Does fiscal stimulus work?[1]

Edouard Challe[2]

Prisme N°11
November 2007

[1] The ideas presented here are the results of recent research carried out with Xavier Ragot. I would also like to thank Robert Boyer for his comments on the text and Richard Crabtree for the English translation.

[2] Edouard Challe is a researcher at the Centre National de la Recherche Scientifique (CNRS). He taught economics at the University of Cambridge from 2003 to 2005.

Summary

This article examines the way in which fiscal policy impulses (variations in government spending and tax cuts) affect aggregate variables such as GDP, consumption, investment and employment. Economic theory distinguishes three potential channels of transmission for these impulses, according to whether they affect the equilibrium through their *wealth effects*, their *aggregate demand effects*, or their *liquidity effects*. We therefore intend to evaluate the extent to which these theoretical channels are consistent with the empirically observed impacts of fiscal stimulus. Although economists have traditionally focused their attention on wealth effects and aggregate demand effects, traditionally associated with the "classical" and "Keynesian" paradigms, recent works on the subject show that liquidity effects also play an important role. Finally, in the presence of aggregate demand effects and liquidity effects, fiscal stimulus is all the more effective over the short term when it is financed by government debt issue. The gains achieved through debt-financed stimulus can, however, conflict with the social costs resulting from high levels of long-term public debt, and this raises a specific problem concerning the dynamic consistency of fiscal policy.

Introduction

In Europe at least, and certainly in France, fiscal policy is now considered the poor relation of economic stabilization policy. There are several powerful reasons for this. First, the fiscal policies of the "Euro-zone" countries are highly constrained by the Stability and Growth Pact (SGP), as they were previously by the Maastricht criteria, imposed to ensure the structural convergence between national economies, which was required for the introduction of the single currency. For a country like France, whose budget surplus has been structurally negative for the last 30 years and has frequently flirted with or even exceeded the treaty limit of 3 per cent of GDP, the SGP makes it impossible to implement any large-scale fiscal expansion, to increase government spending without raising taxes or to cut taxes without a corresponding reduction in spending, thus limiting the desired effects of such measures. This institutional constraint is compounded by the fact that both the general public and the academic world are almost totally fixated on monetary policy, an obsession nurtured by the recent creation of the European Central Bank and partly justified by the considerable influence of interest rates on the level of activity throughout the Euro zone.

The relative inertia of French fiscal policy stands in striking contrast to the perception and pursuit of fiscal policy in the United States, where the budget deficit fluctuates widely in accordance with the political orientations of successive governments (take, for example, the Clinton administration's concern to cut government spending during the economic boom of the 1990s, so as to reduce the national debt, followed by the repeated tax cuts voted by the Republicans since the year 2000). This "activist" approach to fiscal policy has of late been joined by a change in perception in the academic world, demonstrated by a marked revival in empirical studies of the macroeconomic effects of fiscal shocks, and by the proliferation of theoretical models of different persuasions, all seeking to explain the empirically observed effects. It is therefore worthwhile to explore these recent developments to see what conclusions we can draw from them and, in passing, to measure the progress that has been made since the first formal models based on Keynesian intuitions (notably in the form of the static "IS/LM" model).

We start by evoking a certain number of stylized facts about the evolution of the budget surplus and public debt in France and the United States over the last 50 years, and their relation to economic activity. These facts suggest that fiscal policy cannot be reduced simply to the "passive" functioning of the automatic stabilizers; it has also been discretionary, especially in the United States. We shall therefore discuss the empirical methodologies that can be used to identify discretionary fiscal changes and to measure their effects on economic activity. We will then turn to economic theory to assess the extent to which the theoretical channels of transmission of fiscal shocks are consistent with their estimated empirical impact. Broadly speaking, the theoretical models distinguish between three general types of effect generated by fiscal expansion. The "classical" approach focuses on the *wealth effects* linked to variations in present or future taxation (or both); the "Keynesian" approach underlines the importance of the *aggregate demand effects* of fiscal shocks, insofar as these effects increase output by stimulating public or private demand; lastly, what we shall refer to as the "non-Ricardian" approach sets out to describe the *liquidity effects* at work in economies where credit and insurance markets function imperfectly. Although economists have traditionally focused their attention on wealth and aggregate demand effects, we seek to show, on the basis of recent research, that liquidity effects are equally important. Finally, the analysis of liquidity and aggregate demand effects reveals the fact that fiscal stimulus measures are all the more effective over the short term when they are financed by government debt issue (rather than taxation). We conclude by observing that the advantage to be gained from debt-financed fiscal stimulus can conflict with the social costs associated with excessive long-term public debt, which raises a specific problem of the dynamic consistency of fiscal policy.

Growth, budget deficit and public debt: an overview

One way to summarize the more or less expansionary nature of a country's current fiscal policy is to calculate its budget surplus; a deficit reveals either high government spending in relation to the underlying volume of tax revenue, or tax revenue that is temporarily weak in relation to average government spending, or both. The two graphs on the left of Figure 1 show the comparative evolution of French and

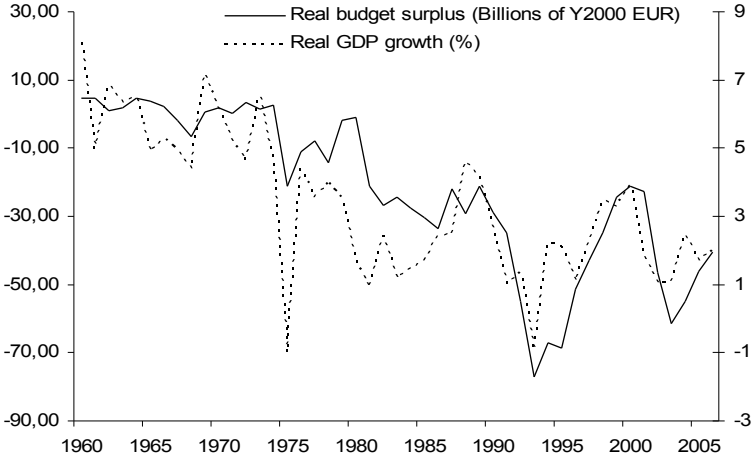
US budget surpluses and growth rates since the beginning of the 1960s. It is easy to identify long-term trends and important inflections in public accounts on either side of the Atlantic over the period in question. In France, the budget surplus is negative over the whole period, with four major dives associated with serious downturns in activity, in 1974, 1980–81, 1993 and 2003. Overall, the budget surplus appears to be strongly correlated with economic growth. This simple observation is confirmed by the top right-hand graph in Figure 1, where each point represents one particular year, with the budget surplus for that year along the x-axis and GDP growth for the same year along the y-axis; the points are close to the regression line (the dotted line), which indicates that the correlation is significant. The situation appears to be fairly different in the United States, where the positive correlation between budget surplus and growth is less pronounced, as can be seen in the historical evolution of the two variables (bottom left-hand graph) and the cloud of points summarizing their joint evolution (the points in the bottom right-hand graph are relatively distant from the linear trend).

