CHAPTER FOUR

The Time-Consistency Problem

> Like the British Constitution, she owes her success
> in practice to her inconsistencies in principle.
>
> —*Thomas Hardy,* The Hand of Ethelberta

> With consistency a great soul has simply nothing to do.
>
> —*Ralph Waldo Emerson,* Self-Reliance

4.1. Introduction

In this chapter, we consider the time-consistency problem; in the two subsequent chapters, we consider various "solutions." Time consistency has become an integral part of explanations of many economic phenomena, in large part because of insights it gives into these phenomena. It helps us to formalize and hence better understand a government's incentives to promise that accumulated capital will not be taxed and then weigh the possibility of capital levies in the face of severe revenue shortfalls. The government's incentive toward time-inconsistent behavior in this case also helps explain why capital accumulation may be so low in countries with weak safeguards against such behavior. A second example concerns why there may be an inflationary bias to monetary policy even if governments realize that perfectly anticipated inflation may have little effect on economic activity. More generally, a significant problem of decisionmaking in democracies is potential time inconsistency since majority preferences change over time, and the nature of certain democratic institutions may be better understood as a response to this problem. We organize this chapter around analysis of a number of examples.

Defining Time Inconsistency

Let us begin with a definition of **time inconsistency**. Suppose that a policymaker is responsible for choosing a policy starting at time t for several periods into the future. Consider his choice of the tax rate for time $t + s$, where we denote by $\pi_{t+s}(t + j)$ the policy chosen at time $t + j$ for $t + s, 0 \leq j \leq s$. A forward-looking policymaker can obviously wait until

$t + s$ to choose the tax rate for that date, or he can choose the $t + s$ tax rate at t (where, in a world with uncertainty, he could choose a vector of state-contingent tax rates, one for each state of nature). If there are no changes in his preferences or in technology, nor any unanticipated shocks between t and $t + s$, one would think from basic dynamic programming that it would not matter whether the tax rate for time $t + s$ is chosen at $t + s$ or at t: the value should be the same. Time inconsistency is said to arise if, though nothing has changed (at least ostensibly), these choices are not equal,[1] that is, if

$$\pi_{t+s}(t + s) \neq \pi_{t+s}(t). \tag{4.1}$$

A natural reaction is, "So, what else is new?" Do we not see politicians quite often announcing that they will carry out a specific policy in the future, but then doing something else when the time comes? They are trading a *promise* of future action against a tangible benefit (such as electoral support) today, but not fulfilling their part of the deal. More generally, anyone who makes an agreement to receive something today against the promise of repaying tomorrow would be tempted to renege and not repay, if such an action would increase his utility. If time inconsistency meant simply reneging on a promise or agreement when an individual finds it optimal to do so, one would still ask how such behavior can be prevented, but the phenomenon itself would not occupy us for very long. What makes the phenomenon interesting is that it occurs in cases where time-inconsistent policy is chosen to *maximize the welfare of those who are misled*. Put simply, the policymaker has the incentive to mislead people for their own good! Furthermore, as noted above, the fundamental characteristics of the policymaking environment appear not to have changed. If the environment has changed (for example, due to an exogenous shock to the economy), a change in the optimal policy would not be surprising. With no ostensible change in the fundamental environment, the result in (4.1) appears puzzling.

The Examination Problem

We begin with a simple example, leaving for later an analysis of what lies behind the time-consistency problem. Though it will not be obvious at this point, a conflict of interests of some sort is necessary for time inconsistency in policy choice to arise.

[1] The term "time inconsistency" was introduced into economics by Strotz (1956), though the reason for time inconsistency in his model is quite different from the reason here. He considers an individual with a utility function which does not change over time, but where discounting of future utility is not exponential. To take a discrete-time example, suppose individuals treat the current period differently than future periods, in that $\Omega(c_t, c_{t+1}, \ldots) = u(c_t) + \alpha(\beta u(c_{t+1}) + \beta^2 u(c_{t+2}) + \cdots)$, where β is the standard discount factor and $\alpha < 1$. Because of the nature of discounting, c_{t+1} chosen at $t + 1$ will differ from c_{t+1} chosen at t.

