

## **optimal fiscal and monetary policy with commitment**

‘Optimal fiscal and monetary policy with commitment’ is a policy of choosing taxes and transfers or monetary instruments to maximize social welfare.

‘Commitment’ refers to ability of a policymaker to make binding policy choices.

### **The Ramsey approach to the optimal taxation**

‘Ramsey approach to optimal taxation’ is the solution to the problem of choosing optimal taxes and transfers given that only distortionary tax instruments are available.

A starting point of a Ramsey problem is postulating tax instruments. Usually, it is assumed that only linear taxes are allowed. Importantly, lump sum taxation is prohibited. Another assumption crucial to this approach is that all activities of agents are observable.

Given the set taxes, a social planner (government) maximizes its objective function given that agents (firms and consumers) are in a competitive equilibrium. Usually, it is assumed that government’s objective is to finance an exogenously given level of expenditures. It is important to note that if the lump sum taxes were allowed than the first welfare theorem would hold, and the unconstrained optimum would be achieved.

There are two common approaches to solving Ramsey problems. The first is the *primal* approach, which characterizes a set of allocations that can be implemented as a competitive equilibrium with taxes. By ‘implementation we mean’ the following: for a set of taxes find a set of (consumption and labour) allocations and equilibrium prices such that these allocations are a competitive equilibrium given taxes. Conversely, a set of (consumption and labour) allocations is implementable if it is possible to find taxes and equilibrium prices such that these allocations are a competitive equilibrium given these prices and taxes. Implementation often makes it possible to simplify a Ramsey problem by reformulating a problem of finding optimal taxes as the problem of finding implementable allocations. This reformulation is referred to as the *primal approach* to Ramsey taxation.

**Main lessons of Ramsey taxation: uniform commodity taxation, zero capital tax in the long run, and tax smoothing**

One of the central results of the literature on Ramsey taxation is *uniform commodity taxation* (Atkinson and Stiglitz, 1972). Consider a model with a finite set of consumption goods that can be allocated between government and private consumption. All of these goods are produced with labour. Assume that each consumption good can be taxed at a linear rate. Then, under certain separability and homotheticity assumptions, commodity taxation is uniform, that is, the optimal taxes are equated across consumption goods.

Ramsey taxation provides a compelling argument against taxing capital income in the long run in a model of infinitely lived households. The *Chamley–Judd result* (Chamley 1986; Judd 1985) states that in a steady state there should be no wedge between the intertemporal rate of substitution and the marginal rate of transformation, or, alternatively, that the optimal tax on capital is zero. The intuition for the result is that even a small intertemporal distortion implies increasing taxation of goods in future periods in contrast to the prescription of the uniform commodity taxation. Therefore, distorting the intertemporal margin is very costly for the planner. Jones, Manuelli and Rossi (1997) extend the applicability of the Chamley–Judd result by showing that the return to human capital should not be taxed in the long run. Chari, Christiano and Kehoe (1994) provide the state-of-the art numerical treatment optimal Ramsey taxation over the business cycle and conclude that the *ex ante* capital tax rate is approximately zero.

There has been a long debate on the optimal composition of taxation and borrowing to finance government expenditures. Barro (1979) considers a partial equilibrium economy and argues that it is optimal to smooth distortions from taxation over time, a policy referred as *tax smoothing*. The implication of this analysis is that optimal taxes should follow a random walk. Lucas and Stokey (1983) consider an optimal policy in a general equilibrium economy without capital, and show that, if government has access to state-contingent bonds, optimal taxes inherit the stochastic process of the shocks to government purchases. Chari, Christiano and Kehoe (1994) extend this analysis to an economy with capital and showed the Lucas and Stokey results remain valid in that set-up with or without state contingent debt, as long as the government can use taxes on capital to effectively vary the *ex post* after-tax rate of return on bonds. Finally, Aiyagari

et al. (2002) show that, if *ex post* taxation of returns is impossible, the optimal taxes follow a process similar to a random walk. They also show the conditions under which the tax smoothing hypothesis is valid.

### **The Mirrlees approach to optimal taxation**

The Mirrlees approach to optimal taxation is built on a different foundation from Ramsey taxation. Rather than stating an ad hoc restricted set of tax instruments as in Ramsey taxation, Mirrlees (1971) assumed that an informational friction endogenously restricted the set of taxes that implement the optimal allocation. This set-up allows arbitrary nonlinear taxes, including lump-sum taxes.

