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Courbes de Laffer et multiplicateurs budgétaires à partir du modèle Mèlèze

Résumé

Cet article utilise une modélisation DSGE de la zone euro développée à l'Insee dans un but d'évaluation *ex ante* de réformes budgétaires. Les principales caractéristiques de ce modèle sont comparables aux modèles standards utilisés dans les principales organisations internationales et banques centrales. À l'aide de courbes de Laffer généralisées, nous constatons que les niveaux effectifs de taxation sont en deçà de ceux maximisant les revenus du gouvernement. Toutefois, ce résultat dépend du niveau de compétition monopolistique sur le marché des biens. Nous étudions aussi les multiplicateurs budgétaires de court- et long-terme pour divers instruments budgétaires. Nos résultats sont comparables avec ceux obtenus dans d'autres modèles DSGE mais aussi avec ceux obtenus dans le modèle macroéconométrique Mésange. Néanmoins, selon le comportement des autorités monétaires et budgétaires et l'instrument considéré, les multiplicateurs budgétaires de court-terme varient substantiellement de 0,2 à 1 point autour du multiplicateur moyen dans les cas les plus extrêmes. De manière plus générale, il existe une marge de manœuvre importante pour des politiques budgétaires dites mixtes.

Mots-clés : multiplicateur budgétaire, courbe de Laffer, modèle DSGE, union monétaire

Laffer curves and fiscal multipliers: lessons from Mèlèze model

Abstract

We use the two country DSGE model of the Euro area Meleze developed at Insee to perform *ex ante* fiscal reforms evaluations. The main features of the model compare with standard tools developed in international institutions and central banks. In practice, tax rates are below the government revenues maximizing rate identified by generalized equilibrium Laffer curves in the model. The extent of this result nevertheless depends on the degree of monopolistic competition on the goods market. We also analyse short and long term multipliers for numerous fiscal tools. These compare to standard DSGE simulations as well as to the macroeconomic model Mésange. However, depending on the behaviour of fiscal and monetary authorities, short-term fiscal multipliers variations are substantial, from 0.2 up to 1 point around the baseline in the most extreme case. All in all, there exists room of manoeuvre for so called mixed-strategies fiscal policy.

Keywords: fiscal multiplier, Laffer curve, DSGE model, monetary union

Classification JEL : E10, E62, F45

1 Introduction

Since the beginning of the great recession, fiscal policy has either been investigated as a short term solution out of the crisis or now through the scope of fiscal consolidation.

Fiscal reforms or consolidation have already been assessed through DSGE models. In the European context many works were conducted on the Quest III model (D'Auria et al., 2009; Roeger and in't Veld, 2010; Vogel, 2012; Annicchiarico et al., 2013; in't Veld, 2013). Coenen et al. (2008b) investigate fiscal consolidation in the New Area Wide Model (NAWM). Clinton et al. (2011) provide similar insights in the case of an international model (GIMF). Coenen et al. (2012) give an extensive review of the size of fiscal multipliers in the main institutional models.

Most of these papers plead in favour of so called *mixed strategies*. Actually, they advocates for fiscal consolidations based on an immediate, sharp but transitory increase in taxes along with a permanent but gradual decrease in government spendings. Such packages simultaneously ensure a permanent and immediate decrease in public deficits but also minimize the negative impact on activity, both in the short and long run.

However, they also highlight that the evaluation and the design of efficient fiscal packages is not a straightforward task. Factors such as the monetary environment, the competition level, the international setting or the heterogeneity of households influence the success of consolidation or stimulation policies. However, the large number of available fiscal tools allows for some room of manoeuvre in the design of programs, and fiscal authorities and policy-makers must rely on detailed evaluations of all possible reform scenarios.

In the present paper, we aim to give a French outlook and compare the effect of transitory or permanent fiscal reforms in a standard feature DSGE model for France within the Euro Area.

First, we derive generalized equilibrium Laffer curves as specified in Trabandt and Uhlig (2011). Contrary to Trabandt and Uhlig (2011), our model includes monopolistic imperfections which we find responsible for a sizeable increase in the potential additional revenues from capital taxation. Also, French tax rates are below the revenue maximizing rates.

In a second step, we simulate increases in public spending, transfers or decreases in various tax rates calibrated to 1% of pre-stimulus output. The resulting fiscal multipliers are compared to the main existing DSGE models based on the results provided in Coenen et al. (2012), and to the French macroeconomic model Mésange developed at Insee (Klein and Simon, 2010). We find that our model gives comparable multipliers for transitory shocks but highlight that these measures of the fiscal multipliers crucially depend on their timing and the way both fiscal and monetary authorities commit or react to

the stimulus. Short-term fiscal multipliers variations range from 0.2 up to 1 point around the baseline in the most extreme case, with therefore very different implications in terms of policy-making.

It is noteworthy that for transitory measures, public spending fiscal multipliers can range from 0.7 to 1.3; cuts on distorting tax rates provides lower multipliers; coordination across countries in a monetary union leads to larger fiscal multipliers. This compares to empirical work on the French public spending multiplier as presented in [Cléaud et al. \(2013\)](#). Estimating an SVAR over the period 1980-2010, and following a one quarter shock, they exhibit a 1.1 instantaneous multiplier, close to our corresponding simulation.

The model Meleze used in this paper stems from [Campagne and Poissonnier \(2016\)](#) and features the standard modelling choices of the two country monetary union literature. The modelling elements are those generally embedded in large scale models developed in central banks and international institutions among which are GEM at the IMF ([Bayoumi et al., 2004](#)), NAWM at the ECB ([Coenen et al., 2008a](#)) or in open economy EAGLE ([Gomes et al., 2012](#)), QUEST III at the European Commission ([Ratto et al., 2009](#)) and its R&D version ([Roeger et al., 2008](#)).

Regarding the behaviour of fiscal authorities, the government uses public spending to stimulate and monitor economic activity. It can also exogenously modify its fiscal policy along different axes: lump-sum transfers and taxes on consumption, labour, capital income or dividends. As detailed below, we implement a traditional budget rule with government expenditures reacting to the output gap and past deficits. We also propose an alternative to traditional budget rules used in the literature, and derive a forward-looking optimizing behaviour for the government.

In Meleze, we replicate two different settings: France against the rest of the Eurozone, and a symmetric calibration for the Euro area.

The rest of the paper is organised as follows: Section 2 gives a short presentation of the model and its calibration. Section 3 analyses long term fiscal properties of the model through Laffer curves. Section 4 and 5 study transitory and permanent fiscal reforms respectively. The technical reader may refer to the companion paper ([Campagne and Poissonnier, 2016](#)).

2 Outline of the model: Meleze

This section gives a short presentation of the main features of the model, namely: a model of two countries in monetary union, comparing with standard tools developed in international institutions and central banks ([Christiano et al., 2005](#); [Smets and Wouters, 2003](#)). A more detailed description of the model, the first order conditions, their steady state and linearisation is given in the companion paper ([Campagne and Poissonnier, 2016](#)).

2.1 General framework

The model consists of two countries where continuum of firms and households interact on the goods, labour and capital market. Both firms and households are consider immobile across countries.

As advocated by [Mankiw \(2000\)](#) in the context of fiscal analysis, we distinguish between two types of households. A fraction of these households is *Ricardian*, that is not financially constrained. They hold financial asset (or debt), own capital which they lend to firms in their country (once installed capital is assumed to become immobile) and also own financial intermediation firms. Therefore, they receive interests and dividends. These *Ricardian* households also choose their investment each period by arbitrating between capital and the risk free asset. *Non Ricardian* households on the contrary are financially constrained and do not hold any asset.

Both types of households also provide labour on a monopolistically competitive market. For this reason, households are paid with a mark-up over their marginal disutility. Wage rigidities are added over the cycle following [Erceg et al. \(2000\)](#), and each household can only reset its wage in adequateness with his optimal consumption-leisure arbitrage with an exogenous probability. In this framework, there is no involuntary unemployment and labour adjusts only at the intensive margin (hours worked).

Households finally consume both domestic and imported goods which are also partial substitutes. For the *Ricardian* households, being non financially constrained allows them to smooth their consumption over time. *Non Ricardian* households on the contrary cannot. Once their wage level is set, their labour supply is given by firms demand, their income ensues which they consume entirely within the same quarter.

Firms produce partially substitutable goods from a standard constant returns to scale production function. Production factors are labour and capital. Total factor productivity is exogenous and growing at the same pace across countries. At each period firms optimize their relative demand in capital and labour to minimize their production cost, taking the aggregate wage and capital rental cost as given. Partial substitutability across goods allows firm to price a mark-up over their marginal cost. Over the cycle, with an exogenous probability each firm can reset its price to maximize its expected discounted profits, while internalising its market power. Those price rigidities lead to a New Keynesian Phillips curve.

