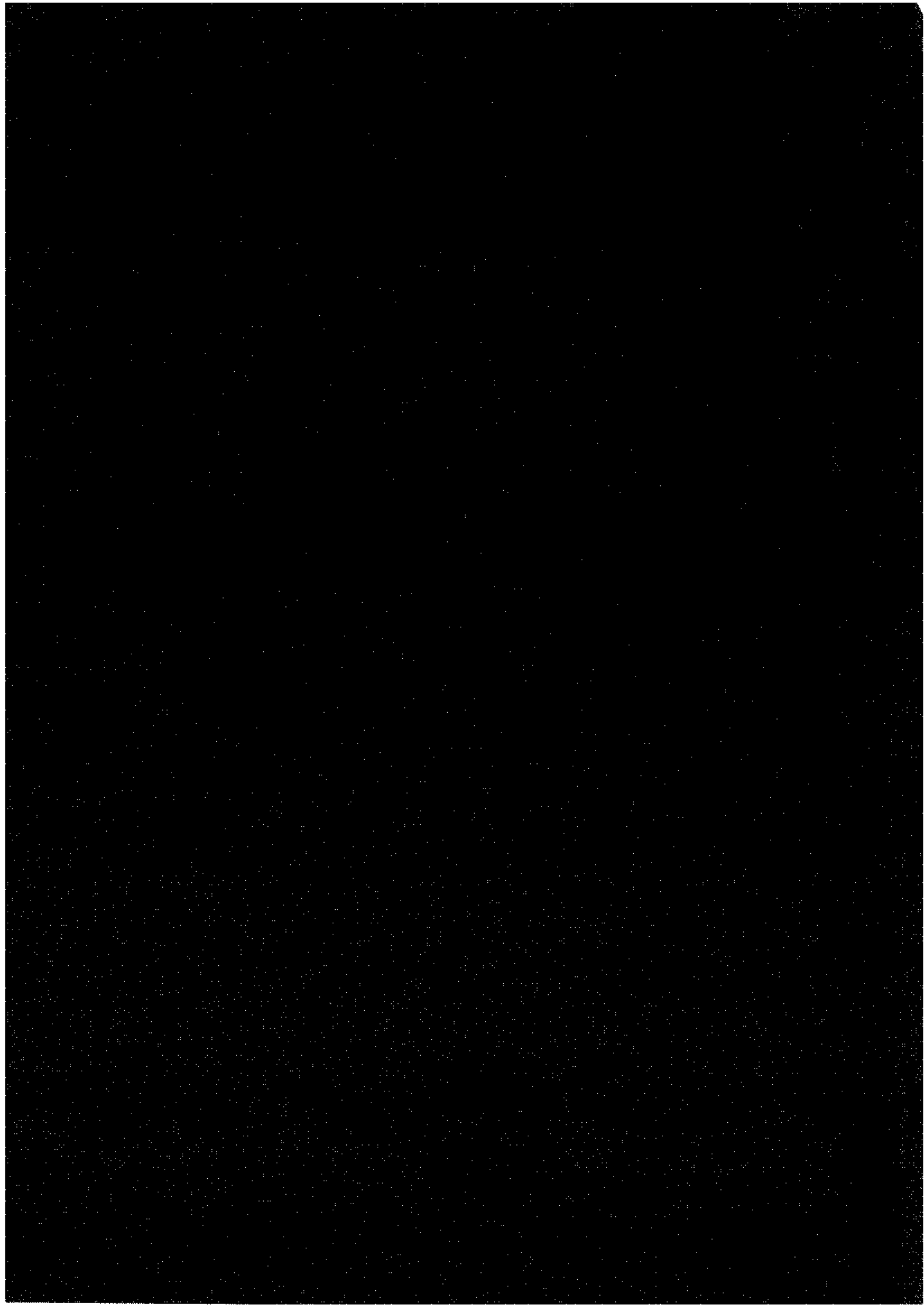


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CROWDING OUT AND THE GOVERNMENT BUDGET

1. Introduction

A long-standing problem in both economic theory and economic policy is whether, and if so to what extent, an increase in government expenditure can expand total expenditure or effective demand, and with it total employment, if the money supply is held constant and the additional expenditure is financed by capital market borrowings. The view that it cannot be trusted to do so was firmly held by the British Treasury in the 1920s and came to be known as 'the Treasury View' (cf Hancock 1970 p. 110). The theoretical underpinnings of this view were provided by R.G. Hawtrey, who argued that if the government borrows money to finance public works, that will in most cases be at the expense of private expenditure (Hawtrey 1925). Only if the velocity of circulation of money would go up, could effective demand for labour increase. This is of course unexceptionable, it simply follows from the equation of exchange, $MV = PT$. Where opinions differ is on the question whether the velocity of circulation can increase or not. In Hawtrey's view, it cannot, barring exceptional circumstances, sc., when the outlook for industry is extremely unfavourable: "The idle balances are not in general accumulated for want of attractive enough permanent investments; they are rather composed of unemployed circulating capital, often that of manufacturers who prefer not to be dependent on their bankers" (Hawtrey 1925 p. 43). Apparently, to Hawtrey's mind the demand for money is interest-inelastic. Only with abnormally poor profit expectations would there be any idle balances in the Keynesian sense (Hawtrey's 'idle balances' seem to be held from what Keynes called the precautionary motive). All this translates, given the money supply, into an LM-curve with a vertical section and a horizontal section, the latter hardly ever relevant.