The informational friction posed in those models is unobservability of agents' skills: only labour income of agents can be observed. Therefore, from a given level of labour income it cannot be determined whether a high-skill agent provides a low amount of labour or effort, or whether a low-skill agent works a prescribed amount. The objective of the social planner (government) is to maximize *ex ante*, before the realization of the shocks, utility of an agent. This objective can be interpreted as either insurance against adverse shocks or as *ex post* redistribution across agents of various skills. An informational friction imposes *incentive compatibility* constraints on the planner's problem: allocations of consumption and effective labour must be selected such that an agent chooses not to misrepresent its type.

In summary, the objective of the Mirrlees approach is to find the optimal incentive–insurance tradeoff: how to provide the best insurance against adverse events (low realizations of skills) while providing incentives for the agents to reveal their types (provide high amount of labour).

### **Main lessons of Mirrlees approach in a static framework**

Theoretical results providing general characterization of the optimal taxes in the static Mirrlees environment are limited. The central result is that the consumption–leisure margin of an agent with the highest skill is undistorted, implying that the marginal income tax at the top of the distribution should be optimally set equal to zero. Saez (2001) is a state-of-the art treatment of the static Mirrlees model in which he derives a

link between the optimal tax formulas and elasticities of income. Mirrlees (1971) was also able to establish broad conditions that would ensure that the optimal marginal tax rate on labor income was between zero and 100 per cent.

**Main lessons of dynamic Mirrlees literature: distorted intertemporal margin**

Recent literature starting with Golosov, Kocherlakota, and Tsyvinski (2003) and Werning (2001) extends the static Mirrlees (1971) framework to dynamic settings. Golosov, Kocherlakota, and Tsyvinski (2003) consider an environment with general dynamic stochastically evolving skills. An example of a large unobservable skill shock is disability that is often difficult to observe (classical example is back pain or mental illness). Golosov, Kocherlakota, and Tsyvinski (2003) show for arbitrary evolution of skills that, as long as the probability of agent's skill changing is positive, any optimal allocation includes a positive intertemporal wedge: a marginal rate of substitution across periods is lower than marginal rate of transformation. The reason for this is that this wedge improves the intertemporal provision of incentives by implicitly discouraging savings. This result holds even away from the steady state and sharply contrasts with the Chamley–Judd result that stems from the exogenous restriction on tax instruments. Golosov, Kocherlakota, and Tsyvinski (2003) and Werning (2001) show that in a case of constant types a version of uniform commodity taxation holds and the intertemporal margin is not distorted.

Implementation of dynamic Mirrlees models is more complicated than implementation of either static Mirrlees models, which are implemented with an income tax, or Ramsey models of linear taxation. By 'implementation' we mean finding tax instruments such that the optimal allocation is a competitive equilibrium with taxes. One possible implementation is a direct mechanism that mandates consumption and labour menus for each date. However, such a mechanism can include taxes and transfers never used in practice. Three types of implementations were proposed. In Albanesi and Sleet (2006), wealth summarizes agents' past histories of shocks that are assumed to be i.i.d. and allows us to define a recursive tax system that depends only on current wealth and effective labour. Golosov and Tsyvinski (2006) implement an optimal disability insurance system with asset-tested transfers that are paid to agents with wealth below a

certain limit. Kocherlakota (2005) allows for a general process for skill shocks and derives an implementation with linear taxes on wealth and arbitrarily nonlinear taxes on the history of effective labour.

### **Optimal monetary policy**

The theory of the optimal monetary policy is closely related to the theory of optimal taxation. Phelps (1973) argues that the inflation tax is similar to any other tax, and therefore should be used to finance government expenditures. Although intuitively appealing, this argument is misleading. Chari, Christiano and Kehoe (1996) extend the Ramsey approach to analyse optimal fiscal and monetary policy jointly in several monetary models, and found that typically it is optimal to set the nominal interest rate to be equal to zero. Such a policy is called a 'Friedman rule', after Milton Friedman, who was one of the first proponents of zero nominal interest rates (Friedman, 1969). To understand intuition for the optimality of Friedman rule, it is useful to think about distinctive the features that distinguish money from other goods and assets. In most models money plays a special role of providing liquidity services to households that cannot be obtained by using other assets such as bonds. Inefficiency arises if the rates of return on bonds and money are different, since by holding money balances households lose the interest rate. When a nominal interest rate is equal to zero, which in a deterministic economy implies that inflation is negative, with nominal prices declining with the rate of households' time preferences, the real rates of return on money and bonds are equalized and this inefficiency is eliminated.

