

# 6010

## TAXATION: MACRO ASPECTS

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### Abstract

This chapter on macro aspects of taxation begins with a discussion of the contribution of taxation to stabilization policies. The budget constraint of the government and the expectations of economic agents about taxation are crucial elements here. The effectiveness of countercyclical policies has, however, been challenged by questions about the relevancy of the timing of taxation. We therefore cover the Barro-Ricardo equivalence theorem. Next we review the literature on taxation and inflation and the positive approaches to taxation. The discussion so far relates primarily to closed economies. The last section surveys some of the publications on the macro aspects of taxation in open economies.

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### 1. Introduction

Over the past decades taxation has increased to levels not experienced before, which has stimulated theoretical and empirical research on the effects of taxation. The search for policy instruments to stimulate economic growth, led most governments to reform taxation (= lower marginal rates), especially income taxation. Notwithstanding, for most economic agents total taxes are still the main single item on the expenditure side of their accounts. Reactions to current and expected taxation are therefore among the more important economic decisions to be made. These decisions cannot be neglected by policymakers. For economists, the sheer size of taxation implies that no macroeconomic shock can be analyzed without considering the effects on the government finances. Frequently in theoretical research the tax rate is assimilated to the income tax rate. The discussion about the effects of this tax could serve as a guide for the theoretical macroeconomic effects.

The interest in taxation or, more generally, in public finances, has not only been stimulated by the rise in 'instant' taxation but also by the tax-postponing policies pursued by many governments since the mid -1970s through the accumulation of government debt. Analyses of the long-run problems related

to large stocks of government debt were never as relevant. Data for, for example, the 15 countries of the European Union illustrate the extent of the accumulation of government debt. Total debt amounts now (1998) to about 5,270 billion ECU or 70.5 percent of GDP. This represents 153 percent of current yearly taxation. The per capita debt of every EU citizen equals nearly 14,000 ECU.

Just as it does for any economic entity, a budget constraint unites all operations of the government. This constraint thus links tax policy with expenditures policy, deficits and monetary policy. Any distinction between the different policies is therefore somewhat arbitrary. Evidently some choices had to be made in this survey. We restrict this survey to issues that are directly related to the macroeconomic aspects of taxation. This implies that we will not discuss the relative merits of monetary and fiscal policy, or the link between taxation and government expenditures. We agree here with Kay (1990, p. 18): 'The link between tax and spending is now close and symmetric. But this symmetry is rarely reflected in the theory, or the practice, of tax policy'. Furthermore, we will not consider sectorial, regional or local aspects. As a result, studies concerning, for example, the taxation of international income or commodity flows (tariffs) will not be surveyed. References related to the government debt will only be discussed when they have a direct impact on taxation. This explains, for example, the absence of studies on the world debt problem. Similarly, studies on the political determinants of the deficit or debt policies will not be surveyed; however, the political aspects of taxation will be covered. The literature on the history of taxation and the early discussion about the effects of taxation will not be surveyed. We refer to, for example, Webber and Wildavsky (1986) and Musgrave and Shoup (1959). Taxation is considered in a narrow sense so we will not cover alternatives to taxation such as regulation (see Chapter 5000). Note that because of lack of space, we could not include the literature on taxation and growth and the general equilibrium approach to taxation. We also refer the reader to other related chapters (6000 for optimal taxation, 6020 for tax evasion, 6030 property taxes, 6040 consumption taxes, 6050 income taxation, 6060 corporate taxation, 6070 inheritance taxation and 6080 international taxation).

Our survey can be viewed as integrating the macroeconomic effects of taxation into the intertemporal budget constraint of the government. This constraint determines the sustainability of announced fiscal policies and therefore the perception of fiscal policy by economic agents.

We start our survey with the contribution of taxation to stabilization policies (Section 2). In this discussion, the budget constraint of the government (Section 3) and the expectations of economic agents about taxation (Section 4) are crucial. The effectiveness of countercyclical policies has, however, been challenged by questions about the relevancy of the timing of taxation (Section 5). In the next section (Section 6) we review the literature on taxation and

inflation. Section 7 provides an overview of the positive approaches to taxation. The previous discussion relates primarily to closed economies. The last section (Section 8) surveys taxation in open economies.

## **2. Taxation and Stabilization Policies**

The macroeconomic aspects of taxation and fiscal policy have systematically been assimilated with the stabilization function. (The allocative and distribution function being the subject of more specific instruments; they are part of other surveys.) More recent research has, however, been rather critical about the traditional approach because of the formulation of anticipations and medium and longer-run implications of the models under consideration.