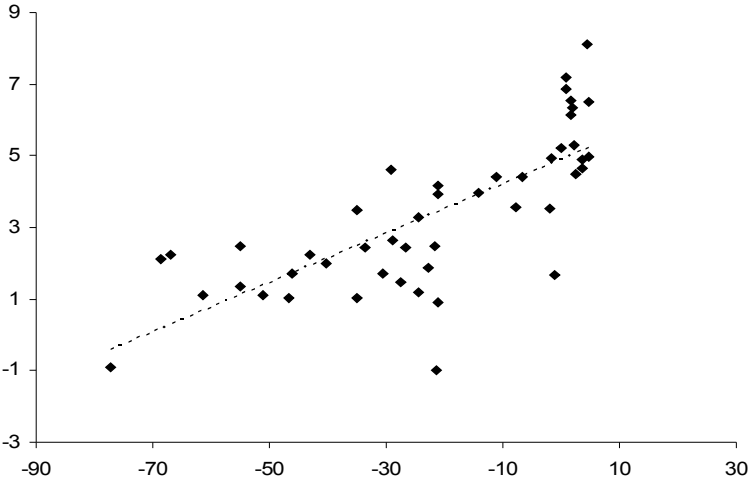
The correlation between real GDP growth and the budget surplus, obvious in France, but also visible, although weaker, in the United States, is hardly surprising: it reflects the natural functioning of the "automatic stabilizers", through which a fall in economic activity reduces the taxes levied on the different components of agents' incomes and deepens the budget deficit, which contributes to limiting the recession.[3] The fact that this correlation is far from perfect, however, indicates that fiscal activity cannot be reduced to the automatic stabilizers. Indeed, it can be read as a sign that fiscal policy has regularly been used as an exogenous discretionary tool during the period in question.

[3] The notion of "automatic stabilizers" encompasses all non-discretionary mechanisms of the variations in tax and social security contributions, which help to cushion the reduction in households' disposable income following a slowdown in GDP growth (or, symmetrically, to limit the increase in households' disposable income during a transitory period of strong growth). Income tax obviously has that property as it is progressive, and thus procyclical. The same is true for unemployment insurance, since during a recession the unemployment benefits paid out increase while contributions paid in decrease.

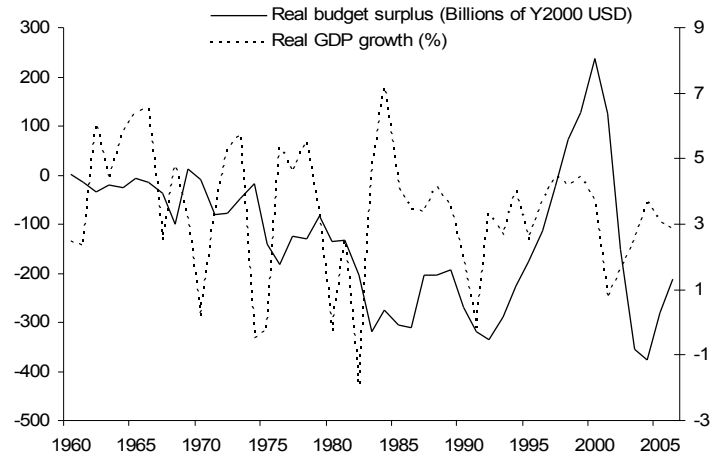
Figure 1. Budget surplus and growth in France and the United States