The modelling of governments' behaviour is conducted along two lines. First, we implement a traditional budget rules with government consumption reacting to the output gap and past deficits. Second, and as an alternative to these rules, we also consider here forward-looking optimizing governments. Their objective is to maximize households' intertemporal utility derived from public spending in partial information as an approximation for the exact Ramsey problem. We consider public consumption as a proxy for actual public spendings, public investment, public employment and production of public

services altogether. For this reason public spendings are purchased from domestic producers only. In a discretionary manner, governments collect taxes on wages, capital interests, dividends, consumption and investment. They can distribute transfers to both types of households. They also hold debt both at the steady state and over the cycle.

In addition to the production of real goods by the firms, a union wide financial market produces financial intermediation services for both households and governments. Financial intermediaries deduct from the interest rate set by the central banker a fee under the form of a debt elastic spread which is akin to *fisim*. There are no risk or agency issues in our model so that this fee is not to be interpreted as a risk premium of any kind. In practice, these financial intermediaries ensure the closing of the model as exposed in [Schmitt-Grohé and Uribe \(2003\)](#) and have a very small production compared to NFCs.

2.2 A focus on fiscal authorities

By and large, the purpose of governments is to stimulate domestic production, labour and individual consumption, as well as to provide with public and collective goods and services. In the real world, fiscal policy is implemented through a large number of instruments summarized here into exogenous taxes on consumption, labour and capital incomes, exogenous lump-sum transfers to households and endogenous public expenditures encompassing all dimensions of public intervention in the absence of public production or employment in the present model.¹

Lump-sum transfers are endogenised in Section 5.2 to ensure the long-run convergence of public debt when public consumption does not.

Public consumption dimmed endogenous is modelled in two alternative ways. We either follow a traditional modelling with the implementation of budget rules or we propose an alternative to the Ramsey problem and model a welfare-optimizing government under bounded rationality.

2.2.1 Budget rule

Budget rules can be implemented in different ways all relying on the *ad hoc* description of governments' spendings as a function of observable endogenous variables. Following [Corsetti et al. \(2010\)](#), we implement a resembling contra-cyclical budget rule in the following form:

$$\hat{G}_t^i = 0.9\hat{G}_{t-1}^i - \frac{0.01}{gy^i}\hat{y}_{t-1}^i + 0.02\frac{\overline{pa}^i}{\overline{gy}^i}\hat{pa}_{t-1}^i \quad (2.1)$$

where \hat{G}_t^i , \hat{pa}_t^i and \hat{y}_t^i respectively denote the deviation of public consumption, the public asset to GDP ratio, and production from their steady state value. In addition, \overline{pa} denotes the long-term debt to GDP

¹A complete and detailed description of fiscal authorities is given in [Campagne and Poissonnier \(2016\)](#)

ratio target and $\bar{g}\bar{y}$ the share of public consumption in GDP.² This approach is standard in the institutional modelling literature and taken on in models such as Quest III, GIMF, NAWM, etc.

2.2.2 Optimizing government: a simplified approach to the Ramsey problem

Rationale The introduction of rationality in DSGE models historically and naturally leads to the definition of an optimal government behaviour as a normative benchmark, namely the Ramsey policy. Indeed, in an internally consistent DSGE approach, governments seek to maximize the welfare of their domestic households, and it is therefore natural to define the objective of fiscal authorities as the maximization of the utility of households. In the presence of rationality, this maximisation is indeed subject to the public budget constraint but also to the full set of model constraints. In particular, when choosing the optimal level of public expenditures G_t , the government internalizes its indirect impact on households' consumption and labour supply, and therefore households' utility. One strength of this standard Ramsey approach is its robustness to the Lucas critique as it defines a structural behaviour consistent with the hypotheses of the model. In addition, as we introduce government spending in the utility function in *MELEZE*, this Ramsey approach appears to be even more strongly justified.

However, solving a Ramsey problem is both analytically and numerically complex (when not infeasible) in large models, especially within the business cycle, as well as unrealistic as it does not embody political choices observed in the real world that may depart from optimality. This reason underlies the classical choice of *ad hoc* budget rules in DSGE models.

As an alternative to these rules, we propose a new approach based on a simplified version of the Ramsey problem where the government still maximizes households' utility subject to its transfers/tax revenues budget constraint, however not taking into account all other constraints. Concretely, the government solves the Ramsey problem taking endogenous variables other than public expenditures (such as $C_T^i(\tau)$ and $L_T^i(\tau)$ here) as given. As a result, such a government focuses only on the utility derived by households through the direct action of the government rather than through second turn effects on other endogenous variables. As for budget rules, this remains inconsistent with the DSGE approach of a full knowledge of economic mechanisms by agents. However, this may also be interpreted as a difficulty for fiscal authorities to exactly assess the impact of its policies on the economy.

Closer to the full Ramsey problem, we believe this approach to be more robust to the Lucas critique than traditional budget rules as it partially micro-found the behaviour of the government. However, both approaches suffer from the same paradoxes when embedded in a general equilibrium model solved under rational expectations. First, in order to solve for such a model, expectations of all agents are assumed formed through the entire model. It is then paradoxical to assume that either the government maximizes its objective under a subset of constraints or maximizes an implicit objective through a rule

²As $\bar{p}\bar{a}$, the long-term value of the public asset to GDP ratio, is negative, this indeed implies that public spendings decrease when public debt increases so as to ensure the long-term solvency of the government.

defined outside the model. Second, both modelling are only simple descriptions of fiscal authorities and do not encompass real-world phenomena such as the will of authorities to get reelected that may induce sub-optimal behaviours.³

Program and objective of the government As the government now seeks to maximise the intertemporal flow of utility of households, the analytical government's program at date t is as follows:

$$\max_{G_T^i, PA_T^i} E_t \sum_{T=t}^{\infty} \beta_8^{T-t} \mathcal{U}(C_T^{R,i}, C_T^{NR,i}, L_T^{R,i}, L_T^{NR,i}, G_T^i) \quad (2.2)$$

$$\text{s.t. } PA_t^i = \left(R_{t-1} - \psi^8 \left(\frac{PA_{t-1}^i}{P_{t-1}^i \bar{Y}^i T r_{t-1}} \right) \right) PA_{t-1}^i + v_t^{w,i} W_t^i L_t^i + v_t^{k,i} r_t^{k,i} CPI_t^i K_{t-1}^i \\ + v_t^{c,i} CPI_t^i (C_t^i + I_t^i) + v_t^{D,i} D_t^i + v_t^{FD,i} FD_t^i - P_t^i G_t^i - \Phi_t^i \quad (2.3)$$

where \mathcal{U} is a weighted average of households' utility based on Ricardian ($C^{R,i}$) and non Ricardian households ($C^{NR,i}$) consumptions, labour supplies ($L^{R,i}$ and $L^{NR,i}$) and public consumption (G^i). In addition, PA_t^i denotes the nominal public assets of country i at the end of period t , R_t^i the nominal interest rate, W_t^i real hourly wages, $r_t^{i,k}$ the interest rate paid on physical capital, K_{t-1}^i the capital stock available at the end of period $t-1$, CPI_t^i the relative price of consumption, C_t^i consumption, I_t^i investment, D_t^i dividends paid by non financial firms, FD_t^i financial intermediation dividends, P_t^i the production price, and Φ_t^i are nominal transfers to households. $v_t^{c,i}$, $v_t^{w,i}$, $v_t^{k,i}$, $v_t^{D,i}$ and $v_t^{FD,i}$ respectively denote the tax rate level on consumption, wages, capital revenues, dividends and financial dividends. β_8^i is the government discount factor and ψ^8 is a financial intermediation spread paid by the government depending on its real past net financial position.

Solving for the previous program yields a Euler equation for government consumption that define the behaviour of fiscal authorities in *MELEZE*.

2.3 Steady state and calibration

In the present quarterly model, growth is exogenous. In the long run, all real variables grow at the same rate, that of TFP common to both countries. A full description of the steady state, the associated relationships and the calibration is also given in the companion paper (Campagne and Poissonnier, 2016).

Taking into account all these relationships imposes crucial restrictions on structural parameters, endogenous ratios to GDP, as well as on endogenous variables in level. We calibrate our model as to match the situation of France within the Eurozone over the period 1995-2007, and as to stay coherent with the traditional DSGE literature⁴ for structural parameters. Tables 1 and 2 in the companion paper

³See for instance, the public choice theory literature.

⁴Trabandt and Uhlig (2011), Roeger et al. (2008), Martin and Philippon (2014), Smets and Wouters (2002), Annicchiarico et al. (2013), Vogel (2012), Coenen et al. (2012), Eggertsson et al. (2014), Ratto et al. (2009), Everaert and Schule (2008), Bayoumi et al. (2004), Høj et al. (2007), Kaplan et al. (2014), Bussiere et al. (2011), European Commission's Quest III R&D model for France

present actual data for France and the Euro Area and their corresponding values at steady state, along with the values of the corresponding structural parameters.