The Treasury View implies that increased government expenditure fully crowds out private expenditure. In Keynesian analysis, complete crowding out is the exception rather than the rule. The Monetarists returned to the Treasury View. In fact, they had little choice but to do so if they wished to uphold their view that the price level is roughly proportional to the money supply. They rejected 'fine tuning', i.e., discretionary or activist macro-economic policies designed to stabilise the economy. This leaves little room for activist fiscal policies. They marshalled empirical evidence to support their view that national income, in particular private consumption, is highly correlated with the money supply (which means a stable income velocity of money) but not with autonomous spending, including the government budget deficit. Friedman and Meiselman (1963) found that the income velocity of money was more stable than the Keynesian autonomous expenditure multiplier or the investment multiplier. Andersen and Jordan (1968) regressed changes in GNP on changes in monetary and fiscal variables (the celebrated St. Louis-equation). These studies started an avalanche of empirical work. The results of the reduced-equation estimates of the Monetarists were inconclusive; they proved sensitive for the choice of independent variables, whilst doubts were expressed as to the exogeneity of these variables: results are biased if the policy variables (in this case changes in the money supply and the full-employment budget surplus) were actively used for stabilisation purposes (cf Kösters 1973, Monissen 1973, Arestis 1985 p. 177). Also, Friedman and Meiselman's finding that in the years of the Great Depression the investment multiplier was more stable than income velocity, could hardly be seen as damaging for

the Keynesian position. Simulations with large-scale models of the American economy generally showed positive short-term results of fiscal policy, which after one or a few years tended to disappear or even become negative when calculated in real terms, though the effects remained positive in nominal terms (cf Fromm and Klein 1973; Infante and Stein 1976, section 4). In this chapter we survey the various mechanisms that can contribute to partial or complete crowding out. It may be noted that the subject is of wider interest than only economic policy; it also bears on the interpretation of historical developments, e.g., the question whether the debt-financed war efforts of the British government during the Napoleonic Wars contributed to slow economic growth through leaving fewer funds available for private investment (Heim and Mirowski 1987).

The IS/LM-model which will be used to analyse crowding out is essentially a model for the short term. Government budget deficits, run up in the course of a fiscal expansion, result in ever-increasing volumes of government debt, though, which in itself may influence spending and national income. The impact of an increasing government debt may be studied in a somewhat intuitive way in the framework of the IS/LM-diagram, but also in a more formal way in an IS/LM-model supplemented by an equation showing the government budget constraint. This equation represents the fact that government expenditure, in so far as it is not financed by taxes, is financed either by creating new money or by increasing the bond supply. Such models will be covered in the last section. The short-term nature of the model should not blind us for longer-term results of fiscal policies. In so far as private investment is crowded out by public consumption, future growth will be impaired. Of course, if private consumption is crowded out by public investment, or private investment in a consumption-goods industry by badly-needed infra-structural investments, it's the other way round. No a priori verdict seems possible.

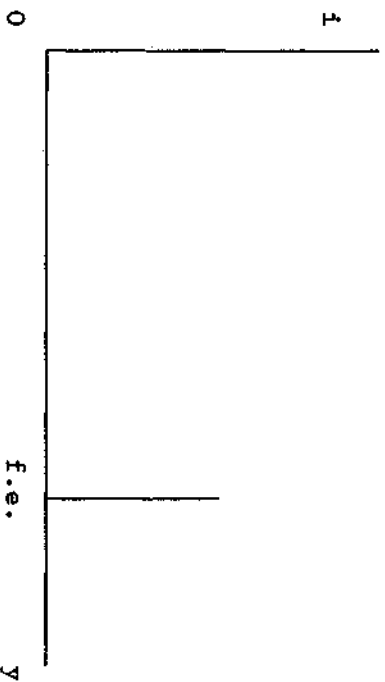
2. Crowding out

2.1 Real vs nominal crowding out

It stands to reason that at near-full employment, which is the normal situation in the Monetarist view, any sizeable expansion of real government expenditure can only occur at the expense of real private expenditure. In that case real crowding out occurs. In terms of the IS/LM-diagram, a positive fiscal impulse shifts the IS-curve to the right, beyond the point of full-employment. Prices will rise and, given the nominal money supply, real balances will fall. The LM-curve consequently shifts to the left. Wealth effects will drive the IS-curve to the left as well, firstly because of a real-balance effect caused by the higher price level and secondly because rising interest rates will decrease the value of financial assets held by the public, including shares, i.e., claims to physical assets. These wealth effects reduce private spending. A case could be made for the idea that bonds are both an asset and a debt to the public, so that a price fall of bonds leaves net wealth unimpaired. Even so, it may have an asymmetrical impact on the spending behaviour of debtors and creditors, in the sense that debtors may increase their spending by more or less than creditors decrease theirs. Equity shares, though, are unequivocally net wealth and a fall in this component of wealth will depress private spending.

