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Progressive Taxation, Macroeconomic Stabilization and efficiency in Europe

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Progressive Taxation, Macroeconomic Stabilization and efficiency in Europe [1]

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ABSTRACT

The paper contributes to the debate on the stability/efficiency tradeoff of automatic stabilizers. A simple AD-AS two-country model is presented and illustrates circumstances where a reduction in taxes can foster stabilization. The testable implication from the model is that tax cuts can either increase or decrease volatility depending on the structure of the taxation system. Hence, lowering taxes for efficiency purposes may have not cost in terms of stabilization. This implication is tested for OECD countries over the period 1960-2000 taking account of the endogeneity and omitted variables issues identified in the literature. We found acceptably robust evidence that the size of governments in OECD countries has played a stabilizing role for both output and inflation. However, the relationship between government size and macroeconomic stability is not linear. The composition of public finances, in particular the tax mix, matters for output and price volatility. Distorting taxes, namely taxes on labor, might have negative effects on macroeconomic stability. Consequently, the potential trade off between stability and flexibility might not exist.

JEL classification: E3, E6, H1

Keywords: Automatic stabilizers, efficiency, Europe

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1. INTRODUCTION

The economic-policy framework of the Economic and Monetary Union (EMU) is characterized by a centralization of monetary policy at the European Central Bank (ECB) level and the set up of rules for national authorities on the fiscal policy side. This makes both academics and policy makers concerned with the limited ability of individual countries to use discretionary fiscal policy to react to national specific shocks (see Buti and Sapir (2002)). The rationale for avoiding discretionary fiscal policy for anti-cyclical purposes may be found in its impact on growth and the risk of its use to non-economic purpose. For instance, Fatas and Mihof (2002) have documented that discretionary fiscal policy makes economies volatile and that such volatility lowers economic growth (0.6 percentage points per additional percentage point in volatility). Sapir and Sekkat (2001) have shown that discretionary policy has been used, in many instances, for pure electoral purpose.

With the Stability and Growth Pact (SGP) automatic stabilizers become the key mechanisms for macroeconomic stabilization[2]. Automatic stabilizers are traditionally associated with the Keynesian model of business cycles, and are seen as paramount for smoothing business cycle fluctuations. Progressive taxation makes disposable income less volatile than income and reduces fluctuations in GDP or income. In this framework taxes are always output stabilizing and the higher and the more progressive are the taxes the larger will be the smoothness of output. However, available evidence suggests that higher and progressive taxation may have an adverse impact on economic efficiency. Lucas (1990), focusing on growth, concluded that tax changes do alter long-run growth rates, although the quantitative effect seems to be small. Caucutt et al. (2003) extended the Lucas model and showed that a decrease in the progressivity of taxes has a positive effect on growth. Unlike Lucas, they found that the quantitative effects of eliminating progressivity can be economically significant. This is confirmed by Li and Sarte (2004) who also found a higher impact than in Lucas (1990). [3] Even if avoiding discretionary policy, policy makers may, therefore, still face a crucial tradeoff between stabilization and efficiency. Reducing the tax burden in order to enhance efficiency may have a cost in terms of less demand smoothing via automatic stabilizers.

Over the last three decades, total tax burdens **(**total tax revenues in terms of GDP**)** in the EU have increased markedly to stand at a significantly higher level than in the US. The EU total tax burden was more than 10 percentage points higher than in the US (over 40% compared with less than 30%). Moreover, over the last three decades, the total tax burden in the EU has increased by around 8 percentage points of GDP, but it has remained broadly stable in the US. These differences are much more important when labour taxes are considered. Tax revenues obtained from labour income (social security contributions plus personal income taxes on labour income) in the EU represent more than 20% of GDP while in the US they amount to only about 15% of GDP**.** Moreover, the observed increase in the tax burden on labour sharply compares with the developments observed in capital and consumption taxes. In terms of the total labour income, the tax burden on labour in the EU increased from 25% in 1970 to the current ratio close to 40%. The tax burden on capital has increased in the EU only by around 3 percentage points over the last thirty years (from below 20% at the beginning of the seventies), while that on consumption remained practically unchanged at 20%. In the other side of the Atlantic, the tax burden on labour also increased, but only by 6 percentage points (from 17% in the 1970s), but those on capital and consumption fell by around 10pp and 3pp, respectively.

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[2] Small structural deficits may be only allowed in particular circumstances and on a temporary basis.
[3] Moreover, Buti et al (2002) argue that automatic fiscal stabilization may come at the expense of efficiency if it induces economic agents to delay their adjustment to shocks.

Given the documented increase in taxation, especially on labor, one may infer that policy makers consider the tradeoff between the stabilization and efficiency to be favorable to the former. In this paper we argue, however, that such a tradeoff may not always be relevant. We present a simple AD-AS two-country model, to illustrate circumstances where a reduction in taxes can foster stabilization. We derive the following testable implication from the model: tax cuts can either increase or decrease volatility depending on the structure of the taxation system. Hence, lowering taxes for efficiency purposes may not cost in terms of stabilization. This implication is tested for countries over the period 1960-2000. The empirical model takes account of the endogeneity and omitted variables issues identified in the literature. We found acceptably robust evidence that the relationship between taxation and macroeconomic stability is not linear. The composition of public finances, in particular the tax mix, matters for output and price volatility. Distorting taxes might have negative effects on macroeconomic stability. Consequently, the potential trade off between stability and flexibility might not exist. The analysis implies that a reduction in the tax burden might carry a "double dividend" of efficiency gains and better fiscal stabilization properties. This should be encouraging for countries with high tax burdens that are considering a reduction in the size of the public sector.

The rest of the paper is articulated along five sections. First, the AD-AS model for two countries in a monetary union is analyzed. Then, section 3 presents a number of stylized facts on output and price volatility and on the size of the public sector. Section 4 presents the main findings of the econometric analysis in which output and price volatility is explained not only in function of the total tax burden but also in terms of the structure of taxation. Finally, section 5 recapitulates.

2. THE MODEL

In the standard AD-AS model, fiscal policy only affects the macroeconomic equilibrium through aggregate demand. Hence, automatic stabilizers stabilize output in the presence of both demand and supply shocks. Furthermore, automatic stabilizers also stabilize prices in presence of a demand shock. However, non-discretionary fiscal policy will be inflation destabilizing after a supply shock.

Fatas and Mihov (2001), using robust empirical analyses, have tested the relationship between the average size of government (as measured by the share of government spending or taxes in total output) and the volatility of business cycles. Their results lent strong support to the notion that larger governments have a stabilizing effect on output. They also examined the sensitivity of their results to inclusion of various control variables, to the de-trending method and to the endogeneity issue raised by Rodrik (1998). The later has suggested that there is endogeneity in the joint determination of overall economic volatility and the size of government spending. The results in Fatás and Mihov (2001) seem to be robust to differences in specifications, estimation techniques, sample periods, de-trending methods, and data sets.

