

# Lessons of sixty years of fiscal policy<sup>\*†</sup>

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## Abstract

Using legal document and budget laws, we built instruments variables of fiscal shocks in France. From the motivations of the measures, we were able to identify *exogenous* fiscal shocks, that were not decided to stabilize or stimulate the economy in the short-run. These instruments allow us estimating without bias the short-term Keynesian fiscal multipliers. As such fiscal shocks are very frequent in France, we were able to distinguish the fiscal multipliers according to the motivation of the measures. Increase in transfers happens to boost consumption and growth in the short-run while rising aggregate prices. Spending enhancing competitiveness also favors growth in the short-run. More surprisingly, tax cuts targeted on household had no significant effect on growth. This feature could suggest that French may behave as “Ricardian” agents. Overall, the Keynesian framework appears to be a relevant description of the French economy.

**Key words:** fiscal policy, Keynesian and neo-keynesian models

**JEL Classification:** E12, E62

## 1 Introduction

### 1.1 Measuring the effects of fiscal policy

The recurrent debate over the effects of fiscal policy has recently become more intense in the United States, strengthened by the financial crisis and the vote of

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<sup>†</sup>This paper only reflect the views of the authors and not the opinion of the World Bank, Sciences-Po Paris or the Direction Générale du Trésor.

large stimulus packages. The controversy has also been fueled by the emergence of the neo-Keynesian macroeconomic models, which put emphasis on forward expectations. According to “traditional” Keynesian models, expansionary fiscal stimuli are indeed supposed to increase consumption, GDP and employment in the short-run. Neo-Keynesian models however predict that expansionary measures cause consumption to fall because agents tend to save more as they fear future tax increase.

This theoretical argument has been lasting for decades partly because econometric problems have prevented empirical evidence to be fully conclusive. Measuring empirically the effects of fiscal policy is problematic, as neither public expenditure<sup>1</sup> nor tax revenue<sup>2</sup> are independent of the business cycle. As a consequence, simple regressions of GDP over public spending or revenue do not allow estimating without bias the fiscal multipliers. Two methods have been proposed in the literature to tackle that issue.

First some authors suggest to calculate business cycle “adjusted” series of expenditure and revenue, assuming exogenous elasticities of spending and revenue to GDP. Such series introduced in VAR models usually lead to estimate positive responses of consumption, employment and GDP to expansionary fiscal shocks<sup>3</sup>. Nevertheless these measures of the multipliers remain fragile, as they are sensitive to the values chosen for the elasticities of the fiscal variables to GDP.

The second method introduced by Ramey and Shapiro (1998)[13] considers exogenous events<sup>4</sup> as instrumental variables of fiscal shocks. Studies using Ramey and Shapiro’s data tend to show that increases of military spending in the US were followed by a reduction of private consumption in the short run. In a recent article, Ramey (2008)[14] argues that such increases of military spending are largely anticipated. As the VAR models are unable to take into account such expectations, Ramey shows that the first method based on VAR models could lead to biased estimates of the fiscal multipliers<sup>5</sup>. This finding strengthens the relevance of the estimation methods based on exogenous events or *event studies*.

Romer and Romer (2007)[15] have moved this second method further ahead by digging the intentions of the legislators who voted fiscal measures out of the U.S.

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<sup>1</sup>Social protection expenditure, especially unemployment benefits as well as stimulus packages tend to grow during downturns, see Darby and Melitz (2007)[5].

<sup>2</sup>Girouard and Andre (2005)[9] estimate the elasticity of tax revenue to GDP to be around unity in France.

<sup>3</sup>Rotemberg and Woodford (1993)[16], Blanchard and Perotti (2002)[2], Fatas and Mihov (2001)[7], Fischer and al. (2004)[3], Montford and Uhlig (2002)[11], Gali, Lopez and Valles (2007)[8], Perotti (2007)[12].

<sup>4</sup>such as declarations of wars after 1945 in Ramey and Shapiro’s article.

<sup>5</sup>Ramey shows especially that VAR models can estimate *positive* responses of the consumption from data simulated by a neo-classic model where military spending increases are fully anticipated.

budget documents. Doing so they could determine *ex ante* whether a measure had been voted to respond to the evolution of the economy<sup>6</sup> or not<sup>7</sup>. According to their estimations, *exogenous* tax cuts have a positive and persistent impact on GDP in the U.S.

Although Romer and Romer's method only permits to measure the effects of new discretionary exogenous measures, it provides reliable and precise estimates of the fiscal multipliers. This approach also address Raimey's critics because the "fiscal shocks" identified from the budget documents are rather announcements than actual spending and are likely to be anticipated.

## 1.2 The French particularities

As Romer & Romer's methodology requires both very detailed sources of legislative information and macroeconomic variables over a long period of time, it is very costly to implement. The French case seems interesting for several reasons. First such a study is possible because the needed data, both economic and legal are available on a yearly basis since the early 1950s. More crucially, the degree of centralization in France and the predominance of the government and the public sector over the economy in the French tradition explain that legislators have passed manifold fiscal measures in sixty years. With plentiful data, France could be a good candidate to study the effects of different kind of fiscal shocks (such as tax cuts vs. spending for instance). The French economy is also much more open than the American one and monetary policy has been less accommodating, especially since the late 1970s because of the European integration. Consequently fiscal multipliers may differ from Romer & Romer's estimates on U.S. data. A study on France could be an opportunity to challenge the Keynesian predictions about the sensitivity of fiscal multipliers to openness and monetary policy.

The Romer and Romer's study on U.S. fiscal policy cannot be directly replicated using the French data for several reasons. First neither the dependent variable, GDP growth nor the explaining ones, the budgetary shocks, are stationary series. It is therefore necessary to introduce additional variables in the regressions to control for exogenous trends. Table 1 indicates indeed that during the fifties and sixties GDP annual growth was around 5% while it was limited to more than 1,1% per annum during the 2000s.

Symmetrically, the size of the government (that is the share of public expenditure in the GDP) has increased from 35% in 1950 (see table 1) to 56% in 2009, especially during economic downturns while it did not decrease much during recoveries<sup>8</sup>. The size of government fluctuates over time in the U.S. because the

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<sup>6</sup>in which case it is assumed to be *endogenous*.

<sup>7</sup>in which case it is assumed to be *exogenous*.

<sup>8</sup>The size of the government indeed rises about 4.7 pp in 1975, 2.7 pp in 1981, 3.0 pp in 1993

congress passes temporary measures to stimulate the activity during crisis. In the contrary French legislators rather create new taxes and allowances which are unlikely to be reversed during recoveries.

	1950s	1960s	1970s	1980s	1990s	2000s
Annual GDP growth	4.7	5.7	3.7	2.4	2.0	1.2
Size of government <sup>a</sup>	-	38.9	42.4	49.7	52.9	53.1
Share of tax measures <sup>b</sup>	3.1	0.0	5.6	17.3	45.2	64.1
Progressive income tax <sup>c</sup>	2.9	3.7	4.3	5.6	5.1	4.0
Flat income tax <sup>c</sup>	0.0	0.0	0.0	0.0	1.7	4.8

<sup>a</sup> as the share of public expenditure into GDP. <sup>b</sup> Share of the amounts of the new discretionary measures modifying revenue, as opposed to spending.

<sup>c</sup> as a share of GDP.

Table 1: Fiscal trends by decades

Fiscal policy has also evolved toward greater complexity in France since 1950. The role of the government has changed from the provision of basic services such as security and education in the 1950s to the mitigation of the business cycle from the 1970s, the reduction of inequalities in the 1980s and the support of long-term growth in the 1990s and 2000s. As a consequence the instruments used have also mutated: numerous tax cuts and targeted exemptions have replaced the steady increase of the ministries budget of the old times<sup>9</sup> (see table 1).