In the above case there was real crowding out, but no full nominal crowding out: nominal national income increased. There was some nominal

crowding out to be sure, because of the rise in the rate of interest. Various mechanisms can be thought of that cause nominal crowding out. In a fixed-price setting real and nominal crowding out come to the same thing, of course. Those mechanisms will now be covered. Two groups may be discerned: (i) mechanisms that act via the rate of interest and (ii) mechanisms that do not act via the rate of interest. These latter mechanisms cause ex ante crowding out. Crowding can of course be full or partial.



explanation of symbols: i = rate of interest, y = real national income, f.e. = full-employment income.

Real crowding out without full nominal crowding out.

2.2 Crowding out through the rate of interest

In the IS-LM diagram, a fiscal impulse is represented by a rightward shift of the IS-curve. Full crowding out will occur if the LM-curve runs vertically. This means that both the money supply and money demand are interest-inelastic. The rate of interest rises to such an extent that private expenditure is reduced to the same amount as government expenditure is increased. With an upward-sloping LM-curve, crowding out will of course only be partial. Full crowding out will also occur if the IS-curve runs horizontally. Again, with a given money supply total expenditure cannot increase and any increase in government spending takes place at the cost of a decrease in private spending.

Other mechanisms may complicate matters. A debt-financed fiscal expansion may make people feel richer, if government debt is seen as net wealth by the public. Such an increase in wealth will on the one hand increase the demand for money, resulting in a leftward shift of the LM-curve (see for an empirical estimate Butkiewicz 1979). On the other hand, it will increase spending out of a given income, resulting in a rightward shift of the IS-curve. The rate of interest will increase (except of course if the economy is in the horizontal section of the LM-curve). The outcome for national income is uncertain (unless the economy is in the horizontal section of the LM-curve, in which case the shift of the IS-curve unequivocally increases income).

Finally, account should be taken of the ever-increasing volume of government debt held in the public's portfolios. The LM-curve depicts the equilibrium conditions in the Walrasian money market given the volume of debt. With a change in the volume of debt, the rate of interest that ensures portfolio balance at any given level of income, has to change. The public will only accept higher volumes of government debt, given their wealth and the volumes of other assets, if the return on

government debt increases. Put differently, the LM-curve shifts upward (Hahn 1980 p. 11, Visser 1980 p. 290). The resulting crowding out may be called portfolio crowding out.

It has been argued that for portfolio crowding out to occur bonds and real capital must be closer substitutes than bonds and money. If, conversely, bonds and money are close substitutes, an increase in the volume of bonds may, for reasons of portfolio composition, drive up the price of existing real capital (Butler 1985 p. 47, Tobin 1971 p. 225). An increase in the volume of one asset or group of assets disturbs portfolio balance and increases the demand for the other assets, driving up their prices. An increase in the price of existing capital (equity shares) means that Tobin's q-ratio rises (see above, Ch. 1). In other words, the required rate of return on capital falls. At any given bond rate of interest the desired capital stock will increase, and with it, in the short term, the volume of investment. The IS-curve will shift to the right. As seen in section 2.1 above, an interest-induced wealth effect may work in the same direction.

Empirical research conducted by Frankel (1985) suggests that the effects of portfolio composition on the structure of the rates of return are minor. His research does not preclude, however, an upward movement of all rates of return in tandem because of increased government budget deficits (Frankel 1985 p. 1063). One way of testing for crowding out is to look at interest rates, but that does not measure actual crowding out, i.e., the fall in private expenditure caused by higher interest rates and, possibly, wealth effects. Higher interest rates may affect private expenditure on consumer durables, but will mostly bear upon investment. One could try to capture the effects of debt-financed government spending on private investment directly, without the detour via interest rates, by including the change in the outstanding volume of government debt in the investment function. In this way Gebula (1978) found evidence of significant crowding out in Canada and the US, 1949-1976, even when accounting for the endogeneity of the budget deficit.