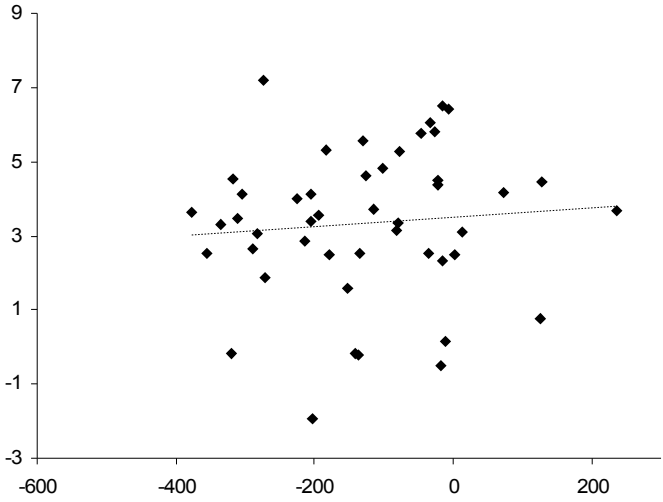
A. France





B. United States





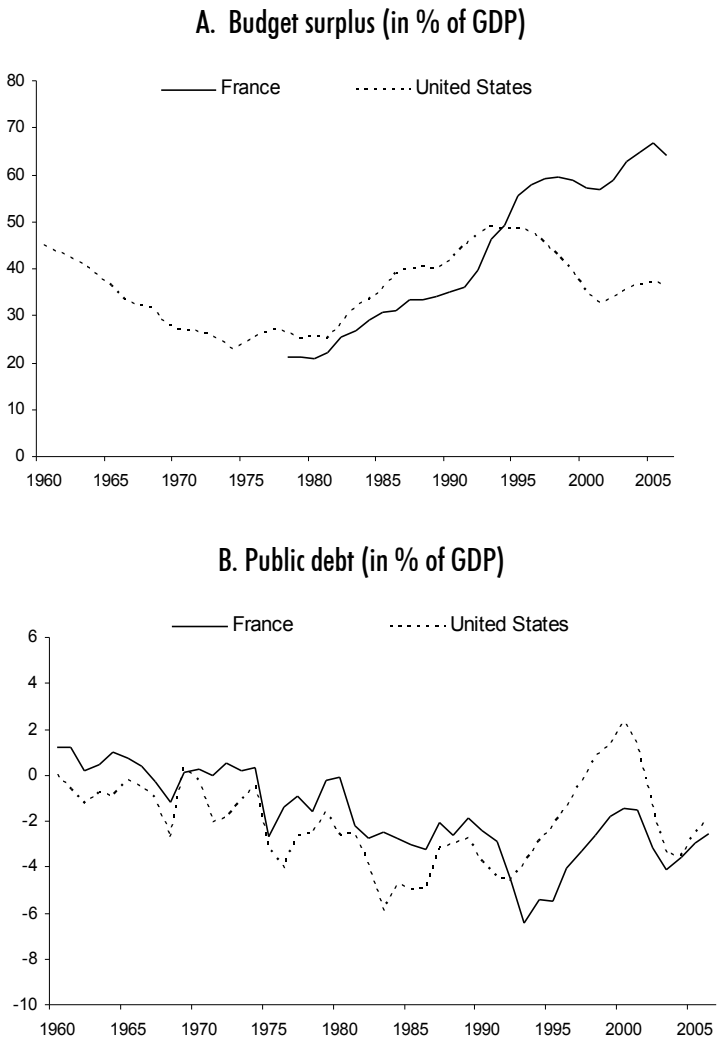
Source: Calculations on the INSEE database for France and data from the Bureau of Economic Analysis and the White House Office of Management and Budget for the United States. In each case, the GDP deflator is used to convert nominal series to real series.

Expansionary fiscal shocks, when they stimulate activity, typically induce *negative* correlation, not positive, between the budget surplus and GDP growth. This is obviously the case for tax cuts, which aggravate the budget deficit, at least over the short term. Likewise, a rise in government spending that is effective from a macroeconomic point of view, but which is not wholly financed over the short term by a corresponding increase in taxes, will boost output and at the same time reduce the budget surplus. Lastly, expansionary discretionary shocks, like all economic policy shocks, have delayed effects, weakening the strong contemporaneous correlation between growth and budget surplus induced by the automatic stabilizers. We can therefore interpret the relative loss in correlation between growth in activity and budget surplus as an indicator of the more or less discretionary nature of fiscal policy, in contrast to the systematic reaction induced by the automatic stabilizers.[4] This general argument, applied to the data underlying Figure 1, suggests that both France and the United States experienced discretionary fiscal shocks during the period under consideration, but that these shocks were more frequent, and probably larger, in the United States than in France.

Lastly, the activism of US fiscal policy compared to French policy is also reflected in the budget surplus variations over this period and their repercussions on the public debt stock. To illustrate this point, Figure 2 compares the budget surplus/GDP and public debt/GDP ratios for the two countries, where French public debt is measured according to Maastricht criteria (the series is available from 1978 on), and US public debt is gross and consolidated to ensure comparability between the two series. Although US debt was no lower than French debt between 1978 and 1994, the US economy distinguished itself by its capacity to sharply reduce the public debt in an "activist" manner (that is, over and above the action of the automatic stabilizers, through a counter-cyclical reduction in government spending) during the strong growth period of the 1990s. In comparison, the reduction in the public debt/GDP ratio during the years of sustained growth in France (1998–2001) was more limited, for it was based essentially on the automatic stabilizers (beyond the mechanical fall in the surplus/GDP ratio entailed by GDP growth).

[4] This is the reasoning that underlies the calculation of the cyclically-adjusted budget surplus: the discretionary component of fiscal policy is separated out by removing the variations that are endogenously and systematically linked to variations in GDP. The difficulty then lies in estimating the elasticities representing the systematic response of public spending and revenue to these variations (see Girouard and André, 2005).

Figure 2. Budget surplus and public debt in France and the United States



Source: INSEE (France), BEA (United States) and Office of Management and Budget (United States). In both countries, the measurement of public debt is gross and consolidated, i.e. the assets of public administrations are not deducted but debts owed between different administrations are. In the United States, this corresponds to the "gross federal debt held by the public".

Identification of fiscal shocks and empirical evaluation of their dynamic effects

It may be possible to detect the existence of an active discretionary fiscal policy by a "quick glance", but such a method is obviously inadequate to the task of actually identifying the fiscal shocks (that is, giving them a precise date and size). Yet this identification is the necessary prerequisite to a quantitative evaluation of their effects on the macroeconomic variables. Faced with this difficulty, econometric studies have followed one of two general methods. The first approach, originally applied to US data by Blanchard and Perotti (2002), and then used on French data by Biau and Girard (2005), consists in recovering the underlying discretionary shocks directly using time series. This technique of identification, described as "structural", involves isolating the effect of the automatic stabilizers to begin with, and then assuming the (realistic) hypothesis that the shocks on taxes (the variations in tax revenue *excluding* the automatic stabilizers) take three months to respond to unexpected variations in GDP (the time required for the authorities to decide on and implement a particular fiscal measure). This method makes it possible to isolate, for each period, the purely exogenous component of the two instruments of fiscal stimulus (spending and taxes), and then to evaluate their effects on the macroeconomic aggregates over different horizons. In particular, these studies conclude that an increase in government spending has an expansionary effect on GDP, employment, private consumption and wages. The effect on private investment is more ambiguous, depending notably on the horizon considered, the time series used and the specific technique of identification applied to the data.[5] The structural study of tax shocks is less well-developed than the study of spending shocks, but the works available suggest that discretionary tax cuts stimulate activity, at least over the short term. We shall return to these empirical effects later, when we discuss the channels of transmission of shocks and the consistency between the observed effects and the channels proposed by the theoretical models. The impact of a government spending shock according to the structural approach is summarized in Table 2, a little later on.

[5] For the United States, see Blanchard and Perotti, 2002; Fatas and Mihov, 2003; and Gali, Lopez-Salido and Valles, 2007. For France, see Biau and Girard, 2005.

The second method of isolating fiscal shocks, known as the "narrative" approach, consists in the qualitative identification, in the economic history of a country, of changes in economic policy such as tax reforms or programmes involving variations in spending, and then, when possible, to put figures to these changes. Broadly speaking, the narrative approach uncovers fewer dates of shocks than the structural approach (which, by construction, creates one fiscal shock and one spending shock for each period, usually a quarter), but it also brings out more important shocks than those deduced by the structural approach. Thus, for the United States, Ramey and Shapiro (1998) adopt a very conservative approach by identifying unexpected changes in government spending with phases of acceleration in defence spending, essentially linked to the outbreak of wars. Again for the United States, Romer and Romer (2007) follow a similar approach by comparing fiscal shocks (and certain spending shocks) with the dates of tax reforms, and then supplying an estimation of the cumulative monetary cost for each reform.[6] Table 1 illustrates the narrative method by summarizing the main recent fiscal shocks identified by the authors (to our knowledge, no comparable work is yet available for French fiscal policy).