3 Laffer curves

First highlighted by Laffer at the end of the 70's, the homonymous curves linking financial revenues to the level of taxation appear as a good outlook of the room for manoeuvre for raising tax revenues in order to reduce indebtedness. As such, we perform a standard analysis of the Laffer curves generated by the model in line with the general equilibrium approach of [Trabandt and Uhlig \(2011\)](#) (T&U henceforth). Their general equilibrium approach has the advantage of taking into account the full model setting when computing tax revenues.

More precisely, to allow comparability with T&U, variations in one tax rate are conducted at constant public transfers. In [Trabandt and Uhlig \(2011\)](#), this type of simulations is referred as *g*-Laffer curves (as opposed to *s*-Laffer curves where tax variations are conducted at constant government spending). Meanwhile, other tax rates are left unchanged, and therefore, the clearing of the government budget constraint is ensured through endogenous public expenditures and debt level modelled in a budget rule. This choice corresponds to the standard behaviour of our model.

	VAT	Labour income tax	Capital income and dividend tax
Tax base (= \overline{TB})	$\overline{RPC}(\overline{C} + \overline{I})$	$\overline{RPC}(1 + \overline{v}^c)(1 + \overline{v}^w)\overline{RW}\overline{L}$	$\overline{RPC}\overline{r}^k\overline{K} + \overline{d}\overline{Y}$
Tax revenues	$\overline{v}^c\overline{TB}^{VAT}$	$\frac{\overline{v}^w}{1 + \overline{v}^w}\overline{TB}^{Labour}$	$\overline{v}^k\overline{TB}^{Capital}$

* Tax on financial dividends are in practice negligible as the tax base is very small.

Real values are expressed with respect to the deflator of public consumption that is the production price.

\overline{X} indicates steady state values and \overline{TB}^X the steady state tax base for tax X. *RPC* stands for relative price of consumption, *C* and *I* for consumption and investment, *RW* for purchasing power of wages VAT included, *L* for hours worked, *K* for the capital stock, *Y* for production and *d* for the profit ratio (non financial dividends). \overline{v}^c corresponds to the consumption tax rate, whereas \overline{v}^w and \overline{v}^k are the labour and capital revenues tax rates.

Table 1: Tax bases and associated tax revenues at steady state

Analytically, at the steady state, tax bases and their associated tax revenues are given by Table 1. Note that as VAT, our model allows the labour tax rate \overline{v}^w to be higher than 100%. This directly reflects the fact that \overline{v}^w is actually paid by firms and represents the tax rate on *net* wages.⁵ In terms of compensation of employees $\overline{RPC}(1 + \overline{v}^w)(1 + \overline{v}^c)\overline{RW}\overline{L}$, the labour tax rate will therefore be $\frac{\overline{v}^w}{(1 + \overline{v}^w)}$ and indeed strictly lower than one. To allow comparison with T&U, labour income tax Laffer curves plotted below are expressed on compensation of employees.

⁵That is after-tax wages paid by firms and actually received by households.

Initial tax rates in both models are given in Table 2, showing comparable calibrations. The large difference in capital income tax rate between the two models is a consequence of different tax bases. Actually, we choose to tax profits in *MELEZE* as we are unable to distinguish between dividends (D) and revenues from physical capital ($\bar{r}^K \bar{K}$) in the data. Absent of dividends in T&U, their capital tax base is therefore smaller and requires a higher tax rate to match data.

	<i>MELEZE</i>	Trabandt and Uhlig (2011)
Consumption tax	20.3%	18.0%
Labour income tax	39.1%	46.0%
Capital income tax	21.0%	35.0%

Labour income tax corresponds to the tax rate on compensation of employees. In *MELEZE*, this rate is given by $v^w / (1 + v^w)$.

Table 2: Tax rates in France

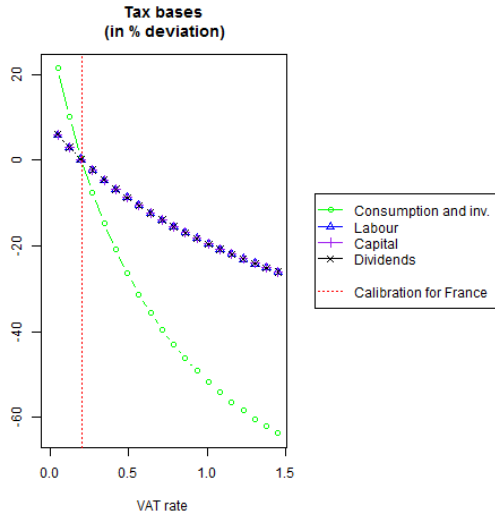
Figure 1 and Table 3 present and describe the steady state Laffer curves in *MELEZE*. Our calibration shows that France is evolving far from the maximum of the Laffer curves. All tax rates stand on the left side of the maximum, that is increasing the tax rate will yield higher tax revenues. The Laffer maximum threshold on the labour tax rate on compensation of employees is around 72%, with additional revenues up to 17%. For capital income taxes, the maximum tax rate is 43% with potential additional tax revenues of 3%. For VAT, as demand for goods persists even at high tax-included prices, tax bases decrease at a moderate pace so that the Laffer curve does not reach a maximum for reasonable values of v^c .

Comparing with Laffer curves derived for France in T&U's neoclassical exogenous growth model, they find a flatter labour Laffer curve with maximum additional revenues of 5% corresponding to a threshold tax rate of 44%. On the contrary, for capital income tax, their calibration shows a maximum tax threshold with additional revenues close to zero.

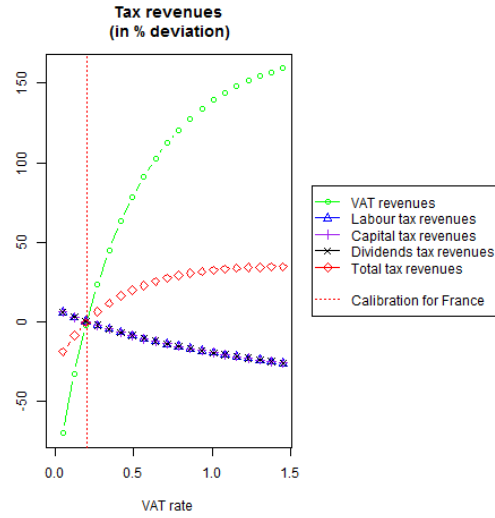
These differences across models may arise from two different potential causes, namely the choice of calibration and the structure of the model.

Calibration of the models First, the authors stress the importance of the Frisch elasticity, that is the elasticity of hours worked to the wage rate, on the shape of the Laffer curves. They show that a decreased Frisch elasticity, that is a more inelastic labour supply, leads to higher potential maximum tax rates. In *MELEZE*, the Frisch elasticity is equal to 1/2, that is equal to T&U baseline calibration. As such, this cannot explain the differences across models.

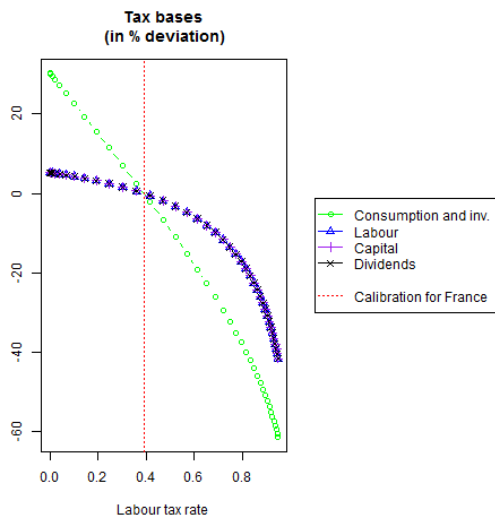
Similarly, T&U explicit a, yet minor, influence of the intertemporal elasticity of substitution of consumption. Recalibrating our model as to match $\sigma_c = 1$ as in T&U does not lead to major changes in our results.