In the Keynesian tradition (see any textbook on macroeconomics or public finance; for expositions and extensions Modigliani, 1944; Peacock and Shaw, 1976; Turnovsky, 1977, and Frenkel and Razin, 1987; for an adaptation of traditional Keynesian demand management to the stagflation situation of the 1980s, we refer to Vines, Macriewski and Meade, 1983; see also Baily, 1978, for a discussion of the changing economic environment and its impact on stabilization policies) fiscal policy, and therefore taxation, is one of the main instruments to stabilize the economy. Stabilization policies are designed to minimize the gap between current and potential production and employment and to limit the inflation rate. This importance of fiscal policy derived from the economic situation in the 1930s and 1950s and the perceived properties of the economy (deficient aggregate demand, rigid prices and wages, an elastic money demand and an inelastic investment function). The asymmetry in its implementation (expenditures and taxes were increased but rarely reduced) resulted in a structural increase in the relative size of the government budget. This was further stimulated by the Haavelmo effect (Haavelmo, 1945) or the balanced-budget multiplier. This effect holds that no deficit penalty for higher public spending financed by an increase in taxes exists since a similar increase in taxes and government expenditures would increase income by the same amount. Later Knoester (1980, 1983) disputed this result by stressing that instead an inverted effect exists as a result of the link between taxes and wages. Furthermore, much faith was placed in the automatic stabilizing properties of expansive policies: any budget deficit would soon disappear thanks to the induced beneficial effects on economic growth (recent work is by Rodseth, 1984; Kyer, Mixon and Uri, 1988; Uri, Mixon and Kyer, 1989a, 1989b). Cameron (1978) argues that the increasing openness of countries 'created' a demand for stabilization policies.

The mainstream approach in the 1960s was to view the economy as similar to a system that, by a clever use of impulses, could be controlled. This led to an

intensive search for the value of the multipliers. It explained, partly, the exploding use of large-scale econometric models (see Hickman, 1972, for the state of the debate at the beginning of the 1970s; see Sims, 1982, for an evaluation). However, also reduced form models gained some popularity. This could be explained by the success of the St. Louis model (named after the Federal Reserve Bank of St. Louis). That model (Anderson and Jordan, 1968) intensified the discussion between Keynesians and the monetarists since it was shown that monetary policy and not fiscal policy affected income. In these reduced forms no attention was paid to incentives effects, so we do not survey these studies.

On the empirical level, one should remember the Goldfeld and Blinder (1972) point that reduced forms could give misleading results on the efficacy of fiscal policy if this policy is designed to stabilize the economy. Intuitively, if fiscal policy manages to stabilize income, no correlation between the deficit and income will be found.

In the late 1960s and early 1970s thus a lively discussion about the most appropriate policy course emerged. Buchanan and Wagner (1977) argued that the Keynesian theory destroyed the classical thesis, strengthened by constitutional rules, that budgets should balance and that deficits were immoral.

Until the early 1970s, the main - if not the only - argument to denounce fiscal policy concerned crowding out; that is, that the impact of an increase in government expenditures on total demand would be offset by lower private investment or consumption expenditures. (The traditional result could thus also be defined as 'crowding in'.) Obviously, at full employment a complete crowding out of private by public expenditures occurs so fiscal policy can only determine the division of output between the public and the private sector. When resources are not fully employed, different effects matter such as the increase in the interest rate (financial crowding out), in wealth, the composition of wealth (portfolio crowding out) and inflation (see Spencer and Yohe, 1970; Carlson and Spencer, 1975, 1980; Meyer, 1975; Buiter, 1977; Cavaco-Silva, 1977; Scarth, 1977; Turnovsky, 1977; Cohen and McMenamin, 1978; Floyd and Hynes, 1978; Friedman, 1978; Bruce and Purvis, 1979; Stevens, 1979; Taylor, 1979; Aschauer, 1985, 1988; Aschauer and Greenwood, 1985).

Besides crowding-out, many other questions on the business cycle stabilization potential of fiscal policy have been raised. How is a tax reduction or a deficit financed? Is the policy credible? Is the policy sustainable? What about the foreign effects? What motivates policymakers to modify taxes? The literature on some answers to these questions will be surveyed later.

We will not extend the discussion into different versions of the Keynesian and classical models like the Tobin (Tobin and Buiter, 1976; Buiter and Tobin, 1980) or Brunner-Meltzer (Brunner and Meltzer, 1976) models, since they focus on and refine monetary transmission mechanisms, or extend on the neo-

Keynesian or disequilibrium models.

Finally, note that in recent research shocks in taxes are considered to produce business cycles fluctuations (Christiano and Eichenbaum, 1992; Braun, 1994b; McGrattan, 1994; Johnsson and Klein, 1996). This feeds the criticisms about the possibility to use taxes as a stabilization tool.