However, large governments may also have an impact on economic efficiency. As recently argued by Buti et al (2002), there are also negative supply-side effects involved in using automatic fiscal stabilizers. Automatic fiscal stabilization may induce people and businesses to delay their adjustment to shocks. Social security systems, labor market institutions and tax systems are behind such a delay. Because they smooth the adverse effect of a shock, they may make workers less concerned with such an effect. In this context, automatic stabilization may come at the expense of efficiency if it hinders the appropriate response to supply shocks. Policy makers may, therefore, face a crucial tradeoff between stabilization and efficiency:

reducing the tax burden in order to enhance efficiency and fostering market flexibility may cost in terms of less demand smoothing via the automatic stabilizers.

The existence of the above tradeoff has been questioned by Buti et al. (2002). They argued that there is a critical level of taxes beyond which a reduction in taxation may not only improve efficiency, but also render fiscal automatic stabilizers more effective. Specifically, the conventional view is challenged if the distorting effects of taxes are explicitly specified in the model, in particular if they are meant to affect the elasticity of the supply function. In this case, financing government spending through distorting taxation might destabilize output in the case of supply shocks. Moreover, fiscal policy would be price destabilizing not only in the event of a supply shock, but also after a demand shock.

The basic tenet of the model is that automatic stabilizers operate not only on the demand side through their impact on disposable income, but also on the supply side. Distorting taxes affect the level of equilibrium unemployment and potential output. What is important in our analysis, however, is the impact of distorting taxes on the reaction of output to unexpected inflation, that is the slope – not the position - of the aggregate supply curve. A similar result is obtained by Hairault et al (2001) although their purpose is different. They used a dynamic stochastic imperfect competition model to show that introducing some distorting taxation increases both allocation efficiency and stabilization. The government is assumed to tax firms' input (labor and capital) and to transfer tax revenues to households in a lump sum way. The welfare gain is that such a policy reduces the negative effect of market power on factor demand. They identified the optimal tax rate that maximizes welfare. The authors also showed that when households are averse to work hours' fluctuations, labor supply is increasing in tax (subsidy) rate.

The modified AD-AS model is not the only conceptual framework where taxes have pervasive effects on output stability. Gali (1994) considers a real business cycle (RBC) model in which the government raises distorting taxes to finance –in a sustainable way- lump sum transfers and government purchases. The model, which is calibrated in order to reproduce stylized features of the US economy, is assumed to be affected by both transitory and permanent technology shocks. The effects of such supply shocks on output volatility are then simulated under alternative values of the tax rate and of government purchases, both in percentage of the output level. Output volatility is measured as the standard deviation of either the percent deviations of output from trend, or the percent output growth rates. In both cases, the author concludes that, for a given tax rate, the increase of government purchases will always reduce output volatility, whereas changes in the tax rate will generate changes in the same direction in output volatility, given a constant ratio of government purchases to output.

The channels through which taxes destabilize output in the event of a supply shock have been explained by Galí (1994) on the basis of the effects of distorting taxation on the elasticity of labor supply. A higher tax rate would enhance the response of employment to a technology (supply) shock leading to a larger response of output. The reason is that distorting taxation lowers labor productivity. However, the mechanism underpinning the stabilizing effect of government purchases is just the opposite. An increase of government purchases leads to higher employment in the steady state and to a lower response of output to a technology shock.

We consider a version of the standard AD-AS model of a monetary union composed of two countries and closed vis-à-vis the rest of the world (see Buti et al (2002)). The aggregate demand and Phillips supply curves for the home country are written as:

(1) $$y^d = \phi_1 d - \phi_2\left(i - \pi^e\right) - \phi_3\left(\pi - \pi^*\right) - \phi_4\left(y - y^*\right) + \varepsilon^d$$

(2) $$y^s = (\omega - \alpha t)\left(\pi - \pi^e\right) + \varepsilon^s$$

where y is output, d is the budget deficit, π is inflation (‘^{e}’ reads ‘expected’), i is the nominal interest rate and t is the tax rate. y, d and t are expressed in terms of potential (baseline) output. ε^{d} and ε^{s} represent, respectively, uncorrelated temporary demand and supply shocks of zero mean. All the variables are percentage points deviations with respect to the baseline. ϕ_1, ϕ_2,ϕ_3 ,ϕ_4 ,ω and α are non-negative parameters. The same equations can be written for the foreign country (for which all variables are marked with ‘*’).

Equation (1) assumes that fluctuations in aggregate demand depend on (changes in) the budget deficit, the real interest rate, competitiveness, foreign demand and a shock. Aggregate supply depends on inflation surprise and a shock. The difference here is that the slope of the supply function (2) depends on taxes. Hence, α captures the distorting effects of taxes on the supply curve. With $\alpha = 0$, the system (1) plus (2) becomes a standard model in which fiscal policy operates only through the demand while with $\alpha > 0$ higher distorting taxes make the supply curve less elastic. In the appendix, we formally show how taxation could affect the elasticity of the Phillips curve and consequently the slope of the aggregate supply curve.

To get the intuition that, with progressive taxes, the reaction of production to an inflation surprise is smaller the larger the tax burden, assume that workers pass through the cyclical variations in their tax burden at least partly onto employers. This is a “real wage resistance” hypothesis which was confirmed by Daveri and Tabellini (2000) for continental Europe. However, Layard (1997) found that in the long-run tax neutrality holds, but, given that what is crucial for our analysis is real wage resistance in the short run, our analysis is not incompatible with long run neutrality of taxes. Take the case of a positive inflation surprise. As employers demand more labour to increase production, they will have to pay higher wages to cover not only for the higher prices but also on account of the fact that wages move up onto a higher tax bracket; this tends to limit the rise in production

Aggregate demand and supply equations are complemented with the policy rules followed by the fiscal and monetary authorities. The central bank aims at stabilizing inflation and output of the currency area as a whole. We posit a simple Taylor rule of the form:

(3) $i = \bar{\pi} + \beta\bar{y}$

where $\bar{\pi} = \lambda\pi + (1-\lambda)\pi^*$ and $\bar{y} = \lambda y + (1-\lambda)y^*$ are, respectively, the average inflation and output gap of the currency area (λ and 1-λ being the weights of the domestic and the foreign countries in the area) and β is the relative preference of the monetary authority for output over inflation stabilization. We assume that the monetary authority sets interest rates so as to maintain inflation on target in the "medium run", which, in this simple setting, means in absence of shocks. Since shocks – regardless of whether they are symmetric or country-specific – are serially uncorrelated with zero average, this implies $\pi^e = \pi^{e*} = 0$.

For the fiscal authority, we assume that the two governments pursue a neutral discretionary policy, which implies that they set a target for the structural budget balance and let automatic stabilizers play symmetrically over the cycle[4]. The deviation of the actual budget balance from the baseline (the latter being structural balance in absence of shocks) is:

(4) $d = -ty$

Trade balance consistency implies:

(5) $\pi - \pi^* = (y - y^*)\phi_5$

[4] This is the definition of a well behaved" fiscal authority, according to Alesina et al. (2001). For more sophisticated reaction functions of fiscal authorities in EMU, see, Buti, Roeger and in't Veld (2001).

where $\phi_5 = \frac{(\phi_4^* - \phi_4)}{\phi_3 - \phi_3^*}$.