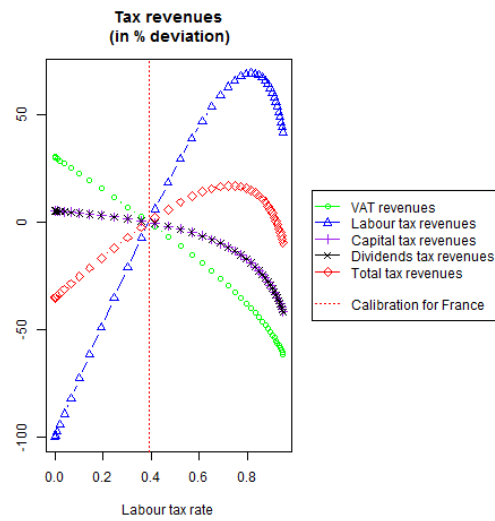
(a) Consumption tax



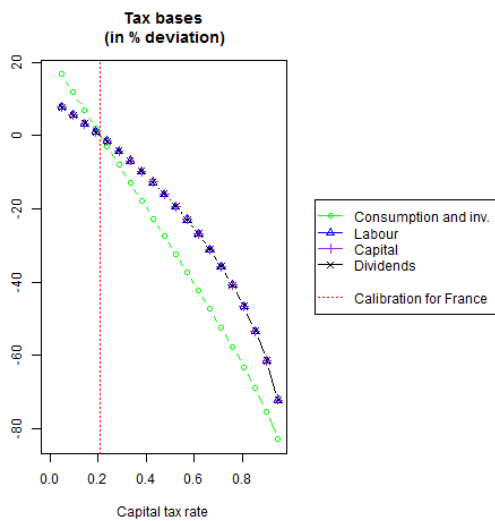
(b) Consumption tax



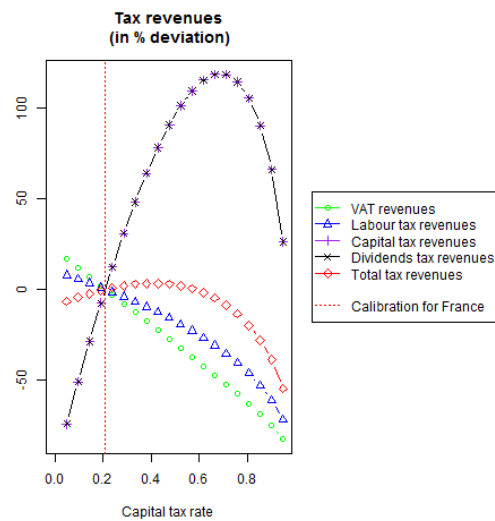
(c) Labour income tax on gross wages



(d) Labour income tax on gross wages



(e) Capital income tax



(f) Capital income tax

Figure 1: Laffer curves - Tax bases and revenues in France

	Model	Variation	Maximum tax rate	Maximum additional revenues
Labour income tax	<i>T&U</i>	<i>baseline</i>	63%	5%
	<i>MELEZE</i>	<i>baseline</i>	72%	17%
		$\theta^1 = \infty$	77%	27%
		$\theta_w^1 = \infty$	72%	17%
		$\mu^1 = 0$	72%	16%
		$\sigma_c^1 = 1$	75%	17%
Capital income tax	<i>T&U</i>	<i>baseline</i>	44%	0%
	<i>MELEZE</i>	<i>baseline</i>	43%	3%
		$\theta^1 = \infty$	24%	0%
		$\theta_w^1 = \infty$	43%	3%
		$\mu^1 = 0$	43%	4%
		$\sigma_c^1 = 1$	43%	3%

T&U refers to [Trabandt and Uhlig \(2011\)](#).

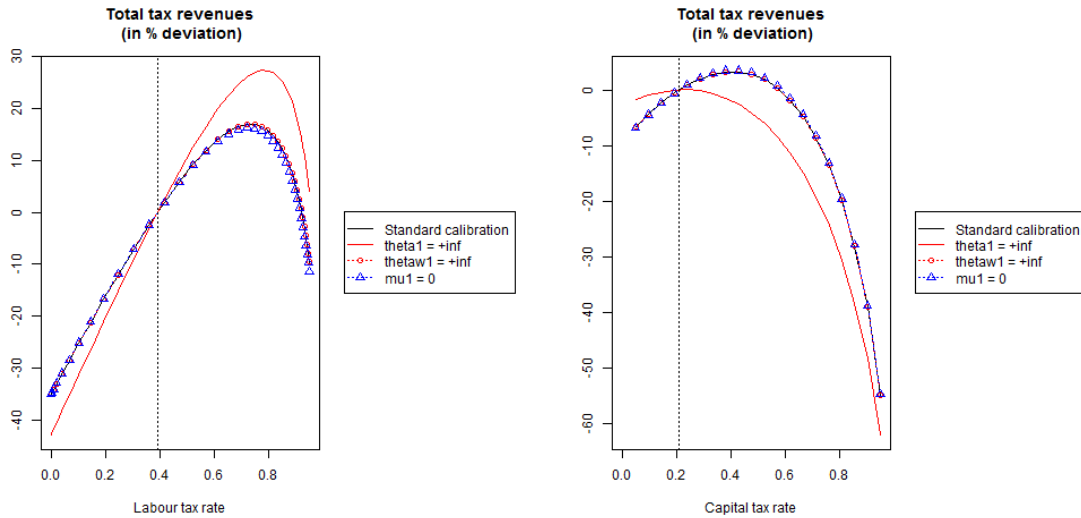
In both models, the inverse Frisch elasticity (σ_l) is equal to 2. The intertemporal elasticity of substitution of consumption is calibrated to $\sigma_c = 1$ in *T&U* against 1.13 in *MELEZE*.

Labour income tax corresponds to the tax rate on gross wages. In *MELEZE*, this rate is given by $v^{wp}/(1+v^{wp})$.

The maximum tax rate and additional revenues correspond to the rate at the maximum of the Laffer curve, and to the revenues at this maximum in comparison to initial calibration revenues.

The case $\theta^1 = \infty$ (resp. $\theta_w^1 = \infty$) corresponds to the absence of real rigidities on prices (resp. on wages), that is the absence of mark-ups. The case $\mu^1 = 0$ corresponds to a zero share of *non Ricardian* agents.

Table 3: Laffer curves comparison for changes in the structure of *MELEZE*



(a) Labour income tax on gross wages

(b) Capital income tax

Figure 2: Laffer curves - Revenues' sensibility to the structure of the model

Concerning the rest of the calibration, *MELEZE* and T&U compare in terms of the share of public consumption or transfers in GDP, the depreciation rate, the inflation rate, the TFP growth rate, the interest rate and the share of capital in the production function. Debt to GDP ratios differ substantially but are explicitly not identified by T&U as a factor influencing the Laffer curves.

Structure of the models One differentiation between *MELEZE* and T&U is the introduction of a fully-fledged open economy framework. T&U introduce open economy effects in a simplified way and stress themselves the weakness of their model in this regard. However, [Auray et al. \(2011\)](#) extends T&U framework in a two country setting and show no major differences in Laffer curves induced by trade openness.⁶

An other point of differentiation is the neoclassical structure of T&U model. T&U model is a neo-classical framework with firms trading on perfectly competitive markets. In *Meleze*, the neo-Keynesian structure with the introduction of monopolistic competition leads to a distorted steady state.

As depicted on Figure 2a, the existence of price mark-up distortions at steady state in *MELEZE* implies considerable changes for the Laffer curves, increasing observed differences with T&U. With perfectly substitutable goods ($\theta^i = \infty$), price mark-ups disappear and we observe an increase in the maximum labour income tax rate and additional revenues, as well as a decrease for the maximum capital income tax rate and additional revenues. Indeed, as distortions decrease, profits and dividends disappear resulting in a smaller tax base for capital and therefore a lower tax potential. Simultaneously, labour supply increases leading to higher fiscal labour income tax revenues.

On the contrary, monopolistic competition on the labour market (wage mark-up), and the presence of *non Ricardian* agents are of minor influence on the results.

One should also be cautious about the interpretation of these Laffer curves for policy analysis. Indeed, in our model, (*installed*) capital is considered immobile across countries and therefore no tax base evasion and international fiscal competition takes place. Though to a lower extent, the same phenomenon for labour is also excluded from our model. In addition, DSGE models including *MELEZE* rarely model tax evasion to the grey economy. In all, these Laffer curves may reflect more favourable tax environments than reality with larger maximum thresholds and potential tax revenues.

Lastly, [Fève et al. \(2013\)](#) highlight the importance of market completeness for the previous results to hold. Indeed, in an incomplete market setting with heterogeneous agents and a government budget constraint adjusted through debt, they obtain S-shaped Laffer curves arising for crowding out effects of private assets by public ones. In this case, identical tax revenues can be associated to up to three different tax rates with concrete implications for policy decisions.

⁶Note that this is mainly conditional to the fact that both *MELEZE* and [Auray et al. \(2011\)](#) models assume internationally immobile factors of production.

4 Transitory stimuli and fiscal multipliers

We perform a second standard policy exercise, namely the simulations of fiscal reforms focusing in particular on the size of fiscal multipliers. To better understand the mechanisms at work, we compare our model to other institutional DSGE models for Europe developed at the IMF, the OECD, the ECB and the European Commission. Based on these models, [Coenen et al. \(2012\)](#) implement and compare various fiscal stimulus packages and measure instantaneous fiscal multipliers for these models, concluding to strong similarities across models. However, and although our model is in line with these benchmarks, this section aims at giving a deeper understanding of factors influencing the size of fiscal multipliers.