### **3. The Budget Constraint**

In the early stages of demand management policies, the 'loose' reasoning was that, by a judicious timing, no public finance instrument would, over the business cycle, create financing problems. This would be the result of the automatic stabilizing properties of taxation. This view was supported by the spectacular decline in the debt ratio after the Second World War. Later, however, the criticism by monetarists was supplemented by the argument that the budget constraint was neglected. By explicitly incorporating the financing aspects of government decisions two important modifications had to be made to the traditional analysis: fiscal and monetary policy became interrelated and the long-run multipliers were no longer uncertain. References to the basic articles and developments are: Ott and Ott (1965), Christ (1967, 1979), Silber (1970), Steindl (1971), Blinder and Solow (1973, 1976), Meyer (1975), Brunner and Meltzer (1976), Currie (1976), Tobin and Buiter (1976), Cavaco-Silva (1977), Smyth (1978), Cohen and De Leeuw (1980) and Mayer (1984) (surveys are to be found in Turnovsky, 1977; Artis, 1979; and Burrows, 1979). In these contributions, it is stressed that any tax reduction has to be financed implying that the budget constraint must be included in the analysis. This endogenized at least the supply of bonds, possibly money creation and therefore monetary policy. The longer-run consequences on the multipliers strengthened the macroeconomic importance of the marginal tax rate: any change in expenditures (or taxes) must be offset by an identical change in taxes (or expenditures) since no deficit and therefore no monetary or bond financing is allowed. The consequence is the irrelevancy of the method of financing the deficit; only the fiscal structure determines the long-run impact of fiscal policy. Note, however, that this attractive result disappears when interest payments are explicitly included into the budget constraint (Blinder and Solow, 1973, 1974). The size of the long-run multiplier associated with a bond-financed fiscal expansion increases, since taxes must now also finance the higher interest charges. The Blinder-Solow model was extended to include explicit stock-flows interaction of capital and bonds by Tobin and Buiter (1976). Calvo (1985) allows for price increases in a model where the money-bond ratio is important.

#### 4. Rational Expectations

The budgetary constraint criticism of the traditional stabilization instruments is based on the accounting argument that expenditures and revenues are linked by the budget constraint. In the 1970s, further blows on the stabilization approach were inflicted on the basis of more behavioral arguments. Indeed, the traditional approach assumes, although implicitly, that all policy changes occur unexpectedly. The rational expectation assumption, based on Muth (1961), argues that economic agents form expectations about future events. These expectations are rational in the sense that they combine all the available information and therefore do not lead to systematic forecasting errors. The implication of the rational expectations hypothesis is that policies will only be effective when they produce surprises (= forecast errors). By definition, this is not possible in the long run since rational economic agents will detect any policy rule and will therefore no longer be surprised. This is also known as the 'irrelevance hypothesis'. This view has been applied to several policy instruments, most of the time of monetary policy; the core arguments are, however, also relevant to fiscal policy and taxation. The main contributions can be found in Fischer (1980b) and Lucas and Sargent (1981); Baily (1978) and McCallum and Whitaker (1979) apply the monetary policy results to fiscal policy. For our problem at hand it implies that any general expected tax change will already have been discounted by the economic agents in their decision process. An unexpected transitory change in taxation will leave permanent income unchanged. Only permanent unexpected changes are of interest. When government expenditures remain constant, the Ricardo equivalence theorem applies (see below) so the new tax policy will be ineffective. If government expenditures are reduced, the traditional expansive effects, depending on the tax rate change, will apply. The final effects on macroeconomic variables depend on the specification of the model. For example, what is the impact of an increased demand on inflationary expectations? One important policy implication is that fiscal consolidations should not necessarily contract demand due to the benign effects on the expectations about future taxation (see Giavazzi and Pagano, 1990, for an application to Denmark and Ireland). Note that the introduction of uncertain shocks modifies the previous picture slightly in the sense that built-in stabilizers will reduce the variability of income since they provide an automatic and immediate adjustment to current disturbances (McCallum and Whitaker, 1979).

The main publications are Lucas (1972, 1973, 1975, 1976), Sargent (1973), Sargent and Wallace (1975), Barro (1976), Infante and Stein (1976), Sargent and Wallace (1976), Fischer (1977, 1979a, 1979b), Kydland and Prescott (1977, 1980), McCallum (1977, 1980), Phelps and Taylor (1977), Shiller (1978), McCallum and Whitaker (1979), Begg (1980, 1982), Buiter (1980b),

Taylor (1985), Lovell (1986) and Lucas (1986b).

Notwithstanding the previous conclusion on the ineffectiveness of stabilization policies in a rational expectations framework, microeconomic considerations such as the incentives effects of marginal tax rates, social security payments, subsidies, and so on, on labor supply, saving behavior, investment, and so on, imply that even perfectly anticipated policy changes will have some real effects in the medium run. Furthermore, the previous analysis assumes a systematic clearing of the markets. If this assumption is relaxed and a disequilibrium framework is accepted, the standard Keynesian effects reappear even when expectations are rational (see Taylor, 1979; Begg, 1982; Neary and Stiglitz, 1983, and Buiter, 1980b).

### 5. The Timing of Taxation

In the traditional stabilization approach, higher deficits are a crucial instrument to increase growth. However, if expenditures remain unchanged this implies, that sometime in the future taxes will have to be raised. Deficits are thus an instrument to transfer taxes intertemporally. Will citizens be aware of this and take future taxes into account in their decision process? In other words, is there a burden associated with government debt? The discussion on the burden of the government debt emerged forcefully around 1960 (most contributions are in Ferguson, 1964, and Kaounides and Wood, vol. 2, 1992; see also Buchanan, 1958; Modigliani, 1961; Bailey, 1962; Pesek and Saving, 1967, and Cavaco-Silva, 1977).

