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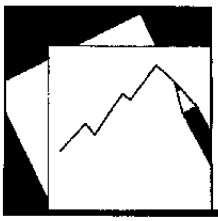

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Automatic Fiscal Stabilizers in France

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Automatic Fiscal Stabilizers in France[1]

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Abstract

In this paper, a simple methodology to assess the effectiveness of automatic stabilizers is proposed and empirically tested using French data for the period 1970–2000. The paper concludes that fiscal stabilizers have dampened output variability by approximately 35-45 percent depending on the measure of potential output used. In addition, the results indicate that fiscal stabilizers mainly operated through the reduction of private investment fluctuations from 1970 to 1985, and through the reduction of private consumption variability thereafter. Due to the counterfactual nature of the analysis performed, the simplicity of the theoretical model, and simultaneity issues that might introduce biases, the results can at most be interpreted as approximations of the phenomenon that is analyzed.

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I. Introduction

The idea that governments can reduce output fluctuations by allowing fiscal stabilizers to work is not new. It was widely explored, not only theoretically but also empirically during the 1950s and 1960s. During the 1970s, the rational expectations revolution and the ideas implicit in the "Ricardian" proposition and the "Lucas Critique" dramatically changed the direction of theoretical and empirical economic research and cast doubt not only on the effectiveness of stabilizers but also on the ability of economists to measure it.

However, the significant fiscal deficits in the United States and Europe during most of the 1980s and early 1990s, as well as the implementation of the Maastricht Treaty leading up to European Monetary Union, brought about new interest in the subject. For instance, in the case of Europe, the renewed interest was grounded in the authorities' intention to avoid breaching the 3 percent deficit limit imposed by the Maastricht criteria and in the recognition that, without the possibility of monetary policy by the monetary union, fiscal policy was the only instrument that the authorities could use to dampen the effects of the business cycle at the national level.

This new state of affairs was soon reflected in the literature. Theoretical contributions took the old Keynesian idea and analyzed it in the light of the new research in economics. Empirical contributions recognized the difficulties in providing accurate estimates of the effectiveness of fiscal stabilizers but also clearly acknowledged the need to have at least approximations of it. Examples of the theoretical work include Christiano (1984), Bec and Hairault (1997), Christiano and Harrison (1999), and Cohen and Follete (2000), among others. The empirical contributions include Cotis and others (1997), van den Noord (2000), and Auerbach and Feenberg (2000), among others.

In this paper a methodology to assess the effectiveness of stabilizers is suggested and applied to French data for 1970–2000. The methodology is based on the separation of permanent from temporary components of fiscal accounts and on the association of temporary components with the workings of fiscal stabilizers. This association makes it possible to construct new series for disposable income of both households and entrepreneurs and therefore to estimate, under certain simplifying assumptions, the effect of stabilizers in private consumption, investment, imports, and output.

The paper is organized as follows. Section II comments on the theory of fiscal stabilizers. Section III briefly reviews the literature on the subject. Section IV describes the methodology that is proposed to estimate the effectiveness of fiscal stabilizers and, in Section V, this methodology is applied for France for the period 1970–2000. A summary and some conclusions are presented in Section VI.

II. The Theory of Automatic Stabilizers

The original theoretical explanation for fiscal stabilizers was that they reduce output fluctuations because some components of fiscal accounts react automatically to the cycle,

increasing public deficits in recessions and decreasing them in expansions. Government revenues increase with positive output gaps and decrease with negative gaps, while some government expenditures, especially those related to social security transfers—such as unemployment insurance—have the opposite behavior. In this way, in the positive phase of the business cycle, disposable income of households and net earnings of entrepreneurs are smaller than they would otherwise be, thus reducing private consumption and investment, while during the negative phase of the cycle disposable income and thus private consumption and investment are higher. By not being synchronized with the cycle, public budgets decrease demand variability and thus GDP fluctuations. In other words, the existence of fiscal stabilizers reduces the Keynesian multiplier.

Provided that the fiscal stabilizers behave in this way, their strength is determined by different factors, the most important being the size of the general government sector. The larger government expenditure as a share of GDP, the more sensitive the public balance will be to fluctuations in economic activity. A second factor that influences the effectiveness of fiscal stabilizers is the degree of openness of an economy. The more open the economy, the less effective fiscal stabilizers will be. At the limit, in an economy with only traded goods, the increased variability in domestic demand that would result from eliminating the automatic stabilizers would be reflected exclusively in a larger variability of the trade balance, not output. Tax structure is also important, since the size of stabilization will depend on how sensitive different tax bases are to the cycle. The generosity of social security transfers and the progressivity of taxes are among other factors that determine the effectiveness of fiscal stabilizers.

Although this has been the traditional view about the workings of fiscal stabilizers, some theoretical issues are implicit in such an explanation and therefore have to be analyzed. It is clear that the effectiveness of fiscal stabilizers depends crucially on how much current disposable income—of both households and entrepreneurs—influences current consumption and investment. This behavior entails the failure of the Ricardian proposition to hold, due, for example, to the existence of credit constraints.[2] If the Ricardian proposition held perfectly, there would be no room for fiscal stabilization, since the private sector would provide all the necessary stabilization through its saving decisions.[3]

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[2] The Ricardian equivalence proposition states that "...budget deficits or social security would not matter for key macroeconomic variables, such as the real interest rate and the quantity of investment," since the debt needed to finance those disequilibria will be paid by raising taxes in the future (Barro, 1996); therefore, the proposition implies that optimal private consumption paths will not be affected by temporary changes in taxes and transfers, since agents will predict a reversal of those changes consistent with an intertemporal balanced position of the public accounts.

[3] However, saving behavior can be destabilizing in some cases, for example, when a slowing economy leads to an increase in precautionary savings due to higher job insecurity and lower earnings prospects. Additionally, there could be a role for fiscal stabilization even in a world where the Ricardian proposition holds perfectly, as shown in Christiano (1984).

In addition, fiscal stabilizers may not work, or may actually increase output variability if there are perverse effects associated with their functioning. Perverse effects may occur if fiscal deficits during recessions give rise to increases in interest rates due to public debt risk or sustainability issues. If this is the case, private consumption and investment may actually decrease during recessions as a consequence of fiscal "stabilizers" and therefore increase the depth of recessions.

III. Literature Review

As Blanchard (2000) puts it, "...automatic stabilizers are a very old, very Keynesian idea." In an excellent paper, Christiano (1984) analyzes the implications of dynamics and post-Keynesian macroeconomics for the traditional theory of fiscal stabilizers.[4] He begins by pointing out that the effectiveness of fiscal stabilizers in reducing output fluctuations is a function of the dynamic structure of the economy. Thus, it is not entirely correct to analyze the ability of stabilizers to reduce output variability only by estimating its contemporaneous or static effect, which has been an implication of the original formulation of the problem. He then analyzes how expectations play a role in the stabilizing properties of fiscal stabilizers. Here he emphasizes two points. The first one is that feedback rules may have no effect at all or, under certain assumptions may lead to perverse effects, i.e., an increase in the variability of output instead of a decrease.[5] The second is that the methods frequently used to evaluate empirically the stabilizing effects of fiscal stabilizers are subject to the Lucas critique (1976). In general, most methods to assess the importance of fiscal stabilizers assume the structure of the economy to be invariant to their elimination, while what actually would happen is that rational agents would adjust their behavior to the elimination of automatic stabilizers and therefore the structure of the economy (reflected in the parameters of an econometric model) would change, making the counterfactual evaluation invalid.

Christiano also analyzes the influence and the effectiveness of automatic stabilizers in models where the Ricardian equivalence proposition holds. Under strict Ricardian equivalence, he argues, automatic stabilizers should not have any effect in dampening output fluctuations. This result is shared by the predictions of the basic life-cycle, permanent income models of consumer behavior, such as those in Deaton (1992): automatic stabilizers will be ineffective

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[4] De Long (1996) explores how these Keynesian ideas influenced U.S. public budget legislation after the Second World War.

[5] Note, however, that fiscal feedback rules and automatic built-in stabilizers are not the same. Fiscal feedback rules are policy actions based on present and past information shared by both the government and private agents; built-in stabilizers respond automatically to current economic conditions. McCallum and Whitaker (1979), using a rational expectations macroeconomic model that includes a supply curve of the "natural type" conclude that fiscal feedback rules are ineffective while built-in automatic stabilizers may influence the variability of output around potential levels. However, Beare (1986), using a similar model finds that fiscal stabilizers may increase output volatility provided they affect the elasticity of aggregate supply.

because households will optimally stabilize their consumption through time. However, Christiano shows that if households are limited in their ability to gather certain information, fiscal stabilizers may be effective in a world that is otherwise strictly Ricardian.

In a different line of thought, Blanchard (2000) points out that fiscal stabilizers will be effective in reducing output fluctuations because the Ricardian proposition does not hold. He mentions death (current taxpayers will not be there when taxes are adjusted in the future), myopia (the adjustment of taxes could be too far in the future), credit constraints (if some people cannot borrow against future income, then current tax changes today will lead to current changes in aggregate demand), and insurance (if taxes are proportional, they will reduce the uncertainty associated with labor income and thus affect consumption). He argues that the first two factors are not likely to be relevant in a discussion about fiscal stabilizers, since recessions rarely last more than two years and, therefore, that the last two factors are likely to be the important ones, especially the number of households that are credit constrained.

In an extension to the usual one-country model, Bec and Hairault (1997) propose a stochastic two-country model to analyze the effectiveness of fiscal stabilizers. Their aim is to study fiscal stabilization from the perspective of an integrated market such as the European Union. Under certain simplifying assumptions they conclude that transfers based on the net foreign account of each country provide perfect risk sharing for private agents and therefore contribute to stabilizing output in both countries.

Finally, Christiano and Harrison (1999) analyze fiscal stabilizers in the context of a real business cycle model with an externality in production. They conclude that stabilization is desirable because in their model efficient allocations are characterized by constant employment and output growth. Additionally, they also point out that it is possible to devise tax-subsidy systems that would eliminate fluctuating equilibria and induce economic agents to internalize the production externality.

The literature has not only explored the theoretical basis of fiscal stabilizers but has also tried to measure their effectiveness. Clement (1960), Eilbott (1966), and Packer and Ripley (1975), among others, are early attempts in this regard. [6] More recently, Dalsgaard and de Serres (1999), using a structural vector autoregression (VAR) model, analyze the effect of different types of shocks in the fiscal balance for some selected European countries. Although they do not supply estimates of the effect of fiscal stabilizers in dampening output fluctuations, they purposefully eliminate policy shocks to observe the effect of the cyclical component of fiscal accounts on output. [7] Fatas and Mihov (1999) study the relation between government size and

[6] These papers intended to assess the quantitative impact of fiscal stabilizers for the United States.