Replacing (3), (4) and (5) in (1) and combining it with equation (2) gives the following semi-reduced forms for output:

$$\text{(6)} \qquad y = -\frac{\omega - \alpha t}{r_t}\phi_6 y^* + \frac{\omega - \alpha t}{r_t}\varepsilon^d + \frac{\phi_2}{r_t}\varepsilon^s$$

where $r_t = \phi_2 + (\omega - \alpha t)[1 - (\phi_6 - \phi_1 t - \beta\phi_2)]$ and $\phi_6 = [\phi_2(1-\lambda)(\phi_5 + \beta) - (\phi_4 + \phi_3\phi_5)]$.

Inflation can be readily computed by equating (6) and (2) under π^e=0.

We turn now to the analysis of shocks, focusing on asymmetric shocks (in the home country). We are interested in analyzing the effects of distorting taxes on the degree of stabilization in the event of shocks. Consider first a country-specific *supply shock* in the home country ($\varepsilon^s \neq 0$, $\varepsilon^d = 0$).

Abstracting from the foreign economy (i.e. $\phi_3 = \phi_4 = \phi_6 = 0$), one can easily check that if there is no distorting effect of taxes on the supply curve (i.e. α=0), output is always stabilized and the higher is *t* the larger will be the stabilization. In contrast, if there is a distorting effect of taxes on the supply curve (i.e. α>0), output is less stabilized than in the previous case. Moreover, there may exist a level of α such that a higher *t* even induces output destabilization. In order to illustrate this, let's examine the impact of a change in *t* on output. We combine (6) with its corresponding equation for the foreign country to get a reduced form. Then, we take the partial derivative of the reduced form w.r.t. *t* to find:

$$\text{(7)} \; \frac{\partial y}{\partial t} = -\phi_2\varepsilon^s\left[\frac{r_t^* r_t - (\omega - \alpha t)(\omega^* - \alpha^* t^*)\phi_6\phi_6^*}{r_t^*}\right]^{-2}\left[\phi_1(\omega - \alpha t) - \alpha(1 - \phi_6 + \phi_1 t + \beta\phi_2)\frac{\alpha(\omega^* - \alpha^* t^*)\phi_6^*\phi_6}{r_t^*}\right]$$

Higher distorting taxes t are stabilizing if the coefficient of ε^s in (7) is negative. The sign however is ambiguous and depends on the size of α. It is easy to check that the derivative is negative for very small values of α and may become positive for very high values of α. Hence, if the distorting effect of taxes on supply is large enough, an increase in taxes may become output destabilizing. It follows that the impact of tax cuts on output stabilization depends on the distortion effect of taxes on the supply curve.

In the case of inflation, we find:

$$(8)\qquad \frac{\partial \pi}{\partial t} = -\frac{\phi_2 \varepsilon^s}{(\omega - \alpha t)^2 B^2}\left[\phi_1 (\omega - \alpha t)^2 + \frac{\alpha(\phi_2 - B)^2}{\phi_2}\right]$$

where $B = \left[\dfrac{r_t^* r_t - (\omega - \alpha t)(\omega^* - \alpha^* t^*)\phi_6 \phi_6^*}{r_t^*}\right]$.

Since the coefficient of ε^s is always positive, an increase in t is inflation destabilizing.

We turn now to the case of a *demand shock* in the home country (ε^s=0, $\varepsilon^d \neq 0$). The partial derivative of output w.r.t. t yields the following expression:

$$(9)\qquad \frac{\partial y}{\partial t} = -\varepsilon^d \left[\frac{r_t}{\omega - \alpha t} - \frac{(\omega^* - \alpha^* t^*)\phi_6 \phi_6^*}{r_t^*}\right]^{-2} \left[\frac{\alpha \phi_2}{(\omega - \alpha t)^2} + \phi_1\right]$$

As the coefficient of ε^d is negative, increasing t is always output stabilizing in the event of a demand shock.

Turning to inflation, we find:

$$(10)\qquad \frac{\partial \pi}{\partial t} = \frac{\varepsilon^d}{(\omega - \alpha t)^2 C^2}\left[2\alpha \phi_1 t + \alpha(1 - \phi_6 + \beta \phi_2) - \omega \phi_1 - \frac{\alpha(\omega^* - \alpha^* t^*)\phi_6^* \phi_6}{r_t^*}\right]$$

where $C = \left[\frac{r_t}{(\omega - \alpha t)} - \frac{(\omega^* - \alpha^* t^*)\phi_6 \phi_6^*}{r_t^*} \right]$

The sign of the derivative may be positive or negative depending on α. Again, one can show that the impact of tax cuts on inflation stabilization depends on the distortion effect of taxes on the supply curve.

Coming back to the RBC model in Galí (1994), although its conceptual framework is not directly comparable with that of the modified AD-AS, their respective predictions are not unapproachable. On the one hand, in the RBC model, the relationship between fiscal policy and output volatility under 'technological' (supply) shocks seems to be basically continuous, and predicts a negative, but very small, relationship between government size and macroeconomic stability. On the other hand, in the modified AD-AS model, such a relationship seems to be non linear. Governments (taxes) become output destabilizing in the event of supply shocks for certain values of α . In particular, the destabilizing effect of the tax rate depends on trade openness. More closed economies seem to afford higher average taxes without destabilizing output in the event of supply shocks. It happens to be that the RBC model in Galí (1994) is calibrated for the US, a large and (almost) closed economy with a relatively small government. Therefore, in the light of the modified AD-AS model, it is not surprising that the potential pervasive effect of the US government on macroeconomic stability is negligible.

This is not the conclusion in Buti et al. (2002), who set up the modified AD-AS two-country model of a monetary union to derive the critical level of taxes beyond which a reduction in taxation may not only yield better efficiency, but also less volatility. They relied on simulations with OECD's INTERLINK model to provide some empirical support to the existence of such a critical level. However, for the existence or absence of such a tradeoff to be consistently examined one needs to rely on the observation of the real world. This is the purpose of the econometric analysis below.

3. MACROECONOMIC STABILITY IN THE OECD, 1960-2000

Table 1 shows several indicators of output and price volatility in 25 OECD countries over the period 1960-2000. The first one is the standard deviation of annual real GDP growth in percentage points. Column (2) shows the standard deviation of the output gap expressed in percentage points of trend GDP (H-P filtered). Although the two of them are the traditional measures of output volatility used in the literature (Galí, 1994, and Fatás and Mihov, 2001), we will mainly refer to the second one in the rest of the paper because both lead to equivalent and comparable results[5], while the GDP gap seems to be a more standard indicator of cyclical output. Table 1 suggests that the degree of dispersion across the sample is relatively wide either in terms of annual real GDP growth or in terms of output gap. The proportion between the lowest and the highest value is greater than 2 in both cases. France, together with Belgium, Denmark, Italy, the Netherlands, Austria, Sweden, Norway and Australia are at the lower end of the scale for the standard deviation of the output gap (below 2%). At the opposite extreme, in Germany, Greece, Japan, Korea, and New Zealand the standard deviation of the output gap over the period 1960-2000 is greater than 3%.