Table 1. Some fiscal shocks in the United States according to the narrative approach

Government spending			Taxes		
Year	Sign	Motivation	Year	Sign	Motivation
2001	+	11 September	2003	-	Stimulation of growth
			2002	-	Stimulation of activity
1997	-	Reduction in deficit	2001	-	Election promise
			1991-93	+	Reduction in deficit
1982	-	Reduction in deficit	1987	+	Reduction in deficit
1980	+	Rearmament	1983	+	Social security reform
1965	+	Vietnam War	1981	-	Election promise

Source: Ramey (2007) and Romer and Romer (2007).

[6] Romer and Romer's approach is more flexible than that of Ramey and Shapiro, and therefore generates more shock dates, insofar as they incorporate all tax reforms, rather than focusing only on unexpected shocks.

Once the shocks have been identified by the narrative method, it is possible to evaluate their effects by treating them as exogenous indicator variables in a univariate dynamic model (see Ramey and Shapiro, 1998, for government spending shocks, and Romer and Romer, 2007, for fiscal shocks) or in a multivariate dynamic model (see for example, Burnside *et al.*, 2004, and Ramey, 2007, for analyses of the effects of government spending), and then to simulate the reaction of macroeconomic variables to the occurrence of one of these shocks. The results obtained are informative. Some of them confirm the effects predicted by the structural identification described above; for example, Romer and Romer (2007) find that a discretionary increase in taxes substantially reduces economic activity over the short term. Similarly, Burnside *et al.* (2004) and Ramey (2007) show that an increase in government spending stimulates activity and employment. The narrative identification method, however, gives radically different results from those of the structural identification of shocks for two essential variables: *private consumption* and *real wages*. It predicts a *negative* reaction of these variables to a spending shock, where the structural approach infers an expansionary effect.

Although this empirical divergence may, at first sight, appear to be fairly unimportant, it is in fact of considerable significance. First, a negative reaction in private consumption would mean that this latter is, at least partly, crowded out by the rise in government consumption; the stimulus then proves to be costly to households (reducing their consumption), and at the same time inefficient from a macroeconomic point of view (because it has little effect on output). Likewise, a negative reaction of wages to a spending stimulus would offset the social gains of such a measure and could compromise its feasibility.

These empirical disagreements also have important theoretical implications, for the main models of macroeconomic fluctuations available to economists make very contradictory predictions about the reaction of consumption and wages to a government spending shock. The way they actually react therefore has a much wider impact on economists' perception of the "correct" model of cyclical fluctuations. Before entering into the detail of the main channels of transmission of fiscal shocks proposed by these models, let us briefly illustrate this last point with the example of the reaction of real wages. If real wages increase in response to a spending shock, this means that it is the *demand for labour* from firms that has shifted (or at least, shifted more than the

supply of labour), which would give credit to a "Keynesian" view of fluctuations; conversely, a fall in wages is only compatible with a marked reaction from *the supply of labour*, and this would be more in keeping with a "classical" conception, according to which the agents choose to work more to pay for the future tax increases made necessary by this fiscal expansion (note that the two theories both predict a *rise in equilibrium employment*, which is, indeed, recorded by all the empirical studies). The empirical effect of a spending shock on wages therefore has the value of a "crucial experiment" that will validate one or the other of these theories. As we shall see, the same is true for the reaction of private consumption.

How do fiscal shocks affect economic activity? The "classical" approach and the "Keynesian" approach

Among the many potential consequences of fiscal shocks on agents' decisions and on the equilibrium, the most immediate effect is probably that of changes in the volume of tax paid by households. For example, as a tax cut affects their disposable income, they can be expected immediately to modify their savings and consumption plans. Likewise, an expansionary government spending shock must be financed either by an immediate rise in taxes (if the government wishes to keep a balanced budget) or by public borrowing, and therefore a rise in *future* taxes. How does this alteration in the intertemporal tax structure modify the optimum choices of agents? When faced with an *a priori* relatively complex question like this, economists generally start by trying to solve it with a simple, stripped-down model, which they then complexify to make it more realistic. In the present case, the simplest model that can answer the question raised, of the *optimum* reaction of households to a change in the *intertemporal* tax structure, turns out to be the elementary "classical" model.

The central element in the classical model is the assumption that households behave in a "Ricardian" manner, meaning that they make their current consumption and savings choices on the basis, not of their current income, which is naturally fluctuating, but of their total wealth, that is, the discounted value of the whole of their present and future income; they "smooth" their consumption over time. This important characteristic stems from several simplifying hypotheses (later, we shall see how the

relaxing of these hypotheses changes the results obtained): prices and wages are assumed to be *perfectly flexible* (so there is no nominal or real rigidity), taxes are *lump sum* (not proportional or progressive); households are *infinitely-lived* (rather than being regularly replaced by successive generations of descendants); finally, they are *free to lend or borrow* as much as they like on the capital markets at the prevailing interest rate (in other words, the capital markets function perfectly, and there is no credit rationing for households). Here, the hypothesis of perfect capital markets is essential, because this is what enables households to insulate their current consumption from possible fluctuations in current income (by an appropriate succession of lending and borrowing).

Let us consider, in this admittedly rather idealized world, the effect of tax cuts financed by debt issue, to be absorbed by a future tax increase. Today's tax cut raises current disposable income, but the future tax hike reduces tomorrow's disposable income. If the interest rate used to discount income is not affected by the policy change, then this evolution in the income profile has *no effect* on total household wealth, as the variation in future income exactly offsets the variation in current income. Thus, the tax cut has no effect on current consumption, which is determined solely by total wealth. In concrete terms, households put their present income gains into savings that will serve to pay the future tax increase. What form do these additional savings take? As the agents save exactly the amount of the tax cut, they buy exactly the additional amount of debt issued by the government to finance it. It follows that on the capital markets, the increase in the supply of government bonds is identical to the increase in the demand for these bonds from households. The interest rate therefore remains the same, as does the volume of savings channelled into productive investment, and therefore the stock of capital. With constant capital, labour productivity is unchanged, so that the demand for labour from firms also remains the same. As, in addition, household wealth remains constant, households have no stronger reason to change their supply of labour than they have to change their consumption demand. As neither the demand nor the supply of labour change, the volume of labour and the equilibrium wage also remain at the same levels as before the fiscal policy change. In the end, a temporary reduction in taxes is *totally neutral* from the point of view of the macroeconomic equilibrium.

