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FISCAL POLICY AS A STABILIZATION TOOL. THE CASE FOR QUASI-AUTOMATIC STABILIZERS, WITH AN APPLICATION TO THE VAT

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Fiscal Policy as a Stabilization Tool. The Case for Quasi-Automatic Stabilizers, With an Application to the VAT

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ABSTRACT

Most of the focus of recent stabilization policy research and practice has been on monetary rather than fiscal policy. This paper explores how, given the limits on monetary policy, fiscal policy could play a larger role. It explores the use of quasi-automatic stabilizers, i.e. changes in taxes or transfers triggered by an aggregate variable. It discusses design issues, in particular how to make such stabilizers truly debt neutral, and what aggregate variable to use as a trigger. It then focuses on a specific stabilizer, a variable VAT rate. It shows its effect in a minimalist NK model, and then discusses a number of analytical issues, both within and out of the minimalist model, such as the implications for inflation, the choice of the tax base, the implications of liquidity constraints, the implication of anticipation effects. It ends by reviewing the empirical evidence on passthrough of VAT changes, and the effects on demand of VAT changes, permanent or temporary.

Olivier J. Blanchard
Peterson Institute for International Economics
1750 Massachusetts Avenue, NW
Washington, DC 20036
and NBER
oblanchard@piie.com

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Most of the focus of recent stabilization policy research and practice has been on monetary rather than fiscal policy. At the same time, the limits of monetary policy, in particular the constraints imposed by the effective lower bound on nominal interest rates, have become more obvious, suggesting a need for a stronger role for fiscal policy. Indeed, fiscal policy, with its large potential set of instruments, would seem to have an important role to play. The case for fiscal policy as a stabilization tool suffers however from well-known problems. In addition to decision and implementation lags, political economy considerations imply that giving more room to fiscal policy may lead to excessive debt financing, an issue known as debt bias. In the current context in which public debt is historically high, debt bias is even more costly.

The way to use more actively fiscal policy for stabilization purposes and avoid both the decision and implementation lags and the debt bias, is thus to design and use debt-neutral quasi-automatic stabilizers. Two words are important here. "Quasi"' indicates that, in contrast to truly automatic stabilizers, the trigger has to be some observable variable, such as measured GDP or unemployment. "Debt-neutral" indicates that, while they lead to variations in the primary balance in the short run, they must be designed to have no long run effect on the debt level.

Quasi-automatic stabilizers work through a combination of income and substitution effects. Some, like those that make unemployment benefit duration a function of the unemployment rate, work mostly through income effects; some, such as varying investment tax credits or varying VAT rates, rely more on substitution effects. As the potential and actual effects of varying unemployment benefit duration have been studied at some length, this paper focuses on the design and the potential effects of variable VAT rates.

The paper is organized as follows.

Section 1 reviews the standard case for using monetary rather than fiscal policy. The logic of the case is straightforward, and most obvious in the minimalist New Keynesian model. In that model, monetary policy is simply the correct Pigouvian response to the main distortion generating fluctuations, namely nominal rigidities. On paper, it can fully stabilize output, and there is just no need to use fiscal policy.

Section 2 discusses the limits of the case. There are many other distortions beyond nominal rigidities, for example those that give rise to liquidity constraints and limit the role of monetary policy. There are also restrictions on monetary policy itself, be it the effective lower bound on nominal interest rates, or membership in a common currency area. In all those cases, there is a natural role for fiscal policy to play.

Section 3 discusses the well documented objections to the use of fiscal policy as a stabilization tool. Decision and implementation lags may limit its effectiveness. And governance issues, in particular the short horizon of policy makers, lead to the risk of debt bias. It argues that these issues can be avoided by the use of quasi-automatic stabilizers. They eliminate decision lags, reduce implementation lags, and if carefully designed, can avoid the debt bias.

Section 4 focuses on the choice of quasi-automatic stabilizers, automatic changes in taxes or spending triggered by the observation of an aggregate variable. It discusses two general issues, what the trigger variable should be, and how to enforce automatic long run debt neutrality.

Section 5 then focuses on a specific tool, namely a varying VAT rate. It shows how, in the minimalist New Keynesian model, it comes close to replicating the use of the interest rate in monetary policy.

Section 6 discusses, within the minimalist model, a number of analytical issues, namely how the use of the VAT rate affects the stability condition, the

evolution of inflation, excluding or including VAT rate changes, and the worry that, because consumers anticipating a recession also anticipate a cut in VAT rates, this may lead the recession to come earlier.

Section 7 goes beyond the minimalist model, discusses the pros and cons of announcing a VAT rate for a definite period or make the end of the program contingent on the state of the economy, whether to apply the change in the VAT rate on all or only part of consumption, and how VAT rate changes affect the economy when there are two types of consumers, unconstrained and "hand to mouth" consumers.

Section 8 looks at the empirical evidence on passthrough, i.e. the degree to which VAT changes lead to changes in consumer prices, and the empirical evidence on the effects on demand, from related experiments, in particular the "cash for clunkers" program in the United States in 2009.

Section 9 concludes. It will be clear that the paper raises more issues than it answers. This reflects in large part the fact that, while there has been exhaustive work on monetary policy and refinements of inflation targeting, there has been much less on fiscal policy as a stabilization tool. Given the circumstances, this might well be where the returns from research are highest.

1 The case for monetary policy as the right stabilization tool.

To explain the large output fluctuations apparently due to shifts in the demand for goods, the mainstream view of macroeconomic fluctuations has focused on the role of nominal rigidities. The argument for the use of monetary policy is best presented in the minimalist New Keynesian model, which introduces two distortions in an otherwise standard equilibrium model: To be able to think about price setting, it assumes that prices are set by monopolistic competitors.

And it assumes that price decisions are staggered in some way, leading to a slower adjustment of the price level than would be the case under flexible prices.[1]

The slow adjustment of the price level implies that, in general, for a given monetary policy, the short term interest rate will not be equal to the neutral rate, i.e. the interest rate that would prevail under flexible prices. This, in turn, implies that aggregate demand and, by implication, output, which is assumed to be demand determined, may not be equal to the output level that would prevail under flexible prices, leading to an undesirable output gap. In the model, the output gap, $\tilde{y}$ depends on the interest rate gap $r - r^n$ and the expected future output gap, according to:

$$\tilde{y_t} = -\sigma(r_t - r_t^n) + E\tilde{y}_{t+1}$$

The equation shows why, within the logic of the model, monetary policy is the proper tool to stabilize the economy. If the monetary authority can set the interest rate equal to the neutral rate, and commit to do the same in the future, then it can eliminate the output gap and stabilize the economy. Put another way, the interest rate is the right Pigouvian tool to use in response to the distortion causing the output gap. This is a powerful result: There is no need for other tools, no need to use fiscal policy as a stabilization device.[2][3]

2 The limits of monetary policy and the scope for fiscal policy

While the minimalist Keynesian model focuses on the role of nominal rigidities, there are many other relevant distortions, which interact with nominal rigidities,

[1] See, for example, Jordi Gali 2015, [18].

[2] The conclusion remains true if the model is extended to allow for investment as well as consumption.

[3] To the extent that monopolistic competition leads to a markup, and thus to a level of output which is too low relative to first best, there is a role for fiscal policy to eliminate this markup through a tax. But this is not a stabilization policy role.

weaken the case for monetary policy and strengthen the case for fiscal policy.

