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WHAT DO WE KNOW ABOUT THE EFFECTS OF FISCAL POLICY?

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I. INTRODUCTION

What do we know and what do we not know on the effects of fiscal policy? This is an ambitious question, to which I do not have the space and especially the ability to answer in full. To limit and organize the discussion, I will take as my starting point what I believe are the key questions involving fiscal policy that have emerged in the recent European policy debate. Very schematically, these questions can be organized as follows:

1. A heated debate has arisen on the possible fiscal causes of the recent mini-recessions in several countries and, indirectly, on the effects of the fiscal clauses in the Maastricht Treaty. A byproduct of this debate is the question: What do we know about the effects of fiscal policy on output and its components? In particular, is the received wisdom in policy circles as embedded in large macroeconometric model -- that fiscal policy affects output mostly via its direct demand effects and interest rates -- still valid?
2. Perhaps the most controversial question in business circles and the media is the distortionary effects of taxation and of several transfer programs, and its reflections on "competitiveness" (variously defined). With the enthusiasm of the late-comers, the European Commission has taken up this crusade in several recent documents.

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As I will show below, because of their very structure the evaluation tools used by national and supranational governments -- the large macroeconometric models -- usually have nothing to say on this topic. Hence the question: Is there any evidence on these effects from the recent developments in the empirics of fiscal policy? A warning: I will focus here on macroeconomic studies, which admittedly may or may not be the most appropriate to investigate this issue.

These two questions are mostly cyclical in nature. More long-run questions also play an important role in the debate, more specifically:

3. What are the effects of fiscal policy on the long-run capital stock and growth?
4. What are the effects of public infrastructure on productivity and growth?

Because the long run is just a succession of several short runs, I think it is prudent to start from the first two questions, and I will not deal much with the third question. And because -- despite the claims of many -- we know next to nothing on the fourth issue, I will ignore it altogether, except for reiterating our collective ignorance on the subject.

In addressing the first two questions, to limit the area of investigation and impose some discipline on the analysis, I will mostly focus on recent theoretical and empirical developments concerning the effects of fiscal policy on three key variables: private consumption, investment, the real wage. As a first pass, these variables are enough to address the questions above and to highlight the new channels explored in the recent contributions.

My conclusion will not be heartening. I will argue that, despite some methodological advances, there is absolutely no consensus on even the basic effects of fiscal policy on the macroeconomy. In this sense, the field of empirical fiscal policy is very different from that of monetary policy. Monetary economists have always agreed on a few basic facts -- after all, everybody agrees that a monetary expansion will cause sooner or later prices to go up.[1] And recent years have witnessed one of the rare cases of convergence on the time series methodology to be applied to monetary economics and

[1] In reality, like all rules, this one too has its exception. In the mid eighties, the advisors to President Alan Garcia managed to argue that a monetary expansion, by increasing demand and therefore output, would have allowed firms with increasing returns to scale to operate at lower marginal costs and therefore to decrease prices.

the fundamental conclusions that it offers. Nothing like this has yet happened in the field of fiscal policy.

The plan of this short paper is as follows. Section II discusses briefly two benchmark models for the analysis of fiscal; policy, the neoclassical model and a typical macroeconometric model, the IMF's MULTIMOD. Section III surveys some recent methodological innovations in the empirical analysis of fiscal policy. Section IV, the core of the paper, compares the results from different approaches concerning the effects of government purchases of goods and services on private consumption, private investment, and real wages. Section V concludes.

II. TWO BENCHMARKS

To provide a framework for the analysis, it is useful to start from two benchmark models of fiscal policy. The first is the neoclassical model; the second is a representative macroeconometric model. They are useful to illustrate the two polar cases of a theoretical model that is widely considered as the benchmark for the study of fiscal policy among academics, and an influential model used for widely cited policy analysis and simulations. Both models can be used for simulations; the outcome of these simulations can then be compared to the evidence from estimated regressions. As we will see, the two models share a surprisingly similar framework, except for two key differences that ultimately generate completely different answers to our questions.

II.A THE NEOCLASSICAL MODEL

Perhaps the main theoretical development in the last decade has been a clarification of the effects of fiscal policy in the neoclassical model, due largely to Ayiagari et al. (1992) and to Baxter and King (1993).

As in most of the theoretical literature on the subject, on the expenditure side fiscal policy is essentially purchases of goods and services. The key channel of fiscal policy in this model is the wealth effect on the representative agent. When government

spending increases, lump sum taxation must increase by the same amount in present discounted value terms; correspondingly, the wealth of the representative individual falls by the same amount. As a consequence, the individual purchases less of the two "goods", the consumption good and leisure; thus, private consumption falls, labor supply increases and the real wage falls. In the long run, the capital/labor ratio does not change, because it is determined uniquely by the rate of time preference; but since the denominator increases, the numerator must increase proportionately. The higher desired capital stock causes investment to jump up to accumulate capital (another way to see this is that the increase in labor supply shifts out the marginal product of capital schedule, inducing higher investment). In the long run, consumption is permanently lower, investment[2] and employment permanently higher, and the real wage returns to the initial level after falling initially.[3]