The magnitude of the political cycle provides a partial explanation of the number and the diversity of the discretionary measures in France. While politicians seem to disregard the business cycle, incumbent governments have a tendency to overspend in electoral years. Indeed while new discretionary measures represent 1.46 point of GDP during a regular year, their amount reaches 1.72 points of GDP during an election year<sup>10</sup>. While politicians may (ab)use of fiscal policy for cultural reasons, these customs may indicate that fiscal multipliers are substantial in France, at least in the short-run.

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and 3.2 pp in 2009

<sup>9</sup>This preference for tax exemptions rather than spending has been favored by the introduction of the “zero volume” norm since 2003 which prevents the legislators to increase the overall expenditure from one year to another beyond inflation. Moreover tax credits aiming to promote beneficial behaviors (such as investment in R & D) are more and more popular.

<sup>10</sup>In average between 1952 and 2008.

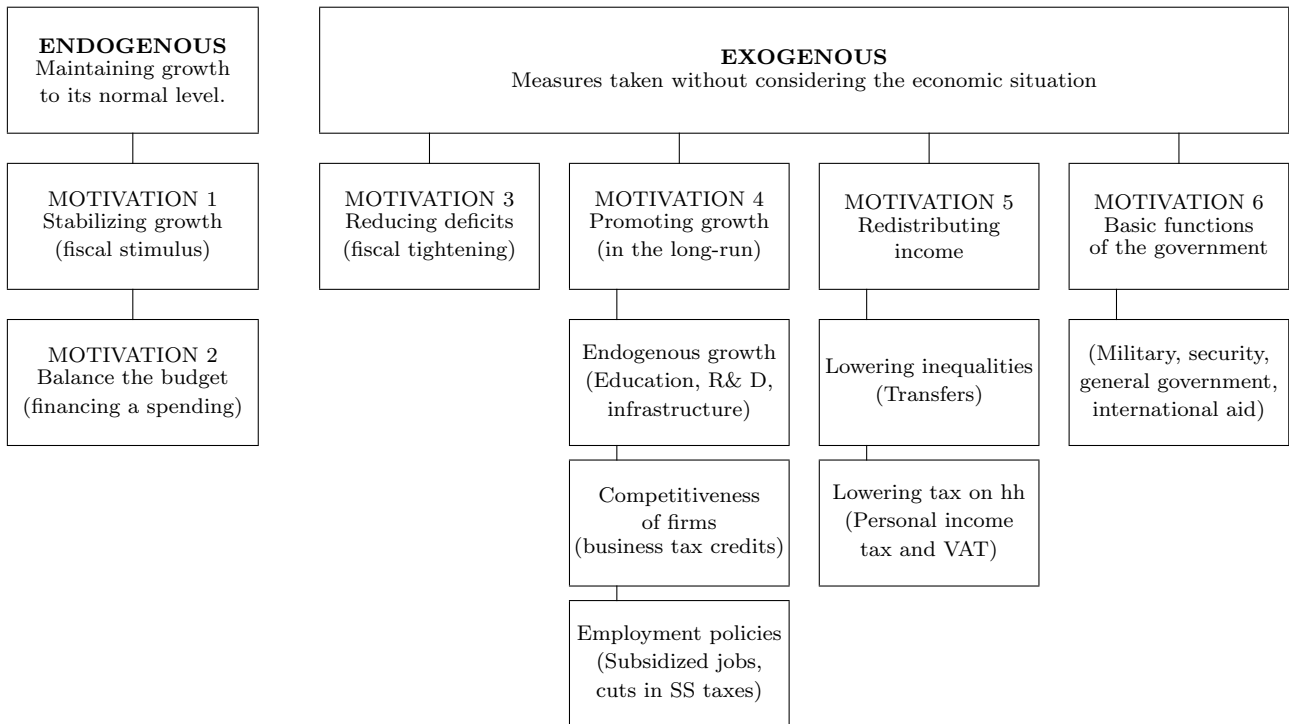


Figure 1: Categories used to list the motivations of fiscal measures.

## 2 Fiscal policy in France

### 2.1 The data

To analyze the motives of the legislators, we mostly used the budget bills, which introduction sums up the sought goals of the main measures. Other documents have been used as complements<sup>11</sup>. A measure is considered to be a “fiscal shock” if its cost (which could be negative in the case of a revenue) estimated by the parliament exceeds 0,025 point of GDP<sup>12</sup>. Each shock is categorized according to its main objective. Extending the Romer & Romer’s methodology, the measure are supposed to be *endogenous* (two categories) or *exogenous* (four categories). Figure 1 explains how shocks are listed.

<sup>11</sup>Appendices of the budget bills edited by the ministry of finance (Notes bleues de Bercy), preliminary speeches of prime ministers to present the bill to the parliament, budget department presentations and social security bills, as most of the new flat income taxes finance the social security budget.

<sup>12</sup>Around 0,5 bn euros in 2008.

## 2.2 Endogenous measures

As Romer & Romer, we assume a measure to be *endogenous* if the legislators voted it to stabilize growth or to maintain it to its “natural” level. Therefore, all countercyclical measures are endogenous (objective 1). Such measures are rare<sup>13</sup> in France, especially when compared to the U.S<sup>14</sup>. Measures aiming to “balance” the budget by providing resources to finance a spending or a tax reduction are also considered to be endogenous (objective 2).

## 2.3 Exogenous measures

A measure which is not *endogenous* is considered to be *exogenous*. Since the 1980s, most of the measures happen to be exogenous. We distinguish four categories: budget balance, growth, redistribution and basic functions of the government. First some measures aim to reduce the public deficits and to better the prospects of the public finance in the long-run (objective three). Such measures are rare in France with only four episodes<sup>15</sup>.

There have been so many measures intending to boost the long-term growth (objective four), that we split them into three subcategories. (i) “Endogenous growth”<sup>16</sup> measures consist of education, R&D and infrastructure spending. Infrastructure spending has been large during the 1950s, at the time of reconstruction. Education expenditure has spiked during the 1960s in response to the baby boom. After the 1975 crisis, endogenous growth spending have decelerated although tax credits to promote R&D expenditure have swelled until the 1980s<sup>17</sup>. (ii) Measures promoting firms competitiveness were based on subsidies before 1985 but rely nowadays on business tax credits. (iii) There are two kinds of measures aiming to promote employment. Subsidized jobs, especially in the public sector and social contribution tax credits<sup>18</sup> have been used extensively by both left- and right-wing governments, especially since the 1990s.

Redistributions measures (objective 5) have evolved since 1950. (i) To reduce inequalities governments have created numerous transfers toward the poor, the elderly, the families and the unemployed mostly between 1950 and 1982. (ii) Since then, the anthem has rather become the reduction of the tax burden weighing on

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<sup>13</sup>There has been only three noticeable stimulus packages in France, in 1975-1976, in 1981-1982 and in 1993 if one excepts the very recent 2008-2009 stimulus plan.

<sup>14</sup>although countercyclical measures have been also rare since the 1980s in the U.S.

<sup>15</sup>The major reforms have been conducted under Juppé (1995-1997) and Coty (1958).

<sup>16</sup>In reference to the endogenous growth theory, where the growth rate can be influenced by the economic policy in the medium/long run.

<sup>17</sup>The French R&D tax credit is now one of the most generous of the OECD.

<sup>18</sup>“Aubry” tax credits (left) in 2000 extended by the “Fillon” (right) tax credits in 2003.

households, whatever the color of the ruling party<sup>19</sup>. But the accumulation of tax cuts and exemptions has eroded the tax base of the personal income tax<sup>20</sup> and reduced its progressivity. Several flat<sup>21</sup> income taxes, with large tax base have been created since 1991, partly to compensate for these losses of revenue.

Eventually, general government expenditure, security and military spending as well as international aid have been clustered into the objective 6, the basic functions of the government. Such expenditure are not supposed to increase growth. These measures have been less and less frequent since the 1950s.

## 2.4 Partisan orientations of the fiscal policy

The fiscal policy conducted by the left- and right-wing governments can be compared by averaging the fiscal measures by motivations (table 2). First the measures promoting endogenous growth (education, R&D and infrastructure) are favored by left-wing governments which allocated 0.33% of GDP per year versus 0.21% for right-wing governments. In the contrary, right-wing governments seem to spend more to boost employment (0.13% of GDP per year versus 0.08% for the socialist party). Nevertheless, most of the recent measures toward employment rely on social security contributions cuts, which may benefit to the entrepreneurs as well.