Liquidity constraints for example imply that some proportion of consumers may not be able to borrow, and thus do not respond to a decrease in the interest rate. In this case, fiscal policy, for example in the form of transfers to those households most likely to be liquidity constrained, can increase aggregate demand in a way monetary policy cannot. Indeed the very reason why monetary policy loses its potency in this case is also the reason why fiscal policy, through current transfers, becomes more potent: the marginal propensity to consume out of current income is higher.

Other distortions also matter, in more complex ways. Take real (as opposed to nominal) wage rigidities, which destroy what Jordi Gali and I have called the "divine coincidence", introducing a trade-off between inflation and the welfare relevant output gap. This is actually what a number of countries faced in the recent Ukraine-triggered energy crisis. By using subsidies to reduce the price of energy charged to consumers, they reduced the inflation rate, limiting the risk of a price wage spiral, while sustaining demand.[4] The full history of the episode needs to be written, but there is a decent argument for concluding that fiscal policy helped monetary policy and played a useful role.

Monetary policy itself may be constrained. The most obvious case arises when a country is part of a common currency area, as is the case for the members of the euro zone. In that case, monetary policy cannot deal with country-specific shocks. National fiscal policy can. It can stabilize demand through transfers if and when needed. As Farhi et al 2014 [15] have shown, it can potentially do more, namely replicate the movement in the real exchange rate that would arise under flexible exchange rates, by using a combination of an increase in the VAT rate and a decrease in the payroll tax.

The effective lower bound on nominal interest rates has very much the same

[4] See Dao et al 2023 [13].

implications, except that it binds in only one direction, preventing monetary policy from increasing output when output is too low. While hitting this lower bound was believed to be an unlikely event, with this belief largely underlying the choice by central banks of a low inflation target and by implication low average nominal interest rates, the constraint has proven to be highly relevant and costly. When binding, it simply eliminates the ability to decrease the short term real interest rate in response to weak demand. Even when not binding today, the expectation that it may be binding in the future and thus limit the future use of monetary policy decreases the ability of the central bank to stabilize output today. And, while other tools such as quantitative easing have been introduced, they have collateral effects. Paradoxically, they deal with a distortion, namely the binding lower bound, by introducing another distortion, namely reducing the term premium from what it would be under flexible prices. Just as in the common currency case, fiscal policy can potentially help by both sustaining demand and adjusting the real exchange rate. Indeed, Correia et al 2013 [11] have shown that a combination of VAT rate decreases, higher investment tax credits, and payroll tax increases can in principle replicate what monetary policy would do if unconstrained.

3 The issues with fiscal policy as a stabilization tool

Fiscal policy suffers, as a stabilization tool, from three well-known shortcomings, decision lags, implementation lags, and debt bias.

Take the lags. Decision lags come from the political process: The government can rarely act unilaterally, and it takes time to get agreement in Parliament. Wars of attrition between parties can delay the decision. Once a decision has been taken, it takes time to change the tax code and put in place the admin-

istrative measures needed to implement it, more so than with monetary policy where moving the policy rate is done instantaneously.

Data from the Congressional Budget Office (CBO) are useful here. CBO has decomposed quarterly changes in the U.S. budget balance between a discretionary component and an automatic component, reflecting the role of the various automatic stabilizers implied by existing tax and transfer rules. Figure 1 shows a scatter plot of both the discretionary and the automatic components of the overall budget balance, both divided by the overall budget (constructed itself as 0.5 times revenues + 0.5 times expenditures), quarterly, since 1965:1. against the unemployment rate.[5] One can draw three main conclusions: The first is that the automatic balance moves closely with the unemployment rate, as we would expect automatic stabilizers to do: The higher the unemployment rate, the more negative the automatic balance. The second is that, not surprisingly, the discretionary balance, which reflects many other decisions than stabilization, is much more weakly associated with the unemployment rate. The third, more surprising finding however is that the discretionary balance is, on average, also associated with movements in the unemployment rate. Regressions of either the automatic or the discretionary balance on the unemployment rate yield roughly the same slope.

Regressions of each of the two balances on a distributed lag of unemployment, reported in Table 1, show however an important difference between the two. The automatic balance reacts strongly to unemployment within the quarter, but the discretionary balance only responds with a lag, although the estimated lag is short. This makes the case for automatic stabilizers, but indicate also that discretionary policy can, at least sometimes, quickly take the relay. This has

[5]For visual clarity, the data in the scatter plot run to the end of 2019, leaving out the very large increase and then decrease in the two balances in 2020, which, if included, would reduce the other points to a small and hard to read cloud. Regressions of each of the two balances on unemployment give however very similar results, whether or not post 2019:4 data are included.

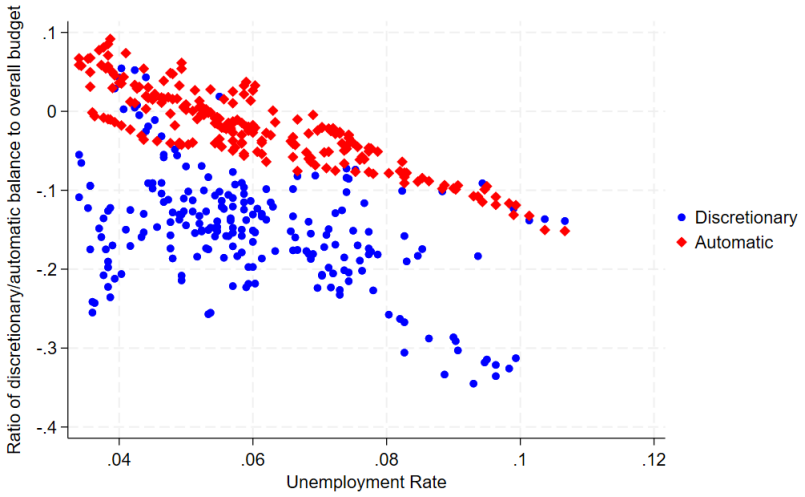


Figure 1: Discretionary and automatic balances versus unemployment

implications for the design of quasi-automatic stabilizers I shall return to.

Table 1: Regression Results

VARIABLES	Discretionary balance	Automatic balance
unrate	-0.232	-2.085***
L.unrate	-3.461	-0.994
L2.unrate	2.135	0.169
L3.unrate	-0.749	-0.0424
L4.unrate	0.194	0.609
Constant	-0.0223	0.119***
Observations	216	216
R-squared	0.232	0.760

Standard errors in parentheses

*** $p \leq 0.01, * * p \leq 0.05, * p \leq 0.1$

Leaving aside lags, the main issue is debt bias. During the period shown in Figure 1, U.S. debt increased from 40% to 120% of GDP. Some of it reflects the effect of crises, in particular the Great Financial Crisis and, later on, the Covid 19 Crisis. But most of it reflects debt bias. The main explanation is the short horizon of policy makers, but others exist and are sometimes relevant, such as

the desire of a government to constrain the actions of the next one (Alesina and Tabellini 1990 [2]). This is why countries have introduced at different times various fiscal rules aimed at limiting the drift in debt. These rules however often constrain the use of fiscal policy for stabilization purposes.[6] Quasi-automatic stabilizers can be designed to avoid debt bias—although this is not as obvious as it first sounds; more on this below. And the more they do, the more the fiscal rules can be strengthened to limit debt bias without reducing the scope for fiscal policy stabilization.

