carries out the government's overall objective; be that motive Pigovian or Political. If the Central Bank is independent enough to allow the preferences of the Central Banker to play a role, the appointment of a Central Banker becomes like a Principal-Agent problem. Appointing a conservative and independent Central Banker may--as in Rogoff (1985a)--help to resolve the credibility problem associated with a low inflation policy.[5]

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[5] In the model without uncertainty, a completely independent Central Banker should be ultraconservative--care only about inflation, not about employment--to replicate the 2nd best outcome. Maybe more interestingly, with uncertainty (and policy set after the resolution of uncertainty, in contrast to wages) a Central Banker that puts more (but not absolute) weight on inflation than the government's true objective would still improve the outcome relative to the 3rd best.

Although the work I have surveyed in this section sheds light on several issues, it has several shortcomings. First, the models are too ad hoc. In particular, the links between the government objective and private objectives and behavior are not spelled out clearly. If the government objective is Pigovian, it is unclear that its particular form squares well with the private objectives in the model.[6] If the government objective is Political, the model fails to specify the behavior of voters as well as the alternative offered by the opposition. Second, the idea that reputation can substitute for formal commitments is interesting, but it has a serious problem. There are many possible reputational equilibria and the government and all private agents must "coordinate" on one of them. As discussed in Rogoff (1987), it is very much an open issue how this coordination problem is solved. The coordination problem may be less severe if the wage setting is done by one or a few large labor market organizations, like in the European economies with centralized wage bargaining.[7] Finally, the macroeconomic models are very rudimentary. In particular, they lack structural dynamics.[8] Introducing such dynamics introduces substantial technical problems, however. With genuine state variables in the model, the relevant game theory becomes the theory of dynamic

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[6] Without any "microfoundations" it is not even clear what arguments in the government's objective should be. For example, one might argue that the costs of inflation are more closely related to expected, as opposed to actual, inflation. Grossman (1987) explores this alternative formulation.

[7] Much of the game theory used in the literature on monetary policy games has been developed with an eye to oligopoly theory. Although no formal result is available, one may conjecture that the coordination problem between a few players each capable of strategic considerations--as in the oligopoly example and in the example with a government and a few labor market organizations--would more likely resolve than the coordination problem between the government and a large number of atomistic private agents.

[8] Backus and Driffill (1985b) do discuss credibility problems in monetary policy within an explicitly dynamic linear-quadratic framework, however.

games, which theory is less developed and harder to handle than the theory of repeated games.[9]

3. Macroeconomic Public Finance

Another literature deals with credibility problems in, what might be labelled, macroeconomic public finance. The models in this literature are simple, but fully specified, intertemporal general equilibrium models. Typically there is a (very) rudimentary CRS production sector, and a representative consumer with perfect foresight and the same planning horizon as the government (often infinite). Distortions arise since the government is restricted to a small number of distortionary sources of revenue--such as labor, capital, or inflationary taxation.[10] The revenues and (often) borrowing finance an exogenous or endogenous path of government spending. The government is strictly Pigovian and adopts a policy that maximizes the consumer's welfare.[11]

Ex ante--at some start-up date s--the optimal 2nd best policy smooths out the tax distortions by equating the distortion on the last $ raised across different tax bases and across time. Therefore, the ex ante optimal tax structure hinges on the ex ante elasticities of taxed factors, goods, and assets with respect to the (explicit or implicit) tax rates. The credibility problem arises because the ex post--at later dates t > s--elasticities typically differ from the ex ante elasticities, except under very special

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[9] In a recent survey, Levine and Holly (1987) emphasise a dynamic game approach in their discussion of time consistency issues.

[10] The private information among heterogeneous private agents, which presumably is what prevents the government from lumpsum taxation, is not modeled.

[11] Lucas (1986) contains a general discussion of this approach to thinking about fiscal and monetary policy.

conditions on private preferences. Since the supply and demand functions enter as constraints in the government's problem, the ex post constraints differ from the ex ante constraints.[12] Consequently, the ex ante optimal policy fails to be ex post optimal. A special case that drives home the point particularly forcefully is when some tax base is elastic ex ante but becomes completely inelastic ex post. Ex post taxation then becomes a "levy"; a tax without distortionary cost. Examples of such levies and the associated credibility problems are discussed by Fischer (1980)--for a levy on already accumulated capital--and by Calvo (1978)--for a levy on already accumulated nominal government debt (money) by surprise inflation.