Although the basic framework of the neoclassical model had been used for the analysis of fiscal policy for some time, the work by Ayiagari et al. (1992) and by Baxter and King (1993) has helped clarify a few issues, and make them part of the common tool-kit of macroeconomists:

1. Intertemporal substitution in labor supply -- a key parameter in RBC models -- is crucial also for the size of the fiscal multiplier. When intertemporal substitution is high, the increase in labor supply following the government spending shock is large, and so is the increase in investment and output.
2. Temporary and permanent increases in government spending have very different effects from what had long been believed. The received wisdom (based largely on Barro and King (1984)) until the early nineties was that a temporary increase in government spending would generate a larger increase in output than a permanent one. The reasoning was that when government spending increases permanently, private consumption falls by the same amount, hence there is no need for an expansion in output to make room for the increased government spending. This reasoning is wrong. As it was pointed out first by Ayagari et al. (1992), the negative

[2] Net investment is obviously zero in steady state; but gross investment is higher because the larger capital stock generates more depreciation each period.

wealth effect is stronger in the permanent case, hence the effects on labor supply, investment and output is also stronger.

3. Perhaps the main conclsion from the work of Baxter and King is that the standard assumption of lump-sum taxation can be very misleading. Even a moderately distortionary taxation can overturn the key signs of the effects of fiscal policy in the neoclassical model.

II.B MULTIMOD

As an example of a macroeconometric model, (and a rather sophisticated one at that), I will use the IMF MULTIMOD model (see IMF (2000)).

The IMF MULTIMOD model is not used for forecasting, but only to evaluate the effects of various policies in the context of the IMF's monitoring of member countries. The \forecasts are mostly the result of subjective judgement and are then fed in the model, to become the baseline; the model is then used to investigate the deviations from the baseline under alternative scenarios on the forcing variables. Thus, the MULTIMOD model is different from other econometric models in that it can largely disregard its own forecasting performance, and therefore it is relatively unconstrained in the choice of the underlying structural equations. For this reason, it tends to be more theory based and sophisticated than most other macroeconometric models.

In fact, MULTIMOD is not very different from the neoclassical model, particularly as concerns the private consumption and investment blocks. There are two key differences however: in the MULTIMOD model, consumers are forward looking but not Ricardian, and labor supply is entirely inelastic. These two seemingly small differences generate very different -- indeed, opposite in many cases -- implications from the two models.

The consumption function in MULTIMOD is the result of aggregating two types of consumers: first, forward looking consumer of the Blanchard (1985) type, for whom

[3] The real wage is determined by the capital labor ratio, which is a function only of preference parameters (the rate of time preference) in steady state.

Ricardian Equivalence does not hold; second, credit constrained individuals, who consume all their disposable income. The investment equation is a standard q-model equation with adjustment costs, which could be a component of the neoclassical model. The model is used to simulate the effects of three fiscal policy instruments: government expenditure, the "basic tax rate", i.e. the ratio of total taxes to GDP; and capital taxation. Importantly, labor taxation (the difference between the last two instruments) is non-distortionary: the labor supply is exogenous. Because in addition there is no government investment, two of the most hotly debated supply effects of fiscal policy are simply shut off from this model by assumption.

In fact, fiscal policy in MULTIMOD operates mostly through two standard channels in the short run, an interest rate and a direct aggregate demand channel. When government spending increases given taxes, government dissavings increases but private savings increases less, because of the non-Ricardian features of the model; the ensuing interest rate increase causes investment to fall. But the increase in government spending raises disposable income directly; this, together with the excess discounting of future taxes by unconstrained individuals implies an increase in consumption on impact by both types of consumers. In the long run private consumption falls because of the higher interest payments on the accumulated debt.

III. NEW EMPIRICAL METHODOLOGIES

I will now review the small but growing empirical literature that has developed recently investigating the macroeconomic effects of fiscal policy. Methodologically, the main innovation is probably the extension to the analysis of fiscal policy of time series techniques -- Vectors autoregressions -- that have long been used in the analysis of monetary policy. VAR's allow a relatively unstructured specification of the dynamics of the model, an especially attractive feature when, as in our case, one would like to first investigate the basic multivariate time series properties of the data. Of course, no model can do away with all a priori restrictions, and VAR's are no exceptions. A priori restrictions are crucial in identifying the fiscal shocks, and as we will see very different approaches are possible here. But conditional on an identification scheme, VAR's also

allow a clear separation of expected and unexpected movements in fiscal policy, another very attractive feature. In fact, VAR's seem ideally suited to apply two of the main recent methodological innovations in the study of fiscal policy, namely

1. The realization that any serious investigation of the effects of fiscal policy must first address the issue of the endogeneity of fiscal policy. In other words, the issue of the correct cyclical adjustment cannot be sidestepped, something that the previous literature had often done.
2. A new attention to the issue of anticipations of fiscal policy. Most theoretical arguments suggest that unanticipated changes in fiscal policy have very different effects from anticipated ones, but disentangling the two in a credible way had always proved difficult.

How do VAR's help in studying fiscal policy? Two approaches have developed in recent years.