4 Debt neutrality, and the choice of trigger

Automatic stabilizers, from the income tax to unemployment benefits, do not depend on the publication of some aggregate variable, do not involve decision or implementation lags, and, as shown in Figure 1, clearly move the budget balance contemporaneously in countercyclical fashion. Their strength however is accidental: Neither the schedule, nor the degree of indexation of the income tax or of unemployment benefits were designed with output stabilization in mind. There is no reason to think that they provide the optimal amount of fiscal stabilization.[7]

The structure of tax schedules contributes to a number of societal objectives, so it is hard to make a case for increasing progressivity just to strengthen automatic stabilizers

One must keep separate the three functions identified by Musgrave and Musgrave 1989 [20], allocation, distribution, stabilization. The structure of tax schedules contributes to a number of societal objectives, so it is hard to make a case for increasing progressivity just to strengthen automatic stabilizers.

[6] See the discussion of EU fiscal rules, for example in Blanchard et al 2021 [5].

[7] An interesting aspect of the discussion about automatic stabilizers is that policy makers are quite happy to let existing automatic stabilizers work, whatever strength they happen to have, but are reluctant to think about to make them stronger (or weaker as the case may be).

The way to improve fiscal stabilization is to introduce better, quasi-automatic, stabilizers—measures which are triggered by (or are continuous functions of) some aggregate variable. Relative to automatic stabilizers, they are triggered with a small lag, due to the collection and publication of the relevant aggregate variable.[8] But, relative to discretionary policy, they eliminate decision and implementation lags, and, if well designed, they can avoid the debt bias.[9]

Quasi-automatic stabilizers already exist. In many countries including the United States and France, the duration of unemployment benefits depends in some way on the unemployment rate. But they are typically not debt neutral. This is most obvious when they are asymmetric, being more generous when unemployment is high but not less so when unemployment is low. Even symmetric stabilizers do not however necessarily imply debt neutrality. Take the simplistic example of a quasi-automatic stabilizer which responds to random white noise fluctuations in output so that the debt ratio associated with the automatic stabilizer takes the form:

$$d = (1 + r - g)d(-1) + x$$

where x, the automatic stabilizer is white noise. Then, clearly, if $(r - g)$ is positive, the debt ratio will follow an explosive process, with an ever wider distribution. Even if $(r - g)$ is equal to zero, the debt ratio will follow a random walk, and thus drift away from zero. What is needed to achieve debt neutrality is a feedback rule of the form:

$$d = (1 + r - g)d(-1) + (x - a\ d(-1)),\ \text{where}\ \ r - g - a < 0 \qquad (1)$$

[8] With more and more information about activity available in real time, the lag will become shorter.

[9] For a thorough review of the nature and the effects of automatic stabilizers in the United States, and a discussion of a number of potential quasi-automatic stabilizers, see Boushey et al 2019 [9]. The book and this paper are complementary. This paper is more methodological, and explores a relatively neglected potential automatic stabilizer, namely the variable VAT rate. The book is more institutional and immediately practical.

This rule, similar to the rule derived by Bohn 1998 [8] for overall debt stability, implies that if, for example, a long recession has led to a large increase in the debt associated with the stabilizer, the government will have on average to choose a negative value of the stabilizer for some time. Note that neither automatic stabilizers, nor existing quasi-automatic stabilizers, satisfy this condition; when designing new ones, it is important to introduce such an explicit feedback rule.

A characteristic of automatic stabilizers and realistic quasi-automatic stabilizers is that they aim at stabilizing output (or unemployment) rather than the output gap (or the unemployment gap), that is the difference between actual output and what it would be if prices were flexible.[10]

With respect to demand shocks, theory suggests that the flexible price output is likely to remain largely unchanged, so that output and the output gap typically move together and there is no issue. But with respect to supply shocks, such as increases in energy prices or supply chain disruptions, the flexible price output is likely to change, so that output and the output gap may move in different ways: a decrease in output for example may reflect a lower flexible price output, with an unchanged or even positive output gap. On paper, one can design stabilizers so that they respond to the output gap, for example, by making them depend on more than one trigger variable. For example, by making them depend on both the unemployment rate and output, to the extent that the two variables react differently to supply and demand shocks. Realistically, they must have a unique trigger. The practical question is whether it should be output or unemployment.

The question can be reformulated as: In the short run, how do unemploy-

[10] A separate issue is the difference between the output gap–the difference between output and flexible price output– and the welfare output gap—the difference between output and optimal output. The two gaps are the same in the simplistic New Keynesian model, but can be different in the presence of other distortions, such as real wage ridigities. I leave this issue aside here.

ment and output depend on demand versus supply shocks? If one is willing to accept that demand shocks have no long-run effect on either output or unemployment, but that supply shocks have a long-run effect on output and no long-run effect on unemployment, one can use econometrics to determine the relative importance of the two shocks at various frequencies. This is what we did in Blanchard Quah 1989 [6][11]. Rerunning the equations in Blanchard Quah using data up to 2019 gives the following results. The proportion of variance 8 quarters out due to shocks without long-run effects, thus interpreted as demand shocks, is 10-25% for output, 60-80% for unemployment.[12] This suggests choosing the unemployment rate as the reference variable.

The approach above assumes however that neither demand nor supply shocks have long run effects on unemployment. It is clear however that there are low frequency movements in the unemployment rate, and one cannot rule out the presence of a unit root, presumably in response to supply shocks. If there are indeed permanent changes in the natural rate, then the debt associated with the stabilizer will not return to zero over time. If for example, the natural rate increases by Δu_n, then the rule in (1) implies that the debt associated with the stabilizer will converge to $\Delta u_n/(r-g-a)$, which may be quite large. This suggests the desirability to have the trigger not be the unemployment rate itself, but a deviation from some moving average of past values, so that the relevant variable returns in expectation to zero.[13]

[11] As discussed in the literature, this is at best an approximation. While the assumption fits productivity shocks well, some supply shocks, such as Covid19, may have short lived effects on output. Some demand shocks may have hysteretic, long-run, effects on output and unemployment.

[12] The range corresponds to different assumptions about the existence or not of non-stochastic trends.

[13] This could be for example the deviation of the unemployment rate from a Kalman filter estimate of the underlying natural unemployment rate.

5 A variable VAT as a quasi-automatic stabilizer

What stabilizer to use? In contrast to monetary policy, there is a near infinity of potential fiscal tools, from the different tax and subsidy rates, to transfers, to public investment. On paper, combinations of these can do wonders. Indeed, the papers by Correia et al 2013 [11] and by Farhi et al 2014 [15] show that portfolios of fiscal measures can replicate monetary policy and achieve the flexible price equilibrium. But, realistically, we have to think of one stabilizer at a time (although one might explore for example the use of both a variable unemployment benefit duration and a variable VAT.).

Within the potential tools, some work mostly through income effects. This is the case for unemployment benefits, for different forms of direct payments to specific groups of individuals—something that was difficult to do during Covid but is becoming increasingly easier with the digitalisation of information about individuals— and for public investment projects. The potential stabilizers explored in Boushey 2019 [9] belong to this category. Others work more through substitution effects, for example the investment tax credit or the variable VAT rate, shifting spending towards or away from the present. [14]

This second category has been less explored than the first, and so I shall focus on the use of a variable VAT rate.[15] This tool is not as exotic as it seems. Temporary VAT rate changes have been used in the past, although not systematically. For example, in the UK, during the Great Financial Crisis, the standard VAT rate was decreased from 17.5% to 15% for 13 months; in Germany, during the Covid crisis, the standard VAT rate was decreased from 19% to 16% from July to December 2020; in Ireland, the standard rate was decreased from 23% to 21% from September 2020 to February 2021.