The optimality of the Friedman rule stands in a direct contrast with Phelps' arguments for use of the inflationary tax together with other distortionary taxes such as taxes on consumption or labour income. The reason for this is that money, unlike consumption or leisure, is not valued by households directly but only indirectly, as long as it facilitates transactions and provides liquidity. Therefore, it is more appropriate to think of money as an intermediate good in acquiring final goods consumed by households. Diamond and Mirrlees (1971) established very general results about the undesirability of distortion of the intermediate goods sector, which in monetary models

implies that the inflationary tax should not be used despite the distortions caused by taxes on the final goods and services.

The intuition developed above is valid under the assumption that nominal prices are fully flexible, and firms adjust to them immediately in response to changes in market conditions. However, even casual observation suggests that many prices remain unchanged over long periods of time, and Bils and Klenow (2004) document inflexibility of prices for a wide variety of goods. Inflexible or *sticky prices* lead to additional inefficiencies in the economy that could be mitigated by monetary policy. For example, an economy-wide shock, such as an aggregate productivity shock or change in government spending, may call for readjustment of real prices. If adjustment of nominal prices is sluggish, the central bank can increase welfare by adjusting nominal interest rates and affecting real prices.

It is important to recognize that the government is also able to affect real (after-tax) prices using fiscal instruments instead. In fact, Correia, Nicolini and Teles (2002) show that, if fiscal policy is sufficiently flexible and can respond to aggregate shocks quickly, then the Friedman rule continues to be optimal even with sticky prices, with fiscal instruments being preferred to monetary ones. In current practice, however, it appears that it takes a long time to enact changes in tax rates, while monetary policy can be adjusted quickly. Schmitt-Grohe and Uribe (2004) show that, as long as tax levels are fixed or the government is not able to levy some of the taxes on goods or firm's profits, then the optimal interest rate is positive and variable.

Most of the applied literature on the monetary policy is based on the joint assumption of sticky prices and inflexible fiscal policy. Woodford (2003) provides a comprehensive study of the optimal policy in such settings. This analysis examines how central bank response should depend on the type of the shock affecting the economy, the degree of additional imperfections in the economy, and the choice of policies that would rule out indeterminacy of equilibria. Two common policy recommendations for central banks share many of the features of the optimal policy responses in this analysis. One of such recommendations – a *Taylor rule* (see Taylor, 1993) – calls for the interest rates to be increased in response to an increase in the output gap (the difference between actual and a target level of GDP) or inflation. Another recommendation, *inflation forecast*

*targeting*, requires that the central bank commits to adjust interest rate to ensure that projected future path of inflation or other target variables does not deviate from the pre-specified targets.

In addition to the analysis set out above, several new, conceptually different approaches to the analysis of monetary policy have emerged in the recent years. For example, da Costa and Werning (2005) re-examine optimal monetary policy with flexible prices in Mirrleesian settings and confirm the optimality of the Friedman rule there. Seminal work by Kiyotaki and Wright (1989) has given rise to a large search-theoretic literature seeking to understand the fundamental reasons that money differs from other goods and assets in the economy. Lagos and Wright (2005) provide a framework for the analysis of optimal monetary policy in such settings.

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See also Optimal taxation, Optimal Fiscal and Monetary Policy – Without Commitment, Income Taxation and Optimal Policies, Monetary Fiscal Policy Overview, new Keynesian macroeconomics, Taylor Rule

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#### *Index terms*

bonds  
 commitment  
 disability insurance  
 Friedman rule  
 homotheticity  
 incentive compatibility  
 inflation targeting  
 inflation tax  
 intermediate good  
 linear taxation  
 lump sum taxes  
 Mirrlees, J.  
 money  
 nominal interest rates  
 optimal fiscal and monetary policy with commitment  
 optimal interest rate

optimal monetary policy

optimal taxation

output gap

partial equilibrium

Ramsey taxation

separability

sticky prices

tax smoothing

taxation of capital income

taxation of consumption

taxation of income

Taylor rule

time preference

uniform commodity taxation