[7] These two authors use the Blanchard-Quah procedure to identify their model. The main aim of their paper is to estimate prudent budgetary margins to avoid breaching the Maastricht Treaty's 3 percent deficit ceiling.

output fluctuations for OECD countries and U.S. states. They find that output fluctuations are lower in those countries that have larger governments. This finding supports the hypothesis that, the larger the size of the government is, the more effective automatic stabilizers will be in dampening fluctuations. Both Cohen and Follete (2000) and Auerbach and Feenberg (2000) analyze the effectiveness of fiscal stabilizers in the United States. The first paper explores several channels through which fiscal stabilizers affect output, using consumption models such as those analyzed in Deaton (1992). Based on individual tax return information, the second paper assesses the impact of personal income taxes on output stabilization. Both papers find that automatic stabilizers have only modestly reduced output volatility in the United States.[8]

Finally, van den Noord (2000) uses the INTERLINK model of the OECD Secretariat to analyze how fiscal stabilizers have contributed to reducing output volatility during the 1990s for several OECD countries. To do this, he sets tax and expenditure flows at their structural levels and assumes that monetary policy responds to the cycle according to a Taylor rule. He finds that automatic fiscal stabilizers have worked to dampen output fluctuations by a quarter on average. However, he emphasizes that there is considerable cross-country variation, which he attributes to differences in the openness and in monetary policy responsiveness of different countries. Thus, his results indicate that automatic stabilizers have substantially reduced output fluctuations in Finland, Denmark, and Sweden, while they have been relatively unimportant for Japan, Ireland, and Austria. For France he reports that fiscal stabilizers have reduced output volatility by about 20 percent.

In the specific case of France, Cotis and others (1997), using consumption models, report a reduction of the effectiveness of fiscal stabilizers during the 1990s. They attribute this reduction to the transition to EMU, which may have contributed to a sharp rise in the reaction of interest rates to public deficits and in the sensitivity of households to the risks of future taxation. Finally, Jeanne (in IMF, 1998) is more concerned about the discretionary response of authorities to reduce output fluctuations than about the effect of fiscal stabilizers in doing so, although he tangentially analyzes the issue of automatic fiscal stabilizers. In order to estimate such a response, he first decomposes the public budget into structural and cyclical components and then runs regressions for different time periods to observe the relation between the primary structural balance and the output gap. He concludes that the French authorities have chosen to run a more countercyclical fiscal stance since the mid-1980s.

IV. The Methodology

The methodology proposed here to assess the effectiveness of fiscal stabilizers is based on a simple Keynesian-type theoretical model, and its econometric estimation.

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[8] Using the Federal Reserve Board (FRB)/U.S. macro econometric model, Cohen and Follete find that automatic stabilizers reduce the Keynesian multiplier by approximately 10 percent, although they have a larger impact on personal consumption. This result is similar to the one obtained by Auerbach and Feenberg, who report that federal taxes offset approximately 8 percent of initial shocks to GDP.

A. The Theoretical Model

In order to assess the importance of fiscal stabilizers, the methodology used here assumes that each variable, $\overline{\overline{z}}$, can be separated into a permanent component, $\overline{z}$, and a temporary component, z,

$$\overline{\overline{z}} = \overline{z} + z. \tag{1}$$

The first component can be associated with the trend, or the permanent component of a series, while the second component can be associated with deviations from the permanent part (output gaps, for instance). Therefore, the change in $\overline{\overline{z}}$ can be expressed as,

$$\overline{\overline{\Delta z}} = \overline{\Delta z} + \Delta z, \tag{2}$$

where $\overline{\overline{\Delta z}}$ indicates total change while $\overline{\Delta z}$ and Δz indicate permanent and temporary changes, respectively. Using a hat (^) to indicate percentage changes with respect to $\overline{\overline{z}}_{-1}$, total percentage changes in the current period are given by,

$$\hat{\overline{\overline{z}}} = \hat{\overline{z}} + \hat{z}, \tag{3}$$

where, e.g., $\hat{\overline{z}} = \overline{\Delta z} \Big/ \overline{\overline{z}}_{-1}$; thus, from (3) it can be said that total percentage changes of any variable are also decomposed into "permanent" and "temporary" parts.[9]

Since output gaps are defined to be temporary deviations of output from its "permanent" or potential value, the methodology analyzed here is designed to estimate how effective fiscal stabilizers are in reducing output fluctuations by analyzing the behavior of the temporary components of relevant macroeconomic and fiscal variables. For that purpose a simple "Keynesian-like" formulation is used,

$$\hat{y} = a_c \cdot \hat{c} + a_i \cdot \hat{i} + a_g \cdot \hat{g} + a_x \cdot \hat{x} - a_m \cdot \hat{m} \tag{4}$$

$$\hat{c} = \beta_1 \cdot \hat{yd} + \beta_2 \cdot \hat{yd}_{-1} + oc \tag{5}$$

$$\hat{i} = \beta_3 \cdot \hat{ye} + oi \tag{6}$$

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[9] All previous period variables are denoted with a $_{-1}$ subscript.

$$\hat{m} = \beta_4 \cdot \hat{c} + \beta_5 \cdot \hat{i} + om \tag{7}$$

Expression (4) is an identity that defines temporary percentage changes in output, $\hat{y}$, to be a weighted sum of temporary percentage changes in consumption, $\hat{c}$, investment and changes in stocks, $\hat{i}$, government expenditures, $\hat{g}$, exports of goods and services, $\hat{x}$, and imports of goods and services, $\hat{m}$. The weights ($a_j, j = c,i,g,x,m$) are the ratios to output for each component in the previous period. Equation (5) states that temporary percentage changes in consumption depend linearly on temporary percentage changes of households' disposable income in the current and previous period plus a component not explained by changes in income. Equation (6) is analogous to (5) but states that temporary percentage changes in investment are a linear function of temporary changes in net income of entrepreneurs plus a component not explained by changes in income.[10] Equation (7) states that temporary changes in imports of goods and services are a linear function of temporary changes in consumption and investment plus other changes not explained by these factors.[11] Since all variables are temporary percentage changes, the coefficients in equations (5) to (7) can be interpreted as elasticities among temporary components.

Expressions (8) to (11) complete the formulation,

$$\hat{yd} = \gamma_y \cdot \left(\alpha^{\hat{l}} \cdot y\right) - \gamma_t \cdot \hat{t}^{\hat{l}} \tag{8}$$

$$\hat{ye} = \delta_y \cdot \left(\alpha^{\hat{e}} \cdot y\right) - \delta_t \cdot \hat{t}^{\hat{e}} \tag{9}$$

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[10] Transitory components of private consumption and investment are expected to be positively correlated with the transitory components of households' disposable income and net earnings of entrepreneurs, respectively. If this the case, larger fluctuations in disposable income will generate larger fluctuations in both private consumption and investment, and therefore, in output. In addition, since the transitory component of consumption is assumed to be affected by the contemporaneous transitory component of households' disposable income and its first lag, both the static and dynamic effectiveness of fiscal stabilizers can be analyzed.

[11] The more open an economy is, the smaller the effect of fiscal stabilizers should be. The model presented here captures the effect on the trade balance of the elimination of automatic stabilizers by focusing the analysis on imports of goods and services. Exports are assumed to be unaffected by fluctuations in domestic demand, which will be reflected only in the behavior of imports. Then, if private consumption and investment are more variable due to the absence of automatic stabilizers, the temporary component of imports will be more volatile too. The validity of this assumption will be tested for the case of France.

$$\hat{t}^l = \theta^l \cdot \hat{y} + ot^l \tag{10}$$

$$\hat{t}^e = \theta^e \cdot \hat{y} + ot^e. \tag{11}$$

Expressions (8) and (9) are identities. Identity (8) defines temporary changes in households' disposable income, $\hat{yd}$, to be a weighted average of temporary changes in households' gross income $\left(\alpha^{l} \cdot \hat{y}\right)$ —where α^l indicates the proportion of total output that goes for labor compensation—and temporary changes in taxes $\hat{t}^l$. The weights ($\gamma_j, j = y,t$) are the ratios to disposable income for each of its components in the previous period. Analogously, identity (9) defines temporary changes in entrepreneurs' net income, $\hat{ye}$, to be a weighted average of temporary changes in entrepreneurs' gross income $\left(\alpha^{e} \cdot \hat{y}\right)$ —where α^e indicates the proportion of total output that goes for entrepreneurs´ compensation—and temporary changes in taxes $\hat{t}^e$.[12] The weights ($\delta_j, j = y,t$) are the ratios to net income for each of its components in the previous period. Expressions (10) and (11) define temporary percentage changes in taxes on households and entrepreneurs, respectively, to be linear functions of temporary percentage changes in output, plus a component not explained by such changes.[13,14]

Replacing (10) in (8) for the current and previous period and (11) in (9) for the current period, we obtain the following expressions,

$$\hat{yd} = \gamma_y \cdot \left(\hat{y} + \hat{\alpha}^l + \hat{y} \cdot \hat{\alpha}^l\right) - \gamma_t \cdot \left(\theta^l \cdot \hat{y} + ot^l\right) \tag{12}$$

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[12] Henceforth in the paper, we will refer $\hat{yd}$ as HHDY, and $\hat{ye}$ as EDY.

[13] For simplicity, when defining households' disposable income and net income of entrepreneurs, only a generic tax was included; however, this generic tax should be interpreted as a weighted average of taxes and transfers, each one with its own elasticity with respect to changes in income.