[14] This distinction focuses on first round (partial equilibrium) effects. General equilibrium effects nearly always involve a mix of the two.

[15] An early examination of the investment tax credit as a stabilization tool is by Taylor [21]. I looked at the investment tax credit as a stabilizer with Larry Summers [7]).

One strong theoretical reason a variable VAT rate is appealing is that it can replicate any real policy rate that the central bank would like to achieve but may not be able to for the reasons we discussed, be it a common currency constraint or the effective lower bound. Let τ be the VAT rate. Let i be the nominal interest rate, Let P be the price level. Then, the relevant real interest rate facing a consumer is given by:

$$(1+i)\,\frac{P}{EP(+1)}\,\frac{1+\tau}{1+E\tau(+1)} \approx (i - E\pi(+1) + \tau - E\tau(+1))$$

The lower the VAT rate today, or the higher the expected VAT rate next period, the more expensive goods are next period relative to today, and thus the lower the real interest rate facing consumers. If for example, because of the lower bound and 2% inflation, the central bank can only decrease the real rate to -2%, but the natural interest rate is -6% (plausible numbers in a recession), then a decrease in the VAT rate from 20% to 15%, announced to return to 20% in one year, does deliver the desired interest rate of -6% ((0.98x1.15/1.2)-1).

5.1 The variable VAT in a minimalist NK model

It would seem as if a variable VAT rate can therefore perfectly replace monetary policy. This is not quite right, as, in contrast to the interest rate, the VAT rate does not affect investment (which is VAT exempt), affects inflation directly, and affects the natural level of output. Going back to the minimalist NK model (Gali 2015 chapter 3 ([18]) (which does not have investment and thus avoids the issue of whether the variable VAT should be coupled with a variable investment tax credit), the presence of a VAT modifies the equations as follows :

The IS equation gives log output as a function of expected log output next period, of the relevant interest rate including the effect of the VAT rate as discussed above, and of a preference shock z, which is the source of demand determined movements in output in the model:

$$y = Ey(+1) - \sigma[i - E\pi(+1) - \boldsymbol{(E\tau(+1) - \tau)} + \ln\beta + (z - Ez(+1))]$$

The Phillips curve is composed of two equations. The first gives inflation excluding VAT, denoted π, and is still given by the Calvo specification:

$$\pi = \beta E\pi(+1) + \kappa(y - y_n)$$

$$\tilde{\pi} = \pi + \boldsymbol{(\tau - \tau(-1))}$$

Inflation depends on expected inflation and the output gap, defined as the difference between actual and natural output. The second equation is an identity, giving the rate of inflation including VAT, denoted $\tilde{\pi}$, and reflecting the mechanical effects of current and next period VAT rates on the price level.

As opposed to changes in the interest rate from monetary policy, VAT rate changes have potentially large direct effects on the inflation rate faced by consumers and thus including VAT. A one-year unanticipated decrease in the VAT rate of five percentage points implies, other things equal, an expected inflation rate higher by 5%. I return to the issue later.

Again, in contrast to changes in interest rates due to monetary policy, **the natural level of output** is affected by the VAT tax rate, as a higher VAT rate makes consumption more expensive relative to leisure. A higher VAT rate decreases labor supply, and in turn output, the strength of the effect depending on the elasticity of labor supply. Let me ignore productivity shocks for the moment.

$$y_n = -\psi\boldsymbol{\tau}$$

In defining **the interest rate rule**, the issue arises of what inflation rate it should depend on. It is clear that having the interest rate depend on the inflation rate including the VAT would in effect force monetary policy to offset most of the effect of the automatic stabilizer. A lower VAT rate would imply higher expected inflation, and thus force the central bank to choose a much

higher nominal interest rate. Thus, it is reasonable to choose a monetary policy rule that sees through the variations in the VAT rate, thus an interest rate rule of the form :

$$i = \rho + \phi_\pi \pi + \phi_y (y - y_n)$$

I return later to the issue of whether the central bank can really "see through" the temporary increase in actual inflation without losing credibility. [16]

This leaves the equation defining how the form of the **quasi-automatic stabilizer**, how the VAT rate varies with activity. This raises a number of issues.

First, how variations in VAT revenues are financed. I assume that they are financed through lump sum taxes, thus avoiding the issue of debt finance, and the need to offset past decreases through higher rates later (as discussed earlier). Lump sum taxes do not affect the equations above.

Second, the issue of whether the VAT rate responds to output or to the output gap, an issue discussed earlier. The issue is irrelevant in the case of preference shocks, but relevant in the case of productivity shocks. Given the difficulty of assessing the value of natural output and output gap, it is more realistic to assume that it responds to output. I return to the issue later.

Third, whether the response is continuous or discrete, with the change triggered by a particular value of output. To keep the linearity of the model, I assume a continuous response:

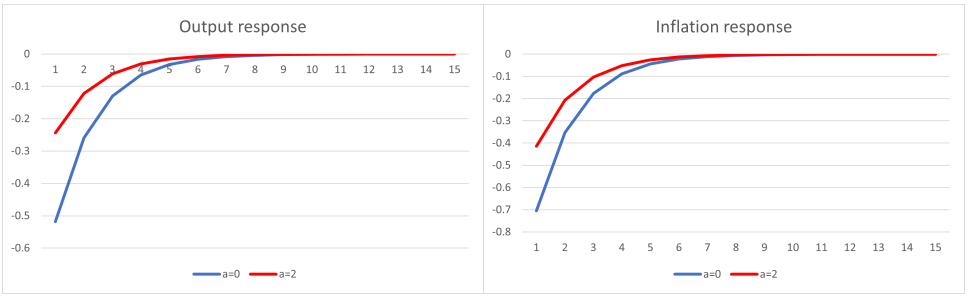
$$\boldsymbol{\tau = a\ y}$$

[16] Note that from a normative viewpoint, within the logic of the minimalist model, the central bank should care about inflation excluding VAT as, under the assumption that prices reflect the VAT rate instantaneously, the additional movement in inflation due to the VAT rate does not induce additional price dispersion and distortions.

5.2 A baseline simulation

Figure 2 shows the results of a simulation where a change in preferences leads to a recession. It considers two values for the coefficient a, 0 and 2. A value of 2 implies that a decrease in output of 1% relative to steady state leads to a decrease of 2 percentage points in the VAT rate. The values of all the other parameters, including those for the interest rule, are the same as in Gali.

Figure 2a gives the effects on output, Figure 2b the effects on inflation, excluding VAT.



(a) (b)

Under those parameters, the simulations show that the stabilizer has substantial effects on both output and inflation. The initial decline in output goes from -0.51% to -0.24%, the initial decline in inflation from -0.70 to -0.41. In other words, the stabilizer stabilizes. This however is not much more than a proof of concept, and it raises a number of analytical issues, both within and out of the minimalist model , and a number of empirical issues to which I now turn.