[5] This is mentioned by both Galí (1994) and Fatás and Mihov (2001) and also applies to this paper. For instance, the correlation coefficient between columns (1) and (2) in table 1 is 0.91, so results for GDP-gap volatility are broadly applicable to GDP-growth volatility (results available on request).

Table 1: Output and price volatility (*)

	GDP growth volatility (standard deviation)	GDP-gap volatility (standard deviation)	GDP deflator growth (standard deviation)	GDP deflator growth (average)	Price volatility (coeff. of variation)	CPI growth (standard deviation)
	(1)	(2)	(3)	(4)	(5)	(6)
Belgium	2,03	1,75	2,67	4,24	0,63	2,89
Denmark	2,43	1,82	3,37	6,27	0,54	3,42
Germany	3,23	3,10	1,89	3,42	0,55	1,79
Greece	4,42	3,29	7,93	11,69	0,68	7,84
Spain	2,89	2,45	5,13	8,82	0,58	5,38
France	1,89	1,44	3,67	5,49	0,67	3,85
Ireland	2,93	2,81	5,48	7,51	0,73	5,62
Italy	2,30	1,62	5,92	8,53	0,69	5,88
Luxemb.	3,47	2,92	4,27	4,43	0,96	2,78
Netherl.	1,89	1,84	2,88	4,25	0,68	2,68
Austria	1,91	1,79	2,07	3,95	0,52	2,11
Portugal	3,19	3,26	7,92	10,62	0,75	8,57
Finland	3,01	3,59	4,40	6,56	0,67	4,40
Sweden	2,08	1,87	3,49	5,98	0,58	3,56
UK	1,98	2,06	5,39	6,93	0,78	5,02
US	2,17	2,04	2,47	4,04	0,61	2,57
Japan	3,74	3,24	4,12	3,95	1,04	4,21
Canada	2,21	2,12	3,43	4,66	0,74	3,14
Switzer.	2,65	2,65	2,45	3,72	0,66	2,37
Norway	1,70	1,78	3,87	5,71	0,68	2,97
Island	3,98	4,03	17,89	20,87	0,86	20,63
Mexico	3,58	3,51	29,74	27,67	1,07	30,52
Korea(7)	3,86	3,51	7,74	10,03	0,77	8,26
Australia	2,10	1,83	4,37	5,77	0,76	4,22
New Z.	3,24	3,25	6,39	7,11	0,90	5,84

The values in columns (1), (3) and (6) are standard deviations of annual growth rates. Column (2) is the standard deviation of the output gap in percentage points of trend GDP. Column (4) is the average annual growth rate of the GDP deflator in percentage points. Column (5) is the ratio between (3) and (7) Standard deviations and averages are calculated over the period 1960-2000 in all the countries, except for output growth and the output gap in Korea, where the sample period is 1970-2000.

Source: AMECO (DG ECFIN) and OECD (Economic Indicators) and own calculations.

The standard deviations of the annual growth rates of the GDP deflator and of the consumer price index (CPI) are shown in columns (3) and (6) respectively. In accordance with the indicator of output volatility we should use one of such standard deviations as indicators of price stability. In particular, we would select the first one since both are almost identical[6], while in most theoretical models prices implicitly or explicitly refer to the GDP deflator. However, as shown in column (4), in statistical terms, the standard deviation and the mean are in this case almost identical. The correlation coefficient between columns (3) and (4) is 0.979, so that analyzing the standard deviation of inflation rates would be equivalent to analyzing average inflation. If we assume that the latter is positively correlated with the inflation target in the long run, it would turn out that analyzing column (3) would look like explaining long-run inflation targets rather than price stability over the cycle. Therefore, we use an indicator of price stability that avoids these problems. This is the indicator in column (5), which expresses price volatility as the ratio between the standard deviation and the mean. On this basis, the dispersion of price stability has no 'long-run inflation-scale effects' and is comparable to that of output stability[7]. The proportion between the lowest and the highest variation coefficient is close to 2. At the lower end of the scale (below 0.6) we find Denmark, Germany, Spain, Austria, or Sweden, while in Mexico and Japan the standard deviation is close to the mean[8].

On the basis of table 1, it is difficult to find clear patterns in the cross-country differences in output and price stability. The consideration of some additional indicators at country level sheds some light on the determinants of macroeconomic stability. Within the framework of

[6] The correlation coefficient between columns (3) and (4) is 0.9955.

[7] Note that the average of the output gap is by construction close to zero in every country, so that the standard deviation of the output gap does is not affected by the scale of its average.

[8] Note that, in accordance with the modified AD-AS model, this refers to the magnitude of price fluctuations and does not necessarily imply any judgement about price stability in the usual sense of discipline. We assume that policy authorities set up the long-run inflation target in each country according to its own preferences. So, a country may by a high-inflation country and still be price-stable according to our definition. As in Buti et al

this paper, the government size, the rate or rates of distorting taxes, the size of the country or the openness to international competition seem to be among the most clear candidates. Table 2 presents for each country the average values over the period 1960-2000 of four alternative measures of government size (total expenditures, current expenditures, total revenues and tax revenues, all in percentage points of GDP), a measure of trade openness (the average of total exports and imports in percentage points of GDP) and a measure of country size (GDP in 1995 purchasing power parities, expressed in percentage points of the US GDP).

(2002), we are only interested in knowing about the determinants of the deviations between actual and target inflation rates in the long run.

Table 2: Government and country size and trade openness (*)

	Total spending (1)	Current spending (1)	Total revenues (1)	Total taxes (1), (2)	GDP- PPPs (3)	Trade openness (1)
Belgium	49,4	43,9	41,4	45,6	3,1	58,6
Denmark	48,3	49,1	46,7	45,1	1,8	31,7
Germany	44,4	43,3	40,2	39,0	22,4	23,9
Greece	35,0	30,7	27,4	29,1	2,0	20,0
Spain(4)	32,9	30,8	28,6	27,7	8,1	16,7
France	45,9	44,7	42,7	40,5	16,8	19,0
Ireland	42,4	36,5	34,3	35,4	0,8	50,9
Italy	43,3	36,0	35,7	39,3	16,0	19,6
Luxemb.	38,6	42,4	40,6	33,4	0,2	58,6
Netherl.	48,0	46,2	42,7	43,0	4,5	49,4
Austria	48,8	47,3	40,6	40,9	2,3	33,5
Portugal	33,0	30,7	25,2	28,1	1,7	28,5
Finland	43,5	45,9	38,7	36,7	1,4	26,8
Sweden	53,5	55,7	48,8	47,1	2,7	29,3
UK	42,8	40,6	35,8	37,9	15,8	24,7
US	32,7	30,3	26,4	29,8	100,0	8,3
Japan	28,8	27,3	23,9	22,4	35,4	10,4
Canada	40,7	38,5	27,7	37,3	9,0	25,8
Switzerl.	46.0	N/A	N/A	N/A	2.8	32,9
Norway	42,2	38.0	46,1	39,0	1.3	37.0
Island	39,3	35,1	37,5	32,5	0.1	35,8
Mexico	N/A	N/A	N/A	N/A	1.4	16,1
Korea(4)	19,0	20,2	17,3	13,8	6,7	32,0
Australia	31,0	28,4	25,8	29,0	5,0	16,4
New Z.(4)	43,3	42,2	35,6	40,3	0,9	27,4

(*) The values in the table are averages over the period 1960-2000
(1) In percentage of nominal GDP. We have assumed that Belgium and Luxembourg have the same degree of trade openness
(2) The period starts in 1970 or later in Denmark, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Finland, Korea and New Zealand. Therefore in these countries the figure for total taxes may not be comparable to the figure for total revenues
(3) US = 100
(4) The period starts in the mid-1960s in Spain, in the early 1970s in Korea and in the mid-1980s in New Zealand.