	LEFT	RIGHT
Exogenous measures	1.26	1.23
Mot. 3 - Reducing deficits	0.00	0.04
Mot. 4 - Promoting growth	0.60	0.69
Endogenous growth	0.33	0.21
Competitiveness	0.15	0.15
Employment	0.08	0.13
Mot. 5 - Redistribution	0.47	0.24
Reducing inequalities	0.11	0.11
Lowering household taxes	0.40	0.17
Mot. 6 - Basic gov. functions	0.19	0.33

Average annual amount voted in % of GDP.

Table 2: Comparisons of the motivations of exogenous fiscal measures according to the partisan orientation of governments

<sup>19</sup>although left coalitions tend to lower VAT tax rather than property or income tax

<sup>20</sup>The revenue of the personal income tax have been halved since 1985. In 2009 it was similar to what it was in the early 1950s.

<sup>21</sup>Such taxes have a flat rate and they affect almost every household while the personal income tax is only due by half of them.

Policies aiming at redistributing income are mostly undertaken by left-wing governments. While a typical left-wing government spent 0,47% of GDP each year for redistribution, right-wing governments only allocated 0,24% of GDP for the same matter. Although left-wing government had a tendency to lower VAT tax rates, they also were the more prone to cut income tax, which only weights on the wealthiest households in France.

Symmetrically, right-wing government favored budget increases for security and defense, about 0,33% per year versus 0,19% per year under left-wing majorities.

Overall, left-wing governments tend to spend slightly more (1,26% per year) than right-wing coalitions (1,23% per year).

Beyond partisan views, each era has known specific priorities, such as defense in the 1950s (because of decolonization wars), education in the 1960s (induced by the post-war baby boom) and economic intervention after the oil crises of the late 1970s. Between 1984 and 1992, both parties tried to boost firms competitiveness to prepare the country to the European integration<sup>22</sup>. Since then, the fiscal policy had been focused on the support to employment and the switch from progressive income taxes to “flat” taxation<sup>23</sup>.

### 3 The estimation process

Like Romer and Romer, we use the fiscal shocks identified through the analysis of the budget laws to estimate the reduced form of the growth-fiscal policy relationship. If the built shocks happen to be actually exogenous, a simple regression allows identifying without bias the fiscal multipliers. However neither the growth rate nor the size of government is stationary series. Therefore naive estimates using OLS regressions could give misleading results.

#### 3.1 Controlling for foreign growth

To tackle this issue, one recalls that French is a largely open economy. Economic growth in France is consequently highly correlated with the growth of its trade partners. Using an index of real economic growth abroad enables to control for trends in GDP which are not related to fiscal policy. Foreign growth influences French growth through two different channels. First as western economies are entangled, their positions in the business cycle are correlated. A foreign growth index can therefore be used as an exogenous instrument of the French business

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<sup>22</sup>French legislators may also have been influenced by the conservative “revolution” undertaken by R. Reagan in the U.S. or M. Thatcher in the U.K.

<sup>23</sup>Interestingly, such a change contributed in fact to increase the taxation of capital versus labor, as the base of the new taxes happen to be wider, including for instance pensions.



cycle. We will introduce for this purpose the US growth rate lagged by one year<sup>24</sup> or the average growth in all the OECD countries except France.

Second French growth is also more directly impacted by its trade partners' growth through exports. To capture this effect, we can use an alternative indicator which measures the external demand to France. But such an indicator might be more endogenous to fiscal policy. A fiscal stimulus in France could enhance the economic activity of France's partners through larger French imports. As a consequence, fiscal multipliers estimated using this second type of index should be lower to the previous ones, as the feed-back effect of fiscal stimulus through partners' exports is not taken into account<sup>25</sup>.

### 3.2 Building the fiscal policy shocks measures

Like Romer Romer, we instrument the fiscal policy by continuous indicators. Each measure likely to have a macroeconomic effect is quantified using the official projections of their cost<sup>26</sup> by the legislators. The yearly fiscal "shocks" are defined as the sum of the changes in spending or public revenue induced by all the measures of similar motivation voted during the year. Such "shocks" are computed in current Euros<sup>27</sup>. The indicators of the public policy ( $\Delta T$ ) are furthermore calculated by dividing the previous "shocks" by the cyclically-adjusted nominal GDP<sup>28</sup>.

Indeed the budget is voted in Fall, at least three months before the beginning of the new fiscal year. As both inflation and GDP is not known with certainty at this date, the expectations of the legislators are embedded into the "shocks". As these expectations are likely to be correlated with what will eventually happen, the yearly "shocks" may be endogenous. Using the real values of the nominal GDP reported in the national accounts to deflate these "shocks"<sup>29</sup> may consequently lead to biased measures of the fiscal policy<sup>30</sup>. Moreover, the significance of the estimates happens to be lower when the following equation (1) is estimated using the "shocks" deflated by the actual nominal GDP as measures of the fiscal policy.

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<sup>24</sup>Historically the French business cycle has been following the US cycle.

<sup>25</sup>See appendix for more details about this indicator.

<sup>26</sup>Or the additional revenue they might induce.

<sup>27</sup>Earlier budget measures in French Francs have been translated in Euros using the official exchange rate, that is 6,55957.

<sup>28</sup>See appendix for details.

<sup>29</sup>That is dividing the fiscal measure of the budget for the year  $N$  by the ex post value of the nominal GDP of the same year  $N$ .

<sup>30</sup>Using the actual GDP as deflator will lead to upward biased measures during economic downturns.

### 3.3 Estimation framework

We use the real GDP growth rate as the dependent variable. To check for robustness we will also use the growth rate of the private sector value added. The reduced form estimated is the following, where  $Y$  is an indicator of output, the dependent variable,  $W$  an indicator of the economic activity abroad,  $\Delta T$  are indicators of the fiscal policy and  $e_t$  an error term:

$$\Delta \ln Y_t = a + b\Delta W_t + \sum_{i=0}^n c_i \Delta T_{t-i} + d\Delta \ln Y_{t-1} + e_t \quad (1)$$

Regressions are run on yearly data<sup>31</sup> using the national accounts from the INSEE between 1951 and 2008. To check robustness, alternative variables of output, foreign growth and fiscal policy will be introduced when running the regression (1). As Romer and Romer, we introduce also the lagged fiscal indicators ( $\Delta T_{t-i}$ ) in the regression (1) to evaluate the impact of fiscal policy in the short- and medium run. Lagged growth will also be introduced to check for robustness.

The partial correlations between the variables (see table 3) are consistent with the theory. First, real GDP growth is positively correlated with the indicators measuring growth abroad. Second, this correlation is higher when using the growth of external demand<sup>32</sup>, which is also logical. Third, the correlation between exogenous fiscal indicators ( $\Delta T_{exo}$ ) and GDP growth is substantial and positive while the correlation between growth and the endogenous fiscal indicators ( $\Delta T_{endo}$ ) is lower and negative. This is consistent with the fact that endogenous measures are assumed to be voted to mitigate the business cycle. Fourth, the correlation between endogenous and exogenous fiscal indicators is null, which support our claim that those two types of measures differ by nature.

	$\Delta \ln W_o$	$\Delta \ln W_x$	$\Delta \ln Y_{us,-1}$	$\Delta T_{exo}$	$\Delta T_{endo}$
$\Delta \ln Y$	0,65	0,87	0,37	0,47	-0,27
$\Delta \ln W_o$	1,00	0,83	0,20	0,29	-0,37
$\Delta \ln W_x$		1,00	0,33	0,34	-0,40
$\Delta \ln Y_{us,-1}$			1,00	0,15	-0,27
$\Delta T_{exo}$				1,00	-0,07

Table 3: Partial correlations of the main macroeconomic variables

<sup>31</sup>Although quarterly national accounts are available, there is no information in the budget indicating at which time in the year the voted measures will be implemented. Thus only yearly regressions are relevant.