6 Analytical and conceptual issues

6.1 Stability

One argument for using fiscal policy is that it can be used when monetary policy is constrained, for example by the ZLB. The condition for stability of the minimalist model without VAT (Bullard and Mitra [10]) is given by :

$\phi_y(1-\beta)+\kappa(\phi_\pi-1)>0$

So, if we think of the ZLB as preventing a downward adjustment, and assume ϕ_y and ϕ_π to be equal to zero, the right hand side is equal to $-\kappa$ and the condition is not satisfied.

The question is how the introduction of the automatic VAT stabilizer helps in this case. The answer, which might be disappointing, is that it does not change the stability condition.

To see this, note that, under the assumptions above, the output gap $y-y_n$ is equal to $(1+\psi a)y$ and the system can be rewritten as:

$y=Ey(+1)-\tilde{\sigma}[i-E\pi(+1)+\ln\beta+(z-Ez(+1))]$ where $\tilde{\sigma}=\sigma/(1+\sigma\ a)$

$\pi=\beta E\pi(+1)+\tilde{\kappa}y$ where $\tilde{\kappa}=(1+\psi a)\ \kappa$

$i=\rho+\phi_\pi\pi+\tilde{\phi_y}y$ where $\tilde{\phi_y}=(1+\psi a)\phi_y$

The value of $\tilde{\sigma}$ does not enter the stability condition, and the condition turns out to take the form:

$(1+\psi a)(\phi_y(1-\beta)+\kappa(\phi_\pi-1)>0$

which is the same as a minimalist model without VAT. Thus, if monetary policy cannot insure stability, the model implies that the automatic stabilizer does not help. How should the result be interpreted?

One can interpret it as indicating that an automatic stabilizer should depend not just on output but on inflation as well—which would modify the stability condition. Or, and this is my preferred interpretation, that the minimalist

model gives too much weight to the expected future, that this has indeed led to a number of paradoxes, and a more reasonable specification increases the scope for stability.

One such specification has been developed by Gabaix 2020 ([17], who has explored the implications of partial myopia vis-a-vis distant events, a highly relevant deviation from the full rationality assumption of the NK model. When introduced in the minimalist NK model, his approach leads to the presence of two extra terms, M and M^f, and the two forward looking equations become:

$$y = M\ Ey(+1) - \sigma[i - E\pi(+1) + \ln\beta + (z - Ez(+1))]$$

$$\pi = \beta M^f E\pi(+1) + \kappa(y - y_n)$$

As both M terms are less than one, the implication is that the future matters less than in the original NK model. The stability condition becomes:

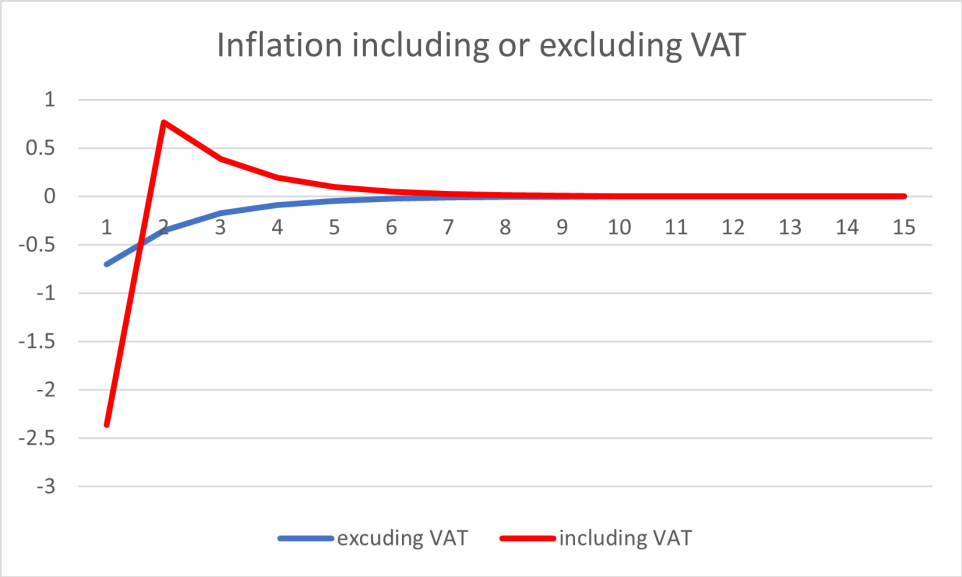
$$\phi_\pi + \frac{(1-\beta M^f)}{\kappa}\ \phi_y + \frac{(1-\beta M^f)(1-M)}{\kappa\sigma} - 1 > 0$$

If M and M^f are equal to one, the stability condition reduces to the minimalist model condition. If they are smaller however, the condition is more easily satisfied, and can be satisfied even if the central bank is facing the zero lower bound. In this case, only the last term matters, and, in particular, the smaller σ, the more likely it is to be satisfied. The extension of the Gabaix model to the introduction of automatic stabilizer is straightforward, with the only change to the stability condition being the presence of $\tilde{\sigma}$ instead of σ. In this case, the stronger the stabilizer, the more likely the stability condition is to be satisfied.

6.2 Inflation

I have focused on the behavior of inflation excluding VAT. Consumers however face actual inflation, i.e. inflation including VAT. Figure 3 shows the behavior of inflation excluding VAT (as shown in Figure 2) and inflation including VAT, for

a value of $a = 2$, in response to an unexpected, temporary, change in preferences. The behavior of inflation excluding VAT is smooth, but not so the behavior of actual inflation. In the first quarter, the unanticipated decrease in the VAT rate leads to an unanticipated inflation rate, (annualized), of -2.4%. Thereafter, it leads in the second quarter to an anticipated inflation rate of 0.8% , which then slowly converges to zero over time.



The interest rate rule I have assumed implies that the central bank sees through that, and does not try to fight actual inflation. If credible, then this is indeed the right policy. However, a long period of above-target actual inflation may lead people to revise their expectations and start affecting inflation excluding VAT. The problem is not unique to VAT changes, and arises for example in the case of temporary commodity price changes. It is nevertheless a potential problem, and a difference between decreasing the real interest rate through lower nominal rates, or through higher inflation.

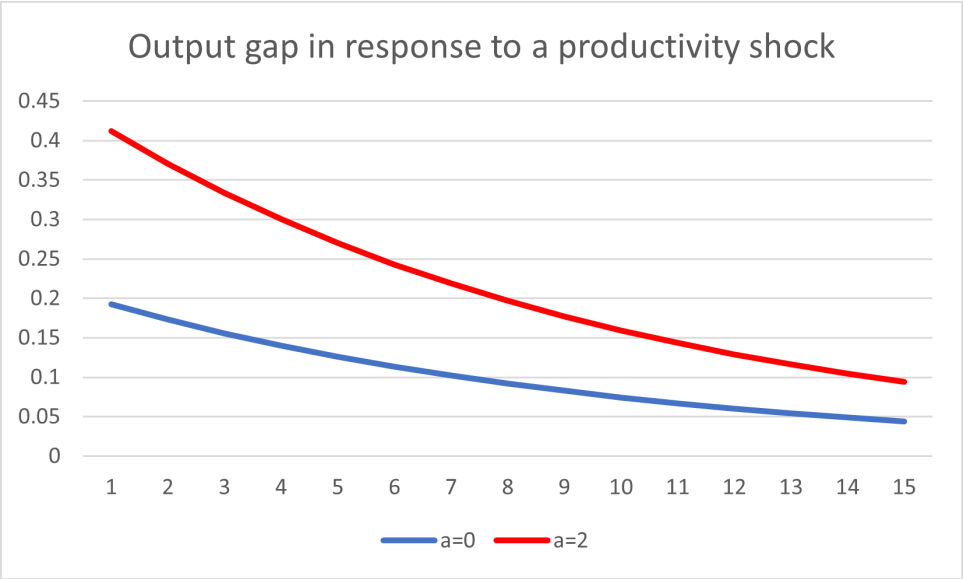
6.3 Supply shocks

As I discussed earlier, one cannot realistically make automatic stabilizers a function of an unobservable variable, such as the output gap or the unemployment gap. It would lead to discussions and disagreements about the measure of the natural level of output or the measure of the natural rate of unemployment, which would destroy the usefulness and the automaticity of the stabilizer. [17] I discussed earlier the choice between the two main candidate variables, and argued for the use of the unemployment rate, whose movements appear to be dominated by demand rather than supply shocks. But even in that case, the automatic stabilizer is going to react incorrectly.