III.A THE FISCAL DUMMY VARIABLE APPROACH

The first one, pioneered by Ramey and Shapiro (1997) and further developed in Edelberg et al. (1999) and Burnside et al. (1999), exploits the occasional large changes in fiscal policy that can reasonably be regarded as exogenous and unanticipated by the private sector. For instance, suppose the increases in military spending associated with the Korean war, the Vietnam war, and the Reagan build-up were unanticipated by the private sector the quarter before they occurred. One can then estimate a standard reduced form VAR which includes the contemporaneous and lagged values of a military buildup dummy variable:

$$(1) \qquad Y_t = A(L)Y_{t-1} + B(L)\, D_t + U_t$$

where Y_t is a vector of variables (in Edelberg et al., it includes real GDP, the three month Treasury bill rate, the price of crude fuel, the log of real defense purchases, and the log of the variable of interest, like private consumption, private investment, the real wage, employment etc.), D_t is a dummy variable taking the value of 1 at the beginning of the

three military buildups, i.e. in 1950:3, 1965:1, and 1980:1, and U_t is a vector of reduced form residuals.

The impulse response to a unit shock to the dummy variable traces out the average effects on output of the average increase in military spending in these episodes.[4] The advantage of this approach is that all is needed is the reduced form VAR. In reality, of course, identifying a priori restrictions are still being imposed, as the validity of this approach rests on four assumptions:

1. the increase in military spending was predetermined, i.e. it did not occur in response to output shocks within the same quarter. If it did, the dummy variable would be correlated with the reduced form residual and the coefficients of the reduced form itself cannot be estimated consistently
2. the increase in military spending was unanticipated by the private sector;
3. the three military buildups were similar in the shape of their effects
4. each of the three military buildups was the only large shock to fiscal policy in that quarter and the four previous quarters. Suppose two quarters before the military spending shock there was a large tax shock: we will not know whether the impulse response we are looking at captures the response of output to the military spending shock, or the delayed (2 quarters) response of output to the tax shock.

III.B THE STRUCTURAL VAR APPROACH

The second approach, developed by Blanchard and Perotti (1999), consists in applying the structural VAR approach to the analysis of fiscal policy. It relies on institutional information about the tax and transfer systems and the timing of tax collections to identify the automatic response of taxes and spending to activity, and, by implication, to infer fiscal shocks. Essentially, this approach does for fiscal policy what a

[4] Thus, this approach extends a time-honored tradition that has used military spending as the quintessential demand instrument (see e.g. Hall (1986)).

number of recent studies have done for monetary policy (in particular Bernanke and Mihov (1998)).

Indeed, the structural VAR approach would seem better suited to the study of fiscal policy than of monetary policy, for at least two reasons. First, budget variables move for many reasons, of which output stabilization is rarely the main one; in other words, there are exogenous (with respect to output) fiscal shocks. Second, in contrast to monetary policy, decision and implementation lags in fiscal policy imply that, at high enough frequency---say, within a quarter---there is little or no discretionary response of fiscal policy to unexpected movements in activity. Thus, with enough institutional information about the tax and transfer systems and the timing of tax collections, one can construct estimates of the automatic effects of unexpected movements in activity on fiscal variables, and, by implication, obtain estimates of fiscal policy shocks. Having identified these shocks, one can then trace their dynamic effects on GDP and its components.

More formally, the starting point is a standard VAR system in reduced form:

$$(2) \qquad Y_t = A(L)Y_{t-1} + U_t$$

where $Y_t = [T_t\ G_t\ X_t]'$ is a three-dimensional vector in the logarithms of quarterly taxes, spending, and GDP, all in real, per capita terms. $U_t = [t_t\ g_t\ x_t]'$ is the corresponding vector of reduced form residuals, which in general will have non-zero cross correlations. As is well known, the reduced form residuals t_t, g_t, x_t have little economic significance: they are linear combinations of the underlying ``structural" tax, spending, and GDP shocks. Without loss of generality, one can write:

$$\begin{aligned} t_t &= a_1 x_t + a_2 e_t^g + e_t^t \\ (3) \qquad g_t &= b_1 x_t + b_2 e_t^t + e_t^g \\ x_t &= c_1 t_t + c_2 g_t + e_t^x \end{aligned}$$

where e_t^t, e_t^g and e_t^x are the mutually uncorrelated structural shocks that we want to recover. The first equation states that unexpected movements in taxes within a quarter, t_t, can be due to one of three factors: the response to unexpected movements in GDP, captured by a_1, x_t, the response to structural shocks to spending, captured by a_2,e_t^g, and to

structural shocks to taxes, captured by e_t^t. A similar interpretation applies to unexpected movements in spending in the second equation. The third equation states that unexpected movements in output can be due to unexpected movements in taxes, unexpected movements in spending, or to other unexpected shocks, e_t^x.

The methodology to identify this system can be divided into three steps.