This is referred to as the "Ricardian equivalence" proposition (Barro, 1989). At the heart of this neutrality lies the fact that, given unchanged current and future government spending, household wealth is not changed by a transitory tax gift, or, for that matter, by any change in the intertemporal tax structure. Ultimately, the fact that the hypotheses underpinning Ricardian equivalence are unrealistic is of little importance. On the contrary, the real interest of the idealized experiment we have just described is that it enables us to understand the role played (or not played) by *wealth effects* in households' reaction to fiscal policy. Tax cuts are neutral, because they do not change household wealth; this is not the case for stimulus through government spending, the expansionary effects of which rely entirely on these wealth effects.

To illustrate this point, let us consider the impact of an announcement of a spending stimulus to be implemented either immediately or in the future (in the second case, the announcement of this policy means that it will be correctly anticipated by households). This will necessarily be accompanied either by a rise in current taxes, or by a future rise in taxes if the spending is financed by borrowing, or by a mixture of the two. In any event, total household wealth falls when this policy is announced: households therefore respond by reducing their current consumption demand. If they can, they also reduce their demand for leisure, in other words they work more to compensate partially for their loss of income. This increase in the supply of labour stimulates employment, but it also brings down the equilibrium real wage, because the demand for labour has not changed (at least, not over the short term). Finally, the increase in the volume of employment stimulates economic activity. To sum up, in the classical model an increase in government spending will, through the influence of wealth effects, cause a reduction in consumption and real wages, but a rise in the levels of employment and economic activity. The effect on investment is a little more complex. On the one hand, the fiscal stimulus provokes an interest rate rise, discouraging firms from borrowing, and thus tending to reduce their investment demand. On the other hand, the rise in employment pushes up the marginal productivity of capital within each firm, thus tending to stimulate investment demand. The net effect is therefore ambiguous; it depends, in particular, on the persistence of the initial spending shock.

The first row in Table 2 summarizes the consequences of wealth effects associated with an increase in government spending.[7] Here again, it would doubtless be desirable to relax the strong hypotheses of the classical model; it should be understood, however, that the consequence of such a move is to introduce new channels of transmission of government spending shocks, rather than disprove the theoretical relevance of wealth effects. For example, Burnside *et al.* (2004) study the effects of spending shocks under a proportional tax system. Other changes are also possible, such as the introduction of price rigidities or imperfect capital markets, which substantially modify the results of the classical model.

One of the essential properties of the classical model is that the factors of production are fully employed: there is neither involuntary unemployment nor output gap. In practice, this property excludes the *aggregate demand effects* of fiscal stimulus traditionally highlighted by the Keynesian approach, notably in its elementary static version. Let us start by recalling the main ways in which the static Keynesian model differs from the classical model. Prices are rigid, not flexible. Output is determined by aggregate demand, to which firms adjust their production and therefore their demand for labour, thus modifying the equilibrium employment level. The supply of labour therefore plays no role. Current investment depends solely on the current real interest rate, which is equal to the nominal interest rate, because prices are rigid, and there is therefore no inflation. Private consumption demand is an increasing function of current disposable income, not of the total wealth of households. Variations in this income therefore have a direct effect on the private component of demand, even if household wealth remains unchanged. In the IS/LM version of the model, agents have a liquidity preference that determines the way the nominal interest rate adjusts to a variation in the demand or supply of money.

Within this static framework, the effects of a fiscal stimulus are particularly easy to predict. Let us take the example of a tax cut. This increases disposable income, which stimulates consumption demand, and therefore firms' production. The demand for labour rises, which in turn pushes up the level of employment and household income. In return, this additional rise in income stimulates consumption, demand and output. It is the initial impact of the tax cut plus the multiplier effect of this feedback

[7] Baxter and King (1993) present a detailed study of the dynamic adjustment of macroeconomic variables following such a shock within the classical framework.

mechanism that finally determines the effectiveness of the tax cut, in other words the power of the aggregate demand effects it provokes. Let us now consider the case of a rise in government spending. This increases aggregate demand (through its public component), which stimulates production and employment. The resulting rise in household income in turn stimulates consumption, so that the private component of demand also rises, which in return increases employment, income and consumption. Note that this sort of spending stimulus is all the more effective when it is financed by government borrowing rather than by taxes; any contemporaneous tax hike would have the effect of limiting the rise in income induced by the increase in public demand, which would in turn dampen the reaction of private demand. Let us recall, finally, that the aggregate demand effects we have just described are somewhat mitigated in the IS/LM version of the model due to the adjustment in investment. This is because the additional production induced by fiscal stimulus heightens the demand for money to carry out transactions, and this, with constant money supply, contributes to a rise in the nominal interest rate. With constant prices, this rate is also the real cost of indebtedness that determines the volume of private investment. Each measure of fiscal stimulus therefore results in a debt issue that partly crowds out private borrowing and investment by firms.

One fairly serious limit to the static Keynesian model is that it does not address the question of the evolution of the debt stock and the way the budget surplus must be adjusted over time to ensure government solvency. To put it another way, this model does not answer the typically classical objection that the growth in public debt generated by fiscal stimulus will have to be financed by a future increase in taxes, and this should, in all logic, influence the current savings and consumption choices of households. If we want to examine the implications of this objection, we must incorporate the essential elements of the Keynesian approach into a classical intertemporal model where wealth effects play an effective role; in this way we should be able to measure the relative power of the wealth and aggregate demand effects at work in this hybrid model, and then judge which are dominant.