In an open economy, additional mechanisms are at work. In a fixed-rate system, the money supply cannot be supposed to be constant. A bond-financed fiscal expansion shifts the IS-curve to the right. Starting from equilibrium, the current account will run into a deficit and, assuming no capital flows, the money supply falls. The LM-curve shifts to the left and the rate of interest rises to cause complete crowding out. With interest-elastic capital flows, however, the rise in the rate of interest caused by the rightward shift of the IS-curve will induce capital imports (we neglect income-elasticity of capital movements). If international capital flows are comparatively interest-elastic, increased capital imports will overcompensate the deterioration of the current account consequent on the rise in national income. There will be a balance-of-payments surplus which makes the money supply increase (provided the capital flows are initiated by the non-bank private sector). In the case of infinitely elastic capital flows, capital imports and the money supply will increase to such an extent that the rate of interest stays at or returns to its original value, so that there is no crowding out whatsoever. Knoester (1980 pp. 152-'56) found for the Netherlands 1953-1975 that bond-financed fiscal impulses led to crowding out *via* balance-of-payments deficits. In later periods increased interestelasticity of international capital movements seems to have changed the picture, in the sense that crowding out is shown to be only partial (see for a roundup of Dutch studies Visser 1983 and for the results of more recent estimates using the models of The Nether-

Lands Bank and the Dutch Central Planning Bureau Den Butter 1988 and Central Planbureau 1987 respectively).

In a completely-flexible-rate system, international payments do not affect the money supply and the LM-curve is fixed (abstracting from changes in the price level that might result from exchange-rate movements and the resulting changes in import prices; price-level changes make the real money supply, given the nominal money supply change in the opposite direction and lead to shifts of the LM-curve in the interest rate-real income plane). Exchange-rate movements that follow in the wake of fiscal policy measures may, however, weaken or strengthen the effects of such measures. A fiscal expansion increases national income, ups the import bill and tends to create a deficit on the current account of the balance of payments. The rate of exchange (the price of foreign currency in terms of domestic currency) will rise (domestic currency will depreciate), which boosts exports and drives the IS-curve further to the right. In the process, the rate of interest increases. If capital flows are interest-elastic, net capital imports will increase. This drives the rate of exchange down and shifts the IS-curve to the left (supposing that the Marshall-Lerner condition is fulfilled). The more elastic capital flows are, the more the rate of exchange is pulled up. At the limit, when capital flows are infinitely elastic, the rate of interest cannot diverge from the world rate of interest. Any rightward shift of the IS-curve following on a fiscal impulse immediately induces capital imports that lower the rate of exchange to such an extent that the deterioration of the current account exactly balances the increase in government spending. The IS-curve returns to its original position, cutting the LM-curve at the given world rate of interest. Crowding out is complete.

In all this we have abstracted from expectations. Government policy measures may of course affect the expectations of the public. The public may get nervous about a growing volume of government debt, fearing future tax hikes and therefore cutting down on longer-term investments (this is a different mechanism than the full tax discounting discussed in section 2.3.2 below, where uncertainty is assumed away, government bonds are no net wealth. The IS-curve then shifts to the left. Conversely, firms may feel safe in the knowledge that government does its best to prevent a slump occurring and step up investment in new plants. The IS-curve shifts to the right.

2.3 Ex-ante crowding out

Crowding out may also occur without a preceding rise in the rate of interest. This is called ex-ante crowding out. Two approaches may be discerned: ultra-rationality and the Ricardian equivalence theorem. In both cases, a higher volume of government debt meets with a higher volume of private savings. The additional government bonds can be taken up in the public's portfolios without any need for the rate of interest to rise. It is tacitly assumed in these approaches that the increase in available private funds is fully directed to government bonds. That would change the composition of portfolios, though, which in itself might bear on interest rates. Such effects are neglected in the literature on these subjects.

2.3.1 Ultra-rationality

David and Scadding (1974) studied the savings ratio in the United States over a 70-year period. They were struck by the fact that gross private savings, including expenditure on consumer durables, were by and large constant over that period as a percentage of GNP, defined including the imputed annual gross rental flow on consumer durables. This constancy occurred despite changes in the distribution of private saving between personal saving and business saving and changes in the share of output absorbed by the public sector. They sought to explain these phenomena by the assumption of ultra-rationality. As to the composition of savings, this means that private persons adjust their saving to changes in business saving, not so strange if private persons see themselves as the owners of the business firms. This phenomenon is not at issue here. As to the size of the public sector, ultra-rationality implies that tax-financed government services, such as schooling or medical care, are full substitutes for individually bought services. Private agents lower their spending to the full amount of the tax increase and the private savings ratio as a fraction of GNP does not change. David and Scadding (1974 p. 241) presuppose that consumption expenditures by the government are financed by taxes, whilst government investment is financed by bonds. In addition, their brand of ultra-rationality is based on the belief that the private sector treats government deficits as public investment and consider public investment and private investment perfect substitutes. An increase in bond-financed public spending in their view therefore reduces private investment by a similar amount. This is what they call ex-ante crowding out (David and Scadding 1974 p. 243). Given the constant private savings ratio, it means that extra funds become available in exactly sufficient volume to absorb the new government bonds. The increased supply of bonds meets with an increased supply of funds and the rate of interest need not increase to draw funds away from other applications.