<sup>32</sup>That is when we weight foreign countries GDP growth by their relative share in French exports.

## 4 The short-run effects of fiscal policy

### 4.1 Simple regressions

In these simple regressions, we use GDP growth as the dependent variable and the average GDP growth in the OECD countries<sup>33</sup> to control for exogenous trends. The fiscal indicators used are the sum of respectively all exogenous and endogenous measures divided by the cyclically adjusted GDP. Table 4 presents the estimation results, whether we introduce the lagged fiscal indicators or not.

Measures	Exogenous		Endogenous	
$\Delta \ln W_t^o$	0.68** (6.2)	0.51** (4.9)	0.73** (5.8)	0.53** (5.0)
$\Delta \ln Y_{t-1}$	-	0.43** (4.3)	-	0.53** (5.7)
$\Delta T_t$	0.43* (2.9)	0.45** (3.4)	-0.18 (0.3)	-0.67 (1.5)
$\Delta T_{t-1}$	0.34* (2.4)	0.00 <i>ns</i>	0.30 (0.6)	0.98† (2.3)
Period	1952-2008	1953-2008	1952-2008	1953-2008
adj. $R^2$	0.54	0.66	0.40	0.63

Dependent variable is real GDP growth. OLS. T-stats are between brackets.

†, \* and \*\* respectively indicate significance at the 5%, 1% and 0.1% level.

Table 4: Short-term effects of fiscal measures (in % of *ex ante* GDP) on growth.

As suggested by the theory, the short-term multiplier of the *endogenous* measures is not significant, while the multiplier of the *exogenous* ones is positive and significant, whether lagged growth is introduced also or not. The effect of foreign growth is always very significant, which confirms the dependency of the French economy to the global economy. From these simple estimations one can deduce that the short-term (“Keynesian”) multiplier of exogenous spending/tax is about 0,4 the year of the shock and cumulates to 0,6-0,7 after one year.

We can evaluate the stability of such multipliers in time by running the regression on different period samples: 1950-1990, 1960-200 and 1970-2008. Results are reported in table 5. The first-year multiplier remains significant and steady above 0.4 for exogenous measures, while insignificant for endogenous ones. The second-year multiplier although never significant evolves between 0.25 and 0.30 for exogenous measures.

<sup>33</sup>Each country’s growth is weighted by overall GDP in constant US\$.

Measures	Exogenous			Endogenous		
$\Delta \ln W_t^o$	0.60** (4.4)	0.81** (6.1)	0.67** (4.7)	0.47** (3.0)	0.87** (5.2)	0.66** (4.0)
$\Delta T_t$	0.41† (2.1)	0.45* (2.5)	0.42† (2.1)	-0.89 (1.5)	0.03 (0.1)	-0.17 (0.3)
$\Delta T_{t-1}$	0.28 (1.4)	0.31 (1.8)	0.24 (1.3)	-0.09 (0.2)	0.30 (0.6)	0.40 (0.9)
Period	1952-1990	1960-1998	1970-2008	1952-1990	1960-1998	1970-2008
adj. $R^2$	0.38	0.56	0.45	0.32	0.46	0.34

Dependent variable is real GDP growth. OLS. T-stats are between brackets. †, \* and \*\* as in table 4.

Table 5: Estimates of the short-term effects of fiscal measures on growth according to the period of estimation.

## 4.2 Robustness checks

The equation (1) is estimated introducing alternative indicators to control for exogenous trends, US GDP ( $\Delta \ln Y_{-1}^{us}$ ) and world demand to France ( $\Delta \ln W^x$ ) or using rather the private sector value added growth ( $\Delta \ln VA$ ) as a dependent variable. Estimates are reported in table 6.

As in the previous specifications, endogenous measures appear to have no significant effect on either GDP or private sector value added growth. In the contrary, exogenous measures have always positive and significant effect on output, whatever the series we used.

When we calculate the increase in private value added induced by exogenous fiscal measures in GDP points, we obtain that a shock about one GDP point *ex ante* carries out an increase in private output of 0.35 points of GDP the first year and an additional one of 0.29 the year after. This means that in average almost all the effect of the exogenous fiscal measures goes through the stimulation of the private sector.

As expected, the fiscal multipliers are respectively higher when controlling with the lagged U.S. GDP and lower when using the external demand. Indeed, U.S. GDP is unlikely to be correlated with the fiscal measures while the imports of France's trade partners are likely to be stimulated by French expansionary fiscal measures. Eventually, a lower bound for the short-term response of GDP to an exogenous fiscal measure is likely to be around 0.3.

Monetary policy can theoretically influence the effects of the fiscal policy. However, this hypothesis is likely to be less critical in France than it may be in the United States. The monetary policy in France is run by the European Central Bank de facto since 1993. The independence of the ECB is not only stated by the European treaties but has been strengthened by the appointment of conservative chairmen. In addition to that, as France only represents one fifth of the euro area

Measures	Exogenous			Endogenous		
	VA	GDP	GDP	VA	GDP	GDP
Dep. var. <sup>a</sup>						
Foreign ind. <sup>b</sup>	$\Delta \ln W_t^o$	$\Delta \ln W_t^x$	$\Delta \ln Y_{t-1}^{us}$	$\Delta \ln W_t^o$	$\Delta \ln W_t^x$	$\Delta \ln Y_{t-1}^{us}$
$\Delta \ln W_t$	0.77** (5.3)	0.86** (12.6)	0.26* (2.7)	0.81** (4.9)	0.97** (12.5)	0.34* (2.9)
$\Delta T_t$	0.52* (2.6)	0.29* (2.9)	0.64** (3.6)	-0.33 (0.5)	0.45 (1.3)	-0.86 (1.4)
$\Delta T_{t-1}$	0.43† (2.3)	0.23** (2.5)	0.19 (1.1)	0.13 (0.2)	0.35 (1.1)	0.35 (1.1)
Period	1952-2008	1952-2008	1952-2008	1952-2008	1952-2008	1952-2008
adj. $R^2$	0.46	0.80	0.30	0.32	0.75	0.15

OLS. <sup>a</sup>Dependent variable is real growth either of private sector value added (VA) or GDP.

<sup>b</sup>One uses average OECD countries GDP ( $W^o$ ), OECD demand ( $W^x$ ) or U.S. lagged GDP ( $Y_{t-1}^{us}$ ) growth rates to control for exogenous trends in French GDP. Other notations similar to table 4.

Table 6: Estimates of the short-term effects of fiscal measures on growth, alternative series.

and regarding the high frequency of exogenous<sup>34</sup> fiscal shocks, is it unlikely that the ECB, assuming that it would be prone to it, could actually accommodate the French fiscal policy. Before that, the French monetary policy has been mainly focused on maintaining some parity with the other European currencies since the creation of the European monetary snake in 1972. This system was replaced in 1979 by the European monetary system. If we exclude the three devaluations of the period 1981-1983<sup>35</sup> the value of the currency has been maintained since the late 1970s. Therefore, considering the dynamic of the fiscal policy in France, the monetary policy does not appear to have much accommodated the efforts of the legislators since that time. Between the end of the Second World War and the early 1980s however, devaluations of the Franc had been used extensively to control the external deficit. Two different piece of evidence allow gauging the potential effects of monetary policy.

First, as the fiscal multiplier are similar when estimated over the period 1950-2008 (where monetary policy was active) and 1970-2008 (where monetary policy was passive), it seems very unlikely that the correlation between growth and the exogenous fiscal multipliers can be fully driven by monetary policy.

Second, we tried to estimate a Taylor rule by regressing the real interest rate<sup>36</sup>

<sup>34</sup>The exogenous fiscal shocks are by nature likely to be uncorrelated with the fiscal policy of the other members of the euro area.

<sup>35</sup>Which happened to take place precisely at the same time of the “stimulus” of the socialist party, which was a package of *endogenous* measures.