[14] In the absence of perverse effects, the transitory component of government revenues should move in the same direction as the transitory component of output, and some government expenditures, specifically transfers, in the opposite direction.

$$\hat{yd}_{-1} = \gamma_{y_{-1}} \cdot \left(\hat{y}_{-1} + \hat{\alpha}^{l}_{-1} + \hat{y}_{-1} \cdot \hat{\alpha}^{l}_{-1} \right) - \gamma_{t_{-1}} \cdot \left(\theta^{l} \cdot \hat{y}_{-1} + ot^{l}_{-1} \right)$$

$$\hat{ye} = \delta_{y} \cdot \left(\hat{y} + \hat{\alpha}^{e} + \hat{y} \cdot \hat{\alpha}^{e} \right) - \delta_{t} \cdot \left(\theta^{e} \cdot \hat{y} + ot^{e} \right).$$

Substituting (12) in (5) and (6), using the resulting expressions in (7) and then again in (4), we obtain,

$$\hat{y} = z_1 \cdot \hat{y}_{-1} + z_2 \cdot oy, \tag{13}$$

where,

$$z_1 \equiv \frac{\beta_2^{'} \cdot (a_c - a_m \cdot \beta_4)}{\left[1 - \beta_1^{'} \cdot (a_c - a_m \cdot \beta_4) - \beta_3^{'} \cdot (a_i - a_m \cdot \beta_5)\right]} \tag{13'}$$

$$z_2 \equiv \frac{1}{\left[1 - \beta_1^{'} \cdot (a_c - a_m \cdot \beta_4) - \beta_3^{'} \cdot (a_i - a_m \cdot \beta_5)\right]}$$

$$oy \equiv \left[a_g \cdot \hat{g} + a_x \cdot \hat{x} + oc^{'} \cdot (a_c - a_m \cdot \beta_4) + oi^{'} \cdot (a_i - a_m \cdot \beta_5) - a_m \cdot om \right].$$

In addition, in (13') we used the following definitions,

$$\beta_1^{'} \equiv \beta_1 \left[\gamma_y \cdot \left(1 + \hat{\alpha}^{l} \right) - \gamma_t \cdot \theta^{l} \right], \qquad \beta_2^{'} \equiv \beta_2 \left[\gamma_{y_{-1}} \cdot \left(1 + \hat{\alpha}^{l}_{-1} \right) - \gamma_{t_{-1}} \cdot \theta^{l} \right], \tag{14}$$

$$\beta_3^{'} \equiv \beta_3 \left[\delta_y \cdot \left(1 + \hat{\alpha}^{e} \right) - \delta_t \cdot \theta^{e} \right],$$

$$oc^{'} \equiv \left[oc + \beta_1 \cdot \left(\gamma_y \cdot \hat{\alpha}^{c} - \gamma_t \cdot ot^{l} \right) + \beta_2 \cdot \left(\gamma_{y_{-1}} \cdot \hat{\alpha}^{l}_{-1} - \gamma_{t_{-1}} \cdot ot^{l}_{-1} \right) \right],$$

$$oi^{'} \equiv \left[oi + \beta_3 \cdot \left(\delta_y \cdot \hat{\alpha}^{e} - \delta_t \cdot ot^{e} \right) \right].$$

Expression (13) has the form of a difference equation in the temporary percentage change of GDP; the coefficient z_1 is a dynamic multiplier, while z_2 is the usual static multiplier. Neither z_1 nor z_2 is constant, since their components can change through time, for example, due to a

change in the distribution of income between labor and capital. Note that stabilizers may help reduce contemporaneous output fluctuations but increase them dynamically. This point is emphasized in Christiano (1984).[15] Obviously, z_1 should be, on average, less than 1 in absolute value in order for temporary innovations not to produce explosive changes in output.[16] Additionally, if fiscal stabilizers work in the expected theoretical way, both multipliers should be higher when they are not allowed to function.

By a straightforward manipulation of its components, this theoretical formulation can be used to assess the effectiveness of fiscal stabilizers. By associating the workings of stabilizers with the components of $\hat{t}^{l}$ and $\hat{t}^{e}$ that react to changes in output, i.e., $\theta^{l} \cdot \hat{y}$ and $\theta^{e} \cdot \hat{y}$, respectively, it is possible to estimate what the effect of shocks in output fluctuations will be, if fiscal stabilizers are not allowed to work.

If automatic stabilizers do indeed stabilize, fluctuations in output should be larger when $\theta^{l} \cdot \hat{y}$ and $\theta^{e} \cdot \hat{y}$ are eliminated. However, since no restrictions will be imposed to make this occur, fiscal "stabilizers" may actually destabilize when using the values of θ^{l} and θ^{e} found from the data. Note also that changes in government expenditures are assumed to be exogenous with respect to changes in output, so it is implicitly assumed that fiscal stabilizers work through taxes and transfers, which is the common belief among policymakers and, as will be seen, is supported empirically in the French case.

B. The Empirical Estimation

The simplicity of the theoretical formulation allows its estimation with the use of macroeconomic time series. It is necessary to first divide univariate time series into permanent and transitory components, a task for which several procedures exist, e.g., ARIMA processes or data filtering (using, for instance, the Hodrick-Prescott filter or the Beveridge-Nelson decomposition)[17] In this paper, the permanent component of a series is identified with the fitted

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[15] See also the references therein, especially Smyth (1974).

[16] In (13), the condition $|z_1| < 1$ must hold in order for the difference equation to converge. This must be the case, since otherwise the expression would not be a difference equation in temporary percentage changes of output. The numerator of the coefficient will be positive provided that $\beta_2' > 0$ and that $a_c > a_m \cdot \beta_4$; both inequalities will hold for reasonable values of the parameters. Since the denominator will be positive if automatic stabilizers work in the theoretical by expected way (see Appendix I), the coefficient of $\hat{y}_{-1}$ will be less than 1 provided that $(\beta_1' + \beta_2') \cdot (a_c - a_m \cdot \beta_4) + \beta_3' \cdot (a_i - a_m \cdot \beta_5) < 1$.

[17] A good reference on decompositions of series between permanent and temporary components and the problems associated with them is De Masi (1997).

values of an ARIMA process and the temporary component with the residuals. Since the raw series are I(1), the ARIMA processes are estimated on log differences.[18]

Dummy variables, if statistically significant, are included in the estimation of the ARIMA processes to account for changes in tax legislation, economic shocks, or peaks and troughs of business cycles. Additionally, they are useful in cases where the time series are the result of the addition of several individual components (for instance, in the case of "other revenues" or "other taxes"). In the estimation of the ARIMA processes of government total expenditures and government consumption (both as defined by the national accounts), general government revenues, general government taxes, general government expenditures, general government primary expenditures, general government consumption expenditures, and general government compensation of employees, a dummy variable for the period 1970–82 was included to account for the significant change observed in fiscal accounts (see Section 4.1). In addition, dummy variables are included in the estimation of the ARIMA processes of private investment (including stock changes), entrepreneurs' net income, imports of goods and services, corporate taxes, other personal and income taxes, and other taxes and other revenues, in most cases to reflect policy changes or peaks and troughs of business cycles that, if left uncorrected, would wrongly change the permanent component of the series.

After the permanent and transitory components of each series are identified, the latter can be used to estimate the parameters. After the values of the parameters are estimated, the effectiveness of fiscal stabilizers can be assessed by the following steps.

First, new series for temporary percentage changes in taxes are constructed. This is done by subtracting from the original series the part that is explained by temporary changes in output,

$$\hat{t^{l}_{new}} = ot^{l} \qquad (10')$$

$$\hat{t^{e}_{new}} = ot^{e}. \qquad (11')$$

Expressions (10') and (11') intend to exclude the effect on taxes of fiscal stabilizers, and are therefore used to construct new series of households' disposable income and net income of entrepreneurs (also in levels) that exclude the effect of fiscal stabilizers. If the stabilizers do stabilize, the new series of disposable income of households and net income of entrepreneurs should fluctuate more than the original series.

Using the new series of disposable income of households and entrepreneurs, and assuming that the permanent percentage changes of these series remain unaltered, new

[18] The stationarity of all series was tested using augmented Dickey-Fuller tests, which are available on request.

temporary percentage changes of households' disposable income, $\hat{yd}_{new}$, and net income of entrepreneurs, $\hat{ye}_{new}$, are calculated and used to estimate new series for temporary percentage changes in private consumption, investment and imports of goods and services. This is done by substituting in (5) $\hat{yd}$ by $\hat{yd}_{new}$ and in (6) $\hat{ye}$ by $\hat{ye}_{new}$; these substitutions allow the construction of new series for temporary percentage changes in consumption, $\hat{c}_{new}$, and private investment, $\hat{i}_{new}$, which are then used in (7) to obtain new series for temporary percentage changes of imports of goods and services, $\hat{m}_{new}$. Finally, these new series are used in (4) to obtain the estimated temporary percentage changes of output when fiscal stabilizers are not allowed to work, $\hat{y}_{new}$. Once the two components have been separated, the comovements among the transitory components of fiscal accounts with the transitory component of output are analyzed. Again, if stabilizers do stabilize private consumption, investment, imports of goods and services and output should fluctuate more than the original series, which is the case for the French experience. Additionally, we found that dynamic multipliers, with or without the effect of fiscal stabilizers, are effectively less than 1, and that the multiplier without stabilizers is larger than the one with stabilizers, as is the case for static multipliers.[19]

V. Results for France: 1970–2000

A. Some Stylized Facts

Before reporting the results obtained from applying the methodology to the French data, the evolution of some relevant fiscal and macroeconomic variables will be briefly described.[20,21] Figure 1 depicts the behavior of general government revenues and expenditures as a percentage of GDP. During the last thirty years there has been a significant increase in the general government expenditure-to-GDP ratio, which peaked at levels around 55 percent during the early 1990s. As Jeanne (in IMF, 1998) points out, most of this growth can be ascribed to an increase in social expenditures in the 1970s and early 1980s, as can be seen in Figure 2. The revenue side exhibits the same general trend, with social contributions being the component that explains the increase (Figure 3). During the late 1990s, government revenues stabilized at around 52 percent of GDP.

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[19] During 1975-99, z_1 was on average 0.45 with stabilizers while it was 0.47 without them, whereas in the case of z_2 the figure with stabilizers was 1.01 and 1.03 without stabilizers.

[20] The source of all data series is the IMF's World Economic Outlook database.

[21] For more about the stylized facts of the fiscal accounts, see Jeanne (in IMF, 1998).