In the absence of commitment possibilities, credibility in the form of ex post optimality is imposed as a constraint in the optimal tax problem, in addition to the conventional market equilibrium and solvency constraints. This typically leads to welfare losses relative to the ex ante optimal policy.

While the literature has often not treated the macroeconomic public finance problems in game theoretic terms, the set-up described above is formally a dynamic game. An ex ante optimal policy corresponds to an Open-Loop Dominant Player (Stackelberg) Equilibrium, with the government as the leader and each private agent as a follower. A credible policy corresponds to a Feedback Dominant Player Equilibrium. The Feedback requirement is equivalent to imposing a natural extension of Bellman's Principle of Optimality from a one-player (game against nature) to a multi-player set-up. It corresponds to Subgame Perfection plus the restriction that players' strategies are memory-less (depend only on current state variables). Alternatively, the 3rd best policy may be seen as the Feedback Nash Equilibrium in a game between a sequence of succesive governments (private agents are still followers viz. each

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[12] See Rogers (1986) for a pedagogical exposition of this point.

of them).

The literature has concentrated on finding solutions to the government's credibility problem, in the sense that the ex ante optimal policy indeed can be made credible in the absence of commitments.[13] A first result is due to Lucas and Stokey (1983). They consider a set-up where the government can not impose any levies by assumption: there is neither capital nor money and debt repudiation is ruled out by assumption. Each government, in an infinite sequence of governments, chooses freely a welfare-maximizing program of labor tax rates and borrowing to finance a given path of government spending. Different ex ante and ex post constraints, due to different labor supply elasticities, cause a credibility problem for the ex ante optimal 2nd best policy. But the problem may be solved if there is government debt of sufficiently rich maturity (and contingency in the case of uncertainty). Then, there is a unique restructuring scheme for the government debt which, if followed by each government, gives succeeding governments proper incentives to continue following the 2nd best policy. The precise argument is fairly complicated, but the basic intuition is the following: Changing the tax rate for a particular date affects the interest rate for that date, which in turn affects the market value of debt of the corresponding maturity. Present and planned future tax rates thus affect government wealth. Therefore, the inherited maturity structure of the government debt is a "state variable" that enters into the constraints of each government's policy problem. Changing that state variable, each government can counteract changes in its successor's constraints that emanate from a difference between ex ante and ex post labor

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[13] There is no credibility problem when the ex ante optimal policy achieves the 1st best. This (uninteresting) situation occurs when there is no need to raise any distortionary taxes because, say, the government has enough initial assets; see Turnovsky and Brock (1980).

supply elasticities.

Persson, Persson and Svensson (1987) extend the analysis to an economy with money, so that the government chooses distortionary inflation taxes (money growth rates) in addition to the labor taxes. A restructuring scheme still exists that makes the 2nd best policy credible. In particular, the credibility problem associated with an ex post inflationary levy on money can be solved. The benefit of raising revenue by diluting the real value of money is counteracted by a loss of revenue if the government holds claims on the private sector in the form of nominal bonds. If each government inherits a zero nominal position against the private sector, the incentive for a surprise inflation disappears.

Some progress towards finding a solution to the credibility problem associated with capital levies is made in Kotlikoff, Persson and Svensson (1986). In a model with overlapping generations, the old in each period have an incentive to tax already accumulated capital to avoid distortionary labor taxation. Hence, an ex ante optimal 2nd best policy promising not to tax capital faces a major credibility problem. But a social contract (or a"law"), which prescribes the 2nd best policy, may effectively be sold from each generation to the next by an intergenerational transfer from young to old (also prescribed by the social contract). If the social contract is violated it becomes valueless, and the prospective capital loss introduces a cost for ex post deviations that may help enforce a no-capital-levy equilibrium.

Most of the literature deals with a representative consumer so that the government's Pigovian objective incorporates only efficiency considerations. An extension where agents are heterogenous and the government is concerned also with distribution, can produce different results. As shown by Rogers (1986), a deviation from the ex ante optimal policy that increases efficiency may worsen

distribution according to the government objective. The credibility problem may thus be less pronounced.