Source: AMECO (DG ECFIN) and OECD (Economic Indicators) and own calculations.

As a general rule, EU countries have larger governments in terms of total and current expenditure. The exceptions are Greece, Spain and Portugal, where the size of expenditure is comparable to that of the US. Unsurprisingly, governments are larger in most EU countries also in terms of total revenues[9], and, accordingly, EU countries have higher average tax rates, as measured by the ratio of total tax revenues to GDP. Leaving aside Germany, France, Italy,

[9] As is well known, public deficits have been high and persistent in EU countries, especially since the mid-1970s. This is the reason why revenues do not match expenditures even in the very long term (40 years).

the UK, Japan and, to a lesser extent, Spain and Canada, most countries are very small by US standards. Most small countries (Belgium-Luxembourg, Ireland, the Netherlands, Austria, Norway, Korea) are relatively open economies, while large countries, such as the US or Japan trade much less in terms of GDP[10].

Table 3: Correlation between volatility, government size, openness and country size

	Output stability (1)	Inflation stability (2)	Total expend. (3)	Current expend. (4)	Total revenue (5)	Tax revenue (6)	Trade openness (7)
Inflation stability	0.54*						
Total expend.	-0.45*	-0.41*					
Current expend.	-0.50*	-0.39*	0.99*				
Total revenue	-0.40*	-0.36	0.95*	0.93*			
Tax revenue	-0.44*	-0.38	0.94*	0.91*	0.96*		
Trade Openness	-0.03	-0.12	0.40*	0.34	0.46*	0.45*	
Country Size (8)	-0.35	-0.15	-0.21	-0.19	-0.29	-0.26	-0.71*

* Significant at 5%. Asymptotic critical value between $2x(1/25)^{0.5} = 0.40$ and $2x(1/22)^{0.5} = 0.43$
(1) Standard deviation of the output gap in percentage of trend GDP over 1960-2000[(a)]
(2) The ratio between the standard deviation and the average over 1960-2000[(a)] of the annual percentage change in the GDP deflator
(3) Logarithm of the average total expenditures (% of GDP) over 1960-2000[(a)]
(4) Logarithm of the average current expenditures (% of GDP) over 1960-2000[(a)]
(5) Logarithm of the average total revenues (% of GDP) over 1960-2000[(a)]
(6) Logarithm of the average tax revenues (% of GDP) over 1960-2000[(a)]
(7) Logarithm of the average exports and imports (half % of GDP) over 1960-2000[(a)]
(8) Logarithm of the average GDP (PPPs) over 1960-2000[(a)]
[(a)] See footnotes in tables 1 and 2 for the exceptions.

Table 3 presents simple correlation coefficients between columns (2) and (5) of table 1 (output-gap and inflation volatility), and the columns in table 2. The results suggest a negative correlation between output volatility and the size of governments, whatever the indicator considered. Indeed, this is explained by the fact that total expenditures, current expenditures,

[10] This would also be the case of Germany, France or Italy if intra-EU trade were excluded. Still, when comparing such large EU countries with other Member States it becomes clear that they are relatively closed economies.

total revenues and tax revenues are in the long run four different aspects of the same phenomenon[11], which we refer to here as the size of the public sector. The results for the relationship between price stability and government size are much more ambiguous. As a matter of fact, while in the case of output stability the correlation coefficients are in absolute value greater than the critical value, in the case of price volatility the correlation coefficients are much closer to, or even below, the critical value. The table also stresses the strong association between government size and trade openness, as well as that between the latter indicator and country size. Overall, larger public sectors and lower output volatility go hand in hand, as do government size and trade openness, while larger countries have the tendency to be less open to international competition.

The above evidence is, however, still anecdotal. For consistent conclusions to be drawn, one should use adequate econometric tools to examine the relationships between government size and macroeconomic stability. This is the purpose of the next section.

4. ECONOMETRIC ANALYSIS

Before investigating the implication of the theoretical model in Section 2, we should determine a basic specification for output and inflation volatility. Such a basic specification should in particular take account of endogeneity and omitted variables problems which can bias the relationships between government size and macroeconomic stability.

4.1 Preliminary analysis

Both problems, endogeneity and omitted variables, have been extensively discussed by Fatas and Mihov (2001) within the framework of the relationship between government size and output stabilization. Regarding omitted variables, one can not exclude that third factors affect

[11] In the very long run the four indicators should move together.

both volatility and government size. Neglecting such a possibility can bias the estimates in either direction. To deal appropriately with this issue we consider two control variables which have proved to be important in Fatas and Mihov (2001): openness and country size. The inclusion of the former is based on Rodrik (1998) argument that because governments reduce volatility in the economy, one should expect that more open economies, which are by implication more volatile, will tend to have larger governments. The inclusion of the later was rationalized by Fatas and Mihov (2001) on the grounds that if there are fixed costs in setting up governments, then a large economy will have a relatively small government. On this basis, table 4 presents regression results of output and price volatility on tax revenues, trade openness and country size (the three of them in logarithms).

Where output volatility is concerned, the table illustrates some fundamental points made in the literature. According to Rodrick (1994), and corroborated by Fatás and Mihov (2001), a simple regression between output volatility and government size would be biased towards zero. The absolute value of the coefficient of government size unambiguously increases when including trade openness. Additionally, the table indicates that output volatility increases with trade openness. However, the coefficient of this variable is only significant at 10%.

According to table 3, there is a strong and negative correlation between country size and trade openness. This could suggest that country size is a very important determinant of volatility, while trade openness is, to a large extent, determined by the size of the domestic market. This assumption is supported by table 4, which shows that the inclusion of country size further reduces the potential bias of government size, while significantly increasing the explicative power of the model. Moreover, its coefficient is significant at 1% and negative.[12] Larger economies would be less volatile because their big domestic markets would largely cushion the effects of external shocks. Given the same size of the public sector larger economies are

[12] Note that the coefficient of openness becomes non significant when country size is introduced.

less volatile than small countries. This supports the theoretical finding of the modified AD-AS model that the tax rate above which fiscal policy destabilizes output is higher in large economies. Table 4 suggests that a large economy has more room for compensating potential destabilizing effects of tax distortions or, in other words, that, for becoming output-destabilizing, governments have to be bigger in large economies than in small ones.