(1) Use institutional information about tax, transfer and spending programs to construct the parameters a_1 and b_1. In general, these coefficients could capture two different effects of activity on taxes and spending: the automatic effects of economic activity on taxes and spending under existing fiscal policy rules, and any discretionary adjustment made to fiscal policy in response to unexpected events within the quarter. The key to the identification procedure is to recognize that the use of quarterly data virtually eliminates the second channel. Direct evidence on the conduct of fiscal policy suggests that it takes policymakers and legislatures more than a quarter to learn about a GDP shock, decide what fiscal measures to take in response, pass these measures through the legislature, and actually implement them. The same would not be true if one used annual data: to some degree, fiscal policy can be adjusted in response to unexpected changes in GDP within the year. Thus, to construct a_1 and b_1, one only needs to construct the elasticities to output of government purchases and of taxes minus transfers. There is virtually no meaningful automatic feedback from economic activity to government purchases of goods and services; hence, $b_1 = 0$. To construct the net tax elasticities, Blanchard and Perotti (1999) use work by the OECD (see Giorno et al. (1995)), suitably modified to take into account that the data are quarterly rather tan yearly.

(2) With these estimates of a_1 and b_1, one can construct the *cyclically adjusted* reduced form tax and spending residuals, $t_t' \equiv t_t - a_1 x_t$ and $g_t' \equiv g_t - b_1 x_t \equiv 0$ (as $b_1=0$). Obviously t_t' and g_t' may still be correlated with each other, but they are no longer correlated with e_t^x. Thus, they can be used as instruments to estimate c_1 and c_2 in a regression of x_t on t_t and g_t .

(3) This leaves two coefficients to estimate, a_2 and b_2. There is no convincing way to identify these coefficients from the correlation between t_t' and g_t': when the government increases taxes and spending at the same time, are taxes responding to the increase in spending (i.e. $a_2 \neq 0$, $b_2 = 0$) or the reverse? Blanchard and Perotti (1998) adopt an agnostic approach. They identify the model under two alternative assumptions:

in the first, the assumption is that tax decisions come first, so that $a_2 = 0$ and b_2 can be estimated; in the second, the assumption is that spending decisions come first, so that $b_2 = 0$ and a_2 can be estimated. It turns out that, in nearly all cases, the correlation between t_t' and g_t' is sufficiently small that the ordering makes little difference to the impulse response of output.

IV. A COMPARISON OF RESULTS FROM OLD AND NEW APPROACHES

In this section, I will compare the results from recent empirical contributions on the effects of an increase in government purchases of goods and services. Although in the majority of OECD countries transfers are larger than purchases of goods and services, in most models (including the benchmark neoclassical model and MULTIMOD) government spending is identified with purchases of goods and services; transfers are treated, at best, implicitly as negative taxes.

There are several possible ways to organize the discussion. I believe a useful one is to look in succession at the effects of fiscal policy on the three variables of interest mentioned in section I - private consumption, private investment, and the real wage. To put these contributions in perspective, I will compare them with the prevailing practice, as embedded in large scale macroeconometric models, and with the benchmark theoretical model, the neoclassical model.

Ideally, one would like to define the same experiment in all approaches. This is not always possible, because the experiment in simulations typically involves feeding the system the whole path of government spending, while in regressions fiscal policy is an endogenous variable. Still, whenever possible I will rebase all experiment so that the initial shock is an unanticipated increase by 1 percentage point of GDP in government purchases of goods and services. I will also try to convey an idea not only of the sign of fiscal multipliers, but also of their size; this latter information, however, has to be considered highly approximate.

IV.A EFFECTS ON PRIVATE CONSUMPTION

Table 1 summarizes the effects of a shock to government purchases of goods and services in the various models. I will now provide a summary of the results, with a brief intuition.

The neoclassical model. I consider three basic experiments: a permanent increase in government spending, a temporary increase in government spending (like a four year war), both financed by lump sum taxation, and a temporary increase in government purchases of goods and services financed by distortionary (output) taxation. The parameters of the model underlying the simulations reported in Table 1 are the same as in King et al. (1988) and are discussed there.

Permanent increase in government spending, lump-sum taxation. Government spending increases by 1 percentage point of GDP permanently (because taxes are lump-sum, the time path of taxation is irrelevant). Due to the negative wealth effect on forward looking, unconstrained consumers, private consumption falls on impact by .6 percentage point of GDP, and then it recovers to fall -- relative to the initial steady state -- by only .3 percentage points in the long run, relative to the initial steady state the capital stock increases and agents' leisure recovers.

Temporary increase in government spending, lump-sum taxation. Now suppose government spending increases by the same amount, but only temporarily, to finance a four year war. The key difference is in the size of the wealth effect, which is much smaller than before. As a consequence, private consumption falls by .3 pp of GDP on impact, and then goes back to its initial steady state.

Temporary increase in government spending, distortionary taxation. Now take the same experiment of a temporary increase in government spending, but assume that taxation, instead of being lump-sum, is distortionary. Assume also that taxation rises to keep the budget balanced (clearly a suboptimal policy, but a relevant one for most European countries). The negative wealth effect is stronger because distortions have increased, but labor supply falls because of distortionary taxation; hence now both private consumption falls much more than before.

MULTIMOD. Consider the following experiment: government spending increases permanently by 1 percentage points of GDP; taxes are held constant for five years, then the basic tax rate is adjusted to hold the government debt/ GDP ratio constant at 5 percentage points above the baseline level.