Figure 1. France: General Government Revenues and Expenditures
(In percent of GDP)

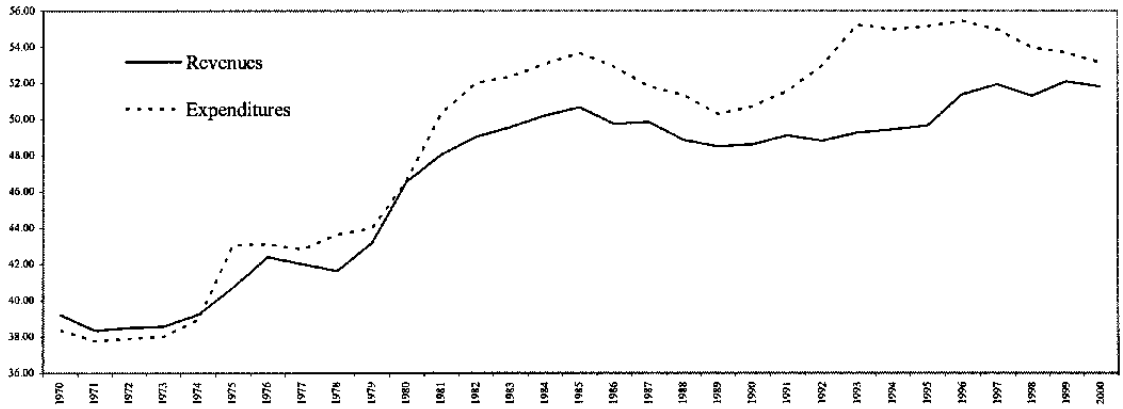


Figure 2. France: General Government Expenditures
(In percent of GDP)

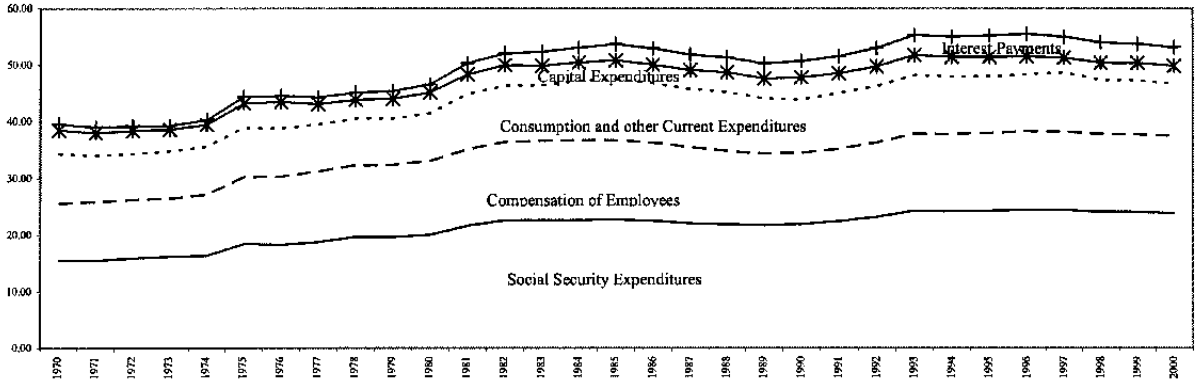
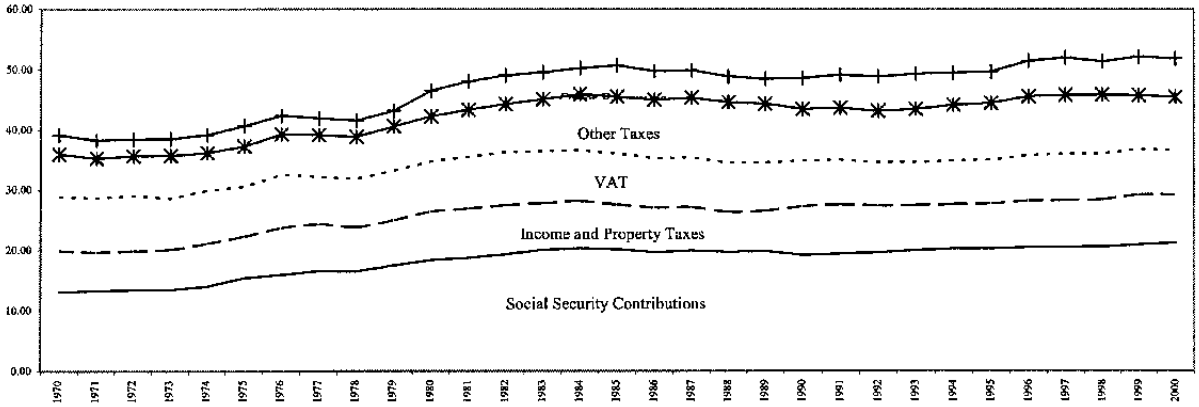


Figure 3. France: General Government Revenues
(In percent of GDP)



The increase in revenues and expenditures was accompanied by a deterioration of the fiscal balance, which turned from a surplus of around 0.5 percent of GDP during the early 1970s to deficits in excess of 3 percent of GDP during most of the 1990s. The steady fiscal deficits caused an increase in public debt and interest payments, which accounted for about one-fifth of the rise of the general government expenditure-to-GDP ratio. The deficit decreased to less than 2 percent of GDP in 2000, helped in part by a cyclical upswing (Figures 2 and 4).

Additionally, the general government expenditure-to-GDP and revenue-to-GDP ratios were influenced by cyclical fluctuations in economic activity; in this respect, the fiscal accounts have consistently behaved in a counter cyclical manner, with higher primary fiscal deficits associated with periods of slower economic activity (Figure 5).

With respect to the components of the national accounts, private consumption has steadily decreased as a ratio to GDP, reaching around 54 percent of GDP during the late 1990s, in comparison with levels around 58 percent of GDP during the 1970s. In contrast, imports of goods and services increased from an average of 14 percent of GDP during the 1970s to 21 percent on average during the 1990s.[22] Private investment (including stock changes) has closely followed the business cycle and moved together with imports of goods and services, especially since the mid-1980s (Figure 6).

B. Estimation of the Effect of Fiscal Stabilizers

In this subsection the proposed methodology is applied to the case of France.[23] The cyclical properties of fiscal accounts can be investigated at a more disaggregated level by looking at the correlations between the components of general government revenues and expenditures and cyclical fluctuations in output. Table 1 shows the correlations of temporary components of macroeconomic aggregates and fiscal accounts with the contemporaneous temporary component of output and its first lag and lead. Contemporaneous correlations are all in the expected directions. Temporary components of private consumption, investment, and imports show significant positive correlations with the temporary component of output.

Temporary government consumption is negatively correlated with the cycle, while temporary government investment is positively correlated, i.e., the former is anticyclical while the latter is procyclical. However, neither correlation is statistically or economically significant, which supports the common belief among policymakers that fiscal stabilizers work through

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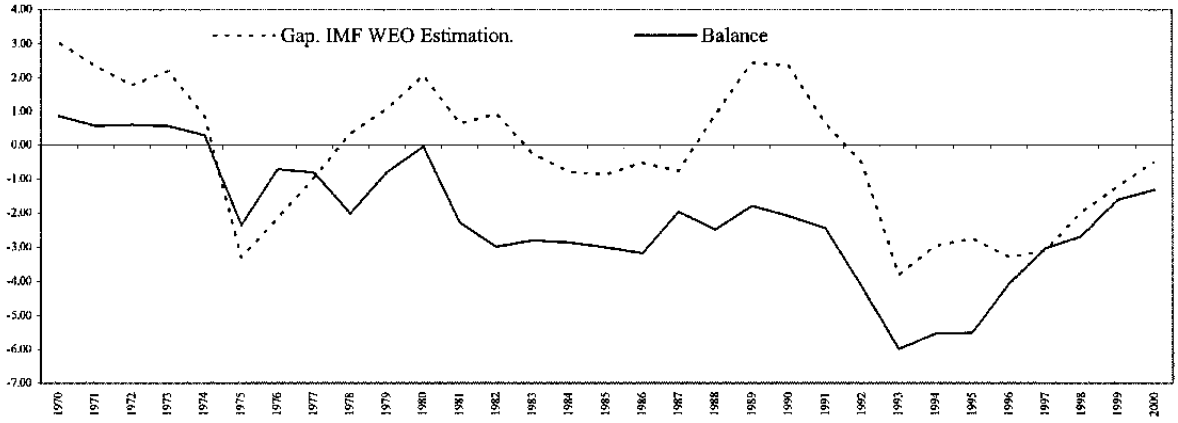
[22] During the period 1997-2000, imports of goods and services increased to an average higher than 24 percent of GDP.

[23] A report of the ARIMA estimates, interpreted as the permanent part of the series analyzed, is included in Tables A1, A2, and A3 of Appendix II.

Figure 4. France: General Government Balance and Output Gap
(In percent of GDP and potential GDP)



Fiigure 5. France: General Government Primary Structural Balance and Output Gap
(In percent of potential GDP)

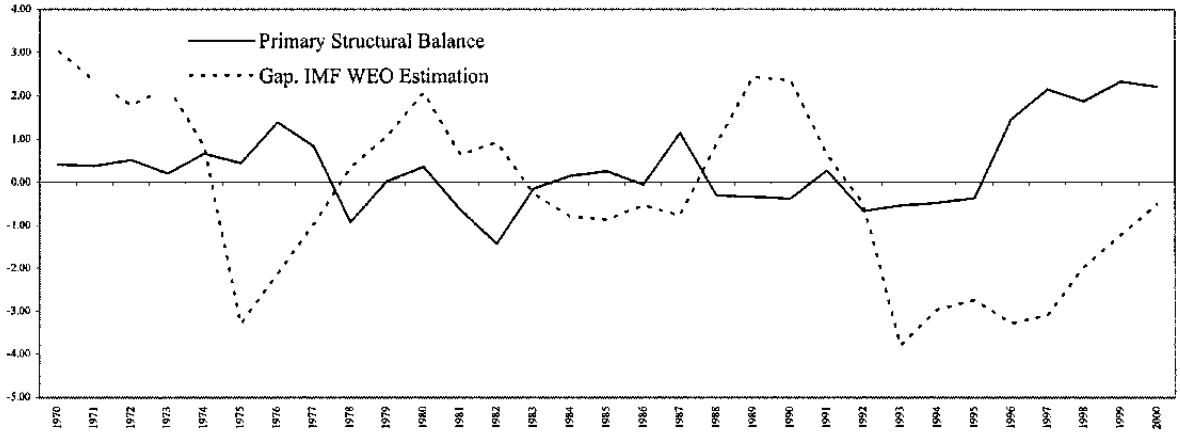
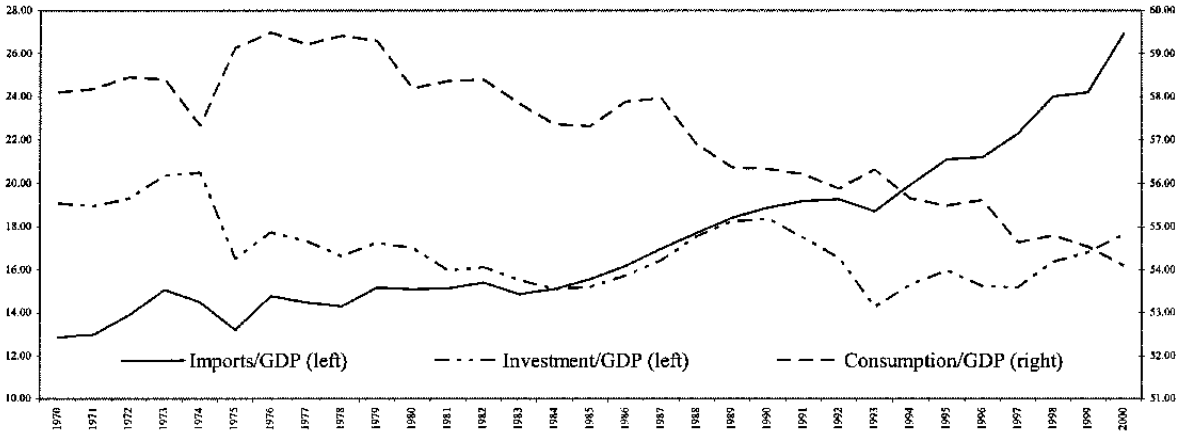


Figure 6. France: Components of National Accounts
(In percent of real GDP)



government revenues and net transfers.[24] Temporary general government revenues are all positively correlated with the temporary component of output, but more so in the case of taxes. It is worth noting that social security contributions move less procyclically than social security expenditures move countercyclically.