That is precisely the task undertaken by Gali, Lopez-Salido and Valles (2007) in a recent contribution on the subject. In their model, prices are sticky, in other words firms can only occasionally adjust their prices (and not in every period, as they can in the classical model). It is the demand for labour, not the supply, that determines the

equilibrium employment level, because wages are centrally fixed by a trade union, above the level that would balance supply and demand. Investment is governed by intertemporal planning: it responds negatively to the real cost of indebtedness (as in the static model), but also to the expected future profits of firms. Lastly, households can be of two types: some of them behave in a "Ricardian" manner, smoothing their consumption over time and adjusting their current consumption to their total wealth; the others are "Keynesian" or "rule-of-thumb" households who spend the whole of their current income. The government is subject to an intertemporal budget constraint and adjusts its tax revenue over time to ensure stability of the debt/GDP ratio.

The implications of this dynamic model follow very directly from these hypotheses, which have no other objective, ultimately, than to reproduce the properties of the static model. The effects of fiscal stimulus are therefore exactly the same, apart from two slight differences. Not surprisingly, the strength of aggregate demand effects now depends on the ratio of Keynesian households to Ricardian households, so that they only dominate wealth effects if this ratio is above a certain threshold. The second difference concerns the reaction of investment: whereas, in the static model, public debt raises the interest rate and reduces private investment, in the dynamic model the increase in demand also has the effect of raising the expected profits of firms, which tends to stimulate investment demand; the net impact on investment is therefore ambiguous. The impact of aggregate demand effects on the different macroeconomic variables are summarized in the second row of Table 2.

As we have just seen, one of the indispensable factors for the functioning of aggregate demand effects is the sensitivity of household consumption demand to changes in their current income. Keynes, of course, attributed this behaviour to a "fundamental psychological law". Another hypothesis, however, perhaps more contemporary and less controversial, is that some individuals behave in a Keynesian way, because they are subject to *liquidity constraints* that prevent them from borrowing to consume as much as they would like to, given their future incomes and the actual interest rate. In this situation, each additional unit of current income takes the place of the missing credit, and is therefore wholly consumed. Ultimately, however, as we shall see, this is only a relatively minor effect of the liquidity constraint hypothesis. Once this hypothesis has been assumed, the macroeconomic consequences reach far beyond the simple aggregate demand effects highlighted by the Keynesian approach.

Liquidity effects in "non-Ricardian" models

Earlier, we pointed out the importance of two particular hypotheses in the establishment of the Ricardian equivalence proposition: the infinite horizon of agents and the perfect functioning of capital markets. In contrast, models that dispense with one or the other of these hypotheses are qualified as "non-Ricardian". Taking into account the finite horizon of households and the continual renewal of generations alters the neutrality of the classical model, because a tax cut can increase the wealth of the present generation, while transferring the cost of the measure onto future generations. Taking into account the effects of generational renewal might, nonetheless, appear to be more appropriate for the study of long-term problems (such as the optimum average levels of public debt and capital stock) than for the study of the short-term effects of fiscal stimulus. On the other hand, the existence of liquidity constraints on agents' borrowing capacities has an immediate effect on the reaction of households to macroeconomic shocks, because they may find that they cannot freely smooth their consumption in response to fluctuations in income. It is important to make clear here that taking into account liquidity constraints fundamentally modifies the dynamic properties of the macroeconomic models, to such an extent as to form an emerging paradigm, the generality of which is similar to the price rigidity hypothesis. These constraints make it possible, in particular, to take into account phenomena as diverse as the non-neutrality of monetary policy (see, for example, Algan *et al.*, 2005), the persistence of unemployment (Acemoglu, 2001), or the amplitude and the propagation of macroeconomic fluctuations (Kiyotaki and Moore, 1997). Within the framework of the question of interest to us here, we will show that the presence of such constraints makes it possible to uncover some Keynesian intuitions concerning the effectiveness of discretionary fiscal policy, but within a theoretical framework that is much more parsimonious than the dynamic version of the IS/LM model described earlier.

Challe and Ragot (2007) study the effects of short-term fiscal shocks in a simple dynamic model with this property. In the economy they study, households suffer fluctuations in their individual incomes, because they move randomly between

employment and unemployment.[8] Unemployment insurance is assumed to be imperfect, in other words it does not allow households to eliminate completely the income fluctuations generated by these transitions (in keeping with what can actually be observed in countries with such insurance systems); in the language of economists, this is a particular form of *insurance-market incompleteness*. Lastly, the liquidity constraints faced by unemployed households are such that they cannot borrow enough to insulate their current consumption completely from income fluctuations.[9]

One general property of this type of model (often referred to as "Bewley models", after their inventor) is that households compensate for the lack of social insurance by individual *precautionary saving*: with the aim of smoothing their consumption at least partially, they accumulate assets when their current income is high (when they are employed, in the present case), and then deplete these assets when their current income is low (when they are unemployed). The sorts of assets that can fulfil this role of precautionary saving efficiently are described as *liquidity means*, because they can easily be converted into consumer goods following an unfavourable income shock (such as losing one's job). Government bonds, which are a relatively risk-free asset with a return that shows little correlation to the probability of becoming unemployed, are a favoured form of liquidity. As deficit-financed expansionary fiscal shocks increase the public debt, they influence the quantity of liquidity in circulation in the economy, and therefore the overall capacity of households to constitute their precautionary savings. In this context, a larger volume of liquidity enables households suffering a negative income shock to limit the reduction in their individual consumption, thus raising total private consumption. We therefore expect these *liquidity effects* of fiscal stimulus to provoke an increase in private consumption, as well as stimulating output and employment, and this is exactly what the article by Challe and Ragot (2007) aims to verify.

After an expansionary fiscal shock, the government is assumed to choose the level of taxes according to the level of current public debt, so as to ensure a gradual return of the debt/GDP ratio to a long-term target figure (this return may take place

[8] Carrol (1992) has shown that the risk of unemployment does indeed constitute the main risk of income variation for US households.