The mainstream Keynesian position (also known as 'the new orthodoxy') was that government debt was different from private debt (repayment of principal and payment of interest is mortgaging future resources) since 'we owe government debt to ourselves': future generations pay interest and principal to themselves so leaving disposable income unaffected. This argument was reinforced by the proposition that the deficit cannot be a burden on future generations because their resources are unaffected; the exception being foreign debt. These views were criticized since higher deficits implied lower taxation. This allows current generations to consume more and so to crowd out investment. Future generations thus inherit less capital. The distinction between domestic and foreign debt is not relevant since, although foreign debt does not crowd out investment, the revenue from the capital will benefit foreign lenders. Posner (1987) extends this view by arguing that foreign borrowing allows higher investment. *Ceteris paribus*, the burden of the internally held debt will be higher than for foreign debt.

In 1974, Barro rephrased the problem of the debt burden in 'Are Government Bonds Net Wealth?'. By doing so, he could focus the attention on

the behavior of taxpayers. Barro showed that the real burden on current and future generations occurs when government uses resources for consumption; the financing of government expenditures (taxes or borrowing) is not relevant: they are equivalent (tax neutrality). This proposition is now known as the 'Ricardian equivalence theorem' (some of the papers by Ricardo are reprinted in Kaounides and Wood, vol. 1, 1992; for a discussion on the historical origins see Buchanan, 1976; O'Driscoll, 1977, and Asso and Barucci, 1988; see also Hakes and McCormick, 1996).

The novel feature of Barro's approach is that he showed that intergenerational gifts and bequests turn an overlapping-generations economy with finite-lived households into an infinite-lived households economy whose consumption would not be affected by intertemporal redistributions of lump-sum taxes.

Phrased in a stabilization framework, the Ricardian equivalence theorem holds that when the government issues bonds, at the same time a liability is incurred to pay interest annually and to reimburse the par value at the date of maturity. Formulated from a wealth point of view, the net present value of the future tax liabilities equals the price of the bond. If taxpayers do capitalize future tax liabilities, the positive gross wealth effects of a bond issue will be offset by an equivalent liability leaving net wealth unchanged. Government bonds will then not be part of net private wealth. In other words, a decrease in public saving will be exactly offset by an increase in private saving, leaving total saving unchanged. Formulated from a financing point of view, the financing of government deficits is irrelevant for the real side of the economy so a substitution of debt for taxation does not affect economic development. As a result, in this ultrarational situation fiscal policy is ineffective. This can be viewed as 'ex ante crowding out' (David and Scadding, 1974). If the macroeconomic effects of current taxation are comparable to those of deficits, a choice between current or future taxation will have to be made by considering allocative effects (see Ihuri, 1988).

General discussions of the Ricardian equivalence theorem can be found in Buiter and Tobin (1979), Brennan and Buchanan (1980b), Tobin (1980), Bernheim (1987, 1989), Modigliani (1987), Perasso (1987), Leiderman and Blejer (1988), Flemming (1988), Morris (1988), Barro (1989), Thornton (1990), Seater (1993), Van Velthoven, Verbon and Van Winden (1993). Tramontana (1985) and Fields and Hart (1990) place the discussion in a traditional IS-LM framework.

The Barro proposition resulted in an intense discussion and many empirical tests. Several authors, especially Keynesians, questioned his assumptions. Since taxes are in general not lump-sum taxes, tax changes involve modifications in the size and timing of marginal taxation. This affects incentives and induces intertemporal substitution effects (Buiter, 1989, and Trostel, 1993). One can also question whether taxpayers are interested or informed about taxes and the



government debt. This refers to the existence of fiscal illusion (Stiglitz, 1988). Similarly, is the public not assuming that government has no intention of paying off the principal (Cox, 1985)?

Barro (1974) showed that the infinite life assumption is sufficient but not necessary for his proposition. A finite life assumption has the same implication if one assumes that the current generation considers the wellbeing of future generations and adjust intergenerational transfers (bequests or transfers *inter vivos*) to interventions of the government (for example, a tax reduction will be matched by an increase in voluntary transfers). Expenditures on education are different since a government deficit can increase welfare: parents will be allowed to invest more in their children's education (see Drazen, 1978). Further discussion about this issue is to be found in Blanchard (1985), Hubbard and Judd (1986), Auerbach and Kotlikoff (1987), Frenkel and Razin (1987), Poterba and Summers (1987), Weil (1987), Abel (1988), Bernheim and Bagwell (1988), Musgrave (1988), Kotlikoff, Razin and Rosenthal (1990), Lopez and Angel (1990), Abel and Bernheim (1991), Lord and Rangazas (1993) and Jaeger (1993).

The assumption of perfect capital markets has been criticized by several authors. Hubbard and Judd (1986) stress that consumers may face a liquidity constraint, so they prefer future taxes to be substituted for current taxes. Artis (1979) and Leiderman and Blejer (1988) argue that a higher discount rate may be applied to future tax liabilities (for example, as a result of a higher risk of default) compared to future interest payments so there is a gain in present wealth by using debt rather than taxes. In other words, since market imperfections create liquidity constraints, borrowing by the government is cheaper compared to household borrowing. Government surpluses and deficits may thus be used to reallocate consumption through time: a net positive effect of indebtedness would thus occur if the government is more efficient than the private sector in carrying out the loan process between generations or if the government acts like a monopolist in the production of the liquidity services associated with debt issue (see Daniel, 1993). Webb (1981) stresses, however, differences in the ability to repay debt between households and the government. A point somewhat related to capital market imperfections is that bequests cannot be negative, which would be required if it is expected that future generations would be richer (Modigliani, 1987). Yotsuzuka (1987) stresses the importance of the exact type of capital market imperfections. The general conclusion that capital market imperfections imply debt non-neutrality is rejected.