While the literature suggests some ways whereby credibility problems in macroeconomic public finance may be solved, there are many things that it does not do. First, little progress is made on comparing the credible 3rd best policies to the non-credible 2nd best policies.[14] This is disappointing because the models have well-specified microfoundations, so that meaningful evaluations of the welfare costs of credibility problems could potentially be made. The lack of progress reflects the difficulties in charactherizing even 2nd best optimal tax policies, or, alternatively, the difficulties in finding solutions to dynamic games. Second, most of the literature does not attempt a positive explanation of the social institutions that develop to deal with credibility problems. The restructuring schemes mentioned above are normative prescriptions which solve the credibility problem only under special, and, it appears, very restrictive conditions. Finally, the resolution to the credibility problem by restructuring government debt still presupposes "partial" precommitment, in that government debt is always honored by assumption. At the models' level of abstraction, it is hard to see the difference between ex post deviations from a plan for taxation and ex post debt repudiation.

4. Policy Coordination

I use "policy coordination" broadly to label a context with more than two policy makers. I will discuss two cases, one with two governments that interact internationally and one with two political parties that interact

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[14] Even in simple two-period models such as those in Fischer (1980) and Rogers (1986) it is hard to get anlytical solutions and comparisons between 2nd and 3rd best policies must proceed via simulations.

domestically. Similar issues come up in other contexts, however.[15]

The growing literature on international policy coordination initiated by Hamada (1976) has largely been motivated by real world issues such as the "Group of Three (Five, Seven)" meetings about cooperation in macroeconomic policy making, and the discussion about the costs and benefits of joining the European Monetary System. A detailed survey of this voluminous literature is far beyond the scope of this paper. I will only comment briefly on how credibility problems arise and how they are treated methodologically.

The literature highlights the externalities in the choice of macroeconomic policies by individual governments due to international spill-over effects. Ex ante--before the other government has set its policy instruments--a Pareto Optimal "coordinated" or "cooperative" policy internalizes the externalities by maximizing a weighted sum of the two governments objectives. Ex post, the choices prescribed by the coordinated policy are only 2nd best for each individual government, however, and (in the absence of precommitments) the usual credibility problem arises. When both countries' policies are ex post optimal, they typically make losses relative to the coordinated policy.

At least methodologically, one can identify two branches of the literature. One branch deals chiefly with monetary policy within simple and ad hoc macroeconomic models without inherent dynamics. The government objective is formulated as a "Tinbergen-type" quadratic loss function over deviations of macroeconomic variables from some target values. The choice of monetary policy is modelled as a one-shot game between two governments and the private sectors, which may or may not be repeated over time. Ex post optimality is imposed by

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[15]   Another example, analyzed by Alesina and Tabellini (1988), is the interaction between a Fiscal and a Monetary Authority with partly conflicting objectives.

Nash Equilibrium (and by further refinements when the game is repeated). The outcome is compared to one out of different hypothetical combinations of precommitment possibilities; when one or both governments can commit vis-a-vis each other and/or vis-a-vis the private sector.[16]

Another branch deals with monetary and sometimes fiscal policy within simple ad hoc macromodels that do have inherent dynamics. The government objective is again a loss function, but the choice of policy is now modelled as a dynamic game. Due to the dynamics in the model, the credibility problems get more complicated than in the static set-up. Ex post optimality can be imposed, say, by Feedback Nash Equilibrium (with each government a Dominant Player vis-a-vis the private sector), and the outcome can, in principle, be compared with a coordinated policy. The complexity of the models bar analytical solutions, however, except in special linear-quadratic examples' and even then an evaluation of the solutions must largely proceed by computer simulations.[17]

One set of results is analogous to the results in Section 2: The losses in the Nash equilibrium of a one-shot game are not unavoidable. If the game is repeated, the countries may coordinate on a superior policy, possibly on the ex ante optimal policy, in a "reputational" equlibrium. The same non-uniqueness problem remains, however.

Another set of results arise when ex ante optimal policies suffer from a "double credibility problem": one deriving from the interaction between the governments, the other deriving from the interaction between each government and the private sector like in Sections 2 and 3. As in the "theory of the second best", two distortions may interact in such a way that elimination of

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[16] For a pedagogical exposition of the typical model in this branch of the literature, see Canzoneri and Henderson (1987).

[17] Several of the contributions in Buiter and Marston (1985) are representative examples of this approach.

one leads to an inferior outcome. This explains results such as those of Rogoff (1985b), who shows that precommitment to government-government coordination alone may yield a worse outcome (for both governments) than the ex post optimal policy, and of Oudiz and Sachs (1985), who show that precommitment to government-private coordination alone may yield a worse outcome than the ex post optimal policy. It is unclear how relevant these "paradoxical" results are, however. Although formally possible, it seems highly implausible that a policy maker may make binding commitments vis-a-vis only a subset of the other agents. Maybe one should think of the coordination between a subset of the agents as arising in a reputational equilibrium, but that is not the way the results have been derived.[18]

Finally, some papers have tried to evaluate the losses due to the credibility problem with coordinated policies. In line with Oudiz and Sachs (1984) the general finding is that the costs in terms of the government objectives are "small". But the government objectives are ad hoc loss functions and the results are derived by simulations in models without microfoundations for private behavior. It is therefore unclear exactly what the losses measure and how seriously the results should be taken.