4.1 Fiscal multipliers dependency to the model class

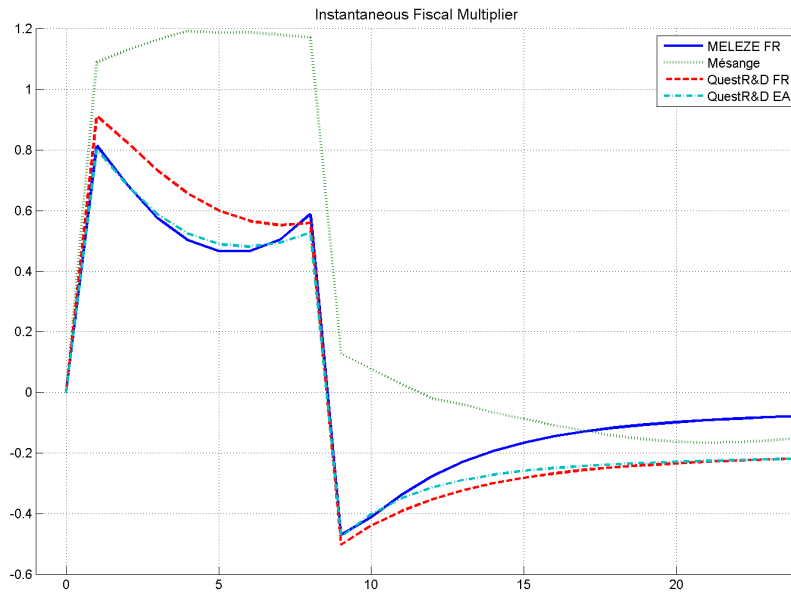
We implement a two-years increase in public spendings amounting to 1% of *ex-ante* output, with no monetary accommodation. Classically, we define the instantaneous fiscal multiplier as the ratio of the change in output to the 1% increase *ex ante*.

Following this stimulus, we find that the fiscal multiplier is lower than one both for our model and the R&D version of QuestIII (Figure 3a). This result is in line with other DSGE models (Figure 3b) with multipliers ranging from 0.8 to 0.9 in all *European* models (namely OECD's Fiscal, EC's Quest, ECB's NAWM and IMF's GIMF).

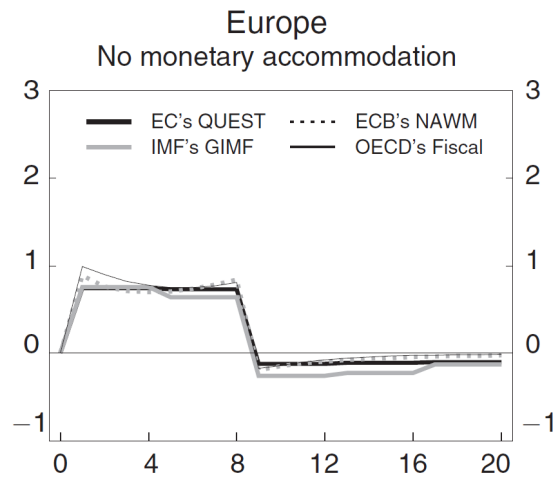
With the macroeconomic model *Mésange* ([Klein and Simon, 2010](#)) however, the instantaneous fiscal multiplier is larger than one making this model more *Keynesian* than the otherwise *neo-Keynesian* DSGEs. First of all, the smaller size of the fiscal multiplier in DSGE models compared to *Mésange* model comes from the central bank's response (interest rates being exogenous in *Mésange*). In traditional DSGE models, an increase in final demand by the government represents a potentially inflationary pressure and the central bank's Taylor rule advocates an increase in the nominal interest rate that mitigates the favourable effects of the public spendings stimulus. As we show in the next section, in the presence of monetary accommodation, that is when the nominal interest rate is kept temporarily constant, fiscal multipliers increase further in our model (and in other DSGE models) and compare to the size observed in the *Mésange* model.

More generally, the backward structure of macroeconomic models⁷ does not allow the design of complex Taylor rules based on inflation expectations. However one can implement rules similar to the one in *Meleze* based on contemporary inflation. In the case of *Mésange* and as France shares a common monetary policy with other Eurozone members, the absence of economic spillovers and feedbacks with other members limits the impact of a Taylor rule as France represent only a fifth of the Eurozone.

⁷With the exception of a few hybrid models such as the FRB-US at the FED including expectations.



(a) ... in *Meleze*, *QuestIII R&D*, and *Mésange*



(b) ... in *QuestIII*, *NAWM*, *GIMF* and *OECD's Fiscal*

Government spendings increase for 2 years by 1 percent of *ex ante* output. In the upper figure, fiscal multipliers are plotted for France only in *Meleze* and *Mésange*, and both France and the Euro Area for *QUEST III R&D*. The lower figure is taken from [Coenen et al. \(2012\)](#). Note that for *Quest III*, responses are annualized in the bottom panel.

Figure 3: Instantaneous fiscal multipliers for a two-year increase in government consumption

4.2 Policy implementation sensitivity of fiscal multipliers

We now turn to a sensitivity analysis of the size of fiscal multipliers with respect to the policy implementation of the shock. In particular, we focus on the dependency to the duration of the shock and the behaviour of both the government and the central bank.

Monetary and fiscal accommodation Fiscal multipliers depend on the way both the fiscal and monetary authorities respond to the stimulus, that is the way they are modelled. We consider three different variants for a two years increase in public spendings equal to 1% of pre-stimulus output: (i) the benchmark case where the government and the central bank set their decisions *as usual* (no accommodation), (ii) the case where monetary policy accommodates the fiscal authority's decision by keeping its interest rate at the steady state level and (iii) the case where the government also commits to its decision by not reacting to the transitory increase in public debt. We run these simulations with either our forward looking optimizing government or with an acyclic budget rule taken from Corsetti et al. (2010) (Figure 4a).

Monetary accommodation, by not raising the interest rate following an inflationary increase in final demand, magnifies the fiscal multiplier (Figure 4a). Indeed, as the nominal interest rate remains unchanged, the increase in inflation expectations lowers the real interest rate therefore fostering private consumption and investment. When the government commits to the increase in public spendings and the central bank is accommodative, the fiscal multiplier is now larger than one with an order of magnitude comparable to the *Mésange* model but with a different timing likely due to the absence of expectations in *Mésange*. In particular, and up until the end of the transitory shock, the fiscal multiplier remains high in *Mésange*, whereas it decreases before the end of the shock in *Mélèze* due to the anticipated recession by households.

Moreover, when the government is modelled as forward looking and with our calibrations, it compensates its own spending shock through the endogenous level of public spending more rapidly than with a budget rule, which mitigates the fiscal multiplier. It does so by anticipation of higher future debt.

Duration The duration of the shock mitigates the size of the fiscal multiplier (Figure 4b). With a one quarter (unexpected) increase in public spendings, the fiscal multiplier is larger than one. The longer is the fiscal stimulus, the smaller is the multiplier and the larger is the after effect when the reform is abrogated. This compares to empirical work on the French public spending multiplier as presented in Cléaud et al. (2013). Estimating an SVAR over the period 1980-2010, and following a one quarter shock, they exhibit a 1.1 instantaneous multiplier, close to our corresponding simulation.

This stems from both the need for the government to decrease spendings after the end of the stimulus to reimburse past deficits, and from today's expectations of households about this changes in the fiscal stance.

	<i>Coenen et al.</i>		<i>MELEZE</i>	
	US	EU	EA	FR
Government consumption	1.55	1.52	1.66	0.99
Targeted Transfers (to <i>non Ricardians</i>)	1.30	1.12	1.58	0.68
Consumption taxes	0.61	0.66	0.46	0.53
General transfers	0.42	0.29	0.66	0.27
Corporate income taxes	0.24	0.15	0.09	0.04
Labour income taxes	0.23	0.53	0.59	0.58

We assume that fiscal stimuli of 1 percent of *ex ante* output are implemented for 2 years. The first two columns correspond to [Coenen et al. \(2012, Table 3\)](#).

Table 4: Average first-year instantaneous multipliers from different types of fiscal stimulus

All in all, we stress that one should be particularly cautious to identify the underlying policy implementation when referring to fiscal multipliers. Indeed, the mere quantification of fiscal multipliers is hard to directly transpose into policy evaluations, timeliness and the political context being crucial determinants of their size.