Apart from the question if the gross private savings rate is really a constant over time in all countries, it is, as Tobin (1980 p. 65) notes, completely gratuitous to conclude that an extra dollar of government deficit will displace a dollar of private investment. Without David and Scadding's rather far-fetched assumptions, a constant gross private savings ratio undermines the idea of ex-ante crowding out. If the private sector does not consider debt-financed government spending a perfect substitute for private investment, a battle for scarce investment funds may follow on an increase in such spending, driving the rate of interest up.

2.3.2 The Ricardian Equivalence Theorem

Finally, we have the Ricardian equivalence theorem, which might more appropriately be called the pre-Ricardian equivalence theorem (cf. O'Driscoll 1977, Feldstein 1982). The equivalence referred to is the equivalence between taxes and debt as sources of finance for government expenditures. Again, there is ex-ante crowding out. This results from full tax discounting: government debt is not seen as net wealth of the private sector, because private agents take account of the future burden of taxes that will be levied to pay interest and amortisation. When the public sector substitutes bond-financing for taxes, private agents will increase their savings out of their increased disposable income in order to provide for these future taxes and the higher volume of government debt is taken up by the public without any need for the rate of interest to rise. If the way of financing public spending does

not matter, we have a public-finance version of the Modigliani-Miller theorem of the irrelevance of the distribution of a firm's liabilities over debt and own funds.

Barro (1974) showed that a shift from tax-financed government expenditure to bond-financed expenditure will leave private spending unaffected under a number of conditions (see also Butler 1985 section 5 and Leiderman and Blejer 1988):

i) Firstly, the public must be able and willing to leave bequests to next generations and not let government finance affect decisions in this respect. Short-lived individuals would otherwise not discount future tax liabilities and increase spending after a shift from taxes to bond-financing by the government, in the process reducing their bequests. In other words, a sequence of generations must behave like an immortal individual. It may at first sight look somewhat far-fetched to assume a bequest motive with virtually the whole population. But bequests need not necessarily be made in the form of money or tangible wealth, they can also be made in the form of, e.g., investment in education. Moreover, they may be made in reverse order, from young to old, which removes an asymmetry from the system. All this boils down to an equal planning horizon of the public and private sectors. But does that always result in Ricardian equivalence? Probably not. If the public responds to higher expected future taxes not by increased savings, but by higher investments in their children's education (i.e., by increasing their offspring's income-generating capabilities rather than their tangible wealth), current spending increases (Feldstein 1982 p. 5).

(ii) Secondly, there must be perfect foresight. Without perfect foresight, an increase in future tax liabilities following a shift from tax-financing to debt-financing might increase uncertainty as to the incidence of future taxes. Risk-averse agents feel less wealthy as a result and reduce their consumptive expenditure (Dotsey 1985 p. 11). ((iii) Thirdly, taxes and transfer payments must be lump sum, or, more generally, non-distortional. If not, they affect behaviour. Taxes on income, e.g., may discourage income-generating efforts and reduce aggregate income below the level attained with bond-financed government expenditure. Apart from this, Tobin (1978 p. 619) notes that government obligations differ from future tax liabilities as to liquidity (see point (iv)), uncertainties (see point (i)) and distribution among citizens. This might well cause aggregate spending behaviour different from a situation of tax-financed government expenditure. It is not a priori clear in which direction spending would move.

(iv) Fourthly and finally, the rate of interest faced by the public must be the same as the rate faced by the government. In actual practice, the government's borrowing rate is usually lower than many a private borrower's rate, because of lower perceived risk and lower costs of acquiring information on credit-worthiness and of monitoring the borrower. A debt-financed tax cut, therefore, can be seen as the government borrowing on behalf of private agents, increasing liquidity of the private sector in the process. By a tax cut, private agents are allowed to increase consumption, as if the government granted them a loan to be repaid by future taxation (cf Chan 1983 pp. 369-'71, Dotsey 1985 p. 9, Webb 1981).

It may be noted that the equivalence theorem does not in itself imply that bond-financed government expenditure does not affect aggregate spending, only that its effects do not differ from those of tax-financed expenditures. A Haavelmo-effect is therefore not precluded. If, however, private spending on consumption is a function of wealth, the equivalence theorem does seem to imply complete crowding of private

expenditure by government expenditure. Not only is there debt-neutrality or no effect of changes in government debt on spending, but also fiscal impotence: fiscal policy is without any effect on consumer expenditures and the IS-curve in general. Taxes reduce private wealth and private consumption is reduced in step. So is consumption when bonds finance an increase in government expenditures: the government siphons off part of the public's income stream by selling bonds that are not net wealth. Keynesian deficit spending is both futile and innocuous in that case, as Tobin (1980 p. 52) notes. Private consumption is affected by government spending, but not the rate of interest nor, presumably, private investment.