Table 1. France: Correlations of Transitory Components of Macroeconomic Aggregates and Fiscal Accounts with the Transitory Component of Output

National accounts			
	GDP(-1)	GDP	GDP(+1)
Private consumption	0.09	**0.68**	0.56
Private investment and stock changes	-0.09	**0.78**	0.11
Government expenditure	0.16	**0.12**	0.11
Government consumption	-0.11	**-0.14**	0.02
Government fixed investment	0.18	**0.11**	0.18
Imports	-0.08	**0.78**	0.17
General government revenues			
	GDP(-1)	GDP	GDP(+1)
General government revenues	0.03	**0.35**	-0.05
General government taxes	-0.24	**0.47**	0.10
Value added tax	-0.14	**0.40**	0.03
Income and property taxes	0.17	**0.45**	-0.16
Personal income taxes	0.25	**0.27**	-0.25
Corporate taxes	-0.19	**0.46**	0.11
Other income and property taxes	0.11	**0.33**	0.27
Other taxes	-0.04	**0.40**	0.34
Other revenues	0.26	**0.43**	-0.01
Social security contributions	-0.05	**0.12**	0.14
General government expenditures			
	GDP(-1)	GDP	GDP(+1)
General government expenditure	0.09	**-0.52**	-0.39
General government primary expenditure	0.04	**-0.27**	-0.27
General government consumption expenditure	0.03	**-0.24**	-0.08
General government compensation of employees	0.04	**-0.07**	-0.61
General government capital expenditure	0.08	**0.21**	-0.04
Social security expenditures	0.24	**-0.25**	0.06

[24] Government expenditures referred to in this paragraph are measured according to national accounts definitions, i.e., they do not include transfers. General government expenditures as measured in the fiscal accounts—which do include transfers—show the same correlation signs when split in their components, i.e., the temporary component of general government consumption expenditure is negatively correlated with the cycle as well as employee compensation—one of its component parts—while capital expenditure is procyclical.

Table 2 reports the results of the regressions among several transitory components. First it shows the regression coefficients that are obtained regressing the transitory components of private and public consumption, as well as private and public investment, against the transitory component of GDP, and its first lead and lag. It also shows the coefficients that result from regressing the temporary component of imports of goods and services against the transitory components of private consumption and investment, as well as their first lead and lag. Finally, it reports the regression coefficients from regressing the temporary component of private consumption against the transitory component of households' disposable income (HHDY), and its first lead and lag, as well as the transitory component of private investment against the transitory component of entrepreneurs' net earnings (EDY), and its first lead and lag. The contemporaneous coefficients are all of the expected sign, i.e., temporary private consumption has a positive and statistically significant regression coefficient against contemporaneous temporary GDP and HHDY, behavior that is resembled by temporary private investment but against EDY.[25] The regression coefficient of government consumption against contemporaneous temporary GDP is negative, and positive in the case of government investment. However, neither coefficient is statistically significant at the usual confidence levels, which is consistent with fiscal stabilizers working through taxes and transfers. Finally, regression coefficients of temporary imports of goods and services against contemporaneous temporary consumption and investment are positive and statistically significant, especially so in the case of consumption.

Tables 3 and 4 show regression coefficients for the transitory components of general government revenues and expenditures, respectively, against the contemporaneous transitory component of output and its first lead and lag. In the case of revenues, personal income taxes, corporate taxes, and the value-added tax all have positive and statistically significant regression coefficients against contemporaneous temporary GDP, which is also the case for all other taxes, except social security contributions, which are economically but not statistically significant. In the case of general government expenditures, neither temporary government consumption nor capital expenditures have statistically significant regression coefficients. Temporary social security expenditures are economically and statistically significant at slightly less than the 80 percent confidence level.

[25] Regression coefficients of temporary private consumption against contemporaneous temporary HHDY and its first lag are economically and statistically significant which supports our formulation of temporary consumption.

Table 2. France: Regression of Components of Domestic Absorption with GDP

	GDP(-1)	GDP	GDP(+1)
Private consumption	0.091	0.637	0.504
	(0.622)	(0.000)	(0.003)
Private investment and stock changes	-0.539	4.853	0.720
	(0.664)	(0.000)	(0.551)
Government expenditure	0.142	0.103	0.097
	(0.407)	(0.546)	(0.585)
Government consumption	-0.107	-0.143	0.023
	(0.570)	(0.434)	(0.900)
Government fixed investment	0.603	0.364	0.615
	(0.385)	(0.600)	(0.388)
	C(-1)	C	C(+1)
Imports	1.391	1.447	-0.363
	0.054	0.008	0.640
	I(-1)	I	I(+1)
	-0.248	0.249	-0.007
	0.023	0.003	0.954
	HHDY(-1)	HHDY	HHDY(+1)
Private consumption	0.316	0.175	0.047
	(0.007)	(0.144)	(0.709)
	EDY(-1)	EDY	EDY(+1)
Private investment and stock changes	0.189	1.272	-0.291
	(0.599)	(0.000)	(0.377)

Notes:
In parentheses, the probability that H_0:coef=0 cannot be rejected.

Having calculated all the relevant elasticities, the effect of fiscal stabilizers in dampening output fluctuations can be assessed. For that purpose, HHDY and EDY are recalculated using new series of taxes and transfers that exclude the estimated effect of fiscal stabilizers. After that, new series for private consumption and investment are obtained with the use of the recalculated series of HHDY and EDY. Finally, a new series of imports of goods and services is constructed using the new series of temporary private consumption and investment. If fiscal stabilizers work in the expected way, taxes and transfers should fluctuate less if fiscal stabilizers are not allowed to work, while HHDY, EDY, and therefore private consumption, investment, imports of goods and services and output should all fluctuate more.[26]

[26] Figures of the levels of these macroeconomic variables as well as of taxes and transfers, their fitted long-term values, and the series without the effect of automatic stabilizers are included in Appendix II.

Figures 7, 8, 9, and 10 show private consumption, private investment (including stock changes), imports of goods and services, and output with and without the estimated effect of automatic stabilizers. These figures show that fluctuations without automatic stabilizers are noticeably larger, and thus fiscal stabilizers indeed work in the expected theoretical way.

Table 3. France: Regression of Components of General Government Revenues with GDP

	GDP(-1)	GDP	GDP(+1)
General government revenues	0.044	0.579	-0.067
	(0.891)	(0.059)	(0.831)
General government taxes	-0.480	0.906	0.229
	(0.214)	(0.012)	(0.554)
Value added tax	-0.379	1.243	0.182
	(0.541)	(0.033)	(0.769)
Income and property taxes	0.854	2.154	-0.579
	(0.382)	(0.019)	(0.548)
Personal income taxes	0.905	0.960	-0.822
	(0.188)	(0.159)	(0.247)
Corporate taxes	-1.952	4.744	0.771
	(0.323)	(0.011)	(0.701)
Other income and property taxes	0.794	2.269	1.790
	(0.551)	(0.073)	(0.170)
Other taxes	-0.126	1.233	0.904
	(0.833)	(0.031)	(0.129)
Other revenues	1.321	2.316	-0.232
	(0.230)	(0.026)	(0.831)
Social security contributions	-0.073	0.230	0.144
	(0.818)	(0.475)	(0.653)

Notes:
In parentheses, the probability that H_0:coef=0 cannot be rejected.

Table 4. France: Regression of Components of General Government Expenditures with GDP

	GDP(-1)	GDP	GDP(+1)
General government expenditure	0.087	-0.573	-0.450
	(0.691)	(0.005)	(0.037)
General government primary expenditure	0.031	-0.273	-0.268
	(0.873)	(0.152)	(0.172)
General government consumption expenditure	0.095	-0.745	-0.251
	(0.883)	(0.230)	(0.692)
General government compensation of employees	0.032	-0.041	-0.531
	(0.848)	(0.809)	(0.000)
General government capital expenditure	0.468	1.371	-0.279
	(0.724)	(0.284)	(0.833)
Social security expenditures	0.397	-0.379	0.061
	(0.211)	(0.224)	(0.850)

Notes:
In parentheses, the probability that H_0:coef=0 cannot be rejected.

Figure 7. France: Changes in Private Consumption
(In percent per annum)

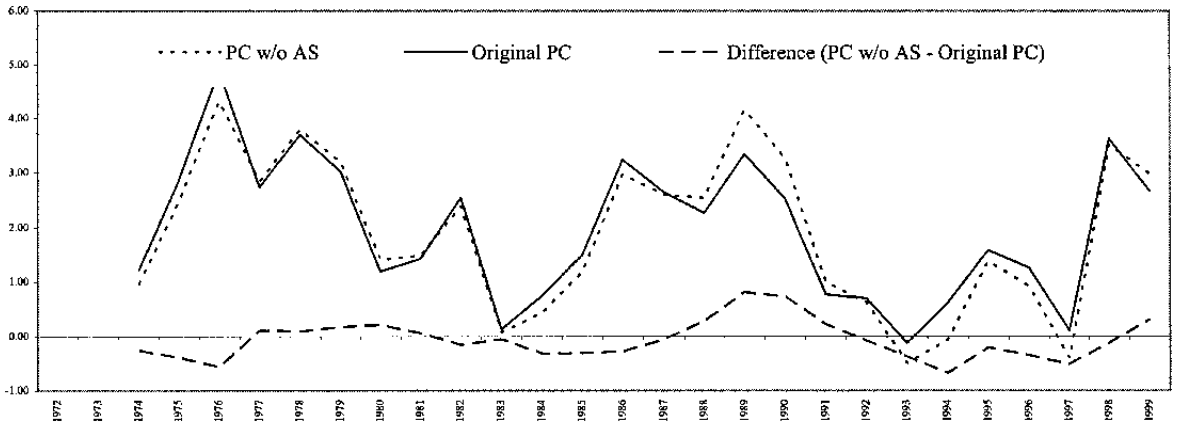


Figure 8. France: Changes in Private Investment and Stock Changes
(In percent per annum)