Regressions GDV1 to GDV4 in table 4 also indicate a negative correlation between price volatility and government size. However, the relationship is much weaker in this case. The coefficients are only significant at 5% or 10% and the maximum adjusted R^2 is only 20%. Yet, the conclusions are comparable to those for output volatility. Large governments reduce price volatility, while the deviations between actual and target inflation tend to be lower in large countries. Overall, table 4 seems to suggest that the combination of large domestic markets and large public sectors unambiguously lowers output volatility and, albeit to a lesser extent, inflation deviations from target.

Table 4: Regressions for output-gap and inflation volatility

	Intercept	**Tax revenues (1)**	**Trade openness (2)**	**Country size (3)**	**Adjusted R^2**
[Output-gap volatility(4)]					
OGV1	7.25	-1.35			0.16
	(1.44)***	(0.41)***			
OGV2	7.16	-1.75	0.46		0.19
	(1.51)***	(0.45)***	(0.27)*		
OGV3	11.9	-1.79		-0.26	0.43
	(2.10)***	(0.44)***		(0.08)***	
OGV4	13.3	-1.59	-0.37	-0.33	0.43
	(2.84)***	(0.43)***	(0.29)	(0.11)***	
[Inflation volatility (5)]					
GDV1	1.41	-0.20			0.10
	(0.37)***	(0.10)*			
GDV2	1.40	-0.24	0.05		0.09
	(0.46)***	(0.11)**	(0.08)		
GDV3	1.95	-0.25		-0.03	0.20
	(0.34)***	(0.10)**		(0.02)*	
GDV4	2.10	-0.23	-0.04	-0.04	0.17
	(0.44)***	(0.09)**	(0.07)	(0.02)**	

Heteroskedastic-consistent standard errors in parenthesis; *** significant at 1%; ** significant at 5%, * significant at 10%.
(1) Logarithm of the average tax revenues (% of GDP) over 1960-2000[(a)]
(2) Logarithm of the average exports and imports (half % of GDP) over 1960-2000[(a)]
(3) Logarithm of the average GDP (PPPs) over 1960-2000[(a)]
(4) Standard deviation of the output gap in percentage of trend GDP over 1960-2000[(a)]
(5) Ratio between the standard deviation and the average over 1960-2000[(a)] of the annual percentage change in the GDP deflator
[(a)] See footnotes in tables 1 and 2 for the exceptions

Yet, the simple inclusion of control variables might not totally offset the bias due endogeneity. If governments stabilize business cycles, economies that are inherently more volatile might end up choosing larger governments. Here, there is a simultaneity issue and the inclusion of control variables does not solve the problem. Unless adequate instruments for government size are used the estimate will be biased. Table 5 looks at both omitted variables and simultaneity problems. Where simultaneity is concerned, we follow the main stream of the literature on the determination of the size of the public sector (see Fatás and Mihov, 2001, and Martinez-Mongay, 2002, and the references therein) and choose as the main determinants of government size per capita income (in 1995 PPPs), the old-age dependency ratio (people 65 or older in percentage of total population) and trade openness (see table 2) . [13]These three variables, expressed in logarithms, will be used as instruments to re-estimate our preferred regressions of table 4. We use the Generalized Method of Moments and jointly estimate the output and inflation equations. Given that their error terms are likely to be correlated, joint estimation will improve the efficiency of the estimators.

Rows OG-IV1 and GD-IV1 in table 5 are respectively regressions OGV3 and GDV3 in table 4 re-estimated by the instrumental variable (IV) methods. These have turned to be acceptable specifications for output-gap and inflation volatility. According to the J-test for over-identifying restrictions, it cannot be rejected that the set of instruments are pre-determined variables, while there are no significant changes either in the estimations or in the adjustment when one compares tables 4 and 5.

The other regressions in the table explore the explicative power of one additional indicator: the share of manufacturing gross value added in total GDP. This is a measure of production specialization. The results suggest that a higher specialization in manufacturing, the sector most exposed to international competition, is associated with higher output volatility.

[13] Indicators of the political system have been proposed by Persson and Tabellini (1999) and applied by Fatás and Mihov (2001) to a small sample of OECD countries, where such political indicators do not seem to be significant. Consequently, we do not included here either. Another factor, also proposed in the literature (Martinez-Mongay, 2002) but not included here is the stock of public debt. Although for panels including five-year averages public debt is a relevant determinant. However, our analyses suggest that for longer periods the results (available on request) are less unambiguous. We have opted to consider debt later on as an additional factor explaining output volatility.

Table 5. Instrumental variable estimates for macroeconomic stability

	Tax revenues (1)	Country size (2)	Industry share (4)	Adj. R²	J-test (4)
[Output-gap volatility(5)]					
OG-IV1(6)	-1.74	-0.21		0.43	2.98
	(0.26)***	(0.07)***			[0.39]
OG-IV3(6)	-1.94	-0.33	0.05	0.51	5.45
	(0.37)***	(0.05)***	(0.03)**		[0.14]
[Inflation volatility (7)]					
GD-IV1(6)	-0.22	-0.03		0.20	3.48
	(0.07)***	(0.01)**			[0.32]
GD-IV3(6)	-0.23	-0.03	0.002	0.19	4.24
	(0.08)***	(0.01)**	(0.003)		[0.24]

Heteroskedastic-consistent standard errors in parenthesis; *** significant at 1%; ** significant at 5%, * significant at 10%. All the regressions include an intercept not shown here

(1) Logarithm of the average tax revenues (% of GDP) over 1960-2000[(a)]
(2) Logarithm of the average GDP (PPPs) over 1960-2000[(a)]
(3) Average share of manufacturing gross value added in total GDP over 1960-2000
(4) Test for over-identifying restrictions; p-value between '[]'
(5) Standard deviation of the output gap in percentage of trend GDP over 1960-2000[(a)]
(6) The instruments are trade openness (% of GDP), per capita GDP (1995 PPPs) and the dependency ratio (% of total population). The three instruments are the logs of the averages over 1960-2000.
(7) Ratio between the standard deviation and the average over 1960-2000[(a)] of the annual percentage change in the GDP deflator

[(a)] See footnotes in tables 1 and 2 for the exceptions

4.2 Automatic stabilization and the structure of taxation

Tables 3 to 5 present quite robust empirical evidence of a negative relationship between government size and output-gap and price volatility: larger public sectors stabilize output and reduce inflation fluctuations. Yet, one could wonder whether such a relationship is independent of the tax-mix. Two identical countries in terms of GDP, production structure and government size, could have different tax-mix, thereby exhibiting different elasticities of labor supply. The theoretical analysis in section 2 has shown that the stabilizing/destabilizing impacts of taxes depend on the distorting effect of taxes on the supply curve. With an important distorting effect the destabilization impact might be the dominant one (especially under supply shocks).