Ricardo himself would not subscribe to the theorem that has been named after him. He argues, in Ch. 17 of the Principles, that if the government needs £ 2000 for some purpose, it should be a matter of indifference whether that amount of money be raised by taxes or by borrowings. The money is taken away from other allocations and, to paraphrase Ricardo, its opportunity cost is what really counts. Agents who are, in our parlance, 'rational', would be indifferent between paying £ 100 at once and paying £ 5 per year in taxes (as they would be doing if the government issued consols at 5 per cent). But Ricardo does not believe that agents are rational and therefore is not adherent of the equivalence theorem: an agent who would have to pay £ 100 at once would "save speedily the £ 100 from his income. By the system of loans, he is called upon to pay only the interest of this £ 100, or £ 5 per annum, and considers that he does enough by saving this £ 5 from his expenditure, and then deludes himself with the belief that he is as rich as before" (Ricardo 1965 p. 163).

2.3.3 Empirical tests of ex-ante crowding out

The Monetarist views on crowding out did not necessarily imply ex-ante crowding out, nor did the empirical evidence at the time point in that direction. In fact, empirical tests are not very encouraging for the idea of ex-ante crowding out (Feldstein 1982), though there is a certain plausibility to the notion that tax-financed education or medical care reduce private expenditure on these items by more or less the same amount. As an indirect test, it has been argued that the equivalence theorem would seem to imply that the public's consumption and savings behaviour is indifferent as to fully funded and unfunded pensions systems (Buchanan 1976 p. 341). In particular, a shift from a funded system to a pay-as-you-go system would not increase private spending, because the public would take account of future contributions. This corollary does not seem to be corroborated in actual practice either, though Barro (1976 p. 348) finds the empirical evidence against the view that future taxes or social security contributions are capitalised not convincing.

Direct tests of ex-ante crowding out focus on the consumption function, presumably because ex-ante crowding out leaves the rate of interest and therefore private investment unaffected. This may be correct for the case of full tax discounting, but not necessarily for the case of ultrarationality. Tests of ex-ante crowding out therefore are mostly tests of Ricardian equivalence. We give a quick roundup of some of the empirical research, in order to show the gist of the literature, without any pretence of comprehensiveness (see for a survey of 23 studies De Haan and Zelhorst 1988).

Of course the real market value of government debt does not affect expenditure on consumption if the public does not view government debt

as net wealth. Most research workers try to find additional evidence. They basically apply four further tests of Ricardian equivalence, sometimes in combination:

(1) Firstly, the government budget surplus is added to the consumption function. Tanner (1979) argues that the Barro hypothesis implies that a government budget surplus has a positive effect on private consumption demand. Presumably the public views such a surplus as a reduction in future tax liabilities. A surplus reduces saving just as a deficit increases saving, as we have seen. The equation which he estimated also contained, apart from disposable income and lagged disposable income, real corporate retained earnings, the rate of unemployment, the real stock of consumer durables and the net stock of fixed capital. Corporate retained earnings were assumed to lead to capital gains and therefore to higher wealth and more consumption. In a life-cycle approach, current income gives, in Tanner's view, an underestimate of total lifetime income if unemployment is high. Consumer durables were expected to exert a negative influence (part of total consumption is in the form of services of consumer durables which do not figure in national income) and the stock of capital, being net wealth, was expected to be positively correlated with consumption. For the 1947-74 period in the US Tanner found evidence of tax discounting, with government debt not being seen as net wealth by the public. In the same vein, Kochin (1974) argued that high government deficits should make consumers realise that their true permanent income is lower than is indicated by the level of their current and past disposable incomes, because deficits mean future taxes. Like Tanner, he found a significant negative influence of the government deficit on consumer expenditures on nondurables and services, in his case for the 1952-1971 period in the US. This approach, though, does not seem to discriminate between Ricardian equivalence and a life cycle approach, where people also take account of future taxes. The difference is only that their planning horizons are finite in a life cycle approach.

(11) Micoletti (1988) argues that Ricardian equivalence, or the Barro model, is obtained when in an equation explaining private consumption, the coefficients of disposable income and the government budget surplus are equal. He notes that there may be direct substitutability of private and public consumption. Put differently, it is difficult to separate ultra-rationality and full tax discounting. Indeed, if the government increases its bond-financed spending and the private sector reduces its consumptive expenditure this may be either because of full tax discounting or because of direct substitutability (this case was ruled out by David and Scadding, because only tax-financed government expenditure was consumptive). Micoletti found no support for the idea of ex-ante crowding out for the US, Japan, France and West-Germany over the 1961-1985 period, but he did for Belgium and Italy, precisely the countries with extremely high debt as a percentage of national income and explosive debt dynamics. The most likely explanation in his eyes is that economic agents anticipate a change in fiscal policy when both the government itself and the press question the sustainability of the fiscal stance. This prompts them to increase savings, as a precautionary measure. Ricardian equivalence then occurs only in extreme situations. Lal and Van Wijnbergen (1985) are struck by the fact that in 1983, OECD budget deficits absorbed nearly 52 per cent of gross savings, as against less than 1 per cent in 1970. Ex-ante crowding out would have been a remarkable phenomenon with such a change. They argue that, if private sector agents are completely indifferent between different ways of financing a budget deficit, income equals income minus government expenditure whereas if they are not, the relevant