The model here has output, not unemployment, but the same argument applies. Figure 4 shows the effects of an unanticipated adverse productivity shock on the output gap, defined as actual output minus the natural level of output (taking into account the effect of productivity, but not the effect of the automatic stabilizer), for two values of a, 0 and 2 [18]

[17] This is different from the choice of interest rate rule in monetary policy, where the central bank can respond to what it perceives as the output gap.

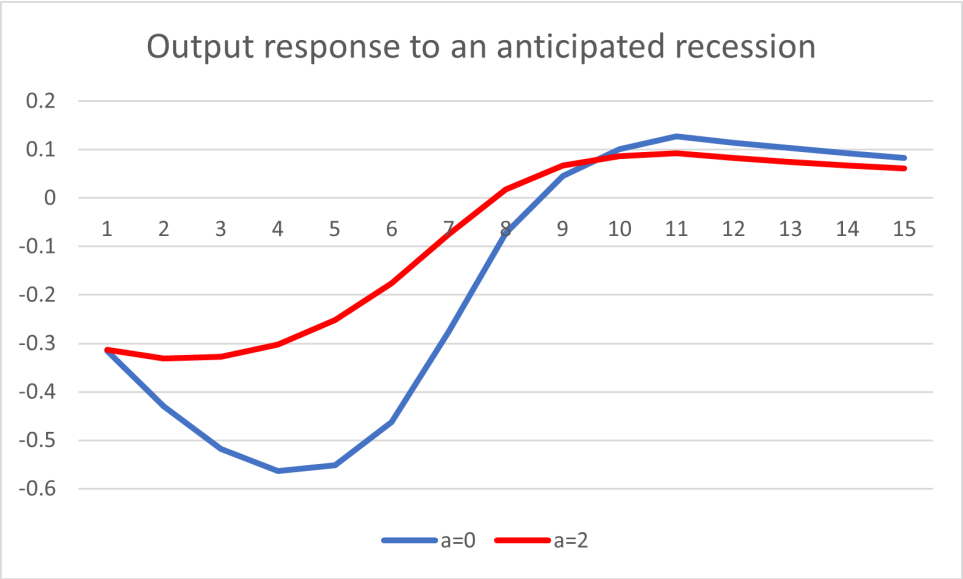
[18] For these purposes, the productivity shock is added to the equation for the natural output level.



Under the parameter values used for the simulation, the blue line shows that actual output declines less than natural output, leading to a positive output gap, so that the right response would be to increase rather than decrease the VAT rate. But, given that the stabilizer depends on actual output, the red line, corresponding to the case where $a = 2$, shows that it leads to a decrease rather than an increase in the VAT, leading to a worse (more positive) output gap. The lesson is an obvious one. This is not again unique to the VAT, and applies to other stabilizers, but it is not irrelevant. Assessing the desirability of automatic stabilizers requires assessing the importance of demand versus supply shocks.

6.4 Anticipation effects

The baseline simulation assumed that the adverse demand shock was unanticipated. But, if for example, consumers anticipate a coming recession and thus anticipate that the VAT tax rate will be lowered then, doesn't this lead them to spend less now, and thus make the recession be deeper and occur sooner?



The answer is given in Figure 5. The blue line shows the path of output absent the stabilizer, an anticipated recession (obtained by assuming a path of preference changes that generate decreasing spending for a while, followed by a slow recovery, and higher spending eventually.[19] The red line shows the path of output when a, the automatic stabilizer, is equal to 2. Note that, indeed, the recession happens one quarter earlier. But, more importantly, it is much shallower than the recession, absent the automatic stabilizer. An earlier, but shallower, recession does not seem to be a major issue.

7 Other analytical issues

The discussion in this section is exploratory, indicating directions in which more research is needed.

[19]The path of output is generated by using a rich path for intertemporal preferences: $z = 0.9\ z(-1)) + 0.1\ \epsilon_z + 0.15\ \epsilon_z(-1) + 0.2\ \epsilon_z(-2) + 0.25\ \epsilon_z(-3) + 0.3\ \epsilon_z(-4) + 0.35\ \epsilon_z(-5) + 0.4\ \epsilon_z(-6) + 0.35\ \epsilon_z(-7) + 0.2\ \epsilon_z(-8) + 0.1\ \epsilon_z(-9) + 0.05\ \epsilon_z(-10)$. I shall not pretend to give a behavioral interpretation to this equation. Under the assumption that the output decline comes from changes in preferences, some expression like this is needed to generate an anticipated recession.

7.1 Trigger and length

The most natural assumption in the simulations was to make the automatic stabilizer a continuous function of output. While this is de facto the case for truly automatic stabilizers, it is impractical for quasi-automatic ones, as they depend on the discrete publication of an aggregate statistic. It can still be adjusted as a function of that statistic, whenever it is published. Or it can take the form of a trigger, a value of the unemployment rate (if the unemployment rate rather than some deviation of output from trend is used as the trigger) above which the stabilizer is triggered, and below which it ends.

In either case, this makes the automatic stabilizer state contingent, and thus consumers have to guess what the rate will be in the future, and in the case of a trigger, how long it will be in place. This uncertainty is likely to reduce the effect of the cut in the VAT rate on demand. An apparent alternative is to announce that the lower tax rate, once triggered, will be in effect only for some pre-specified period of time. Such an announcement decreases uncertainty, and the shorter the announced period, the stronger the effect of the lower tax rate on demand. The risk is however to have the lower tax rate come to an end while the economy is still in recession. This appears undesirable.

Another issue is how to manage the combination of the automatic stabilizer and discretionary policy. This relates to the earlier discussion and evidence about automatic and discretionary balances. As we have seen earlier, the discretionary balance appears to respond to the unemployment rate, but with a lag. Should one think of the stabilizer as a bridge to discretionary policy, or as something more akin to the Taylor rule for monetary policy, i.e. as a main instrument to stabilize the economy? The design might be different in each case.

The answer is probably more the second. To the extent that discretionary

policy is subject to debt bias, and the automatic stabilizer can be set up so as to avoid it, it seems better to rely mainly as much as possible on the automatic stabilizer, and, as for monetary policy, make discretionary adjustments if needed, for example if a change in unemployment reveals itself to partly permanent.