<sup>36</sup>We used the 3 month bond interest rate deflated by the growth rate of the consumer price index.

on the real GDP growth and the inflation rate<sup>37</sup>. Whatever the configuration chosen<sup>38</sup> the introduction of the residual of the Taylor rule in the estimation (1) never modified neither the significance or the value of the previously estimated fiscal multipliers.

### 4.3 Fiscal multipliers by motivation of the measures

As *endogenous* measures do not seem to have any *measurable* effect on growth, we will only consider the effects of *exogenous* measures in the following. After quantifying the average effect of fiscal measures on growth, it is probably worthy to know whether different kind of measures induce similar responses of the output.

We begin by investigating if changes in spending and revenue have the same impact on growth. To do so, we cluster all the exogenous measures in two different yearly indicators, whether these measures imply a change in spending ( $\Delta T_t^{sp}$ ) or in public revenue ( $\Delta T_t^{rv}$ ). We introduce first separately and together those two series in the regression (1). Estimations results are displayed in table 7

Measures	Exogenous		
$\Delta \ln W_t^o$	0.71** (6.1)	0.65** (6.5)	0.63** (6.1)
$\Delta T_t$	0.56** (3.9)	-	0.56** (3.8)
$\Delta T_{t-1}$	0.29 <sup>†</sup> (2.1)	-	0.24 (1.6)
$\Delta T_t$	-	-0.72 (1.5)	-0.35 (0.8)
$\Delta T_{t-1}$	-	-0.50 (1.0)	-0.29 (0.7)
Period	1952-2008	1953-2008	1952-2008
adj. $R^2$	0.43	0.60	0.60

Dependent variable is real GDP growth. OLS.

Other notations similar to table 4

Table 7: Short-run effects of spending and revenue on growth.

While the spending multiplier seems to be higher and more significant than the average one, the multiplier of revenue is negative but not significant. As the spending/revenue nature of the fiscal measures is linked to the motivation of the legislators, we further estimate the fiscal multiplier according to the motivations of the measures.

<sup>37</sup>Inflation is again calculated as the annual growth rate of the consumer price index.

<sup>38</sup>We estimated a Taylor rule as an autoregressive model with and without an error correction term.

To do so, we cluster the fiscal measures in two yearly indicators. In the first one, ( $\Delta T^m$ ), we add up all the exogenous fiscal measures of the year which have been motivated by the motivation we are interested in. All the other measures are clustered in the second indicator ( $\Delta T^o$ ). The results are reported in table 8.

Although restrictive measures do not seem to have an effect the first year, they have a dramatic negative impact during the second year. This result is all the more strong that the number of restrictive episodes had been very limited since 1950.

The measures aiming at enhancing long-term growth, through investments in human capital or R&D have a stronger effect than average (the multiplier is above one) but it takes at least one year for them to affect growth. This is not illogical as those measures are supposed to favor long-term growth. Measures promoting firms competitiveness<sup>39</sup> have also a powerful effect on growth, which seems to be quicker. Interestingly, measures promoting employment do not have significant effects on growth, at least in the short run. Two different mechanisms could explain this odd property. First, subsidized and public-financed jobs, which one can usually find in the non traded sector could lead to distortions in the economy and divert the workforce from more productive employment. Second, cuts in social contribution and labor tax have been massively used by all governments to lower unemployment. Those measures aim creating less-productive jobs mostly for unskilled workers, who happened to be more hit by unemployment. But as a consequence they also tend to slow down aggregate productivity growth by favoring less-productive jobs over high-productive ones. In both cases, if the (negative) effect on overall productivity is similar to the (positive) effect on employment, fiscal measures promoting employment may indeed have only a limited impact on value added. It is to be noted however that employment measures happen to have very strong effects on the level of employment. Such effects however need some time to materialize, between three to five years. This result justify *ex post* the large efforts conceded by all governments to lower labor cost, especially for low-skilled jobs, and to subsidy non traded employment.

Measures aiming at redistributing income have very different effects whether they are implemented through increase in social transfers or rather through tax reduction (income or VAT taxes). While an increase in transfers has a very strong effect on growth in the short-run, with a multiplier around 3, tax cuts do not seem to have any significant effect in growth in France, at least in the short-run. An explanation could be that a large part of the social transfers<sup>40</sup> created since the second world war aim to reduce income inequalities and are consequently benefit-

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<sup>39</sup>which have been focused on taxes cuts

<sup>40</sup>Among transfers, one can find generous housing and family allowances, and several compensatory allowances guaranteeing a minimal income.

Motivation	Restrict. <sup>a</sup>	Potential growth			Redistribution		Gov. func. <sup>b</sup>
Sub motiv.	-	Endo. <sup>c</sup>	Comp. <sup>d</sup>	Empl. <sup>e</sup>	Transf. <sup>f</sup>	Tax cut <sup>g</sup>	-
# chocs	4	49	46	26	33	46	48
Av. size	-0.61	0.51	0.31	0.18	0.34	0.29	0.52
$\Delta \ln W_t^o$	0.73** (6.7)	0.57** (6.1)	0.66** (5.9)	0.66** (6.0)	0.67** (6.4)	0.61** (5.7)	0.68** (6.2)
$\Delta T_t^m$	-0.53 (0.5)	0.42 (0.9)	1.06† (2.2)	-0.75 (0.6)	2.54* (2.8)	-0.16 (0.3)	0.57 (1.7)
$\Delta T_{t-1}^m$	2.19† (2.3)	1.1† (2.4)	0.34 (0.7)	-0.23 (0.2)	0.89 (1.1)	-0.62 (1.3)	0.05 (0.1)
$\Delta T_t^o$	0.44** (3.0)	0.39† (2.0)	0.29 (1.6)	0.39† (2.4)	0.17 (0.9)	0.49** (3.1)	0.39 (1.8)
$\Delta T_{t-1}^o$	0.31† (2.2)	0.09 (0.5)	0.30 (1.6)	0.28 (1.8)	0.05 (0.3)	0.37† (2.3)	0.47† (2.3)
Period	1952-2008						
adj. $R^2$	0.56	0.55	0.54	0.53	0.57	0.57	0.53

Dependent variable is real GDP growth. OLS. Other notations similar to table 4. <sup>a</sup>Restrictive fiscal policy. <sup>b</sup>basic functions of the government (military and security). Measures promoting: <sup>c</sup>endogenous growth, <sup>d</sup>firms competitiveness, <sup>e</sup>employment. <sup>f</sup>Change in social transfers. <sup>g</sup>Measures aiming to redistribute income to households through tax cuts (income and VAT taxes).

Table 8: Short term effects of exogenous measures according to their motivation.

ting to the poorest households. Symmetrically, most of the tax cuts, especially the income tax reforms, benefitted to the wealthiest households, as this tax is very progressive in France. Our results are therefore consistent with the Keynesian views, which assume that the marginal propensity to consume, and therefore the inefficiency of the fiscal measure, increases with income. In addition to that, French households could react as “Ricardian” agents in face of (unreasonably) large and frequent cuts in income taxes. They may worry that such practices would jeopardize the sustainability of the public finances and would result in the long-run in larger tax increases.

Last, spending more to strengthen the basic functions of the government has a positive impact, which comes very quickly as there remains no additional impact during the year after the shock.

#### 4.4 Effects on the GDP components

To check that the previous estimates can be identified as the short-term “Keynesian” multipliers, we regress the different exogenous fiscal shocks on the main components of GDP. This exercise allows exhibiting the effects of certain categories of measures whose effect on total GDP was not significant. To do this exercise, we build new fiscal indicators ( $\Delta T^j$ ) by sorting the exogenous measures according



to their motivation  $j$ . Then we estimate the following equations (2), where  $Z$  is a specific component of the GDP and the coefficients  $c_z^j$  can be assumed equal to zero.

$$\Delta \ln Z_t = a_z + b_z \Delta W_t^o + \sum_{s=0}^2 \sum_j^n c_z^j \Delta T_{t-s}^j + e_t^z \quad (2)$$

Estimations results are reported in table 9.