Buchanan and Wagner (1977) and Feldstein (1988) discuss the perfect certainty assumption of future tax liabilities. The complexity of the tax system would lead to an underestimation of future tax liabilities. Note that Barro (1974) argues that uncertainty would result in an overcompensation of future tax liabilities if, as could be advocated, households are risk averse (see also Chan, 1983, and Barsky, Mankiw and Zeldes, 1986). Boskin and Kotlikoff

(1985), Leiderman and Razin (1988), Bomberger (1990), Croushore (1990, 1992, 1996), Handa (1993) and Strawczynski (1995) study the impact of uncertainty in income and returns in an intergenerational altruistic model. Cukierman (1986) considers uncertain lifetimes.

The assumption made by Barro that taxes are lump sum has been frequently criticized. A modification does, however, not lead to straightforward effects since many alternatives exist (taxation of consumption, income, profit, and so on) (see Abel, 1986, and Basu, 1996). Note also that transaction costs associated with the issue of debt are neglected (Carmichael, 1982). A point that surfaced only infrequently in the recent discussion on the Ricardian equivalence, but was omnipresent in the discussion of the early 1960s is the source of the deficit. Does it matter that a deficit is the result of an increase in government investment instead of in transfer payments? Barro assumed government spending to be constant so the only issue was the financing one. Buchanan and Roback (1987) discuss the importance of the source of the deficit; Kormendi (1983) and Bohn (1992) of spending (see also Katsaitis, 1987, and Cebula and Hung, 1996b).

Liviatan (1982) criticizes the neglect of the inflation tax as a source of government revenue. Since additional government debt is frequently financed by money creation, this revenue could partly offset increases in interest charges linked to the issue of government debt. Government bonds will then no longer be neutral.

The list of empirical verifications of the Ricardian equivalence theorem by testing for the effect of the deficit and/or government debt, however defined, on consumption, saving or interest rates is long. Therefore, we are not able to provide any further guidance. Note that any article testing for the effect of the government debt or deficit on an economic or financial variable could be listed. This is especially the case for interest rate equations estimated before the publication of the 1974 article by Barro; we only list those articles that explicitly test for the Ricardo equivalence: (some of the papers are reprinted in Kaounides and Wood, vol. 3, 1992) Kochin (1974), Yawitz and Meyer (1976), Buiter and Tobin (1979), Tanner (1979), Holcombe, Jackson and Zardkoohi (1981), Dwyer (1982), Feldstein (1982), Plosser (1982), Seater (1982), Bennett and Dilorenzo (1983), Kormendi (1983), Koskela and Viren (1983), Makin (1983), Mascaro and Meltzer (1983), Blanchard (1984), Summers (1988), Aschauer (1985), Boskin and Kotlikoff (1985), Evans (1985), King and Plosser (1985), Kormendi (1985), Modigliani, Jappelli and Pagano (1985), Seater and Mariano (1985), Tanzi (1985), Barth, Iden and Russek (1986), Evans (1986), Hoelscher (1986), Kessler, Perelman and Pestieau (1986), Kormendi and Meguire (1986), Merrick and Saunders (1986), Modigliani and Sterling (1986), Barro (1987), Carroll and Summers (1987), Modigliani (1987), Evans (1987a, 1987b), Jones (1987), Modigliani and Japelli (1987), Motley (1987), Poterba and Summers (1987), Boskin (1988), De Haan and Zelhorst (1988), Evans (1988a, 1988b), Gruen (1988), Ihori (1988), Knight and Masson (1988),

Leiderman and Razin (1988), Morris (1988), Nicoletti (1988), Tanzi and Blejer (1988), Viren (1988), Walsh (1988), Boothe and Reid (1989), Buiter (1989), Croushore (1989), Darrat (1989), Evans (1989), Reid (1989), Kormendi and Meguire (1990), McMillin and Koray (1990), Cadsby and Murray (1991), Evans (1991), Gruen (1991), Lee (1991), Standish and Beelders (1991), Whelan (1991), Dalamagas (1992a and 1992b), Graham (1992), Gupta (1992), Kazmi (1992), Nicoletti (1992), Beck (1993), Dalamagas (1993), Evans (1993), Jaeger (1993), Perelman and Pestieau (1993), Akai (1994), Beck (1994), Evans and Hasan (1994), Dalamagas (1994), Mukhopadhyay (1994), Graham (1995), Himarios (1995), Rose and Hakes (1995), Slate (1995), Cebula and Hung (1996a), Chakraborty and Farah (1996), Ghatak and Ghatak (1996), Leachman (1996) and Wagner (1996). Note that no standard approach exists so results are not always comparable. For a discussion of the robustness of the results, see Cardia (1997).