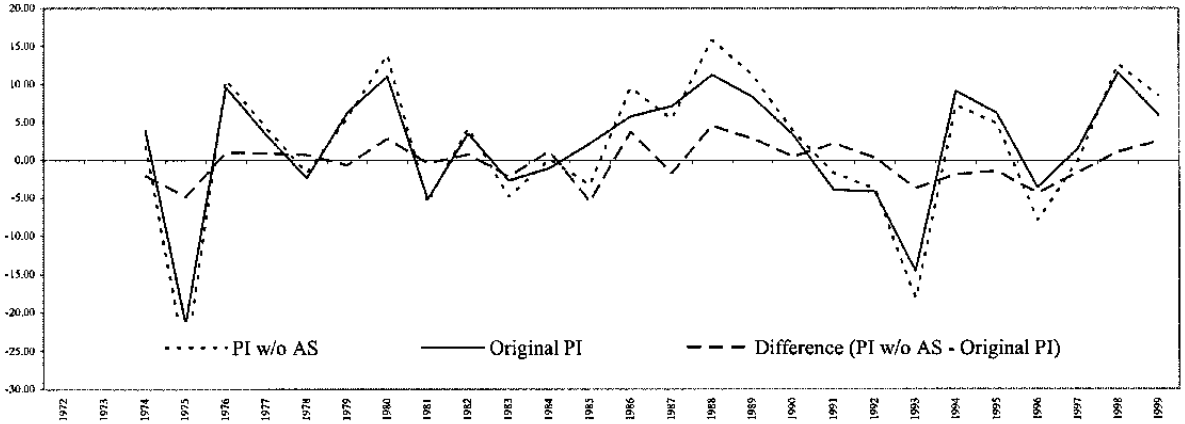


Figure 9. France: Changes in Imports of Goods and Services
(In percent per annum)

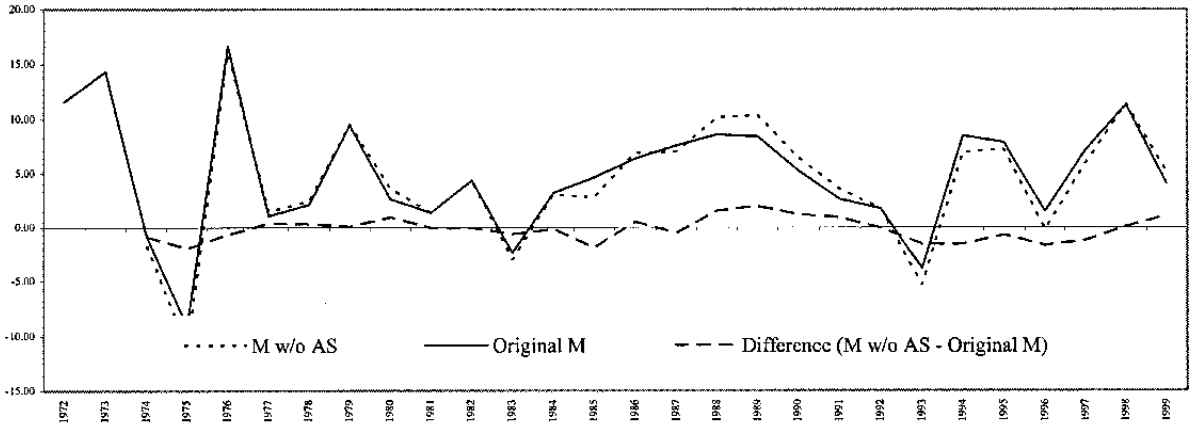


Figure 10. France: Changes in GDP
(In percent per annum)

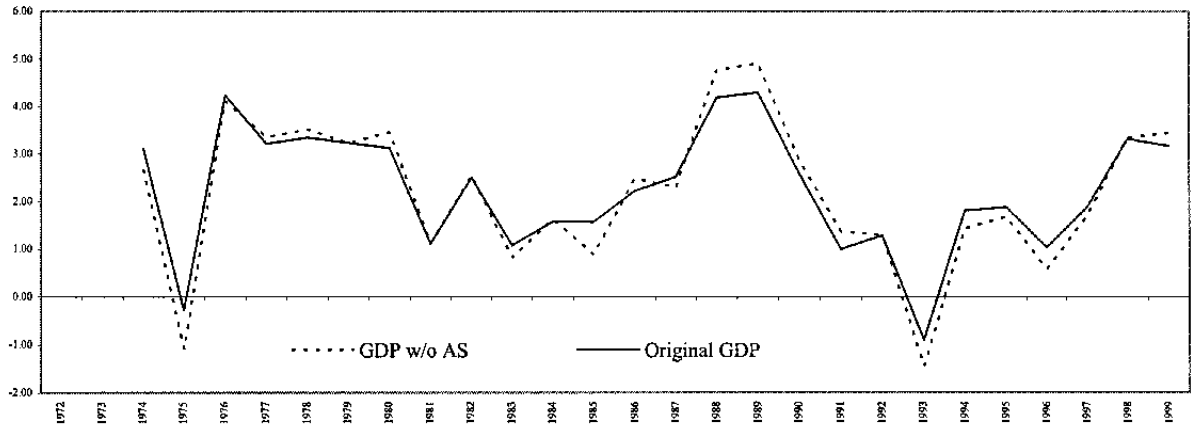


Table 5 reports the ratio of the root mean square errors of private consumption gaps, private investment gaps, imports of goods and services gaps, and output gaps with and without fiscal stabilizers.[27] The larger these ratios are, the larger the effect of automatic stabilizers in reducing fluctuations will be.[28] Table 5 indicates that the estimated reduction of output fluctuations due to the working of the automatic stabilizers during the period 1980–99 was in the range of 33–46 percent, depending on the measure of trend output used.

Consistent with the findings of Cotis and others (1997), the stabilizers were less effective in the 1990s than in the 1980s. In the case of private consumption, the effectiveness of fiscal stabilizers in reducing fluctuations increased in the 1990s with respect to the 1980s, but this was more than offset by the revenue effect with respect to private investment. The effectiveness of stabilizers in reducing imports of goods and services fluctuations is similar to that of private consumption. Overall, the trade balance leaks approximately 15 percentage points of the increased fluctuation due to the absence of automatic stabilizers. Since the

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[27] The root mean square error is defined as $RMS = \sqrt{\frac{1}{j} \cdot \sum_{t=0}^{j} gap_t^2}$, where $gap = \frac{(x - x^*)}{x^*}$ and j is the number of years for which the root mean square error is calculated; x denotes the original series while x^* denotes the potential series. Potential series were constructed using the ARIMA processes reported in Appendix II, Tables A1-A3. In the case of output we used two measures of potential output, one constructed by means of the ARIMA process reported in Table A1 and the one obtained in IMF (2000) by means of a state space model that simultaneously estimates the natural rate of unemployment.

[28] This way of measuring the effectiveness of fiscal stabilizers is also used by van den Noord (2000).

openness of the French economy increased significantly during the late 1990s, the effect of automatic stabilizers should, ceteris paribus, have decreased at the margin.

Table 5. France: Effect of Automatic Stabilizers*

	Avg. 80-89	Avg. 90-99	Avg 80-99
Private consumption	1.37	1.40	1.38
Private investment and stock changes	1.39	1.13	1.26
Imports	1.43	1.39	1.41
Output			
With respect to ARIMA trend	1.50	1.42	1.46
With repect to IMF potential output estimate	1.37	1.29	1.33

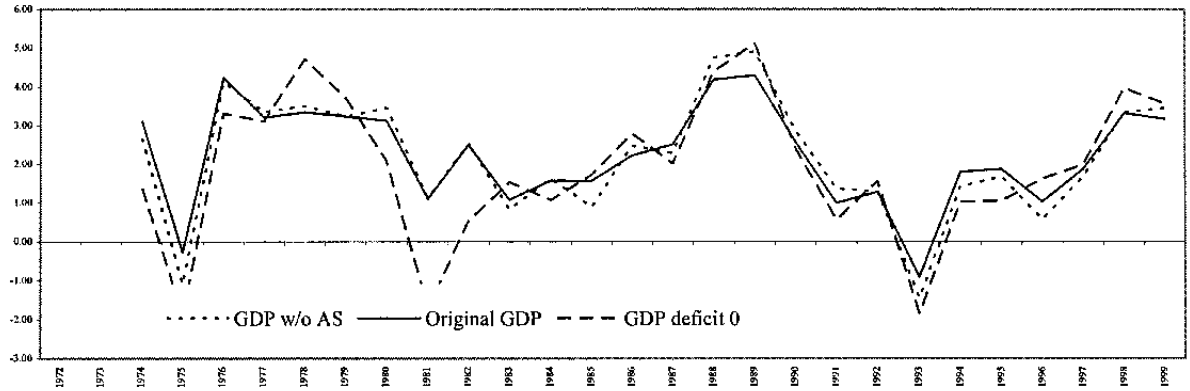
(*) Ratio of RMS of gaps without automatic stabilizers to gaps in the original series. Gaps were measured with respect to ARIMA processes unless otherwise indicated.

As a final exercise, the effect of a balanced budget fiscal rule on output fluctuations was estimated, under the assumption that such a rule had been implemented since 1970.[29] In the case of a zero deficit fiscal rule, fiscal stabilizers are not allowed to work and hence output fluctuations should be higher. Figure 11 shows the original output fluctuations, the estimated output fluctuations eliminating the effect of fiscal stabilizers, and output fluctuations that result from the implementation of a zero deficit fiscal rule since 1970. It is clear that fluctuations are larger in the case of a zero deficit rule than the fluctuations of the two other series. [30] Even though this result can be interpreted only as a rough approximation, it is clear that zero deficit fiscal rules—in the absence of perverse effects—will make fluctuations of GDP wider than if fiscal stabilizers were allowed to work.

[29] The Spanish Parliament has recently adopted a balanced budget rule.

[30] There are several issues related to the counter factual estimation of the effects of such a rule. First, a new series for government interest payments should be calculated beginning in the year after the "implementation" of the rule. The new series should reflect the fact that public debt would not change and thus annual changes in interest payments would be caused only by changes in interest rates. Second, new series of taxes should be calculated in order for the fiscal accounts to be balanced. The method used here was to maintain unaltered the proportions of each component of revenues in total revenues while changing total revenues to make them equal to the new series of general government expenditures. This procedure has some drawbacks. First, output fluctuations will be different, depending on the year chosen as the initial period of implementation of the rule. Second, potential output will be different than the original series and therefore comparisons of relative fluctuations using the RMS of gaps will be unavailable.