The initial increase in aggregate demand, GDP and disposable income causes an almost equal initial increase in private consumption. But eventually, as taxes are increased, private consumption falls about 1.5 percentage points of GDP below its baseline

Notice that here a balanced budget increase in government spending financed by non-distortionary labor taxation would have no first-order effects: disposable income and wealth do not change, and there are no supply effects from either spending or taxation.

The fiscal dummy VAR approach. The experiment here is a unit shock to the military build up dummy variable; the impulse response of the system then traces out the effects of the average military spending shock during the three episodes. I will use the results from Edelberg et al. (1998) as representative of this approach. Because the impact increase in military spending is very small (about .1 percentage point of GDP) and it peaks at 3 percentage point of GDP after about 8 quarters, I will define the experiment as an increase in military spending such that the peak increase is 1 percentage point of GDP.

The response of private consumption is rather mute: it increases by about .1 percentage points of GDP on impact, then it declines to 0 after a few quarters. A possible explanation is that these impulse responses are also picking up the effects of the other large fiscal shocks that occurred at the onset of the Korean military buildup. In fact, it is important to note that total government spending falls when the military buildup dummy variable is shocked; in addition, the beginning of the Korean war buildup was accompanied by large increases in taxes (which increased by more than 2 standard deviations in 1950:2 and 1950:3, exactly the quarter the military buildup started in the Ramey and Shapiro dates). Hence, it is not entirely clear what these impulse responses are capturing.

The structural VAR approach. The experiment here is a shock to purchases of goods and services equal to 1 percentage point of GDP. After increasing on impact, government spending falls steadily to .4 percentage points of GDP above trend after 5 years.

Private consumption increases on impact by .5 percentage points of GDP, then peaks at 1.2 percentage points after 14 months, and stabilizes at about .9 percentage points after 5 years.

The expansionary fiscal consolidation approach. So far, we have assumed that the effects of fiscal policy are linear. But perhaps they are not. A long tradition in economics has claimed that fiscal policy is much more powerful in conditions of economic slack than when there is little capacity utilization. This argument seems plausible, and it is certainly of foremost importance for policymakers; yet, I do not know of any empirical investigation of this argument. Instead, another form of non-linearity has received much more attention, prompted by the experience of several European countries that have undertaken drastic fiscal consolidations.

In a seminal contribution, Giavazzi and Pagano (1990) studied the two largest fiscal consolidations of the eighties - Denmark in 1983-86 and Ireland in 1987-89. During these episodes, the cyclically adjusted deficit fell by a startling 9.5 percent and 7.2 percent of GDP relative to the pre-consolidation year, respectively, and yet private consumption increased by 17.7 percent and 14.5 percent cumulatively. Alesina and Perotti (1996) identify 7 episodes of prolonged and substantial consolidations: the two episodes above, plus Belgium 1984-87, Canada 1986-88, Italy 1989-92, Portugal 1984-86, Sweden 1983-89. In each of these episodes, the primary deficit in the two years after the adjustment was smaller than the average before the adjustment by at least 5 percent of GDP, except in Canada, where the difference is 4.4 percent of GDP. Yet, in all these cases the rate of growth of private consumption was positive in every single year, and it always exceeded the pre-adjustment average rate of growth, with the exception of the Italian episode.[5] It is by now common to refer to this type of episodes as `expansionary fiscal consolidations'.

In light of the results above, expansionary fiscal consolidations pose a double challenge to both the theory and empirics of fiscal policy. First, while it is easy to cite models or estimated equations where government spending shocks have a negative

[5] These numbers are all the more remarkable because the episodes are identified on the basis of the behavior of the cyclically-adjusted deficit, and therefore they are unlikely to be an artifact of cyclical variations in consumption and growth.

impact effect on investment or consumption, in none of the models studied above both statements are true at the same time.

Second, neoclassical economists would have no problem rationalizing a negative effect of government spending on private consumption; indeed, this is the essence of their model. But all others (including neo-Keynesian economists, most policymakers, and most officials in international organizations) believe -- correctly in my view -- that under “normal” circumstances government spending has, at least in the short run, a positive effect on private consumption. For them, the challenge is how to rationalize the fact that, under “other” circumstances, the effects of government spending on private consumption can reverse sign.

But exactly what other circumstances? Both Ireland and Denmark were countries with high deficits and high government debt / GDP ratios. As argued first by Giavazzi and Pagano (1989) and Blanchard (1989), under these conditions it is possible for the effects of fiscal policy to "switch sign". This intuition was later formalized by Bertola and Drazen (1993) for government spending, Sutherland (1996) for taxes, and Perotti (1999) for both. I will briefly exposit here the formalization of Perotti (1999).

The model has four key ingredients, each of them fairly standard in macroeconomic models: first, distortionary taxation; second, a policymaker who effectively discounts the future more than the private sector, so that the economy is initially away from a position of perfect tax-smoothing; third, the coexistence of credit constrained individuals and individuals with free access to credit markets; fourth, government expenditure has a positive effect on output, for instance because of the presence of nominal or real rigidities (for simplicity, we will assume a multiplier smaller than 1).