Overall, the results appear to be consistent with the Keynesian theory. Restrictive shocks, changes in transfers and basic expenditure affect consumption according to the theory. According to the Keynesian theory also, investments do not react to changes in transfer or basic spending<sup>41</sup>. Firms investment however tends to increase with business and labor tax cuts.

Exports appear to be stimulated by measures enhancing competitiveness but also endogenous growth (lagged). A more detailed analysis by sub motivations indicate that this correlation is mostly due to infrastructure expenditure<sup>42</sup> disbursed before 1970. After 1975, there is no more significant impact of endogenous growth spending on growth<sup>43</sup>. The negative effect of basic spending on exports could be due to the distortions induced by military spending. In time of war, productive forces are focused on domestic production.

Imports react along with household consumption after a stimulation of the domestic demand, such as tax cuts, changes in transfers and restrictive measures. The correlation between measures for employment and imports is due at least partially to the spillovers between investment and imports. Cheaper labor favors investment and therefore the imports of investment good<sup>44</sup>. There is a strong connection between transfer increases and import increases. This very dynamic response is compensated one year later: domestic firms need some time to adjust their production level to the new demand.

Contrary to what the Keynesian theory says, income and VAT tax cuts happened to have a negative and significant effect on consumption. Therefore, the absence of a significant effect of tax cuts on GDP (see table 8) could not be attributed only to a lower marginal propensity to consume of the beneficiaries of such tax cuts. Indeed if this were the case, the effect of such tax cuts would be insignificant. In addition to that, the income and VAT tax cuts have always a significant and negative (and quite strong) effect on all the GDP components they could potentially affect<sup>45</sup>: firms and households investment and imports. This “Ri-

<sup>41</sup>whether security, health or education for instance.

<sup>42</sup>while education and RD do not seem to influence growth in the short-run.

<sup>43</sup>although the limited number of observations does not allow to reject a positive correlation.

<sup>44</sup>In 2008, around half of the French investment goods was bought abroad.

<sup>45</sup>In the first order, public consumption and exports are not supposed to vary with tax shocks.

Dep. var. <sup>a</sup>	$\Delta \ln C_t$	$\Delta \ln I_t^b$	$\Delta \ln I_t^o$	$\Delta \ln G_t$	$\Delta \ln X_t$	$\Delta \ln M_t$
$\Delta \ln W_t^o$	0.58 <sup>†</sup> (2.4)	1.08 <sup>**</sup> (3.1)	1.19 <sup>**</sup> (4.2)	0.37 <sup>*</sup> (2.9)	0.89 <sup>**</sup> (3.1)	1.77 <sup>**</sup> (6.2)
Restrict. (-1) <sup>b</sup>	1.98 <sup>†</sup> (2.1)	-	-	2.32 <sup>†</sup> (2.0)	-	9.61 <sup>**</sup> (3.6)
Endo. growth (-1)	-	-	-	-	3.59 <sup>*</sup> (2.8)	-
Firm comp.	-	2.77 <sup>†</sup> (2.3)	-	-	4.59 <sup>**</sup> (3.7)	-
Employ. (-2) <sup>c</sup>	-	7.24 <sup>†c</sup> (2.4)	-	-	-	9.15 <sup>*</sup> (2.8)
Transf.	2.32 <sup>**</sup> (3.1)	-	-	-	-	9.02 <sup>**</sup> (4.3)
Transf. (-1)	-	-	-	-	-	-3.87 <sup>**</sup> (3.6)
Tax cuts	-	-	-2.92 <sup>†</sup> (2.4)	-	-	-
Tax cuts (-1)	-1.13 <sup>†</sup> (2.4)	-2.96 <sup>†</sup> (2.3)	-3.96 <sup>**</sup> (3.1)	-	-	-3.98 <sup>**</sup> (3.0)
Gov. func.	-	-	-	1.08 <sup>*</sup> (2.9)	-1.92 <sup>†</sup> (2.0)	-
Gov. func. (-1)	0.71 <sup>†</sup> (2.2)	-	1.54 <sup>**</sup> (4.2)	-2.43 <sup>**</sup> (3.1)	-	-
Period	1952-2008					
$R^2$ ajusté	0.55	0.35	0.40	0.41	0.44	0.60

<sup>a</sup>Dependent variables from the left to the right: Household consumption ( $C$ ), firms investment ( $I^b$ ), other investment (Real estate and public) ( $I^o$ ), public consumption ( $G$ ), exports ( $X$ ), imports ( $M$ ) and private employment ( $L$ ). <sup>b</sup>The explaining variables are the fiscal indicators sorted by motivation. <sup>c</sup>We use rather  $\Delta T_{-3}^{emp}$  for this regression. OLS. All omitted variables are insignificant.

Table 9: Short-run effects of exogenous fiscal measures on GDP components

cardian” feature of the French economy contrasts strongly with Romer Romer’s finding on U.S. economy. Maybe because French people value more their social security, educational and health systems, they feel that large losses in public revenue could jeopardize these public goods in a near future and react accordingly by increasing their savings. Another explanation could be that losses of public revenues make difficult for the government to maintain the same level of spending in the near future. In that case, our estimates measure at the same time the negative effect of the restrictive policy induced by the tax cuts<sup>46</sup>. It appears indeed that the tax cuts indicators are negatively correlated with public investment. A substantial part of the negative effect of the tax cut on growth could be due to

<sup>46</sup>According to the Keynesian theory, the short-run multiplier of taxes is indeed lower than the multiplier of spending. Thus a tax cut fully balanced by a decrease in spending should have a negative effect on consumption and growth.

the pressures they exert on public investment.

In the short-run, the French economic seems to react accordingly to the Keynesian theory. Although the fiscal multipliers are limited in average, 0.4 the first year and an additional 0.3 the second year, they could be much higher for specific kind of measures. In the next section, we try to underline the consequences of those exogenous fiscal measures in the medium run.

## 5 Fiscal policy in the medium run

### 5.1 Issues to gauge the medium-run impact of fiscal policy

By nature Romer Romer’s methodology is relevant to study the short-run effects of fiscal policy. Using our indicators, which have been constructed from shocks, to investigate the medium/long-run effects of fiscal policy is problematic for two different reasons.

First, to estimate the effect of fiscal measures in the medium-run, one should be able to aggregate short-term shocks over time to build a “stock” variable of exogenous measures. However, all the fiscal measures do not evolve similarly with time. For instance a new spending will be eroded with inflation and real growth while a permanent decrease in a tax rate is likely to have lasting effects. In addition to that, adding measures voted or implemented at different points in time requires choosing a discount rate. But discounting choices are likely to affect the value of the “stock” of measures and therefore to blur the estimates of the long-term multipliers.

Second, to estimate directly long-term multipliers, one needs to introduce both dependent and explaining variables in levels<sup>47</sup>. As neither GDP nor government size (and therefore any “stock” of exogenous measures) series are stationary, such regressions are likely to lead to spurious or highly uncertain estimates.

To tackle those two issues and stay in the original spirit of Romer Romer’s approach, we rather consider the medium effects of fiscal policy through its impact on the price levels.

### 5.2 Effects of fiscal policy on aggregate prices

To measure the effects of the fiscal policy on prices, we use the same methodology. The yearly price variation, that is the inflation rate of the GDP deflator ( $\pi_t = \ln P_t - \ln P_{t-1}$ ) is regressed on the exogenous measures  $\Delta T_{t-s}^i$ . We also control for exogenous trends in the inflation rate by adding in the regression a measure of “foreign” inflation,  $\pi_t^x$ . This inflation rate is built by aggregating also the inflation

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<sup>47</sup>and not using first differences.

rate of France's major trade partners within the OECD, see equation (3) which is similar to eq. (19) in appendix.

$$\pi_t^x = \frac{\sum_{i|\alpha_i > 0.05} \alpha_i \pi_t^i}{\sum_{i|\alpha_i > 0.05} \alpha_i} \quad (3)$$

In addition to that we also control by OECD's growth to take into account external demand shocks. The regression estimated is:

$$\pi_t = a' + b' \Delta \ln W_t^o + \sum_{s=0}^3 \sum_j^n c'^j \Delta T_{t-s}^j + f \pi_t^x + e'_t \quad (4)$$

Regressions results are reported in table 10.