Figure 11. France: Changes in GDP
(In percent per annum)



VI. Summary and Conclusions

In this paper, a simple methodology to assess the effectiveness of automatic stabilizers was developed and applied to the case of France.

Among other factors, the effectiveness of fiscal stabilizers is determined by the size of the government, the responsiveness of taxes and transfers to the economic cycle, the openness of the economy, and the proportion of households and firms that are credit constrained. Fiscal stabilizers will be more effective the larger the ratio of general government expenditures to GDP is, the more responsive taxes and transfers to the cycle are, the less open the economy is, and the larger the proportion of credit-constrained households and firms is. In the case of France, general government expenditures increased significantly during the late 1970s and 1980s, to levels around 55 percent of GDP. At the same time, the openness of the French economy has increased, especially so in the late 1990s. Simple regression analysis indicates significant responsiveness of most taxes and transfers to the cycle, and regression coefficients of temporary private consumption and investment against households' disposable income and net income of entrepreneurs, respectively, are economically and statistically significant which might suggest the presence of some form of credit constraint.

In the specific case of France, it was found that fiscal stabilizers work through taxes and transfers. The reduction in output fluctuations due to fiscal stabilization was estimated at about 35-45 percent. This is somewhat higher than estimates found in most of the literature. Automatic stabilizers seem to have worked more effectively in the 1980s than in the 1990s. This coincides with an increase in the openness of the French economy, especially during the late 1990s. Finally, it was found that balanced budget rules increase output fluctuations and therefore might reduce potential output.

Despite the reasonable results obtained, the methodology presented here has its drawbacks. First, the method used to split the data series into their permanent and temporary components is arbitrary, and clearly other methods could yield different results. Second, elasticities of taxes and transfers are calculated with respect to output and not with respect to the appropriate tax/transfer bases. Even though this simplifies matters, an analysis that

contemplates different tax/transfer bases when calculating elasticities should give more accurate results. Third, the Keynesian-type structure of the model is too simple to account for all the possible ways in which fiscal stabilizers may work. Fourth, the problem of simultaneity embedded in the model may bias the results, as noted in van den Noord (2000). For these reasons, and others mentioned in the paper, it is important to stress that the results should be interpreted, at most, as a useful approximation. The application of alternative methodologies that account for all or part of these flaws should refine the results reported in this paper and would help to test their robustness.

Additionally, it would be interesting to observe the results of the application of the present, or improved, methodologies to the case of countries where "perverse effects" are assumed , ex ante, to be important. This is emphasized in IMF (2001) when, referring to some developing countries, it states, "Given the need to maintain external confidence, most countries have little scope to allow automatic stabilizers to operate, and some (will) need to tighten the underlying stance of fiscal policy to avoid adverse debt dynamics." It is clear that under these circumstances, the functioning of automatic "stabilizers" are bound to increase rather than reduce output fluctuations. Therefore, an adequate theory of automatic stabilizers should contemplate the possibility that under certain circumstances, a "zero deficit" rule policy could dominate the policy of letting the automatic stabilizers work.

Using expression (4), and recalling that, by assumption, we have set the elasticities of changes in temporary government consumption and temporary exports with respect to changes in temporary output to zero, the following expression is obtained,

$$1 = \beta_1^{'} \cdot a_c + \beta_3^{'} \cdot a_i + \beta^{'} \cdot a_m, \tag{A1}$$

where,

$$\beta^{'} \equiv \left(\beta_4 \cdot \beta_1^{'} + \beta_5 \cdot \beta_3^{'}\right) \tag{A2}$$

Using (A1) and (A2) the following is obtained,

$$1 - \beta_1^{'} \cdot a_c - \beta_3^{'} \cdot a_i = \beta_4 \cdot \beta_1^{'} \cdot a_m + \beta_5 \cdot \beta_3^{'} \cdot a_m \tag{A3}$$

Using (A3) in the denominator of the coefficient of (13) and doing some algebra,

$$denom = 2 \cdot a_m \cdot \beta^{'} \tag{A4}$$

which will be greater than zero if $\beta_1^{'} > 0$, $\beta_3^{'} > 0$, $\beta_4 > 0$ and $\beta_5 > 0$, which would be the case if automatic stabilizers work in the theoretically expected way.

This Appendix includes Tables A1 through A3 that report the ARIMA processes for the macroeconomic and fiscal series analyzed in the paper. In addition it includes Figures A1 through A8 that show macroeconomic and fiscal series (in levels), their permanent component as estimated by ARIMA processes and their estimated levels when fiscal stabilizers are not allowed to work. Their behavior confirms prior conclusions.

Table A1. France: ARIMA Processes for National Accounts Components

	C	δ_1	δ_2	δ_3	AR(1)	AR(2)	MA(1)	MA(2)	SC	B-G
GDP	0.020				0.737		-0.958		-5.666	0.228
	(0.000)				(0.000)		(0.000)			
Households' disposable income (HHDY)	0.022				0.494				-4.998	0.210
	(0.004)				(0.006)					
Entrepreneurs' disposable income (EDY)		0.115					-0.487	-0.489	-3.201	0.514
		(0.000)					(0.012)	(0.010)		
Private consumption	0.016				0.786		-0.956		-5.804	0.432
	(0.000)				(0.000)		(0.000)			
Private investment and stock changes	0.038	-0.060							-2.164	0.890
	(0.028)	(0.067)								
Government expenditure	0.021	0.010				-0.821		0.705	-5.785	0.468
	(0.000)	(0.023)				(0.019)		(0.082)		
Government consumption	0.022	0.015			0.627		-0.958		-5.652	0.216
	(0.000)	(0.002)			(0.007)		(0.000)			
Government fixed investment	0.018					0.608		-0.938	-3.112	0.430
	(0.004)					(0.006)		(0.000)		
Imports of goods and services	0.035	0.009					-0.340	-0.656	-3.185	0.605
	(0.000)	(0.070)					(0.022)	(0.000)		

Notes:
All variables are first differences of the logs of real 1995 values.
S C stands for Schwartz criterion.
B G stands for the 2-lag Breusch-Godfrey test for serial correlation.
In parentheses, the probability that H_0:coef=0 cannot be rejected.

Table A2. France: ARIMA Processes for General Government Revenues Components

	C	δ_1	δ_2	δ_3	AR(1)	AR(2)	MA(1)	MA(2)	SC	B-G
General government revenues	0.023	0.028					-0.369		-4.664	0.051
	(0.000)	(0.000)					(0.058)			
General government taxes	0.020	0.019					-0.345		-4.317	0.467
	(0.000)	(0.007)					(0.072)			
Value added tax	0.015				0.596		-0.965		-3.383	0.041
	(0.000)				(0.001)		(0.000)			
Income and property taxes	0.031								-2.655	0.485
	(0.010)									
Personal income taxes	0.011					0.529		-0.968	-3.115	1.000
	(0.021)					(0.000)		(0.000)		
Corporate taxes	0.101	-0.102			-0.795		0.957		-0.906	0.656
	(0.032)	(0.075)			(0.000)		(0.000)			
Other income and property taxes	0.020	0.554	0.882	-0.287	-0.701		-0.963		-1.501	0.254
	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)			
Other taxes	0.047	-0.074					-0.664	0.334	-3.312	0.476
	(0.000)	(0.000)					(0.001)	(0.083)		
Other revenues	0.012	0.250			-0.973		1.532	0.995	-1.985	0.443
	(0.621)	(0.000)			(0.000)		(0.000)	(0.000)		
Social security contributions	0.015				0.913		-0.946		-4.647	0.716
	(0.244)				(0.000)		(0.000)			

Notes:
All variables are first differences of the logs of real 1995 values.
S C stands for Schwartz criterion.
B G stands for the 2-lag Breusch-Godfrey test for serial correlation.
In parentheses, the probability that H_0:coef=0 cannot be rejected.

Table A3. France: ARIMA Processes for General Government Expenditures Components

	C	δ_1	δ_2	δ_3	AR(1)	AR(2)	MA(1)	MA(2)	SC	B-G
General government expenditure	0.023	0.039				0.228		-0.994	-5.311	0.666
	(0.000)	(0.000)				(0.188)		(0.000)		
General government primary expenditure	0.020	0.033				0.574		-0.935	-5.541	0.340
	(0.000)	(0.000)				(0.008)		(0.000)		
General government consumption expenditure	0.020	0.024						-0.436	-3.309	0.800
	(0.005)	(0.042)						(0.075)		
General government compensation of employees	0.019	0.042					0.643		-5.986	0.195
	(0.000)	(0.000)					(0.000)			
General government capital expenditure	0.014				0.475		-0.997		-1.873	0.402
	(0.000)				(0.032)		(0.000)			
Social security expenditures	0.024				0.875		-0.997		-4.692	0.784
	(0.000)				(0.000)		(0.000)			

Notes:
All variables are first differences of the logs of real 1995 values.
S C stands for Schwartz criterion.
B G stands for the 2-lag Breusch-Godfrey test for serial correlation.
In Parentheses, the probability that Ho:coef=0 cannot be rejected.