measure is income minus tax revenues. The first definition is essentially identical with the approach where disposable income and the budget surplus figure separately and Ricardian equivalence is thought to prevail if the coefficients on both variables are similar. Regressions of consumption run on both variables should show which one is most relevant. They found crowding out, but not of the Ricardian variety, i.e., no full crowding out. They did not separately test for the influence of the volume of government debt.

(iii) De Haan and Zelhorst (1989) state that debt neutrality means that in a regression of consumption on disposable income (net national product minus taxes), private wealth including government debt, government debt and government expenditure, the coefficients on the first and the last variables should be equal but opposite.

(iv) The same would go for the coefficients on the second and third variables.

It stands to reason that if private wealth is defined as including government debt, an increase in the volume of government debt requires a negative coefficient of the same absolute value on the debt variable for Ricardian equivalence to hold. If government expenditure increases without any tax increase, Ricardian equivalence tells us that cumulative spending out of disposable income will decrease. De Haan and Zelhorst's measure would be correct, provided disposable income changes pound for pound or dollar for dollar with government expenditure. Otherwise there will be net changes in the sum of private consumption and government expenditure. Similarly, with taxes financing an increase in government spending, their conclusions are only valid if disposable income falls by exactly the same amount as government expenditure rises. In other words, Haavelmo effects are ruled out. Using data by Modigliani and Jappelli for Italy (1950-'82) and own data for the Netherlands, they found that changes in government expenditure were not neutralised by opposite changes in private consumption. Curiously, for Italy debt neutrality was rejected, unlike in Nicoletti's study, whilst total wealth and the government debt volume did show coefficients with opposite signs for the Netherlands (1957-'82), though not of equal magnitude.

Estimates by Feldstein (1982), using a permutation of the various approaches (relevant variables) for the US 1930-1977, failed to support Ricardian equivalence, with the exception of the test for social security. This was after Feldstein corrected for the endogeneity of taxes. An exogenous increase in consumer spending boosts incomes and tax receipts. A positive correlation between taxes and consumer spending is found in this way, which biases the coefficient of the tax variable in the consumption function towards zero. Ricardian equivalence would receive spurious support (Feldstein 1982 p. 12).

The question of ex-ante crowding out is of eminent practical interest. If there is Ricardian equivalence, high government budget deficits cannot be held responsible for high interest rates (the IS-curve would not shift to the right) and its concomitant effects on exchange rates. High US (real) interest rates and the rise of the dollar in 1981 should in that case be explained by restrictive monetary policies. Evans (1985) notes that there have been three periods in US history where the federal deficit exceeded 10 per cent of national income, and that interest rates showed no appreciable rise in those periods. Similarly, the value of the dollar expressed in a number of other important currencies tended over the periode 1948II - 1984III to move inversely with the federal budget deficit (Evans 1986). It should be noted that this in itself is no conclusive indirect evidence of Ricardian equivalence. A budget deficit without ex ante crowding out increases income and im-

ports. If the current account dominates the capital account of the balance of payments, this should contribute to a depreciation, even if the budget deficit pushed the rate of interest up. Moreover, Evans found that interest rates fell with a fall in taxes, keeping federal spending constant, at first sight inconsistent with ex-ante crowding out. This he ascribes to higher real after-tax returns on investments that increased savings. Fischer (1988 p. 328) sees the US fiscal experiment in the early 1980s as a clear refutation of ex-ante crowding out: real interest rates rose and private saving did not increase. Apparently there is room for disagreement, but one condition for Ricardian equivalence to hold, namely no distortions caused by taxes, is unlikely to be fulfilled. Higher government expenditure, whether financed by present taxation or future taxation, is almost certain to lead to higher marginal tax rates (unless national income growth catches up with higher taxes), with probably deleterious effects on economic activity. All in all, even if full ex-ante crowding may have been refuted, it is surely remarkable that no systematic influence of government budget deficits on the rate of interest seems to have been found (cf also Darrat 1989 on the US 1946-1986).

3 The government budget deficit

IS/LM models can be augmented with an equation for the government budget deficit. Such augmented models can be used to study the behaviour of the system when the government budget is not in equilibrium and either the money supply or the volume or government bonds is changing (cf. Blinder and Solow 1974). Wealth effects and interest rate effects move the system to a new equilibrium, if such an equilibrium exists, which may not be the case (Infante and Stein 1976, Buitier 1985). In these models (long-term) debt and capital are perfect substitutes in the public's portfolios, so that an increase in the volume of government debt raises the required rate of return on capital.