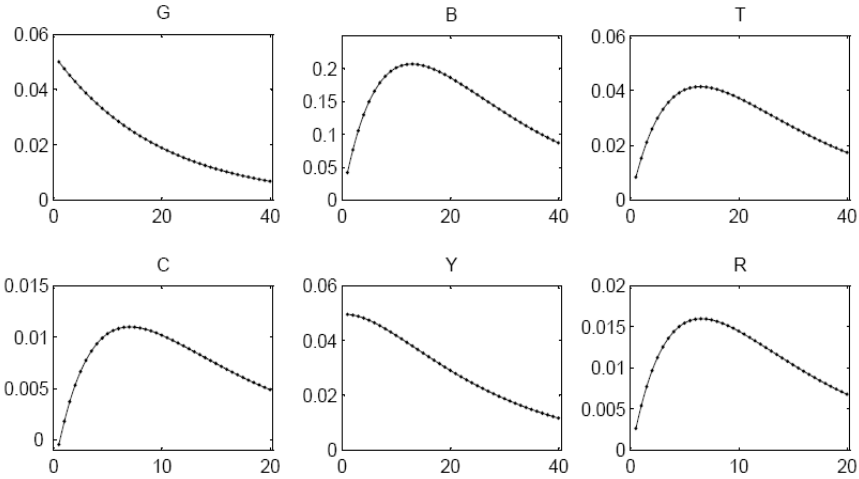
[9] Jappelli and Pagano (1994) empirically study the intensity of credit constraints in some OECD countries. One of the indicators they use is the level of personal capital contribution required when buying a house; this is 20 per cent of the total value of the house in France and in the United States.

more or less quickly, depending on the strength of the tax reaction to the level of current debt). As a tax cut does not give rise to a reduction in government spending, just as a spending stimulus does not give rise to a corresponding rise in taxes, any measure of fiscal stimulus is at least partly financed over the short term by the issuing of government debt. Within this context, the authors study the reaction of the macroeconomic variables to fiscal stimulus, whether this takes the form of an increase in government spending or a tax cut.

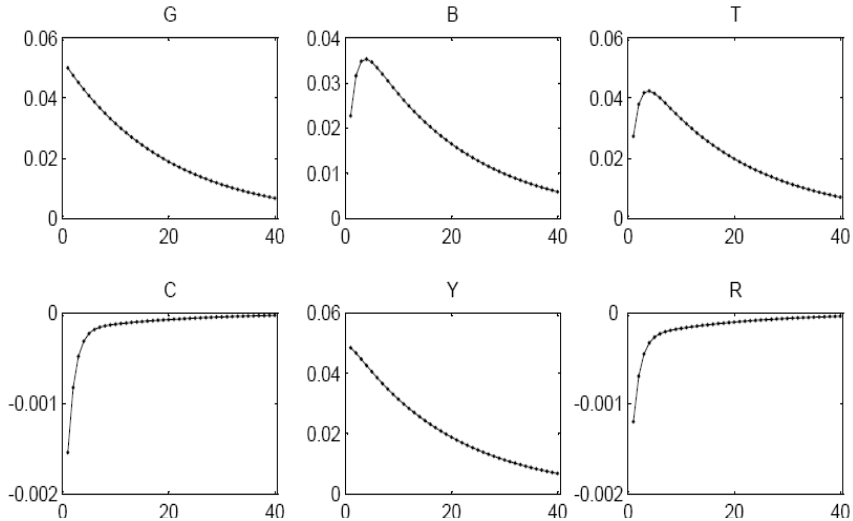
Figure 3 presents the results obtained. The graph sets A and B plot the response of variables over time to a government spending shock. G is government spending, taken to be exogenous and persistent. B is public debt, T is tax revenue, C is consumption, Y is GDP, and R is the current interest rate. Graph set A represents a situation where taxes react relatively weakly to the debt generated by the fiscal shock, resulting in a slow convergence of debt towards its long-term value. Graph set B represents the reverse situation, where the strong short- and medium-term tax reaction causes moderate growth in public debt and rapid convergence towards its asymptotic value.

Figure 3. Liquidity effects and wealth effects linked to a fiscal stimulus

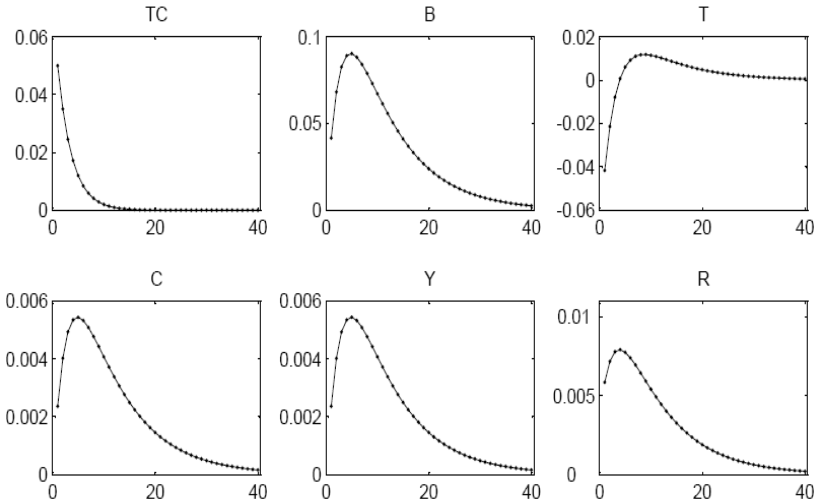
A. Increase in government spending (marked rise in debt)



B. Increase in government spending (limited rise in debt)



C. Tax cut (marked rise in debt)



Note: G is government spending, B public debt, TC is a discretionary, short-term tax cut, T is total tax revenue, Y is output, C is consumption and R is the real interest rate.

By comparing the two graph sets, we can see that the predicted effect does indeed occur: the growth in liquidity induced by the fiscal stimulus tends to stimulate private consumption. In other words, liquidity effects work in the opposite direction to wealth effects. When growth in the public debt is strong, the liquidity effects are also strong, dominating the reaction of aggregate consumption (graph set A). On the other hand, more moderate growth in public debt limits liquidity effects, and these latter are therefore dominated by wealth effects (graph set B). Spending stimulus is therefore *all the more effective when it is financed by government debt issue* and when the tax reaction is moderate. Graph set C represents the reaction of macroeconomic variables to a tax cut when this induces a pronounced rise in the debt stock (TC is an exogenous, discretionary "tax gift", while T is the total value of taxes paid, in other words the tax reaction to the volume of debt *minus* the tax gift). The effect of such a measure is clearly expansionary, like the empirically observed effect and unlike the theoretical

neutrality of the classical model described above (the effects of the tax cut are weaker, but qualitatively similar when it is followed by moderate growth in the debt).

Graph set 3 is derived from a particularly simple specification of the model under consideration, in which fiscal shocks have no effect on the equilibrium wage. In an extension to this, Challe and Ragot introduce a sector of financially-constrained entrepreneurs who can only raise their level of production through the prior accumulation of assets that they then use to pay the wage bill. In this context, a fiscal shock financed by public debt favours this prior accumulation, in turn stimulating the entrepreneurs' demand for labour. The net effect on the equilibrium wage will then be positive, as long as liquidity effects on the demand for labour dominate wealth effects on the supply of labour, which is the case when the increase in public debt is sufficiently pronounced. The impact of liquidity effects on the macroeconomic variables following a government spending shock is presented in the third row of Table 2.