Suppose initially the economy has a low debt/GDP ratio and government spending falls unexpectedly. By the intertemporal government budget constraint, future taxation decreases; as the PDV of taxes and their distortions fall, the wealth and consumption of unconstrained individuals increases; and because taxes do not decrease immediately, the disposable income of constrained individuals falls, and so does their consumption. If the effect on constrained individuals is strong enough, private consumption may well fall, the standard "Keynesian" effect. The government spending multiplier on private consumption is then positive.

Now suppose government debt is large; hence, distortions from taxation are large, and moreover the path of taxation is very steep -- future taxes are much larger than present taxes. When government spending falls, again the disposable income and consumption of constrained individuals falls. But now the wealth of unconstrained individuals increases much more than before, because at high levels of debt taxes and their distortions are high; any given reduction in taxes reduces distortions by much more when debt is high than when it is low. Hence, now the increase in consumption by unconstrained individuals is larger than before, and may well outweigh the fall in consumption by constrained individuals. Thus, aggregate private consumption increases, the "non-Keynesian" effect. The government spending multiplier on private consumption is negative.

A similar intuition holds for an increase in taxes today, compensated by a fall tomorrow -- hence, holding constant spending.

Perotti (1999) provides evidence of this on an annual sample of 19 OECD countries. He regresses the change in private consumption on shocks in government spending and taxation, estimated as usual from country specific VAR's, and allowing for a different coefficient in country-years with high- and low- debt/GDP ratios.

He finds that that a 1 pp point increase in government purchases of goods and services generates an increase in the same year[6] in private consumption by .7 pp of GDP in “normal” (low debt) times, but a fall by about .4 pp of GDP in “difficult” (high debt) times. Similar results are obtained by Giavazzi, Jappelli and Pagano (1999). In their regressions, however, the effects of fiscal policy become non-Keynesian when the size or the persistence of the adjustment is large, rather than when the debt/GDP ratio is large.

The following table summarizes the effects on private consumption of a shock to government spending on goods and services.

[6] Perotti (1999) does not report the implied effects over time.

Table 1: Effects of a shock to government purchases of goods and services on private consumption

	impact	long run	max.
Neoclassical (perm.)	-0.6	-0.3	-0.6(4)
Neoclassical (temp.)	-0.3	0.0	-0.3(16)
Neoclassical (temp. distort.)	-1.1	0.0	-1.5(16)
MULTIMOD	+1.0	-1.0	+1.0(4)
Fiscal dummy VAR	+0.1	0.0	+0.1(1)
Structural VAR	+0.5	+0.9	+1.2(14)
Perotti (1999) “normal” times	+0.7		
“difficult” times	-0.4		

The table reports the change in private consumption, in percentage points of GDP, following a shock to government purchases of goods and services of 1 pp of GDP, or a similar exercise described in the text. In parenthesis the quarter at which the maximum effect occurs.

As one can see, the predictions of the neoclassical model are hardly borne out by the data-based regression approaches (as opposed to the simulation approaches). But the fiscal multipliers obtained in regression approaches tend to be considerably smaller than those in MULTIMOD (and, more generally, in macroeconometric models). This result suggests that econometric models might induce an excessive, and unjustified, sense of (fiscal) power in policymakers.

IV.B EFFECTS ON PRIVATE INVESTMENT

Table 2 summarizes the effects of government spending on private investment in a number of models. I will now briefly review these effects model by model.

The neoclassical model. As before, I will consider three experiments.

Permanent increase in government spending, lump-sum taxation. The negative wealth effect on the private sector causes labor supply to expand. As the desired capital stock increases, private investment jumps on impact by about .4 pp of GDP, and then it falls slowly to the new higher steady state level.[7]

Temporary increase in government spending, lump-sum taxation. As the negative wealth effect is now small, labor supply increases and private consumption falls much less than before. To make room for the increased government spending, private investment falls, by a maximum of about .7 pp of GDP after 1 year.

Temporary increase in government spending, distortionary taxation. The distortions caused by taxation generate a much larger fall in investment, by a maximum of 1.6 pp of GDP after 1 year.

MULTIMOD. Although the investment part of the model is almost exactly as in the neoclassical model, in MULTIMOD there is no labor supply response by the private sector. The only mechanism at work is thus the excessive discounting of future taxes by the private sector, which causes national savings to fall and the interest rate to increase. As a consequence, investment falls by as much as .6 pp of GDP after 1 year and by about .1 pp in the long run.[8]

The fiscal dummy variable approach. Residential investment falls while non-residential investment (about $4/5^{th}$ of the total) increases, by as much as 1.1 pp of GDP

[7] During the transition, private investment falls from its peak on impact because the capital stock increases. This causes a positive wealth effect on the private sector; as the labor supply slowly falls from its peak, the marginal product of capital and investment slowly fall.

[8] In the q-model, the steady-state capital stock and investment depend only on relative factor prices. The real interest rate here returns to its original steady-state level, but the private capital stock falls in steady state because of the increase in distortionary taxes to pay for the larger interest payments.

after 8 quarters. The timing of the peak increase in private investment is roughly coincident with the peak increase in military spending. If one amends the neoclassical model to split investment into the two sectors, of which residential investment is considered a type of durable consumption, these results are broadly consistent with the neoclassical model (see Edelberg et al. (1998)).