Motivation	Restrict. <sup>a</sup>	Potential growth			Redistribution		Gov. func. <sup>b</sup>
Sub motiv.	-	Endo. <sup>c</sup>	Comp. <sup>d</sup>	Empl. <sup>e</sup>	Transf. <sup>f</sup>	Tax cut <sup>g</sup>	-
$\Delta \ln W_t^o$	0.73** (6.7)	0.57** (6.1)	0.66** (5.9)	0.66** (6.0)	0.67** (6.4)	0.61** (5.7)	0.68** (6.2)
$\Delta \pi_t^x$	0.73** (6.7)	0.57** (6.1)	0.66** (5.9)	0.66** (6.0)	0.67** (6.4)	0.61** (5.7)	0.68** (6.2)
$\Delta T_{t-2}^m$	-0.53 (0.5)	0.42 (0.9)	1.06 <sup>†</sup> (2.2)	-0.75 (0.6)	2.54* (2.8)	-0.16 (0.3)	0.57 (1.7)
$\Delta T_{t-3}^m$	2.19 <sup>†</sup> (2.3)	1.1 <sup>†</sup> (2.4)	0.34 (0.7)	-0.23 (0.2)	0.89 (1.1)	-0.62 (1.3)	0.05 (0.1)
$\Delta T_{t-2}^o$	0.44** (3.0)	0.39 <sup>†</sup> (2.0)	0.29 (1.6)	0.39 <sup>†</sup> (2.4)	0.17 (0.9)	0.49** (3.1)	0.39 (1.8)
$\Delta T_{t-3}^o$	0.31 <sup>†</sup> (2.2)	0.09 (0.5)	0.30 (1.6)	0.28 (1.8)	0.05 (0.3)	0.37 <sup>†</sup> (2.3)	0.47 <sup>†</sup> (2.3)
Period	1952-2008						
adj. $R^2$	0.56	0.55	0.54	0.53	0.57	0.57	0.53

Dependent variable is GDP deflator inflation rate. OLS. Other notations similar to table 8.

Table 10: Short term effects of exogenous measures on aggregate price according to their motivation.

Exogenous fiscal measures happen to have no effect on prices during the first two years. It is only two years after the shock that prices seem to react. At this time however, the effects on prices are substantial. As before, measures with different motivations do not have the same impact on prices. Increase in social transfers makes inflation spike three years after the shock. This was predictable as those measure are also the more efficient to stimulate domestic demand. Symmetrically, tax cuts, which had no significant effects on GDP growth cause only limited inflation. Last, measures enhancing firms competitiveness rather induce a decrease in prices. This is also logical as less taxes on inputs are supposed to

translate into production price decrease, precisely in order to gain competitiveness over trade partners.

To deduce the medium-run effects of fiscal policy on growth from the changes in aggregate prices, we have to calibrate the slope of the demand curve.

### 5.3 Using the slope of the demand curve

We model the medium-run macroeconomic equilibrium using an (AS)-(AD) model. The reference price is the average price of the trade partners<sup>48</sup>. We denote therefore  $q_t = \ln\left(\frac{P_t}{P_t^x}\right)$  the “aggregate price level”. The macroeconomic equilibrium is defined at the intersection of a decreasing demand curve  $y^d(\bullet, q_t)$  and an increasing supply curve  $y^s(\bullet, q_t)$  in the prices-output plan  $(q, y)$  where  $y_t$  stands for the logarithm of the GDP. The demand is supposed to depend of the foreign economies captured by  $w_t$  the logarithm of the OECD’s output and also the fiscal policy, captured by an indicator  $T_t$ . The fiscal shocks may affect the GDP after more than two years, however our previous results allow us to assume that:

$$\frac{\partial y_t^d}{\partial T_{t-s}} = 0 \text{ for } s \geq 2 \quad (5)$$

More formally the GDP in log evolves therefore as:

$$y_t = y^d(w_t, q_t, T_t, T_{t-1}) \quad (6)$$

Let us now define the baselines  $\bar{y}_t$  and  $\bar{q}_t$  as the trajectory the GDP and the aggregate prices would have follow in the absence of any fiscal shock for  $t > 0$ . We have therefore:

$$\bar{y}_t = y^d(w_t, \bar{q}_t, T_0, T_0) \quad (7)$$

Taking the first order approximation of the difference between eq. (6) and eq. (7), we can define the deviation of the GDP to the baseline  $\Delta y_t$ , which quantifies the effects of a permanent fiscal shock  $\Delta T$  occurring in  $t = 0$ :

$$\Delta y_t = \frac{\partial y^d}{\partial T} \Delta T_t + \frac{\partial y^d}{\partial T_{-1}} \Delta T_{t-1} + \frac{\partial y^d}{\partial q} \Delta q_t \quad (8)$$

Prices are supposed to be sticky so that the equilibrium is fully determined by the demand in the short-run, following the typical Keynesian views. Therefore, the supply curve is perfectly flat in the short-run and  $\Delta q_t = 0$  for  $t < 2$ . This assumption is consistent with our findings: prices do not react immediately to a

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<sup>48</sup>measured empirically by the index  $P_t^x$  derived from the inflation rate  $\pi_t^x$ , eq. (3).

fiscal shock while GDP evolves in the short-run. This allows identifying the so called “short-run fiscal multiplier” from the previous regressions based on (1).

$$\frac{\partial y^d}{\partial T_{-i}} = \frac{\Delta y_t}{\Delta T_{t-i}} = c_i \quad (9)$$

In the medium-run however, the slope of the supply curve tends toward its equilibrium value. Changes in the aggregate price level are not longer uncorrelated with fiscal policy shocks. Therefore,  $y_t^s(q_t, \bullet) = y_t^d(q_t, \bullet)$  implies that there is a function  $S$  such that the aggregated price  $q_t$  which balances supply and demand is:

$$q_t = S(w_t, p_t^x, T_t, T_{t-1}, T_{t-2}, T_{t-3} \dots) \quad (10)$$

Using the regression results of table 10, we assume that:

$$\frac{\partial S}{\partial T_{t-s}} = 0 \text{ for } s \leq 1 \text{ or } s \geq 4 \quad (11)$$

Equation (11) allows to define the price baseline  $\bar{q}_t$  as:

$$\bar{q}_t = S(w_t, p_t^x, T_0, T_0) \quad (12)$$

As  $p_t^x$  is exogenous, the first order approximation of the difference between eq. (10) and eq. (12) can be simplified with the estimated coefficients of eq. (4):

$$\Delta q_t = \frac{\partial S}{\partial T_{-2}} \Delta T_{t-2} + \frac{\partial S}{\partial T_{-3}} \Delta T_{t-3} = \frac{\partial \pi_t}{\partial T_{t-2}} \Delta T_{t-2} + \frac{\partial \pi_t}{\partial T_{t-3}} \Delta T_{t-3} = (c'_2 + c'_3) \Delta T \quad (13)$$

Combining (13) and (9), the deviation of GDP from the baseline  $\Delta y$  becomes in the medium-run:

$$\Delta y = \left( (c_0 + c_1) + \frac{\partial y^d}{\partial q} (c'_2 + c'_3) \right) \Delta T \quad (14)$$

Using  $\frac{\partial y^d}{\partial q} \approx -0.9$  (see appendix for details), we can calculate the medium-run effects on GDP ( $\Delta \ln Y_{MR}$ ) and price level ( $\Delta \ln P$ ) of the exogenous fiscal shocks according to their motivation (see table 11). It is to be noted that such results may differ from the long-run effects of fiscal measures, as certain spending (such as educational or RD expenditure) are likely to affect the supply after a long time.