7.2 The tax base. All of consumption or just durables?

How strong the effect of the automatic stabilizer is depends very much on the intertemporal elasticity of substitution. The parametrisation used by Gali and thus used in the simulations above is $\sigma = 1$. While this is roughly in line with macro estimates, micro estimates are substantially smaller, closer to 0.2. If so, the automatic stabilizer may have a limited intertemporal substitution impact, and it raises the issue of whether the VAT rate reduction should not be limited to durables, for which the time of purchase need not be the time of consumption, and thus are much more likely to react to a temporary change in the VAT rate. The distortion involved in the price of non durables to durables may be small relative to the effect on purchases on durable goods.

This is indeed what has often happened in the past, for example in the US "Cash for Clunkers" program in 2009, or the French measures in 1994 and 1995, called the Balladurette et the Juppette, for the names of the prime ministers at the time, and to which I return in the next section.

This however raises an issue, which actually applies, to various extents, to most of the stabilization tools, be it monetary or fiscal, available. They increase the demand for specific sectors, and it may be that these are not the sectors primarily behind the decrease in activity. Concretely, a decrease in the VAT rate on automobiles may do more harm than good if the source of the recession is elsewhere, say coming for weak investment. It may lead to excess output in the automobile sector, with sharp increases in prices, while not addressing the negative output gap in other sectors. Thus, before focusing on particular

goods or sectors, it is essential to analyse the sectoral sources of fluctuations, something that I have starting to explore in other work.[20]

7.3 Liquidity or borrowing constraints

As is well known, the minimalist NK model ignores borrowing constraints. In reality, many households face or act as if they face liquidity constraints. To the extent that they do, they are not sensitive to the interest rate, and consume their disposable income. How this affects the use of a variable VAT requires using a model with at least two types of consumers, liquidity and non liquidity-constrained types, or a full heterogenous agent model, a HANK model.

In a model with two types of agents, a VAT rate change still affects both groups directly.

The direct effects are different. Those who are not constrained react as above and the change in their consumption depends on their elasticity of substitution, and their expectations of future VAT tax rates. Those who are constrained can increase real consumption given income, as consumer prices are lower. In effect, the elasticity of their consumption to the VAT rate is equal to one, independent of their elasticity of substitution and their expectations of future VAT tax rates. Thus, it is not clear a priori which of the two groups will react the most.

The general equilibrium effects are also different. Even if the direct effects are smaller when the proportion of liquidity constrained consumers is high, the multiplier effects are stronger as the marginal propensity to consume out of income is higher.

To get a sense of these effects, consider an extension of the minimalist model to two classes of consumers, unconstrained consumers acting according to their Euler equation, and "hand to mouth" consumers spending all their income (a

[20] If one looks at the twelve recessions in the United States since 1950, leaving out four of them largely due to a decrease in government spending, the others have been due to very different combinations of decreases in non durable consumption, durable consumption, residential investment, and non residential investment.

so-called TANK model, with T standing for two). (A full treatment would have to be done along the lines of Debortoli and Gali 2024 [14], who look at the effects of stabilization policy in various versions of a HANK model, including a TANK version. See also Auclert et al 2024 [3] for an examination of fiscal and monetary policy in a HANK model.)

Ignoring shifts in preferences for notational simplicity, the equations giving consumption for each of the two types are given by:

$$c^u = Ec^u(+1) - \sigma(i - E\pi(+1) - (E\tau(+1) - \tau))$$

$$c^c = y_c - \tau + s$$

c^u and c^c denote the (log) consumption of the unconstrained and constrained consumers respectively. s is the lump sum tax or transfer to constrained consumers, associated with the VAT tax revenues. The value of s depends on how the variation in VAT revenues is financed. If fully financed through adjustments in the deficit or surplus, $s = 0$. If partly financed by adjustments in other taxes or transfers, then how much is financed by constrained versus unconstrained consumers determines the value of s.

Assume a continuum of consumers on [0 1], with proportion λ of unconstrained consumers. So, to a first approximation:

$$c = \lambda c^u + (1 - \lambda)c^c$$

Assume equality of steady state consumption for consumers in each group. Assume equal distribution of current income across all consumers . Then:

$$y = \lambda y^u + (1 - \lambda)y^c$$

$$y^u = y^c = y$$

Goods market equilibrium is given by:

$$y = c = \lambda c^u + (1 - \lambda)c^c$$

To solve for equilibrium output, derive c^u as a function of y and c^c:

$$c^u = \frac{1}{\lambda}(y - (1 - \lambda)c^c) = \frac{1}{\lambda}(y - (1 - \lambda)(y - \tau + s))$$

Or

$$c^u = y + \frac{1 - \lambda}{\lambda}(\tau - s)$$

To the extent that a decrease in VAT tax increases the consumption of the constrained consumers (i.e if $\tau > s$), what is left, given output, is smaller for the unconstrained consumers.

Replacing c^u and $Ec^u(+1)$ in the Euler equation, and reorganizing:

$$y = Ey(+1) + \frac{1 - \lambda}{\lambda}\left((E(\tau(+1) - s(+1)) - (\tau - s)) - \sigma(i - E\pi(+1)) + \sigma(E\tau(+1) - \tau)\right.$$

So there are two effects of the VAT tax. To see them most clearly, assume for example that all values next period are back to normal (zero given the normalization). Then:

$$y = -\frac{1 - \lambda}{\lambda}(\tau - s) - \sigma(i - E\pi(+1)) - \sigma\tau$$

So, if, to take an extreme case, $\tau = s$, the outcome is the same as in the minimalist representative consumer model. If the VAT tax is only partially financed by current lump sum taxes, so $(\tau - s) > 0$, there are two effects. The substitution effect, present in the minimalist model, and an income effect, showing as a multiplier. As λ goes to zero, and the aggregate marginal propensity to consume thus goes to one, the multiplier goes to infinity.

8 Implementation issues.

The previous two sections assumed full passthrough of VAT rate changes to prices, and the simulations assumed a value of the intertemporal elasticity of substitution, σ, equal to 1. This section briefly reviews what we know about passthrough, and the reaction of demand to VAT changes.

8.1 Passthrough

If passthrough is slow or partial, this weakens the case for using the VAT as an automatic stabilizer.

A comprehensive study of the effect of VAT changes on prices was done by Bedeneke et al 2015 [4], which looks at changes in VAT rates in Euro member countries, using monthly data from January 1999 to December 2013, covering at 67 categories of products. This yields 65 reforms and 1231 VAT rate changes. Some changes cover narrow categories of products, some cover a larger proportion of consumption. All were intended to be permanent.

To identify the effect of VAT rate changes on prices, the study compares the price of each product to the price of a similar product in other Euro countries not affected by the VAT change, looking at the relative price from 12 months preceding the change (to allow for anticipation effects) to 12 months following the change. It looks separately at changes in the standard VAT rate (covering typically 2/3 to 3/4 of consumption), and in the VAT reduced rate.

The main result is that the estimated passthrough is above 1 (point estimate of 1.4, although not significantly different from 1) for the standard rate, and 0.3 for the reduced rate. The larger the proportion of consumption subject to the change, the higher the passthrough: From close to zero when the proportion is less than 10%, it reaches 1 for proportions higher than 35%. This is as we would expect as the narrower the change, the more likely there are close

unaffected substitutes, forcing producers to limit the increase in the post-VAT price. Perhaps not surprisingly also, increases in the VAT rate lead to a higher passthrough (0.4) than decreases (0.25). Interestingly, some of the adjustment takes place before the actual change.