Table 2. Predicted and estimated impact of government spending stimulus

	Y	N	C	I	w
Wealth effects	+	+	-	?	-
Aggregate demand effects	+	+	+	?	+
Liquidity effects	+	+	+	+	+
Overall impact predicted by theory	+	+	?	?	?
Estimated impact (narrative approach)	+	+	-	?	-
Estimated impact (structural approach)	+	+	+	?	+
Empirical consensus	+	+	?	?	?

Note: Y is output, N is employment, C is private consumption, I is investment and *w* is real wages.

Comparison between the effects of spending shocks predicted by theory, on the one hand (the fourth row of Table 2), and their empirical measurement, on the other (seventh row), is both reassuring and worrying. Reassuring, because for those variables (production and employment) where the empirically measured effects of government spending shocks are unequivocal, the predictions of economic theory are

also unambiguous and, happily, in harmony with the empirical observations. Worrying, because this comparison reveals the extent of our ignorance about the effects a spending shock might be expected to have on several important variables (consumption and investment, but also the supply and demand of labour, and therefore wage levels). The preliminary conclusion that we can draw from this table is that we should perhaps adopt a certain theoretical eclecticism, rather than generalized scepticism about all the empirical studies mentioned at the beginning of the article. The most plausible explanation for the divergences we have observed between the different studies is that all three types of effect (wealth, demand and liquidity) effectively come into play during a fiscal expansion; it is only when they all drive the macroeconomic variables in the same direction that the overall effect on these variables is pronounced enough to be observed robustly and irrefutably in the data. This is only the case for the levels of economic activity and equilibrium employment; for the other variables, the different effects at work tend to offset each other to some extent, causing a less pronounced overall impact and, consequently, a variability in the estimated impact according to the technique of estimation used. We can synthesize this argument by returning to the example of adjustments in the labour market: the most plausible explanation for the lack of empirical consensus on the reaction of real wages is that the labour demand and supply curves *both move* after a government spending shock; this is more or less what the economic theory predicts, from the moment we take all three suggested channels of transmission seriously. At this stage, the question of the relative domination of one or another effect becomes essentially empirical; more research is therefore required to determine the net impact of fiscal shocks on the macroeconomic variables. In particular, it is likely that the relative strength of the different effects depends on the institutional context (notably the organization of labour markets), which has not yet been considered in the literature.

Fiscal policy in the short and long run

Despite their numerous differences in other areas, the non-Ricardian and Keynesian analyses of fiscal policy agree on one essential point: fiscal shocks are all the more effective in stimulating economic activity when they are financed by government

debt issue rather than taxes. For the Keynesians, limiting tax hikes after a spending stimulus prevents too sharp a fall in current income, which would otherwise work against the positive effect of public demand by limiting the growth in private demand. For the non-Ricardians, the transitory increase in the public debt stock entailed by a rise in spending is in itself a factor of effectiveness, because it increases the quantity of liquidity in the economy and thus facilitates its functioning under imperfect insurance and credit markets. For the same reasons, the Keynesian and non-Ricardian models predict that a tax cut is effective in stimulating economic activity, whereas the classical model condemns this measure to neutrality.

Recognizing the leading role of public debt variations in short-term fiscal policy raises, however, a problem of "dynamic consistency" absolutely typical of economic policy dilemmas: the expansion of the volume of public debt may be very desirable in the context of *short-term* fiscal stimulus, but is there not a risk of excessive growth in the debt over the *long term*, above its optimum level? This concern is justified by a simple theoretical consideration: as soon as we deviate even slightly from the hypotheses of the elementary classical model (by assuming, notably, that taxes are not lump sum), the volume of public debt loses the macroeconomic neutrality that characterizes it under the conditions of Ricardian equivalence. An overly high average public debt may then prove to be harmful because of the distortions caused by the taxes required to pay the interest, or even detrimental to the solvency of the government if there is a risk that the corresponding taxes cannot be levied (Bohn, 1991). In general, the optimal level of public debt is not zero: one of the consequences of capital market imperfections is precisely the fact that a long-term rise in the public debt stock is liable to improve the functioning of the economy by increasing the quantity of liquidity in circulation (Woodford, 1990). These gains, however, must be weighed against the social costs of the economic distortions linked to this public debt. The result is that the optimal level of long-term debt is that which best balances the gains linked to the liquidity of the debt against the costs of the distortions it induces.[10]

The tension between the desirability of financing the fiscal stimulus over the short term by the issuing of debt, on the one hand, and the need to limit the long-term level of debt on the other, can only be resolved by ensuring that the fluctuations in debt

[10] According to a simulation by Aiyagari and McGrattan (1998), the optimal public debt/GDP ratio for the United States would be 2/3.

generated by the short-term stimulus measures are of a purely *temporary* nature. In other words, the government should commit, *ex ante*, to applying a fiscal policy that gradually brings the debt back down to a pre-defined target value or zone (ideally, its optimal value), but without constraining the short-term variations in debt to this value or zone. If we return to the example of the budget surplus/GDP and public debt/GDP ratios for France and the United States over the last 30 years (Figure 2), we can see that this fiscal discipline appears to have prevailed to a greater extent in the United States than in France: while both countries, admittedly, allow considerable fluctuations in the public deficit, the debt seems to be more stable in the United States over the period under consideration (although the convergence of the debt/GDP ratio is still fairly slow).[11]

The institutional solution to the problem of dynamic consistency that we have just described is far from self-evident. The fiscal rules of the Maastricht Treaty, for example, illustrate this difficulty rather than solving it. By imposing a symbolic ceiling to the debt/GDP ratio that member states are not to exceed, these rules aim to prevent a debt drift where the distortions generated by excessive tax pressure would *a priori* be harmful. By restricting variations in the deficit/GDP ratio, however, they threaten to preclude the practice of fiscal stabilization through debt issue, despite the many advantages that we have clearly seen this practice to have.

[11] Bohn (2005) confirms, over a longer period, that the US budget surplus is adjusted to ensure the long-term stability of the debt/GDP ratio.

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