The small but growing literature on the interaction between political parties in macroeconomic policy making is largely motivated by a dissatisfaction with modelling policy as being chosen by a single policy maker with either Pigovian or incompletely specified Political objectives. In this

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[18] Canzoneri and Henderson argue that if the reputational equilibrium is supported by "trigger strategies" a la Friedman (1971), coordination between a subset of agents could only arise in equilibrium if this yields them a better outcome than the outcome in Nash Equilibrium. This is fairly evident since the threat in the trigger strategies is to revert to Nash behavior. If more severe threats were allowed, as in Abreu (1982), a reputational equilibrium with counterproductive coordination between some agents could conceivably arise.

literature, credibility-related issues arise naturally as a direct result of the electoral process, which potentially makes the policy maker's ex ante--before elections--and ex post problems very different. Since the literature on credibility and politics is surveyed in detail by Alesina and Tabellini (1987a), I will only comment briefly on some new issues.

It is unclear why forward-looking agents/voters would believe party announcements of post-election policies that are not ex post optimal given the party's objectives. As discussed by Alesina (1987), this seriously questions many results in the political science literature which discusses the ex ante optimal choice of policy platforms without paying any attention to the credibility problems.[19]

Party competition may lead the party which holds office to follow policies that lead to welfare losses. Rogoff and Sibert (1986) shows how a political "budget cycle" may arise even if voters are forward-looking, because the incumbent party may use a suboptimal policy ex ante--before elections--as a signal to the voters about its competency in carrying out policy ex post. This happens even though the two parties share the same objective.

When parties have different objectives, the policy maker ex post may have different objectives than the incumbent policy maker. If the incumbent policy maker can affect some state variable that enters its successor's constraints --as in section 3--he has an ex ante incentive to choose that state variable so as to control the ex post choices. But doing so will lead to welfare losses, relative to the ex ante optimal policy given the sucessor's objectives. Alesina and Tabellini (1987b) and Persson and Svensson (1987) both discuss the

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[19] The credibility problem arises whenever parties care at least somewhat about the actual policy outcomes. If parties only care about being elected--as in the simple median voter model--they are indifferent to the policy outcome and there is no credibility problem.

strategic choice of public debt and deficits along these lines.

5. Concluding Remarks

Credibility problems are likely to show up in many areas of macroeconomic policy making. As we have seen, a credibility problem shows up whenever: the government has a specific objective, there is a difference in the ex ante and the ex post constraints faced by the government, and the ex ante optimal policy does not achieve the 1st best. The ex ante-ex post distinction can refer to: the choice of a nominal contract embodying inflationary expectations; a supply or demand choice that changes the the elasticity of the tax base with respect to the tax rates; the choice of policy by another policy maker; the choice of voters; and so on. Once a credibility problem has been identified, it can be analyzed in detail using tools from the relevant form of game theory.

Recent research has made some progress on characterizing credibility problems, evaluating their costs, and showing conditions when they can be solved. But, the existing literature can be developed further. One example is the very interesting literature on credibility and politics, where exploration has just begun. The existing literature might benefit from cross-fertilization. One example is the lack of microfoundations in the literature on international policy coordination, which may be remedied by borrowing from the approach in the literature on macroeconomic public finance.[20] Applying new game-theoretic methodology may also pay off. One example is the work with tools of cooperative game theory on dynamic coalition formation, which may help resolve when different policy makers can coordinate

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[20] Kehoe (1987) and van der Ploeg (1986) make some interesting attempts in this direction.

their policies and form coalitions over time.[21] There are relevant applications to policy problems that have not yet been made. One example is the analysis of stabilization programs in high-inflation economies, where credibility is an absolutely central issue, but where the existing literature so far has treated government policy as exogenous.[22] Finally, while strongly empirically motivated, the analysis of credibility problems has not been seriously taken to the data. This may be the most urgent task for future research.

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[21] Cooley and Smith (1987) discuss how time-consistency problems may be considered in a dynamic coalitions framework.

[22] See Helpman and Leiderman (1987) for a recent discussion of stabilization programs and the relevant literature.

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