Drawing conclusions from the empirical analysis is difficult. I am inclined to follow Seater (1993, p. 182) when he writes: 'I think it is reasonable to conclude that Ricardian equivalence is strongly supported by the data'. This should not be interpreted absolutely but as a statement that the Ricardian equivalence theorem is an acceptable working hypothesis.

The implication of the Ricardian equivalence theorem for the design of taxation policy (we refer to the chapter on optimal taxation for a more profound discussion) is that taxes should be kept as fixed as possible ('tax smoothing') to minimize the deadweight losses (Barro, 1979). This contradicts the countercyclical approach implied by the standard Keynesian models. In a tax smoothing framework the permanent tax rate should be set so as to finance the permanent primary government expenditures plus interest payments (see also Chari, Christiano and Kehoe, 1991, 1994). Government debt then functions as a cushion for deviations of government spending from its permanent level. We do not extend this analysis since it is part of the optimal taxation literature, covered in another survey.

The Ricardian equivalence theorem does not, by definition, consider any problems related to the financing of the government debt. From a microeconomic point of view an automatic channeling of additional savings into government bonds cannot be assumed. Portfolio holders and tax payers do have alternatives for government bonds but their participation is required to defer taxes to the future. So the constraint should be imposed that bondholders evaluate the policy pursued by the government as credible. If, for example, an increase in inflation is to be feared, no bond issue will be possible (eventually issues of very short run bills are still conceivable). In the more extreme case of a possible repudiation, the demand for government debt will vanish completely. The difference between macro- and microeconomic considerations reflects that taxpayers will not only attempt to minimize their tax share but also to maximize the return on their savings so as to benefit from the postponement of

taxes. This is nothing but another application of the saving paradox.

The credibility of fiscal policy depends on expectations by taxpayers about future policies. The determinants of credibility can therefore not be straightforwardly determined. However, some crucial factors are evident such as a combination of taxes and expenditures that respect the intertemporal budget or present value constraint, that is, the solvency condition of the government. This constraint implies that the discounted value of future primary surpluses equals the outstanding stock of government debt. Note that this does not guarantee that the rise in the debt-income ratio will be bounded. All that matters is that the real growth rate of the debt should be lower than the real rate of interest; the growth rate of income or the tax base is not directly involved (see Persson and Tabellini, 1990, and the collection of papers in Persson and Tabellini, 1994).

Although not identical to the Domar approach (Domar, 1944) (in its simple version a stabilization of the debt-income ratio requires that the real after tax interest rate be smaller than the real rate of growth) it is comparable. The Domar requirement was especially very popular in the early 1980s with international organizations such as the OECD and the European Commission, with government agencies and even governments since, given the high level of the interest rates, its policy implications were relatively straightforward: reduce the primary deficit to stabilize the debt-income ratio.

Articles on this subject are Chouraqui, Jones and Montador (1986), Hamilton and Flavin (1986), Bispham (1987), Spaventa (1987), Kremers (1988, 1989), Trehan and Walsh (1988, 1991), Wilcox (1989), Blanchard et al. (1990), MacDonald and Speight (1990), Corsetti (1991), Hakkio and Rush (1991), Haug (1991), Smith and Zin (1991), Buiters and Patel (1992), MacDonald (1992), Bagliani and Cherubini (1993), De Haan and Siermann (1993), Heinemann (1993), Frisch (1995) and Vanhoorebeek and Van Rompuy (1995).

Violations of the intertemporal budget constraint cannot be excluded, but what are the implications? Feldstein (1982) and Masson (1985) consider uncertainty about the required policy switch in case current policies are unsustainable and Leiderman and Blejer (1988) discuss the uncertainty as to how the spending-tax plan will be adjusted to satisfy the constraint. Bohn (1991) shows that in the United States over the past centuries 50-65 percent of deficits due to tax cuts and 65-70 percent of deficits due to spending cuts have been eliminated later by spending cuts; Kremers (1989) finds that the deficit policy of the 1980s is not consistent with the pattern of the previous decades. The extreme solution to violations of the intertemporal budget constraint is, of course, a default by the government on its debt. Chari and Kehoe (1993) present a general equilibrium model of optimal taxation were this is a policy option.

## 6. Taxation and Inflation

The literature on inflation is vast. We limit ourselves to two aspects that are especially relevant from a fiscal policy point of view. First, inflation as a tax. Inflation should indeed, as a process of price increases, be at least acknowledged, if not stimulated, by the government. The second question concerns the relationship between deficits and inflation.

Unexpected inflation redistributes wealth between debtors and creditors. Since frequently the government is the major debtor, the budgetary consequences of inflation cannot be neglected. Inflation is thus an alternative for traditional taxation. Furthermore, tax systems are most of the time not indexed so, in general, the direct impact of inflation is a more than proportional rise in tax revenues. This is also the case for the taxation of the inflation premium included in interest rates (Darby, 1975), Feldstein, 1976, and Feldstein and Summers, 1978; see also Tanzi, 1984). In this approach inflation is viewed as exogenous. In the optimal inflation literature, inflation is explicitly considered as a policy instrument to generate seignorage revenues for the government. Without considering the numerous country applications, we mention Bailey (1956), Friedman (1971), Tower (1971), Barro (1972), Marty (1973), Phelps (1973), Auernheimer (1974), Cathart (1974), Kahn and Knight (1982), Barro (1983), Calvo and Peel (1983), Cox (1983), Remolona (1983), Brock (1984), Mankiw (1987), Weil (1987), Marty and Chaloupka (1988), Brock (1989), Kigel (1989), Vegh (1989), Bohanon, McClure and Van Cott (1990), Bruno and Fischer (1990), Calvo and Leiderman (1992), Calvo and Guidotti (1993), Guidotti and Vegh (1993a, 1993b), Steindl (1993), Banaian, McClure and Willett (1994), Braun (1994a), Chang (1994), Marty (1994), Mourmoras and Tijerina (1994) and Vegh (1995).