As far as I can tell, all the cases in the Bedeneke study look at changes intended as being permanent. But outcomes may be quite different if the VAT change is known to be temporary rather than permanent. There are few such cases. One, studied by Fuest et al 2020 [16] is a temporary VAT decrease in Germany in June 2009 of 3 percentage points for the standard rate and 2 percentage points for the reduced rate, for an announced period of 6 months. The study, based on a comparison of supermarket prices in Germany versus Austria (where there was no VAT rate change), finds a decrease in prices of 1.3%, implying a 70% passthrough. Another, studied by Crossley et al 2014 [12], is a temporary VAT decrease in the UK in December 2008, of 2.5% for the standard rate and no change in the reduced rate, for an announced period of 13 months. The study, based either on a comparison of prices for goods subject to the VAT and other goods, or between prices of goods subject to VAT and goods in other countries where there was no VAT change, finds a nearly full initial passthrough initially, but followed over time by some increase in prices, and a small further increase when the program ended.

These two studies suggest a substantial and fast passthrough. If one is still worried about insufficient passthrough, one possibility may be to require firms to fully reflect the VAT increase at the time of the change, and to rely on ex-post verification. This is not foolproof as firms may change the price anyway before or after the actual VAT rate change (as seems to have been partially the case in the UK example), but it may be a partial solution.

8.2 Effects on demand and output

Studies of the effect of a temporary change in VAT on demand and output are limited. The study of the UK VAT decrease mentioned above also explores its effect on demand, and concludes that the program cost about 0.3% of GDP and increased expenditure by roughly 0.4%. But as this measure came in a very complex economic environment and was one of many measures taken by the government around that time, it is difficult to identify the effect of the decrease with much confidence.

Perhaps the best study is by Mian and Sufi 2012 [19], who look at the effects of the "Cars Allowance Rebate System" program (informally known as Cash for Clunkers), a set of trade-in rebates, ranging from 3,500 to 4,500 dollars for consumers turning in old inefficient cars, a program announced to last for just a month, from July 24, 2009 to August 24, 2009. While not a VAT decrease, it is close, implying a decrease in the net price of new cars of about 10 to 12% for a month. [21] Identification of the effect is achieved by looking at differences in purchases across 957 metropolitan areas, depending on the estimated number of clunkers in each one. It concludes that of the 670,000 new car purchases during that month, about 360,000 were due to the program. Spending on the program was 2.8 billion. At an average price of new cars of 29,000, the estimate suggests an increase in demand of about 8.7 billion, so a multiplier of about 3.[22] The study also finds however that the increase was fully undone in the following 7 months, showing that the effect was an intertemporal shift in purchases. It also shows the dangers of having a sharp time limit, rather than a contingent one.

[21] There were two very similar measures introduced in France in the 1990s. The first, introduced by Balladur (thus the name, Balladurette), in February 1994 for a period of 16 months was a trade credit for cars older than 10 years. The second, introduced by Juppe (thus the name, Juppette), in September 1995 for a period of 12 months was also a trade credit for cars older than 8 years. These two episodes have been studied by Adda and Cooper [1], who develop and estimate a structural model based on individual scrapping choice to assess in particular on the effects of these two measures depending on the distribution of car ages.

[22] To the extent that the program had second round effects, affecting all cities, these effects are not taken into account in the study. Thus, the true multiplier may be higher.

At the time the program ended, the U.S. economy was still in the middle of a deep recession, with real GDP (in 2017 dollars) in 2009 Q3 equal to 16.3 trillion dollars, compared to 16.9 trillion at the previous peak.

9 Conclusions

Given the limits of monetary policy, we should explore how to give a stronger stabilisation role to fiscal policy. Quasi-automatic stabilizers can both help stabilize and avoid the problems associated with discretionary fiscal policy. I have explored the role of a variable VAT rate, pointing to design issues and how they can potentially be addressed. The empirical evidence appears supportive of the case that, if well used, such a measure can affect demand and output and play a useful stabilization role.

References

[1] Jerome Adda and Russell Cooper. Balladurette and Juppette: A discrete analysis of scrapping subsidies. *Journal of Political Economy*, 108(4):778–806, August 2000.

[2] Alberto Alesina and Guido Tabellini. A positive theory of fiscal deficits and government debt. *Review of Economic Studies*, 57(3):403–414, July 1990.

[3] Adrien Auclert, Matthew Rognlie, and Ludwig Straub. Fiscal and monetary policy with heterogenous agents. October 2024. NBER working paper 32991.

[4] Dora Benedek, Ruud De Mooij, Michael Keen, and Philippe Wingender. Estimating VAT passthrough. (15/214), 2015. IMF Working Paper.

[5] Olivier Blanchard, Alvaro Leandro, and Jeromin Zettelmeyer. Redesigning EU fiscal rules. From rules to standards. *Economic Policy*, 36(106):195–236, April 2021.

[6] Olivier Blanchard and Danny Quah. The dynamic effects of aggregate demand and supply disturbances. *American Economic Review*, 79(4):655–673, September 1989.

[7] Olivier Blanchard and Lawrence Summers. Automatic stabilizers in a low-rate environment. *AEA Papers and Proceedings*, 110:125–130, May 2020.

[8] Henning Bohn. The behavior of U.S. public debt and deficits. *Quarterly Journal of Economics*, 113(3):949–963, August 1998.

[9] Heather Boushey, Ryan Nunn, and Jay Shambaugh. *Recession Ready. Fiscal Policies to Stabilize the American Economy.* Brookings, 2019.

[10] James Bullard and Kaushik Mitra. Learning about monetary policy rules. *Journal of Monetary Economics*, 49(6):1005=1129, 2002.

[11] Isabel Correia, Emmanuel Farhi, Juan Pablo Nicolini, and Pedro Teles. Fiscal devaluations. *American Economic Review*, 103(4):1172–1211, 2013.

[12] Thomas Crossley, Hamish Low, and Cath Sleeman. Using a temporary indirect tax cut as a fiscal stimulus: Evidence from the UK. *Institute for Fiscal Studies*, W14/16, 2014. Working paper.

[13] Mai Chi Dao, Allan Dizioli, Chris Jackson, Pierre-Olivier Gourinchas, and Daniel Leigh. Unconventional fiscal policy in times of high inflation. *IMF working paper*, (23178), 2023.

[14] Davide Debortoli and Jordi Gali. Heterogeneity and aggregate fluctuations: Insights from TANK models. May 2024. Working paper, CREI.

[15] Emmanuel Farhi, Gita Gopinath, and Oleg Itskhoki. Fiscal devaluations. *Review of Economic Studies*, 81(2):725–760, April 2014.

[16] Clement Fuest, Florian Neumeier, and Daniel Stohlker. The pass through of temporary VAT rate cuts; Evidence from German supermarket retail. *CESifo*, November 2020. Working paper 9149.

[17] Xavier Gabaix. A behavioral New Keynesian model. *American Economic Review*, 110(8):2271–2327, August 2020.

[18] Jordi Gali. *Monetary Policy, Inflation and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton University Press, 2015.

[19] Atif Mian and Amir Sufi. The effects of fiscal stimulus: Evidence from the 2009 cash for clunkers program. *QJE*, 127(3):1107–1142, August 2012.

[20] Richard Musgrave and Peggy Musgrave. *Public Finance in Theory and Practice*. McGraw Hill, 1989.

[21] John Taylor. The Swedish investment funds system as a stabilization policy rule. *Brookings Papers on Economic Activity*, 1982(1):57–106, 1982.