The structural VAR approach. Private investment falls by a peak of .7 pp of GDP after 1 year, and the fall stabilizes at -.4 pp of GDP after 5 years.

Fiscal policy, profits and investment (Alesina et al. (1999)). A positive effect of purchases of goods and services on investment is a persistent feature of neoclassical model (provided, as we have seen, taxation is non-distortionary). This result rests on the positive effect on labor supply of the negative wealth shock on individuals. But this is not necessarily the only effect of fiscal policy on labor markets. Indeed, the positive effect of government spending on labor supply would be hard to believe for many participants in the European policy debate. In fact, a realistic modification of the labor market components of the q-model yields dramatically different predictions.

Take a standard q-model of investment, but assume that workers belong to a union. As government spending increases, the aggregate (i.e., including the government's) labor demand facing the union shifts out; given the marginal (opportunity) cost, the union reacts like all monopolists, by increasing the price of its "output", labor. Thus, the real wage increases, current and future profits in the private sector falls, reducing the investment q; this leads to a fall in investment until the new steady state is reached. Thus, in this neoclassical model with unions a government spending shock leads to lower profits, higher real wages, and less investment.

These predictions are indeed borne out in the empirical investigation of Alesina et al (1999), based on a yearly panel of 20 OECD countries over the period 1960-95. They use a structural-VAR procedure to estimate fiscal policy shocks, and then find the effects of these shocks on profits, wages and investment. They find that

1. Government spending shocks have a negative effect on profits ;
2. The fall in profits is indeed intermediated by the labor market, via higher real wages;
3. Profits are positively associated with investment (this is the standard q-relation).

Combining these effects, when government purchases of goods and services increase by 1 pp of GDP[9], investment falls by .4 pp of GDP on impact and by .5 pp in the long run. [10]

The following table summarizes the effects on private investment of a shock to government spending on goods and services.

Table 2: Effects of a shock to government purchases of goods and services on private investment

	impact	long run	max.
Neoclassical (perm.)	+0.4	+0.3	+0.4
Neoclassical (temp.)	-0.1	0.0	-0.7(4)
Neoclassical (temp, distort.)	-1.1	0.0	-1.6(4)
MULTIMOD	-0.6	-0.05	-0.6
Fiscal dummy VAR resid.	0.0	0.0	-0.7(8)
non resid.	+0.7	0.0	+1.1(8)
total	+0.7	0.0	+0.4(8)
Structural VAR	0.0	-0.4	-0.7(4)
Alesina et al.	-0.4	-0.5	-0.5(20)

[9] Strictly speaking, the exercise in Alesina et al (1999) reported here consists in shocking the wage component of government purchases of goods and services.

[10] In fact, during the large fiscal consolidations cited above, private investment boomed even more than private consumption. But the negative multiplier of government spending on private investment is strong enough that a separate theory for normal and difficult times is not needed to explain the investment boom during these episodes (see Alesina et al. (1999)).

The fiscal dummy VAR approach is consistent (with suitable amendments) with the neoclassical approach with lump-sum taxation in obtaining a positive effect of government spending on investment. The other approaches deliver a negative effect on investment, although for very different reasons: the interest rate increase in MULTIMOD, the labor market channel in Alesina et al. (1999). Note that the peak negative response of investment in MULTIMOD, Blanchard and Perotti (1999) and Alesina et al. (1999) is very similar, between .5 and .7 pp of GDP.

IV.C EFFECTS ON THE REAL WAGE

An important recent development is the renewed attention to the channels of operation of fiscal policy. It is safe to say that policymakers and large scale macroeconometric models have long taken for granted that government spending affects output directly by increasing aggregate demand, and indirectly via interest rates. But the neoclassical model emphasizes a different channels, labor supply; and labor markets also play an important, possibly the predominant, role in the European debate on the effects of fiscal policy on employment and competitiveness. It is clearly hard to disentangle these effects, but some progress can and has been made.

Looking directly at the real wage is the obvious first step. In the neoclassical model, an increase in government spending leads to a negative wealth effect as individuals internalize the future higher taxes; hence, consumption falls but labor supply increases and so does output and investment. As the labor supply increases, the real wage falls. In the textbook Keynesian models government spending increases aggregate demand; as one moves down the aggregate labor demand schedule, the real wage falls -- the same qualitative prediction as in the neoclassical model. But this countercyclicality of the real wage has always made neo-Keynesians uneasy. In fact, it is relatively easy to obtain an increase in the real wage in response to a government spending shock. We have seen an example in the q-model *cum* labor unions in Alesina et al. (1999). Another example is Rotemberg and Woodford (1992), who obtain a procyclical real wage in the context of a model of monopolistic competition.

Neoclassical model. As a consequence of the increase in labor supply, the real wage falls on impact, and by less in the case of a temporary government spending shock. As the capital/labor ratio returns to its initial level in the long run, the real wage also returns to its initial level

MULTIMOD. As we have seen, labor supply is perfectly inelastic in this model; hence, the labor market channel of fiscal policy is excluded a priori.