## 6 Conclusions

Using exogenous fiscal indicators built from the budget laws, we showed that fiscal policy has significant effect on growth and prices in the short run. According to our estimates, the fiscal multiplier (mixing spending and taxes) is in average about

Motivation Sub motiv.	Restrict. -	Potential growth			Redistribution		Gov. func. -
		Endo. <sup>a</sup>	Comp. <sup>b</sup>	Empl. <sup>c</sup>	Transf.	Tax cut	
$\Delta \ln Y_0$	-0.53	0.42	1.06*	-0.75	2.54*	-0.16	0.57
$\Delta \ln Y_{+1}$	1.66*	1.52*	1.40*	-0.98	3.43*	-0.78	0.62
$\Delta \ln P_{+2}$	0.61*	-	-	-	3.28*	-	-
$\Delta \ln P_{+3}$	1.61*	-	-	-	3.28	-	-
$\Delta \ln Y_{MR}$	0.21				0.48		

Measures enhancing: <sup>a</sup>endogenous growth, <sup>b</sup>firm competitiveness, <sup>c</sup>employment. \* significant at 5%.

Table 11: Short- and medium term responses of GDP after an exogenous expansionary fiscal measures about one 1% GDP *ex ante*, according to its motivation.

0.4 the year of the shock and rises up to 0.7 a year after. Those figures are similar to the responses of the macro-econometric model MESANGE<sup>49</sup>[10].

Multipliers of spending appear to be higher than the multipliers of taxes, which is consistent with the Keynesian views. Moreover, it seems that motivations rather than the instruments of the measure determine its efficiency. The multipliers of some spending and transfers are larger than one in the short-run, which is consistent with Biau and Girard’s (2005) estimates using a structural VAR[1]. Further analysis showed that most of these effects went through a stimulation of private consumption.

Nevertheless, cuts in income and consumption taxes do not seem to affect much growth, neither in the short- nor the medium run. Those findings confirm also the former results of Biau and Girard (2005)[1]. Analyzing the responses of the GDP components, we found that household and firms’ investment, as well as consumption tend to slow down after such tax cuts. This effect could be explained by simultaneous tightening of public investment and/or a “Ricardian” behavior of the French, worrying about the sustainability of a looser fiscal policy.

According to our estimates, the effects of fiscal policy tend to fade with time, eroded by inflation.

<sup>49</sup>MESANGE is a Keynesian-type model estimated for France on quarterly data, developed by the National Statistics Institute and the French Treasury.

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## Appendix

### Methodology to build the used indicators

#### Average growth rate of the OECD countries except France

To build this indicator, we aggregate real GDP of OECD countries using Penn World Table data available between 1950 and 2004. To complete this series until 2008, we use the series from the World Development Indicators. For each country, we regress the Penn World Table growth rate over the WDI growth rate, see equation (15).

$$\Delta \ln Y_t^{PWT,i} = (1 + a_i)\Delta \ln Y_t^{WDI,i} + b_i + e_t^i \quad (15)$$

Whenever the coefficients  $a_i$  and  $b_i$  are statistically different from zero, we project the GDP series using the Penn World table data between 2005 and 2008 using the equation (15) assuming all residual to be null. When those coefficients are not different from zero, we just append the two series (see eq. 16).

$$\Delta \ln Y_t^i = \begin{cases} \Delta \ln Y_t^{PWT,i} & \text{if } t \leq 2004 \\ \Delta \ln Y_t^{WDI,i} & \text{if } t \geq 2005 \text{ and } a_i \neq 0 \\ \Delta \ln Y_t^{WDI,i} & \text{if } t \geq 2005 \text{ and } a_i = 0 \end{cases} \quad (16)$$

A last issue is that the 30 current members of the OECD joined the organization at different time. We assume here that the year a country joined the OECD is approximately the time where its growth began to have an impact on the French economy. To measure the average “foreign” growth, the relevant number for the year  $t$  is the average growth rate of the countries which were part of the OECD at least since one year (see eq. 17).

$$\Delta \ln W_t^o = \ln \left( \sum_{i \in OECD_{t-1}} Y_t^i \right) - \ln \left( \sum_{i \in OECD_{t-1}} Y_{t-1}^i \right) \quad (17)$$

## Indicator of OECD countries external demand to France

To take into account the intensity of the trade partnership of each OECD country with France, we build this indicator by weighting each country's growth rate  $\Delta \ln Y_t^i$  by the average share of the French exports toward this country  $\alpha_i$  over the period 1995-2006. Denoting  $X^i$  the nominal value of the French exports toward the country  $i$  as published by the OECD, we have (18):

$$\alpha_i = \frac{1}{12} \sum_{t=1995}^{2006} \left( \frac{X_t^i}{\sum_j X_t^j} \right) \quad (18)$$

The indicator is given by (19) where we only keep the major trade partners (such that  $\alpha_i > 0.05$ ):

$$\Delta \ln W_t^x = \frac{\sum_{i|\alpha_i > 0.05} \alpha_i \Delta \ln Y_t^i}{\sum_{i|\alpha_i > 0.05} \alpha_i} \quad (19)$$

## Cyclically-adjusted nominal GDP

This indicator is built in two steps. First, the trend of real GDP is obtained using a H.P. filter. As the new series is smoothed enough and because we use yearly data, this computed GDP trend is not correlated with the short-term evolutions of real GDP. Second, as the trend of GDP price is not so smooth, there could be endogeneity issue if we just use a simple HP filter. To avoid that, we project this trend using a simple autoregressive equation estimated between 1950 and 2008 (see 20).

$$\ln(P_t) = \underset{(23.1)}{1.72} \ln(P_{t-1}) - \underset{(10.5)}{0.75} \ln(P_{t-2}) + c + \epsilon_t \quad (20)$$

The trend of GDP price,  $\ln(\hat{P}_t)$  is then projected using the previous equation assuming all residual to be null. Eventually, the fiscal indicators  $\Delta T_t^j$  are obtained by dividing the sum for each year of the budget cost of all the measures of type  $j$  as projected by the legislators  $M_t^{ji}$  by the calculated trend of the nominal GDP (see 21).

$$\Delta T_t = \frac{\sum_i M_t^{ji}}{HP[Y_t] \times \hat{P}_t} \quad (21)$$

## Calibrating the slope of the demand curve

To determine the slope, we study the long-term macroeconomic equilibrium<sup>50</sup>. Exports  $x$  can be linked to the foreign demand  $w$  and aggregated price  $q$ , assuming

<sup>50</sup>We only consider variables in logarithm here.

constant price elasticity  $\eta^x$ :

$$x = w - \eta^x q \quad (22)$$

In the long-run, the trade account is balanced in nominal terms, which allows getting imports  $m$ :

$$m = x + q = w - (\eta^x - 1)q \quad (23)$$

We consider that the substitution elasticity between the demand of domestic good  $d$  and the imports  $m$  is also constant, equaling  $\eta^m$ . We have therefore in the long-run:

$$d - m = -\eta^m q \quad (24)$$

Replacing (23) into (24) allows determining the price elasticity of the demand of domestic goods  $d$  (25):

$$d = w - (\eta^x + \eta^m - 1)q \quad (25)$$

This leads to the sought elasticity using the definition of the aggregate demand, with  $g$  the public spending and  $\theta_x$  and  $\theta_g$  respectively the share of exports and public consumption in the GDP:

$$y^d = (1 - \theta_x - \theta_g)d(q) + \theta_x x(q) + \theta_g g \quad (26)$$

$$\Rightarrow \eta^d = \frac{\Delta y^d}{\Delta q} = (1 - \theta_x - \theta_g)(1 - \eta^x - \eta^m) - \theta_x \eta^x \quad (27)$$

Using error-correction model to estimate updated elasticities  $\eta^x$  and  $\eta^m$ , we consider the following calibration:  $\eta^x=0.9$ ,  $\eta^m=1.4$ ,  $\theta_x=0.35$  and  $\theta_g = 0.2$ . Eventually the long-term value of the demand curve slope is approximately calibrated to  $\eta^d \approx -0.9$ .