Table 6: Labor related tax burden over time and countries

	Period 1960-1980			Period 1980-2000			Difference		
Country	Direct taxes 1	Social security 2	Labour taxes 3	Direct taxes 1	Social security 2	Labour taxes 3	Direct taxes 1	Social security 2	Labour taxes 3
Belgium	11.62	11.31	34.28	16.83	16.26	42.90	5.21	4.95	8.62
Denmark	24.06	1.81	32.35	28.70	2.55	41.32	4.64	0.74	8.97
Germany	11.33	13.03	35.21	11.87	17.90	40.71	0.54	4.87	5.49
Greece	3.30	7.67	14.94	6.27	11.94	23.40	2.97	4.26	8.46
Spain	3.71	8.76	17.45	9.26	13.01	28.54	5.55	4.25	11.09
France	6.20	15.18	29.86	8.90	20.11	39.30	2.69	4.93	9.45
Ireland	9.41	4.88	14.89	13.70	6.85	24.65	4.29	1.97	9.76
Italy	6.14	11.38	22.90	13.93	14.10	34.88	7.79	2.72	11.98
Luxembourg	15.36	11.53	30.16	17.06	12.54	33.53	1.70	1.01	3.37
The Netherlands	14.45	16.05	36.90	13.58	18.29	40.92	-0.88	2.24	4.03
Austria	10.23	11.20	29.09	12.42	16.23	37.31	2.18	5.03	8.22
Portugal	4.86	5.30	14.40	8.66	9.87	24.08	3.80	4.57	9.68
Finland	13.35	6.78	31.17	17.25	12.63	41.42	3.90	5.85	10.25
Sweden	18.42	9.06	41.23	21.18	14.33	47.67	2.76	5.27	6.44
United Kingdom	15.12	6.33	24.94	15.95	7.83	25.35	0.83	1.50	0.41
United States	13.29	4.60	18.35	13.09	7.00	22.00	-0.20	2.40	3.65
Japan	8.30	4.72	13.15	11.12	8.94	20.14	2.82	4.22	6.99

1:Direct taxes in percentage points of GDP
2:Social security contributions in percentage points of GDP
3:Labour effective tax rates in % of the tax base

From an econometric point of view, the implication of the theoretical analysis is that the coefficient of government size in the output and inflation volatility equations, instead of being constant, may be dependent on the importance of the distorting effect of taxes. For a given government size, the higher is the distorting effect the higher could be the destabilization effect. Let's label the coefficient of government size η, if the implication of the theoretical model fits with the observation of the real world then η=(η_0 + η_1*indicator of the distorting effect of taxes). The expected sign of η_0 is negative and the expected sign of η_1 is positive.

We consider two ways of testing the impact of higher distorting taxes on stabilization. One consists of estimating the relationship over periods of time that are characterized by different levels of distorting taxes. The other consists of estimating the equation over the whole period but interacting the coefficient of government with an indicator of distorting taxes.

To implement the first test, we look at averages over the periods 1960-1980 and 1980-2000. We then run a pooled regression over the resulting two samples with an interaction time dummy (equal to 1 for the second period and 0 for the first) and government size. On the basis of three labor-tax indicators, table 6 illustrates the significant increase recorded by the tax burden on labor over the two periods.

To implement the second test we use the average over the whole period 1960-2000 and interact government size with the labor effective tax rate. Following Mendoza et al (1997) and Kneller et al (1999), the labor effective tax rate is the best indicator of distorting taxes. Moreover, Li and Sarte (2004) show that the share of tax revenue (or social security) over GDP constitutes a poor proxy for average marginal tax rates. Hence, as a further robustness check we also interact government size with direct taxes in percentage of GDP and social security contributions in percentage of GDP. The statistically insignificant coefficients of the two interaction terms are interpreted as an additional support to the importance of the distorting taxes.

Table 7 presents the results of both tests. Starting with the one using the time dummy and averages over two periods, one notices that the average quality of fit is of medium to low levels for inflation and output volatility. For the latter, all coefficients are significant (sometimes highly) with the expected sign while for the former two coefficients (out of four) are significant and only at the 10% level. Although the results seem better with output than with inflation volatilities, the interactions term is significant and positive in both cases. This implies that over the second period government size has had a less stabilizing effect of volatilities, which is in accordance with our expectations.

Turning to the test with an explicit indicator of the distorting effect of taxes, we first observe that the inflation volatility equation again performs poorly in terms of quality of fit. In contrast the quality of fit with output volatility is high, especially when the labor tax rate is interacted with government size. In this case all coefficients are significant with the expected sign. In particular, consistently with the prediction of the theoretical model, the coefficient of the interaction term is positive implying that the higher is the distorting effect of taxes the lower is the stabilizing effect of government size on output. Moreover, neither the specification incorporating the interaction term with direct taxes nor the one incorporating the interaction term with social security exhibits a significant coefficient of such terms.[14] As stated above, while the labor effective tax rate is a good indicator of distorting taxes (Mendoza et al (1997) and Kneller et al (1999)), tax revenue (or social security) over GDP constitutes a poor proxy for such taxes (Li and Sarte (2004)). Hence, the fact that the coefficients of the corresponding inter-action terms are not significant is consistent with our analysis.

Overall, the results lend support to the possible destabilizing effects of the tax mix. Where output volatility is concerned, the results suggest that high labor tax rates have perverse effects on output stability. *Ceteris paribus* (given government and country sizes, and the relative importance of manufacturing), output fluctuations will be larger in the countries with higher tax rates on labor. This result is in line with the basic assumption of the modified AD-AS model, namely that the labor supply is affected by the labor tax wedge, which in turn affects the supply function and makes it steeper.

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[14] Their overall quality of fit is also 8 percentage points lower than the one with labor tax rate.

Table 7: Macroeconomic stability and the tax mix

	Output-gap volatility (1)				Price volatility [GDP deflator] (2)			
Government Size (3)	**-2.44 (0.56)*** **	**-4.9 (1.41)*** **	**-2.58 (0.62)*** **	**-2.55 (0.59)*** **	**-0.31 (0.18)***	**-0.17 (0.36)**	**-0.46 (0.14)*** **	**-0.43 (0.14)*** **
Country size (4)	**-0.23 (0.05)*** **	**-0.34 (0.08)*** **	**-0.29 (0.09)*** **	**-0.29 (0.09)*** **	**-0.03 (0.03)**	**-0.04 (0.02)***	**-0.04 (0.02)** **	**-0.05 (0.02)** **
Specialization (5)	**1.43 (0.75)***	**1.04 (0.46)** **	**0.85 (0.49)***	**0.86 (0.49)***	**0.07 (0.22)**	**0.21 (0.12)***	**0.23 (0.11)***	**0.23 (0.12)** **
Government Size* Time dummy (6)	**0.20 (0.09)** **				**0.05 (0.03)***			
Government Size* Labor rate (7)		**1.45 (0.81)***				**-0.16 (0.21)**		
Government Size* Direct taxes (8)			**0.03 (0.30)**				**0.05 (0.06)**	
Government Size* Social Security (9)				**-0.03 (0.30)**				**0.00 (0.07)**
A-R² (10)	**0.34**	**0.64**	**0.56**	**0.56**	**0.27**	**0.39**	**0.39**	**0.38**
J (11)	**3.76 [0.43]**	**7.79 [0.45]**	**8.53 [0.38]**	**8.80 [0.36]**	**3.76 [0.43]**	**7.79 [0.45]**	**8.53 [0.38]**	**8.80 [0.36]**

Models estimated by IV methods (instruments: trade openness, per capita GDP, dependency ratio. Heteroskedastic-consistent standard errors in parenthesis; *** significant at 1%; ** significant at 5%, * significant at 10%. All the regressions include an intercept not shown here.