This example, a favorite of academics, concerns final examinations. As all students know, professors are interested solely in their students' learning, and give examinations only to induce students to study more. At the beginning of the term, it is thus optimal to announce that there will be a final exam. Otherwise, students will not study hard enough given the demands on their time at the end of the semester. In anticipation of an exam, students will study and hence learn more. On exam day, when the students arrive to the exam having learned the material, everyone is better off if the professor cancels the exam (and simply gives each student a satisfactory grade): students are spared the anxiety associated with finding out about grades and can use the exam time for something else; the professor is spared the trouble of grading the exam. Hence, if the professor's original announcement was believed and students studied, time-inconsistent behavior in canceling the exam is optimal.

Is Time Inconsistency Really a Problem?

Before getting into the technical details, we note and briefly address three arguments suggesting that too much emphasis has been put on the time-consistency problem. First, in specific cases it is argued that, in practice, policymakers really do not have the incentive towards time inconsistency that many economists claim. Blinder (1998), for example, makes this argument with respect to monetary policy and the inflation bias problem mentioned at the beginning of the chapter. We examine his argument further at the end of Section 4.4. However, even if one accepts the view that in some specific cases the incentive towards time inconsistency is less strong than models may suggest, the general concept and its implications nonetheless shed light on a number of economic phenomena. The insights one may gain means that time consistency warrants a careful treatment.

Second, even if there is an incentive towards time inconsistency, it is argued that society has found ways to deal with it when it is significant. Hence, in equilibrium, time inconsistency does not result in a serious policy bias away from the optimum. Taylor (1983) makes this point strongly, suggesting that societies create institutional structures for policy-making that mitigate or eliminate time-consistency problems. It is exactly those sorts of institutional solutions that we consider in the next chapter. Understanding the creation of such institutions means first understanding the problem of time consistency itself.

Finally, a more general criticism is that stressing the importance of finding solutions to the time-consistency problem makes us lose sight of the costs of these solutions. This criticism is not so much in terms of the practical costs, such as a loss of flexibility if policymakers are precommitted to a policy (an issue we take up in Section 4.6), but to a deeper notion of the value judgements a society makes in what is seen as too heavily

focusing on the problem of time consistency. Elster (1984), in his brilliant essay on "binding oneself" as a solution to time consistency, argues that values that are worthwhile in and of themselves may be sacrificed in methods of effective precommitment. On a more policy-oriented level, institutional solutions to specific problems, such as central bank independence in the face of pressures for monetary expansion, are seen as contrary to basic democratic principles of accountability.

This criticism runs deeper and cannot be easily ignored. However, because it addresses fundamental issues of the nature of policymaking in a democracy, it also falls somewhat outside the intent of the book. We will return to the issue in our discussion of institutional solutions to the time-consistency problem in Chapter 5, as well as at various points later on, such as in the discussion of democracy and growth in Section 11.4 of Chapter 11. Our approach is to try to illuminate the issues, rather than to give answers. The fundamental importance of the question argues not for putting less stress on the problem of time consistency and its solutions, but in fact for considering the underlying technical issues quite carefully.

4.2. Capital Taxation

We now consider a more technical example, following the pathbreaking paper of Kydland and Prescott (1977). It concerns capital taxation in a two-period, representative agent model, and will be used to illustrate a number of the issues more precisely.[2] Our presentation follows Fischer (1980).

A Simple Model of Capital Taxation

Individuals consume in both periods, but production and government activity occur only in the second period. In the first period, a representative individual receives an income endowment y which he divides between consumption c_1 and accumulation of capital to be used in the second period k_2. Labor l_2 is also supplied in the second period and the production function is linear in k and l, so that product market equilibrium in the two periods is

$$\begin{aligned} c_1 + k_2 &= y, \\ c_2 + g_2 &= al_2 + Rk_2, \end{aligned} \tag{4.2}$$

where g_2 is government spending. Finally, the utility of the representative

[2] This two-period model is a very simple version of the infinite-horizon overlapping-generations model of capital accumulation, exposited in Section 2.4 of Chapter 2.