The basic model is as follows:

$$Y = C[Y + G - T(Y + B), Ms + B/i] + I(Y, i) + G \quad (1)$$

$$Ms = Md(Y, i, Ms + B/i) \quad (2)$$

$$DB/i + DMs = G + B - T(Y + B) \quad (3)$$

where Y = national income (added value) excluding interest on government debt, C = consumption, G = government expenditure excluding interest payments, T = taxes, B = number of government bonds, consols which each pay one unit of money per period on interest (B therefore equals the amount of interest payments per period), Ms = money supply, i = rate of interest, I = private investment, Md = money demand, D = the operator d/dt .

Eq. (1) represents the IS-curve. It is to be noted that interest payments on government bonds figure separately. There is a wealth effect in consumption, wealth consisting of the money supply Ms and the market value of bonds, B/i . Eq. (2), representing the LM-curve, also contains a wealth effect. Note that government bonds are net wealth, there is no debt neutrality in this model. Eq. (3) gives the government budget constraint, showing that a budget deficit (the right-hand side of the equation) implies either debt financing or money creation or both. It is possible to include the stock of capital in both the wealth variable

and the investment function, but that does not contribute to the transparency of the model (cf Blinder and Solow 1973). This kind of analysis can also be extended to open or growing economies (see for an open economy Branson 1976 and for an economy that is both growing and has targets for the current account of the balance of payments Van Ewijk 1986).

This model allows of crowding out through wealth effects, shifts of the IS-curve along a sloping LM-curve and portfolio-balance effects through a rise in the rate of interest because of an increasing supply of bonds. Inclusion of the government budget constraint means that the point of intersection of the LM- and IS-curves represents only a temporary equilibrium if there is a surplus or deficit on the government budget. Changes in the money supply or the bond supply will then lead to further shifts of the IS- and LM-curves. Full equilibrium obtains when

$$G + B = T \quad (4)$$

or, after total differentiation, when

$$dG + dB = T_Y dY + T_Y dB$$

i.e., after rearranging,

$$dY/dG = [1 + (1 - T_Y)dB/dG]/T_Y \quad (5)$$

(we assume that tax rates on interest income are identical to tax rates on other income).

If government expenditure rises and the increase is financed by the creation of money (i.e., by selling Treasury notes to the Central Bank, so that interest payments flow back to the government), eq. (5) reduces to

$$dY/dG = 1/T_Y \quad (6)$$

If $dB/dG > 0$, this means that the long-term multiplier of government expenditure is greater under bond financing than under money financing, provided a new equilibrium is indeed attained. This differs from the short-term effect. In the short term bond-financed expenditure will shift the LM-curve upward (given the money supply, equilibrium on the money market will at any rate of interest only obtain at a higher rate of interest if the bond supply increases; this is the portfolio balance effect). On outstanding bonds, however, interest has to be paid. The government sees itself forced to issue new bonds in order to pay interest. Total wealth therefore increases further, and against an upward shift of the LM-curve the IS-curve shifts to the right. Generally wealth effects on consumption may be assumed to be stronger than wealth effects on money demand, as economic agents will prefer to invest any increase in wealth in assets that give a higher return. It is not impossible for dB/dG to have a negative value. This may happen if the short-term effects of dG are very strong. With a high propensity to consume and strong reactions of investment to changes in national income, national income may grow fast enough for the increase in tax receipts to surpass the increase in government expenditure. For the money supply to be held constant, government debt has to be bought back rather than sold. A curious implication is that open-market operations have a contractive rather than an expansive effect in that case:

the fall in the number of bonds outstanding reduces interest payments, leads to budget surpluses which are used for further buy-backs, private wealth is reduced in the process and the resulting contraction by far outweighs the effects of the increased money supply (Mayer 1984 p. 374).

It should be realised that the outcomes of the above analysis hinge on the supposition that non-interest government expenditure is unaffected by the amount of interest payments and that tax rates are held constant. Furthermore, the results presuppose stable situations, but it is not impossible for the model to explode after a shock, i.e., debt may continue to grow. Gale (1983 p. 160) notes that a strong effect of bond-financed fiscal expansion requires an increase in the capital stock at the same time as an increase in government expenditure. This means that any crowding out of private investment through higher interest rates must be overcompensated by income-induced investments (the accelerator). Of course, it should always be borne in mind that this model is a Keynesian fix-price model, which limits its applicability for long-term analysis. A diagrammatical analysis by Mayer (1984) with flexible prices threw up the same results as the fixprice algebraic model, though. Also, it is a defect that full equilibrium is not made contingent on zero net investment (Arestis 1985 p. 111; see for simulations with a model with flexible prices, equity shares, the stock of capital and explicit expectations Nguyen and Turnovsky 1983 and for a growth model, that of course admits of net investment in equilibrium, Van Ewijk 1986).

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