(1) Standard deviation of the output gap in percentage of trend GDP over 1960-2000[(a)].
(2) The ratio between the standard deviation and the average over 1960-2000[(a)] of the annual percentage change in the GDP deflator.
(3) Logarithm of the average tax revenues (% of GDP) over 1960-2000[(a)].
(4) Logarithm of the average GDP (PPPs) over 1960-2000[(a)].
(5) Average share of manufacturing gross value added in total GDP over 1960-2000.
(6) The corresponding equation is estimated on a sample consisting of averages over the period 1960-1980 and the period 1981-2000. The resulting number of observation is 30. Government size is interacted with a dummy taking the value 1 over the second period and 0 otherwise.
(7) The corresponding equation is estimated on a sample consisting of averages over the period 1960-2000. The resulting number of observation is 17. Government size is interacted with labor taxes in percentage of total labor costs.
(8) The corresponding equation is estimated on a sample consisting of averages over the period 1960-2000. The resulting number of observation is 17. Government size is interacted with direct taxes in percentage of GDP.
(9) The corresponding equation is estimated on a sample consisting of averages over the period 1960-2000. The resulting number of observation is 17. Government size is interacted with social security contribution in percentage of GDP.
(10) Adjusted R^2.
(11) Test for over-identifying restrictions; p-value between '[]'.
(a) See footnotes in tables 1 and 2 for the exceptions.

5. CONCLUDING REMARKS

This paper has discussed theoretical evidence about the stabilizing role of fiscal policy and, in particular, about the potential trade-off between efficiency and stabilization. Although following the major strand of the literature on the relationship between the size of governments and output stability, the analysis also looked at price volatility.

Within the standard framework, distorting taxes enhance output stability but have an impact on potential growth, so that a trade-off between stabilization and efficiency seems to arise. If there is a positive relationship between the size of automatic stabilizers and distorting taxation, any reform aiming at lowering distortions and enhancing efficiency will be at the expense of more macroeconomic volatility. However, the theoretical evidence discussed in this paper suggests that such a trade-off might not exist. As marginal tax rates increase in progressive regimes so do average rates. Within the modified AD-AS, or within the RBC model by Galí (1994), rising average tax rates enhance market distortions and reduce the stabilizing effects of public finances, so that when pursuing efficiency one also gets macroeconomic stability.

On the empirical side, we have presented acceptably robust evidence that the size of governments in OECD countries has played a stabilizing role for both output and inflation. The econometric analysis has also revealed that larger countries have more closed economies, and thus are less affected by external shocks. Moreover, a larger manufacturing sector means a higher degree of exposure to international shocks, which have a pervasive effect on output stability.

A central conclusion of the paper is that the relationship between government size and macroeconomic stability does not seem to be linear. The composition of public finances, in particular the tax mix, matters for output and price volatility. Distorting taxes, namely taxes on labor and capital, might have negative effects on macroeconomic stability. Consequently, the potential trade off between stability and flexibility might not exist.

This debate about the stabilizing effects of fiscal policy is particularly relevant in EMU, where governments only have stability and flexibility to face the perverse effects of asymmetric shocks: fiscal stabilization to reduce macroeconomic fluctuations, and market flexibility to speed up price adjustment and structural change. If, as suggested by the standard model, there were a trade off between stability and flexibility, EMU would not provide governments with enough policy instruments to deal with idiosyncratic shocks. However, if such a trade off does not exist, fiscal reforms aiming at enhancing the functioning of markets would not hamper macroeconomic stability.

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Appendix:

The possible effect of taxation on the elasticity of the Phillips curve.

Consider the following wage formation function:

(1) $$w = f(L) + \gamma T$$

where w is the real producer wage, L is employment and T is the real revenue of distorting tax per worker. We assume the first derivative of the function f with respect to L to be positive. We interpret γ as a coefficient of wage resistance: it varies between 0 (all tax increase are borne by labour) and 1 (tax increases are passed through entirely to employers). Rewriting in rates of change (denoted by a dot over a variable) yields:

(2) $$\dot{w}(1-\gamma\frac{\Delta T}{\Delta w}) = (1-\gamma\frac{T}{w})\rho_1\dot{L}$$

where $\rho_1 = (df/dL)(L/f(L))$, which is the elasticity of the real wage with respect to (cyclical variations in) employment.

Next, we define the average and marginal rates of the distorting tax as, respectively, $t = \frac{T}{w}$ and $t' = \frac{\Delta T}{\Delta w}$.

By replacing t and t' in (2) and defining the tax elasticity with respect to wage earnings ξ as the ratio between the marginal and average tax rate, after some manipulations, we obtain:

(3) $$\dot{w} = \frac{(1-\gamma t)}{(1-\gamma\xi t)}\rho_1\dot{L}$$

We assume the nominal rate of change of the producer wage to equal the expected rate of inflation (π^e) plus the rate of change of the real producer wage and that wages are fully passed into prices (i.e. $\pi = \dot{w} + \pi^e$). Moreover, we assume that for every percentage (cyclical) increase in employment, the unemployment rate declines by a ρ_2 percentage points; i.e. $u - u^* = -\rho_2\dot{L}$, where u is unemployment and u^* is the natural rate of unemployment. Under those assumptions the (inverse) expectations-augmented Phillips curve reads (we leave out other explanatory variables) [15]:

(4) $$u = u^* - \frac{(1-\gamma\xi t)}{(1-\gamma t)}\chi(\pi - \pi^e)$$

and χ is a positive constant which is equal to the ratio of ρ_2 and ρ_1 .

It is easy to see that, provided that taxes are progressive (that is $\xi > 1$) and there is sufficient wage resistance (i.e. a relatively large γ), the reaction of unemployment to an inflation surprise is smaller the larger the value of t[16]. In other words, in countries with higher taxes, a value of inflation larger (smaller) than expected will lead to a smaller (larger) reaction of output which corresponds to a steeper supply function in the output-inflation space. The intuition for this result is clear. Take the case of a positive inflation surprise: as employers demand more labour to increase production, they will have to pay higher wages to cover not only for the higher prices but also on account of the fact that wages move up onto a higher tax bracket; this tends to limit the rise in production.[17]

[15] Taxation may also enter in the determination of the natural level of output (see Dixit and Lambertini, 2000), and not only in the slope of the supply function. Since we are interested in analyzing the response to shocks, this will not be considered.

[16] The condition to have this result is $\gamma * \xi > 1$.

[17] For this to hold true it must be assumed that governments fail to provide an offsetting tax break to moderate wage demands, i.e. do not pursue an incomes policy. But this is consistent with the basic assumption of our analysis: governments solely and fully rely on automatic stabilizers, hence do not modify the tax and spending parameters in response to cyclical fluctuations in economic activity.