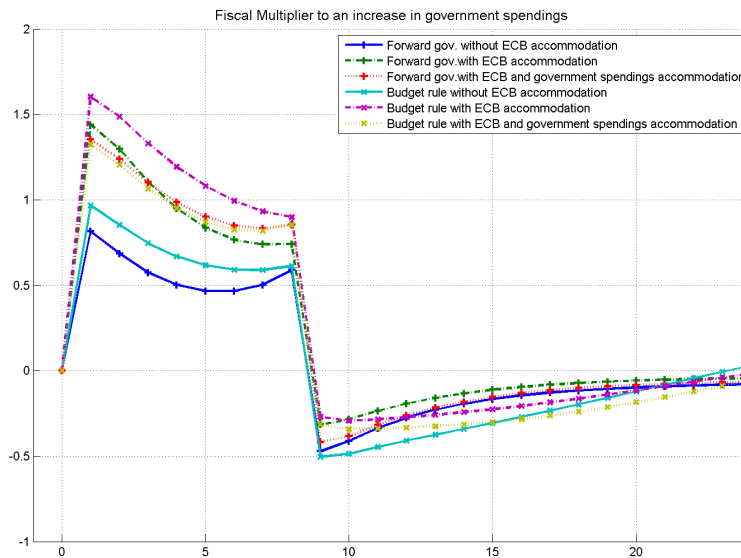
4.3 Fiscal multipliers of other policy instruments

We evaluate the fiscal multipliers of other fiscal stimulus with the same method as for government spendings: we implement a fiscal stimulus (decrease in tax rate or increase in transfers) equal to 1% of *ex ante* output for two years. Results presented in [Table 4](#) are compared with equivalent simulations for Europe presented in [Coenen et al. \(2012\)](#). As [Coenen et al.](#) did, we average out the fiscal multipliers of the first year over the different simulations we have run (accommodative fiscal and/or monetary policy, budget rule or forward looking optimizing government). We also perform equivalent stimulus in the Euro Area as a whole by implementing the same shock in the two countries of our symmetric calibration. The comparison of the fiscal multipliers in this case and in the France only case measure the benefits of coordination of fiscal stimuli in a monetary union.⁸

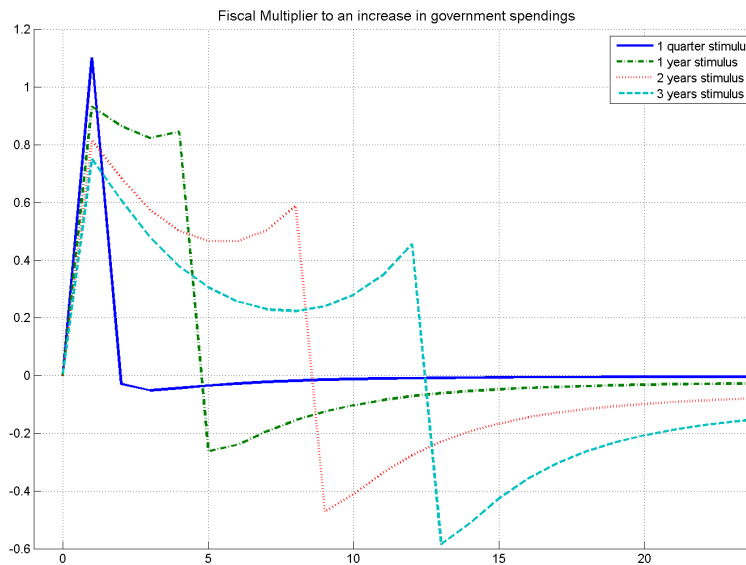
By and large, fiscal multipliers for the Euro Area computed with *Meleze* compare with the results from [Coenen et al. \(2012\)](#) presented in the Table, as well as with [Roeger and in't Veld \(2010\)](#). A first result robust through the models is that only the fiscal multipliers to government spendings or transfers can be larger than one. This is only the case when the central banker accommodates the demand shock by temporarily keeping its interest rate unchanged. An other robust result is the low impact of fiscal stimuli targeted on capital (corporate income tax) relative to other stimuli directly affecting households.

When implemented in the Euro Area as a whole (closed economy) the fiscal multipliers are systematically larger than when the fiscal stimulus is implemented only in France (except for VAT). Coordination is thus an important aspect of fiscal policies to improve their efficiency.

⁸The results remain conditional to the immobility of labour and capital throughout the monetary union.



(a) ... depending on monetary policy accommodation and government's behaviour



(b) ... lasting from one quarter to 3 years

We assume that government spendings are increased by 1 percent of *ex ante* output. In the upper figure, we compare the fiscal multiplier in *Meleze* for France, in the cases where the ECB maintain its interest rate constant or not and whether the government is forward looking or follows a budget rule. We also consider a transitory perfect commitment to public expenditures in which case the government does not react to its spending shock. In the lower figure, we compare the fiscal multiplier in our model for France for 1 quarter, 1,2 or 3 years stimuli.

Figure 4: Instantaneous fiscal multiplier to a transitory increase in government spending by 1% of initial output

However these numbers hide large disparities across simulations. Without considering a deeper sensitivity analysis (with respect to elasticity parameters in particular) there is already a 0.2 to 1 point variability around the baseline for each multiplier.

5 Permanent fiscal reforms

Having looked at transitory fiscal stimuli, we now turn to the effect of permanent fiscal reforms on the economy.

5.1 Tax hikes

In this first part, we look at three different tax hikes, namely, permanent increases in the labour income tax rate, the value added tax rate and the capital income tax rate. We calibrate the reforms to an increase in *ex ante* tax receipts of 1% of initial GDP. In order to allow comparison with the standard macroeconomic model for France *Mésange*, simulations are conducted at constant public expenditures.⁹

Labour income tax In this paragraph, we look at a permanent increase in the labour income tax of 1% of initial GDP. In *MELEZE*, we name labour income tax, the only taxation that applies to labour and paid by firms. As such, unable to actually distinguish between income tax, or social contributions, we compare the results to a weighted combination of four different simulations obtained in *Mésange* regarding permanent increases in the labour income tax, employers'-, employees'- or generalized social security contributions. Results are presented in Table 5.

Following the increase in the labour income tax, households' revenues decrease and therefore private consumption. This decrease affects production and decrease imports relatively more than exports as foreign demand is only affected by second round price effects. As such, the trade balance temporarily improves. Moreover, this increased taxation of compensations paid by firms to workers transmits negatively to wages, decreases labour supply, and further weights on production.

In the long run, the increased taxation of labour revenues permanently distorts the consumption-leisure arbitrage and depletes labour supply, consumption and production. Spillover effects are negligible.

All in all, the impact on the economy compares with the econometric model *Mésange*. Nevertheless, we observe differences in the magnitude of responses with stronger recessionary effects in the short run but weaker ones in the long run.

⁹This corresponds to simulations in the budget rule version of *MELEZE*, where the budget rule is shut down for a large number of period. As a consequence of this choice, we approach permanent shocks by the No Terminal Condition method described in Roeger (1999). Indeed we simulate a quasi permanent shock to allow intermediary convergence to the new *after reform* steady state.

	in % deviation from steady state					
	1Y	2Y	3Y	5Y	10Y	LR
	<i>MELEZE</i>					
GDP (France)	-0.95	-1.05	-0.82	-0.62	-0.60	-0.62
GDP (RoE)	0.02	0.01	0.00	-0.01	-0.01	-0.02
Consumption	-1.47	-1.60	-1.36	-1.23	-1.25	-1.29
Net real wages	-0.88	-1.47	-1.73	-1.89	-1.92	-1.95
Hours worked	-1.44	-1.52	-1.06	-0.66	-0.60	-0.59
Return on capital	-0.44	-0.94	-0.59	-0.16	-0.07	0.00
Investment	-1.38	-2.16	-1.85	-1.04	-0.74	-0.69
Euribor	0.02	0.01	0.00	0.00	0.00	0.00
Inflation	0.08	-0.12	-0.06	0.01	0.00	0.00
Trade balance	0.15	0.22	0.22	0.19	0.18	0.17
	<i>Mésange</i>					
GDP (France)	-0.36	-0.74	-0.89	-0.98	-1.04	-1.27
Consumption	-0.72	-1.49	-1.73	-1.75	-1.73	-1.92
Net real wages	-0.86	-1.08	-1.25	-1.40	-1.50	-1.79
Investment	-0.49	-0.90	-1.04	-1.08	-1.05	-1.34
Trade balance	0.19	0.35	0.34	0.26	0.18	0.10

Y stands for year and LR for long run. RoE means Rest of the Eurozone.

SSC stands for Social Security Contributions.

For these simulations, public expenditures are kept exogenous and growing at the rate of TFP. As such, debt convergence is not ensured and public liabilities diverge, so that we set $\psi = \psi^s = 0$ to avoid feedbacks through explosive financial spreads. In addition, we set $r^y = 0$ to implement a strict inflation-targeting rule.

Some lines are kept unreported for *Mésange* as they do not exist (e.g. foreign GDP) or do not easily compare with *MELEZE* (e.g. labour supply).

In *MELEZE*, the distinction between labour income taxes, employers', employees' and generalized social contributions being impossible, we report a linear combination of all the corresponding simulations in *Mésange*. Weights are as follows: employer's SSC (44.4%), employees' SSC (23.7%), generalized SC (15.3%) and labour income tax (16.6%), corresponding to their share in total revenues in 2007. Disaggregated simulations results for *Mésange* are presented in Klein and Simon (2010).

Table 5: Responses to a permanent labour income tax increase for 1% of initial GDP

VAT In this paragraph, we look at a permanent increase in the value added tax of 1% of initial GDP. Comparison with *Mésange* is here straightforward. Results are presented in Table 6.