Figure A1. France: Gross Domestic Product
(In billions of 1995 Francs)

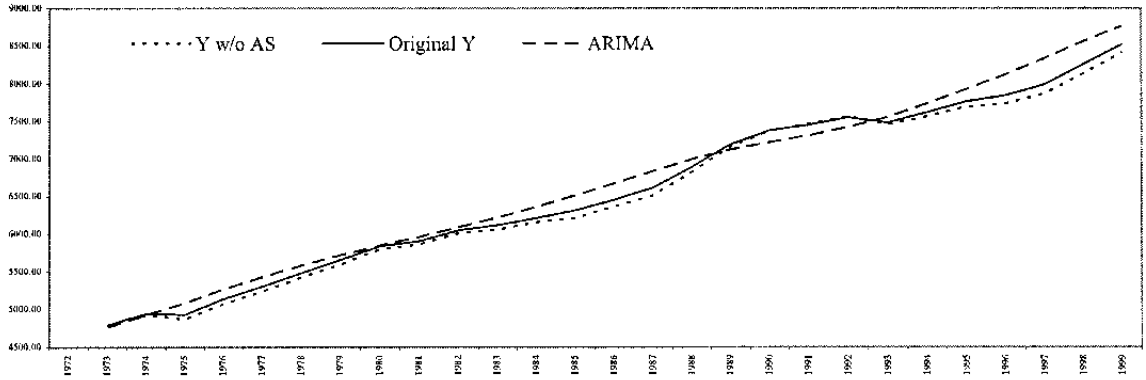


Figure A2. France: Private Consumption
(In billions of 1995 Francs)

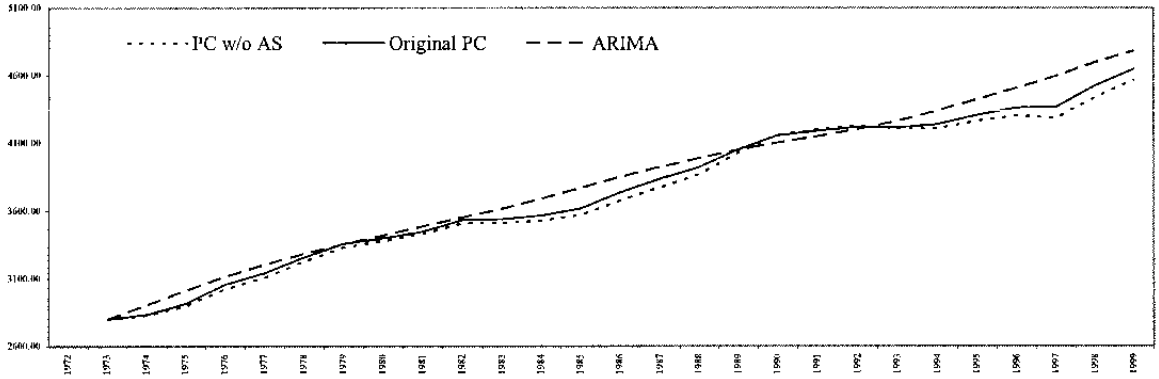


Figure A3. France: Private Investment and Stock Changes
(In billions of 1995 Francs)

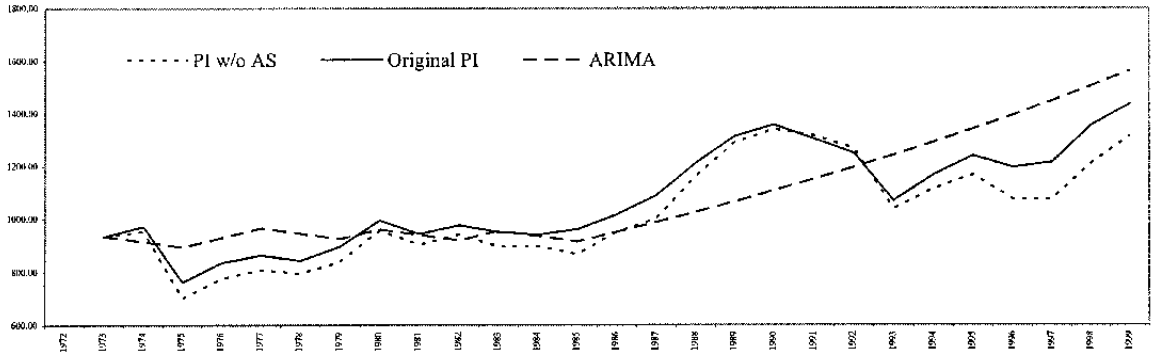


Figure A4. France: Imports of Goods and Services
(In billions of 1995 Francs)

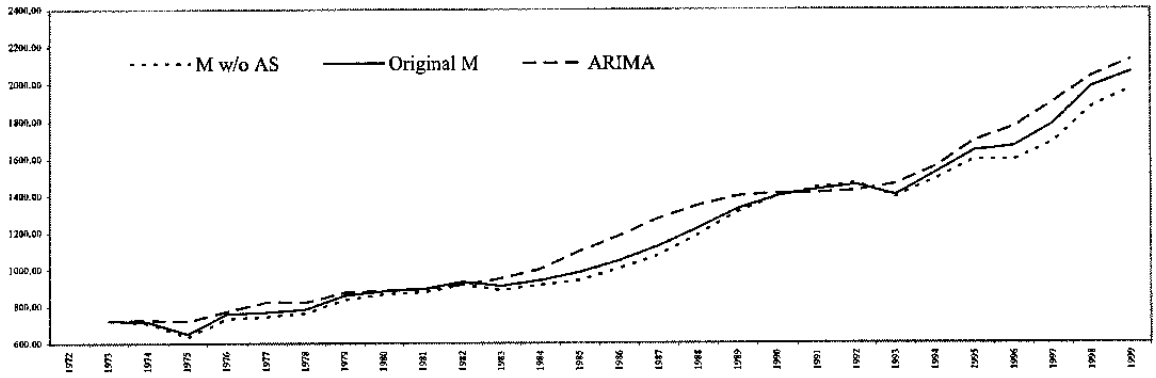


Figure A5. France: Personal Income Tax
(In billions of 1995 Francs)

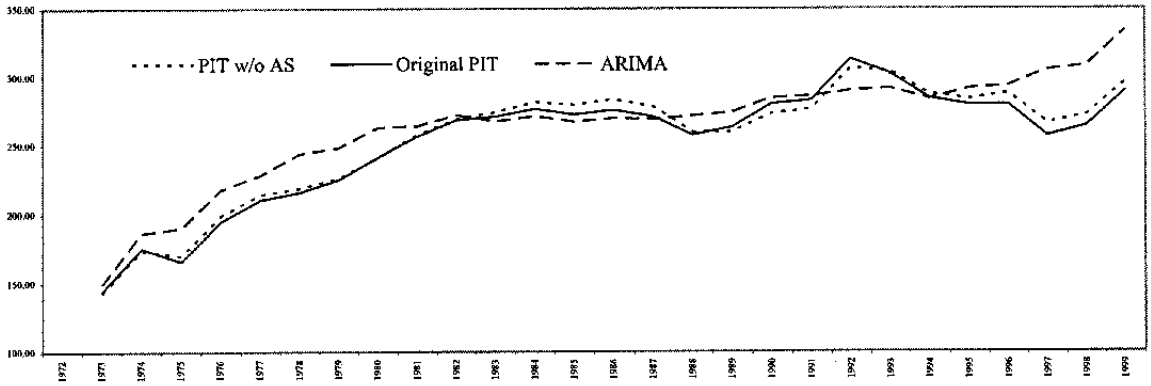


Figure A6. France: Corporate Tax
(In billions of 1995 Francs)

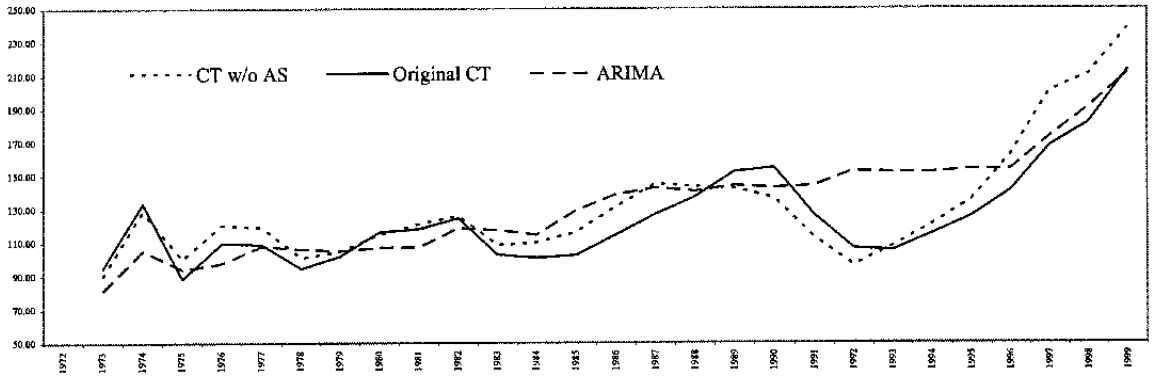


Figure A7. France: Social Security Contributions
(in billions of 1995 Francs)

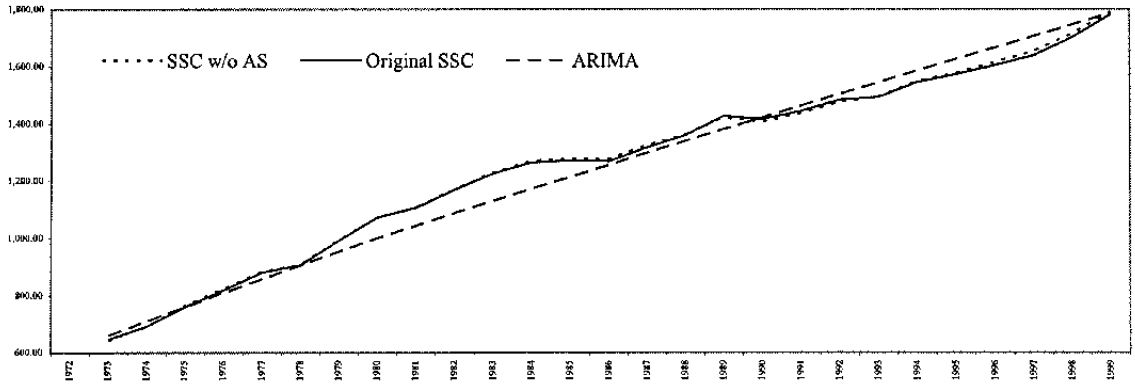
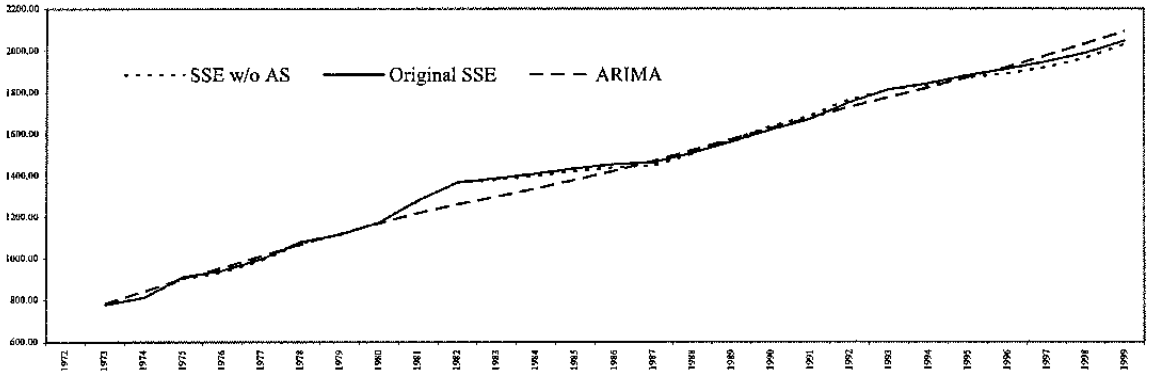


Figure A8. France: Social Security Expenditures
(In billions of 1995 Francs)



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