The traditional assumption is that no alternative payment instruments to domestic money are available. Hercowitz and Sadka (1987) allow for currency substitution. As this limits the revenues from the inflation tax, governments will broaden financial regulations to minimize the domestic use of foreign currencies.

Taxation and inflation are also, although less directly, linked by the budget constraint of the government. Note that taxation will directly affect the price level but since, in general, changes in tax rates do not occur continuously, they will not explain inflation. It is therefore more the decision not to increase taxation by incurring budget deficits that could be important for the inflation process. In general two main channels can be distinguished that link the budget deficit to inflation. A first link results from a monetization of deficits; a second, less direct link, is the consequence of crowding out. Indeed, when higher government expenditures substitute for investment, potential production declines which, when the stock of money remains constant, implies a price increase. Note that this is not the case when the deficit results from a decline in taxes since, following the previous argument, the price level will decline.

Modigliani (1987), however, stresses reverse causation effects running from inflation to higher interest rates and so to deficits; furthermore, restrictive monetary policy to fight inflation lowers income which leads to increased deficits.

Concerning the monetization of the deficit, references mentioned above about the budget constraint are also relevant here. The link between budget deficits, whatever the origin, and inflation was forcefully formulated by Sargent and Wallace (1981) in their 'Some Unpleasant Monetarist Arithmetic': interest payments will, when the government debt exceeds some upper limit, have to be financed by money creation due to a shortage of savings. The 'unpleasant arithmetic' stresses thus that a bond-financed deficit will eventually have to be financed by money creation and therefore lead to a higher inflation rate. Darby (1984) (reply by Miller and Sargent, 1984) argues that the situation described by Sargent and Wallace is unlikely to occur since it requires that the real bond rate exceeds the real rate of growth for a considerable time (see also McCallum, 1984). King and Plosser (1985) discuss, test and reject (for the US as well as for several other developed countries) the link between seignorage revenues and different policy variables. Sargent and Wallace assume that monetary policy accommodates fiscal policy ('fiscal dominance'); Buiter (1987) and Buti (1990) consider different policy regimes (cooperation or leadership between monetary and fiscal authorities). Drazen and Helpman (1990) stress the importance of the policies expected to be used to reduce the deficit (see also Niskanen, 1978; Blinder, 1983; Miller, 1983, and Congdon, 1987).

## 7. The Positive Approach to Taxation

In democratic societies, tax rates are fixed by politicians and not by technicians who aim for an optimal taxation. The traditional approach holds that taxation or government expenditures are instruments that policymakers modify to realize goals such as a stabilization of the economy, a reallocation of resources or a modification in the distribution of income and wealth. This fine-tuning policy faces several problems and risks. For example, the government can misjudge both the size and timing of interventions, many conflicting objectives need to be pursued, the effects of instruments are not known with certainty, data contain errors, the theoretical structure of the model, the parameters, the value of exogenous variables, the nature of exogenous disturbances are not perfectly known, time lags are involved (recognition, decision, execution and response lag), frequent changes in policy instruments affects policy credibility, and so on. See, for example, Friedman (1960), Okun (1972), Kydland and Prescott (1977), Lucas (1980), Cooley, Leroy and Raymon (1984); and see also the recent literature on taxation as a source of business cycle fluctuations: Christiano and Eichenbaum (1992), Braun (1994b), McGrattan (1994) and

Johnsson and Klein (1996). The previous arguments (partly) explain the preference of several authors for policy rules. See the chapter on optimal taxation for more detail. In the public choice literature a different approach is taken. A typical formulation is Brennan and Buchanan (1980a) where a government is seen as a revenue-maximizing leviathan and taxes result out of a struggle between the government and citizens. Taxation is thus essentially viewed as an instrument to satisfy the wellbeing of the policymakers, not of the community and taxes are required to finance government expenditures. In this way taxes are more directly linked to government expenditures than in the 'traditional' approach. We refer to Downs (1957), Meltzer and Richard (1978), Anderson, Wallace and Warner (1986), Blackley (1986), Manage and Marlow (1986), Von Furstenberg, Green and Jeong (1986), Hibbs (1987), Ram (1988), Ahriakpor and Amirkhalkhali (1989), Mueller (1989), Blackley (1990), Holmes and Hutton (1990), Miller and Russek (1990), Cukierman and Meltzer (1991), Hoover and Sheffrin (1992) and Bella and Quinteri (1995). Consider also the collection of papers in Buchanan, Rowley and Tollison (1986). Several articles and books apply public choice arguments to a discussion of taxation or tax reform. It is impossible to survey and list them. A pronounced view is Rose and Karran (1987).