As VAT increases, households' revenues decreases as net real wages drop. Hence, private consumption, labour supply and production decreases. The VAT hike also negatively affects imports (relatively to exports) and therefore the trade balance improves in the short and long term.

In the long run, the reform remains recessionary as labour supply, consumption and investment are permanently decreased. Spillover effects are negligible.

Again, the results compare qualitatively to *Mésange*. More generally, the recessionary impact of the reform is stronger in *MELEZE*.

	in % deviation from steady state					
	1Y	2Y	3Y	5Y	10Y	LR
<i>MELEZE</i>						
GDP (France)	-0.76	-0.58	-0.50	-0.53	-0.63	-0.93
GDP (RoE)	0.03	0.02	0.00	-0.01	-0.01	-0.03
Consumption	-1.41	-1.10	-0.97	-1.03	-1.14	-1.51
Net real wages	-1.12	-1.29	-1.39	-1.50	-1.58	-1.85
Hours worked	-1.14	-0.77	-0.52	-0.39	-0.36	-0.29
Return on capital	-1.10	-0.70	-0.34	0.04	0.31	1.12
Investment	-1.71	-2.62	-2.65	-2.43	-2.31	-2.13
Euribor	0.02	-0.01	-0.01	-0.01	-0.01	0.00
Inflation	-0.28	-0.12	-0.01	0.02	0.01	0.00
Trade balance	0.25	0.33	0.34	0.31	0.29	0.24
<i>Mésange</i>						
GDP (France)	-0.33	-0.54	-0.76	-0.96	-0.95	-0.84
Consumption	-0.54	-0.94	-1.25	-1.39	-1.43	-1.45
Net real wages	-0.81	-0.65	-0.99	-1.43	-1.88	-1.98
Investment	-0.61	-0.80	-0.99	-1.21	-1.13	-1.18
Trade balance	0.25	0.26	0.26	0.22	0.16	0.25

Y stands for year and LR for long run. RoE means Rest of the Eurozone.

For these simulations, public expenditures are kept exogenous and growing at the rate of TFP. As such, debt convergence is not ensured and public liabilities diverge, so that we set $\psi = \psi^s = 0$ to avoid feedbacks through explosive financial spreads. In addition, we set $r^y = 0$ to implement a strict inflation-targeting rule.

Some lines are kept unreported for *Mésange* as they do not exist (e.g. foreign GDP) or do not easily compare with *MELEZE* (e.g. labour supply).

Simulations results for *Mésange* are presented in Klein and Simon (2010).

Table 6: Responses to a permanent VAT increase for 1% of initial GDP

Capital income tax In this paragraph, we look at a permanent increase in the capital income tax of 1% of initial GDP. No comparison with *Mésange* is conducted due to the absence of such a simulation

in Klein and Simon (2010). Results are presented in Table 7.

Following an increase in the taxation of capital, investment is logically strongly penalized both in the short and long run. In the short run, the increase in the capital income tax translates into consumption and labour supply decreases. Given sluggish adjustments in wages and in the stock of capital, this fall in the labour (supply) implies a fall in the return on capital (as the marginal productivity of capital falls). All in all, labour, consumption, investment and output decrease.

Moreover, the decrease in investment implies a permanent decrease in revenues for Ricardian households. As such, in the long run, consumption decreases and labour supply stagnates. As a result the impact of the reform is strongly recessive. Spillover effects are still small but stronger than for labour income tax and VAT hikes.

	in % deviation from steady state					
	1Y	2Y	3Y	5Y	10Y	LR
	<i>MELEZE</i>					
GDP (France)	-0.83	-0.82	-0.79	-0.98	-1.27	-2.26
GDP (RoE)	0.20	0.10	0.04	0.02	0.02	-0.07
Consumption	-1.04	-0.69	-0.53	-0.72	-1.07	-2.24
Net real wages	-0.11	-0.45	-0.71	-1.02	-1.27	-2.12
Hours worked	-1.21	-0.95	-0.59	-0.30	-0.21	0.00
Return on capital	-1.22	-0.83	-0.13	0.90	1.75	4.34
Investment	-4.06	-6.89	-7.48	-7.28	-6.99	-6.46
Euribor	-0.01	-0.03	-0.04	-0.04	-0.03	0.00
Inflation	-0.41	-0.21	-0.03	0.05	0.04	0.00
Trade balance	0.36	0.53	0.56	0.50	0.44	0.28

Y stands for year and LR for long run. RoE means Rest of the Eurozone.

For these simulations, public expenditures are kept exogenous and growing at the rate of TFP. As such, debt convergence is not ensured and public liabilities diverge, so that we set $\psi = \psi^s = 0$ to avoid feedbacks through explosive financial spreads. In addition, we set $r^y = 0$ to implement a strict inflation-targeting rule.

Table 7: Responses to a permanent capital income tax increase for 1% of initial GDP

5.2 Increase in public spendings

We now turn to the response of the economy to a *permanent* increase in government spendings by 1% of *ex ante* output. Contrary to a transitory fiscal stimulus financed by debt (but leaving the long term debt target unchanged), a permanent stimulus raises the question of long-term financing. This can be achieved either by raising taxes, increasing the long-term debt to GDP ratio or decreasing lump-sum transfers to households. In the present section and to allow comparison with Coenen et al. (2012), the long-term additional cost induced by higher public spendings is financed through lower lump-sum transfers. These transfers adjust following an *ad hoc* rule inspired by Quest III (R&D) model, and

	in % deviation from steady state					
	1Y	2Y	3Y	5Y	10Y	LR
	<i>MELEZE</i>					
GDP (France)	0.80	0.51	0.44	0.54	0.78	0.77
GDP (RoE)	-0.09	-0.04	-0.01	0.01	0.00	-0.01
Consumption	-0.12	-0.52	-0.78	-1.02	-0.84	-0.62
Net real wages	-0.08	-0.07	-0.11	-0.19	-0.06	0.07
Labour supply	1.24	0.79	0.69	0.81	0.88	0.75
Return on capital	1.16	0.74	0.60	0.58	0.23	0.00
Investment	-0.03	-0.18	-0.02	0.91	1.56	0.82
Euribor	0.00	-0.01	-0.02	-0.04	-0.04	-0.04
Inflation	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04
Trade balance	-0.06	-0.05	-0.02	0.01	0.00	0.00

Y stands for year and LR for long run. RoE means Rest of the Eurozone.

For these simulations, public expenditures (increase included) are kept exogenous and growing at the rate of TFP. Debt convergence is ensured through endogenous public transfers such as specified in the text.

Table 8: Responses to a permanent increase in public expenditures for 1% of initial GDP

respond to changes in the debt gap from its long-term target and changes in growth rate of deficit.¹⁰

$$\bar{\phi}^1(\hat{\phi}_t^1 - \hat{\phi}_{t-1}^1) = \frac{0.01}{\bar{p}a^1} \hat{p}a_{t-1}^1 + \frac{0.1}{\bar{p}a^1} (\hat{p}a_t^1 - \hat{p}a_{t-1}^1) \quad (5.1)$$

where $\hat{p}a_t$ represents public assets, and $\hat{\phi}_t$ lump-sum transfers to households, deviations from their steady-state values. $\bar{\phi}$ and $\bar{p}a$ respectively are the steady state transfers to GDP and public assets to GDP ratios.

Responses of the economy are given in Table 8, whereas instantaneous and cumulative¹¹ fiscal multipliers computed in Coenen et al. (2012) are given in Figure 5.

Following an increase in government spendings, production increases. The mechanism is identical to the one presented in Baxter and King (1993). Indeed, as government expenditures increases, transfers are reduced creating a negative wealth effect. This in turn creates an incentive for households to consume less and to supply more labour. As labour supply increases, so does both labour and the marginal productivity of capital, also leading to an increase in investment/capital. In the long-run, output demand increases as government demand increases more than households consumption decreases (in part due to the shape of the marginal utility of consumption). Also, as labour and capital also increase, output supply increases. All in all, at equilibrium, this implies a permanent increase in production.

¹⁰However, and contrary to Quest III, we do not include an additional adjustment through endogenous variations in the labour income tax rate.

¹¹See Uhlig (2010).

As exposed in [Baxter and King \(1993\)](#), this mechanism crucially relies on the financing of government spendings. Indeed, in the present case, as expenditures are financed through lump-sum taxes, the decrease in transfers only leads to a wealth effect but does not distort the economy. Financing expenditures by increases in the income tax rate, as is also common in the DSGE literature, introduces distortions in the labour supply that decrease employment. As such, labour can decrease at equilibrium, but also investment and capital as the marginal productivity of capital will be lower. All in all, the effect on output can turn to be negative in the long-run.

Quantitatively, we obtain an instantaneous first quarter fiscal multiplier of 0.9, close to that of a two-year stimulus (see [Figure 4a](#)). However, due the previously mentioned negative wealth effect induced by lower transfers in the medium and long-run, the average first-year multiplier decreases to 0.8. In the long-run, a positive fiscal multiplier of 0.77 remains. Those results are close to simulations for Europe presented in [Coenen et al. \(2012\)](#) and for France presented in [Kilponen et al. \(2015\)](#) with a long-run multiplier of 0.82.