The fiscal dummy VAR approach. Regardless of the deflator used, the (after-tax) real wage in manufacturing falls, by a maximum of between 2.2 and 4.0 percent after about a year and a half from the beginning of the buildup, in close coincidence with the peak in military expenditure.

The structural VAR approach. Blanchard and Perotti (1999) do not have the real wage among their endogenous variables. A related paper that does have the real wage is Rotemberg and Woodford (1992), who obtain a positive response of the real wage in a quasi-VAR that includes the real manufacturing wage, hours worked in the manufacturing sector, and military spending. The real wage increases by about .4 percent on impact, and by about .6 percent in the long run.

Fiscal policy, profits and investment (Alesina et al. (1999)). As part of their investigation of the effects of fiscal policy on profits, Alesina et al. show that a shock to (the wage component) of government purchases of goods and services raises manufacturing compensation by between .8 and 2.2 percent on impact, depending on the specification. In turn, a one percent increase in real compensation depresses profits on impact by between .14 and .4 pp of GDP. The result, when dynamics are taken into account, is the effect on investment that we have documented above.[11]

[11] In a case study of all episodes of expansionary fiscal consolidations, Alesina and Ardagna (1998) provide evidence that the labor market was an important channel of the non-keynesian effects of fiscal policy.

Table 3: Effects of a shock to government purchases of goods and services on the real wage

	impact	long run	max.
Neoclassical (perm.)	-0.6	0.0	-0.6
Neoclassical (temp.)	-0.4	0.0	-0.4
Neoclassical (temp, distort.)			
MULTIMOD			
Fiscal dummy VAR W/CPI	-0.8	-0.8	-3.2(6)
W/PPI	-1.2	0.0	-4.0(6)
W/PGDP	-0.2	0.0	-2.2(5)
Structural VAR (Rot.-Woodf.)	+0.4	+0.6	+0.7(6)
Alesina et al.	[+0.8, +2.2]		

As in previous cases, the neoclassical and the fiscal dummy variables are on one side, and the other approaches on the other.

V. AN ASSESSMENT

Contrary to what the policy discussion seems to take as granted, there is clearly no consensus even on the basic effects of government spending on output and its components.

Is there at least a set of results that is consistent with a specific theory? Overall, the results of the dummy variable approach are consistent with an amended neoclassical model, with a two-good investment sector. The results in Blanchard and Perotti (1999) are instead more consistent with standard Keynesian thinking, with one important exception. Keynesian models are agnostic on the effects of a spending shock on investment: they can be positive if the accelerator effect prevails, or negative if the interest rate effect prevails. However, they predict that the effect of a spending shock is the opposite than the effect of a tax shock. Instead, in Blanchard and Perotti (1999) higher spending and taxes have both a negative effect on investment. An implication of this is that a balanced budget fall in spending and taxes would have a doubly positive effect on investment.

In light of these results, what is perhaps most surprising is the apparent confidence that inspires policymakers -- and many economists -- when evaluating and proposing fiscal policy measures. For instance, the restrictions on fiscal policy imposed by the Maastricht Treaty have often been blamed as a cause of the slowdown of many European economies; but for all we know, they may have made a positive contribution to the cycle. Similarly, in national budget documents a looser fiscal policy is almost invariably associated with a boost to demand and output, an assumption that may be entirely unwarranted, particularly in the case of investment.

But our area of ignorance is even greater when it comes to other channels that I have not dealt with here. It is often claimed that the weakness of the Euro is caused by the lack of appropriate monetary and fiscal policy, which in turn is caused by the absence of a strong supranational fiscal authority. Much of this is, of course, political rhetoric; nevertheless, it would be interesting to know what are the appropriate fiscal policies that would give a boost to the Euro. Nearly all policymakers and economists would believe that a fiscal expansion would appreciate the Euro, and indeed this is embedded in virtually all macroeconometric models. Yet, in the present context this is almost certainly counterfactual: there is little doubt that the news of a surprise fiscal expansion in Europe would cause the Euro to depreciate.

Second, since the Delors plan there are recurrent request in Europe for a major plan of public infrastructure; and more public infrastructure is a daily refrain when it comes to policies for the Italian Mezzogiorno. But again, there is no empirical evidence

that could provide any policy guidance on this topic. Besides the tremendous data problems that plague this type of investigations, the inference that "public infrastructure is good because it has a positive social marginal product" is totally unwarranted. First, is the social marginal product higher than that of private investment? Second, what about the distortionary effects of the associated higher tax revenues? I have never seen a single study that addresses these two issues.

Lastly, recent years have witnessed a shift towards more targeted subsidies to firms, and towards tax credit for investment. Although there may be several theoretical justifications for such a policy shift, I have never seen any empirical study on the macroeconomic effects of subsidies to firms, and certainly no experimental evidence.

Is all this a recipe for fiscal inaction? It is unrealistic to think that a consensus will ever be reached. But we should honestly admit that, at present, our area of ignorance even on basic signs of fiscal policy multipliers is too great. At a minimum, this should suggest using fiscal policy very sparingly.

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