Citizens bear, however, also some responsibility: the aggregate demand for budgetary programs will be excessive since any taxpayer bases his demand on the asymmetry between his small share in the cost of the program he supports and the perceived benefits. Furthermore, they suffer from fiscal illusion (see Dollery and Worthington, 1996, for a recent survey of this literature) that is reinforced by debt finance. As a result, the perceived price of public goods is lower than the effective price resulting in a rise in the demand for these goods. On the other hand, there is little incentive to combat tax increases since the individual share is negligible. As a result the upward pressure on the supply of government programs is stronger than the incentive to hold down the budget so government expenditures tend to rise and be financed by tax increases.

The literature on the 'political business cycle' should also be mentioned here. It concerns the creation of favorable economic conditions at election time so as to increase the re-election chances of the incumbent politicians. Obviously taxation is an instrument that could be used to generate these cycles. We refer to Alesina and Roubini (1992), Borooah and Van der Ploeg (1983), Nordhaus (1989) and Schneider and Frey (1988) for a general review of this literature. Unfortunately not much research has been performed on the use of taxes to generate a political business cycle (see, however, Tufte, 1978; Edwards and Tabellini, 1991; Grilli, Masciandaro and Tabellini, 1991, and Alesina and Rosenthal, 1995).

Econometric tax functions, most of the time for separate taxes and, eventually, specified as reaction functions, have been estimated in many econometric models. More relevant here but much less numerous, are general

tax equations that contain political determinants. We refer, however, to Frey and Schneider (1978), Alt and Chrystal (1981), Pommerehne and Schneider (1983), Renaud and Van Winden (1987), Van Velthoven (1989) and Ohlsson and Vredin (1996).

## 8. Open Economies

The literature on fiscal policies is too vast to cover here in a few paragraphs so we limit ourselves to some general points (we refer to Chapter 6080 for international taxation). The point of departure for the analysis of the impact of taxation-fiscal policy in open economies is the Mundell-Fleming model (see Kenen, 1995, and Marston, 1995, for surveys). The magnitude and size of the multipliers depend on different parameters such as the effect on domestic interest rates (the assumption about the country size and capital mobility is relevant here) and the exchange rate regime. For example, a fiscal expansion in a 'large' country will raise world interest rates and appreciate the exchange rate; in a 'small' country a depreciation can be expected since the trade effects will tend to dominate. In the limiting case of perfect capital mobility, fiscal policy will not affect income: any tendency for interest rates to rise will be matched by a currency appreciation leaving total demand unchanged. In other words, exports are completely crowded out. Textbook references are relevant here.

Extensions by McKinnon (1973), Floyd (1980), Dixit (1985), Persson (1985) and Frenkel and Razin (1987) make use of an intertemporal approach covering aspects ranging from the impact of capital mobility and overlapping generations to different specific tax instruments. One general result is that deficits increase world interest rates and lower consumption but the effects depend on whether a country experiences a surplus or deficit. McKibbin and Sachs (1988) and Kole (1988) consider the importance of country size. In the traditional view financial crowding out will not occur in small open economies since, assuming fixed exchange rates, interest rates are given on the world market. Adjustments to imbalances between saving and investment occur through foreign borrowing by way of current account deficits. As a consequence, fiscal policies in all countries determine crowding out, also in countries with balanced budget. In a Ricardo world, this no longer holds.

The previous results must, however, be modified when non-traded goods are introduced. Some models focus more explicitly on the dynamics and on the budget constraint of the government. Work by Frenkel and Razin (1987) and Knight and Masson (1988) demonstrates that, if bonds are net wealth, fiscal expansions will appreciate the exchange rate so as to finance the government deficit. Buiters (1987) takes the impact of interest rates on investment into account so deficits increase interest rates and as a result lower future domestic



and foreign income. For a given level of government expenditures this constrains future taxes (see also Blanchard et al., 1990; Frisch, 1995).

An interesting collection of additional work on the international aspects of fiscal policy is Frenkel (1988). The survey by Dixit (1985), although limited to tax policy in open economies, should also be mentioned.

Concerning the Ricardian equivalence theorem in an open economy, (see Morris, 1988, for a discussion of the Barro-Ricardo equivalence in open economies) we recall earlier comments about the burden of external versus internal debt.

Note that a huge literature exists about the international coordination of fiscal policy and about fiscal policy in a monetary union. We also stress the important literature on the Maastricht convergence criteria for the European monetary union.

## 9. Conclusion

The macroeconomic aspects of taxation have evolved considerably over the past decades. This is linked to the changing ideas about the role of the government. In a nutshell the dominating current views hold that the government should focus on longer-term goals and be very critical about short-term intervention. Due to the difficulty in modifying tax instruments, this is especially true for taxation. This also holds for the process of shifting taxes through time by piling up debt. Such policies do, however, create uncertainty as to the type of taxes and time at which they will be collected. A modern view of the goals of government intervention will therefore be much less ambitious compared to thirty or forty years ago: the actions by the government should be as predictable as possible so as to reduce uncertainty and support the development of the private sector.

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