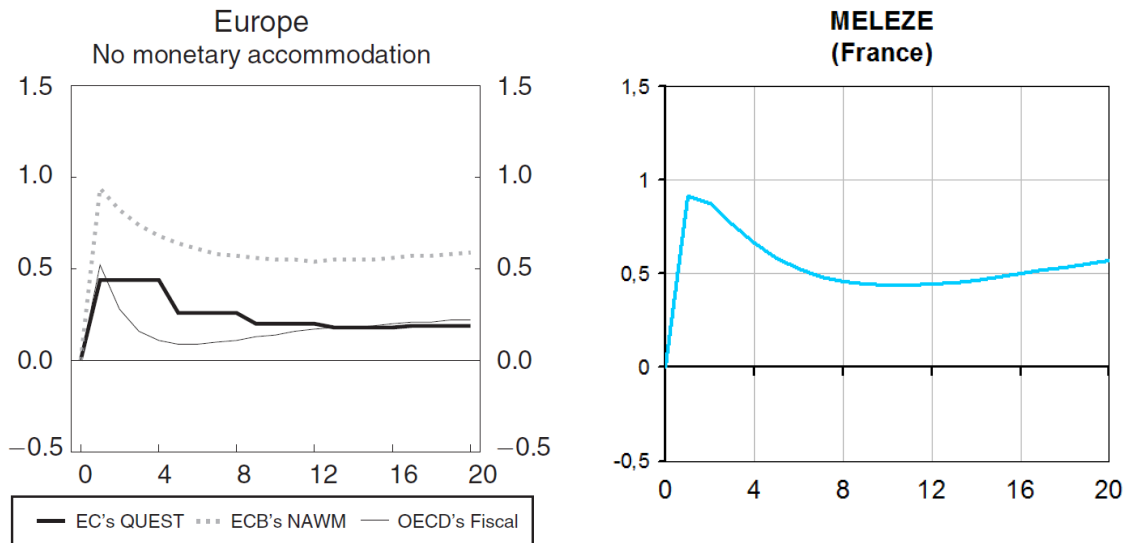
Additional simulations financing public expenditures with an increase in the income tax rate leads to an adverse outcome with a long-run multiplier of -1.30 close to -1.28 obtained for France in [Kilponen et al. \(2015\)](#). In addition, the presence of public consumption in the utility function tends to mitigate the short-run multiplier but with no effect on the long-run one.

5.3 Implications for fiscal consolidation

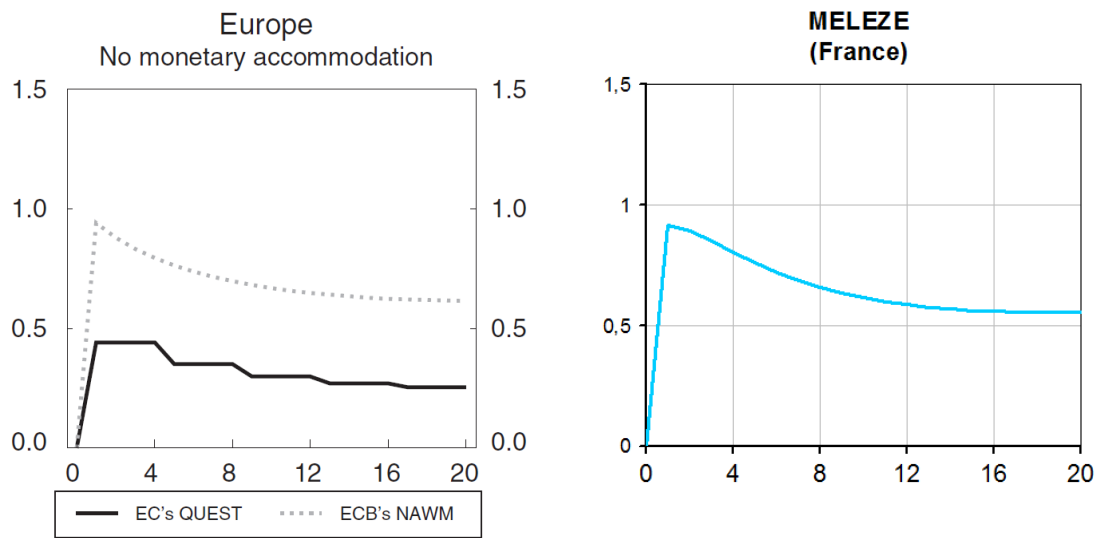
As public debt levels remain high in the Eurozone, one can naturally wonder what are the implications of previous simulations for the design of fiscal consolidation programs. Indeed, we can easily compare [Tables 5, 6, 7 and 8](#) and see that different fiscal adjustment tools have different short-term and long-term effects. For instance, increasing labour income taxes is more detrimental to short- and medium-term activity than a consumption tax increase.¹²

More generally, a large number of papers shows short-term weaker but long-term stronger recessionary effect of distortionary tax increases in comparison to expenditure-based fiscal consolidations. As such, [Clinton et al. \(2011\)](#), [Roeger and in't Veld \(2010\)](#), [Erceg and Lindé \(2013\)](#), [Coenen et al. \(2008b\)](#), [Annicchiarico et al. \(2013\)](#), [D'Auria et al. \(2009\)](#) all plead in favour of so called *mixed strategies*. Actually, they advocate for fiscal consolidations based on an immediate, sharp but transitory increase in taxes along with a permanent but gradual decrease in government spendings. Such packages simultaneously ensure a permanent and immediate decrease in public deficits (and therefore long-term debt) but also minimize the negative impact on activity. On top of that such a design allows to benefit from the long-term positive impact of debt service reduction, without the detrimental effect of permanent

¹²However, in *MELEZE* and as opposed to larger models, this results is inverted after 10 years. This relies to the fuzzy definition of labour taxes in our model that are ultimately borne by both firms and households. Larger models usually introduce a distinction between households and firms labour taxation. As such, an increase in labour taxes fully weights on households with a stronger recessionary effect.



(a) Instantaneous multipliers



(b) Cumulative multipliers

Coenen et al. (2012) assume a permanent increase in government spendings by 1 p.p. of *ex ante* output. The increase in government expenditures is financed through either a decrease in lump-sum transfers to households or labour taxes depending on the adjusting fiscal tool in each model.

Figure 5: Fiscal multiplier for a permanent increase in government expenditures

higher distortionary taxes.

However, [Clinton et al. \(2011\)](#), [Roeger and in't Veld \(2010\)](#), [Erceg and Lindé \(2013\)](#) also insist on the importance of government credibility for the implementation of mixed strategies. Indeed, fiscal consolidation packages relying on transitory increase in taxes need to be perceived as such, and households must expect a decrease in taxation in the long-run. However, data tends to show that this might not always be the case, and the potential lack of public commitment might severely hinder the benefits of mixed strategies.

As an additional and concluding remark, the two country setting of *MELEZE* also shows that spillovers from fiscal consolidation within the Eurozone are relatively small, corroborating [Forni et al. \(2010\)](#) results. However, these results might differ when considering a full international model as in [Clinton et al. \(2011\)](#) extended to non-euro countries, as global reduction in public debt levels can lead to a permanent decrease in the real interest rate generating strong spillovers. As such, the international dimension of policy coordination should not be overlooked.

6 Conclusion

In a neo-Keynesian model for France within the Euro-Area, we analyse the impact of fiscal reforms. Our model includes the traditional *ingredients* of modern large-scale institutional DSGE models such as real and nominal rigidities, capital adjustment costs, *non Ricardian* agents, and a detailed public finance block, and therefore easily compares to the existing literature.

First, we derive generalized equilibrium Laffer curves as specified in [Trabandt and Uhlig \(2011\)](#). Contrary to their paper, our model includes monopolistic imperfections which we find responsible for a slight increase in the potential additional revenues from capital taxation. In the end, French tax rates are found to be below the revenue maximizing rates.

In a second step, we simulate both transitory and permanent shocks for various fiscal instruments. The fiscal multipliers are comparable to existing institutional DSGEs as summarized in [Coenen et al. \(2012\)](#) but also to the macroeconometric model *Mésange* ([Klein and Simon, 2010](#)). However, depending on the specification of fiscal and monetary authorities, fiscal multipliers variations are substantial, from 0.2 up to 1 point around the baseline in the most extreme case, with therefore very different implications in terms of policy-making.

All in all, the evaluation and the design of efficient fiscal packages is not a straightforward task. The monetary environment, the competition level, the international setting or the heterogeneity of households are only a few of the factors influencing the success of different policies. However, the large

number of fiscal tools within the scope of policy-makers allows for some room of manoeuvre in the design of better programs, as advocated in the *mixed strategies* literature.

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