FISCAL POLICY IN A SMALL EURO AREA ECONOMY*

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ABSTRACT

This article discusses the role of fiscal policy in a small open economy of the euro area. In the context of a general equilibrium model, results suggest that fiscal policy can play an active role in stabilising the business cycle, having effects on production and households consumption. The analysis of the impact of fiscal measures should not, however, focus exclusively on its short-run effects, ignoring the medium-run impacts of the exit strategies necessary to ensure a sustainable path of public debt. Results suggest that, if fiscal stimulus measures are implemented, these should be temporary and that the adequate time lag to return to the initial fiscal stance depends, among other factors, on the evolution of the sovereign debt risk premium.

1. Introduction

This article discusses the role that fiscal policy can play in a small open economy integrated in a monetary union. The analysis is based on results obtained in Almeida, Castro, Félix and Maria (2010a, 2010b), in the context of a general equilibrium model called *PESSOA*. There are several reasons to use this type of models, among which the separation of economic impacts throughout several time horizons, divided by different markets, as well as the formal identification of the main transmission channels.[1]

The analysis of the effectiveness of fiscal policy instruments is usually centered on its immediate or short-run effects. However, the macroeconomic impacts of fiscal programs go beyond that horizon, namely due to the need of ensuring a sustainable path for public debt. In this article it is assumed, in particular, that the authorities announce with credibility that they intend to recover the initial fiscal stance, existing before the implementation of the fiscal programs, whether they are of a temporary or permanent nature. The analysis presented in this article also focuses on the macroeconomic impacts of alternative exit strategies, which may take place during different time horizons, and bring about changes in the sovereign debt risk premium.

The next section presents *PESSOA*, in a stylised and succinct way, with emphasis on the role of the government and households, and describes the fiscal program. Section 3 presents the macroeconomic implications of alternative fiscal policy measures. Section 4 evaluates the macroeconomic impact of alternative exit strategies that always garantee that the fiscal stance is paleced back in its initial position. Finally, section 5 presents the main conclusions.

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1 A comparative analysis using general equilibrium models can be found in Cwik and Wieland (2010) and Coenen, Erceg, Freedman, Furceci, Kumhof, Lalonde, Laxton, Lindé, Mourougane, Muir, Mursula, de Resende, Roberts, Röeger, Snudden, Trabandt and in't Veld (2010).

2. *PESSOA*: A general equilibrium model

The role that fiscal policy can play in a small open economy of the euro area is analysed in a context of a general equilibrium model named *PESSOA* (Almeida *et. al.*, 2010c), created and calibrated to incorporate the distinct elements of an economy with these characteristics. As in Adolfson *et al.* (2007), it is assumed that the external environment is imune to developments in the small open economy. In the case of an economy integrated in the euro area, this assumption implies that domestic shocks do not affect monetary policy decisions. In this context, nominal stability is ensured by assuming perfect credibility of the inflation target, set by the ECB in the case of the euro area. Dynamic stability, in turn, is ensured by the adjustment of international trade to fluctuations of the real exchange rate, in a context where the nominal rate is irrevocably fixed and is fully credible. To use an expression from Giavazzi and Paganno (1988), the small open economy in *PESSOA* is effectively "tying its hands" with the rest of the euro area members.

PESSOA closely follows the Global Integrated Monetary and Fiscal Model (Kumhof, Muir, Mursula and Laxton, 2010). Households are non-Ricardian, following the overlapping generations model with stochastic finite lifetime proposed in Blanchard (1985) and Yaari (1965). This enables a more realistic response of economic agents to fiscal policy shocks than the one obtained in an infinitely lived framework. The model is intrinsically New-Keynesian, assuming monopolistic competition and nominal rigidity in both the labour and product markets – a distant context from the perfect competition assumption. Furthermore, the model incorporates elements of real rigidity to obtain realistic responses of investment and imports.

Section 2.1 presents *PESSOA* in a succinct and stylised way. Special attention is paid to the behaviour of households and the Government, and in particular to the non-Ricardian features of the model, in order to thoroughly evaluate the role that fiscal policy can have in an open economy of the euro area. A more detailed presentation of the model, the formal optimisation problems of economic agents, as well as the calibration can be found in Almeida *et al.* (2010a, 2010b and 2010c). Section 2.2 presents in a stylised way the different fiscal programs.

2.1. The model

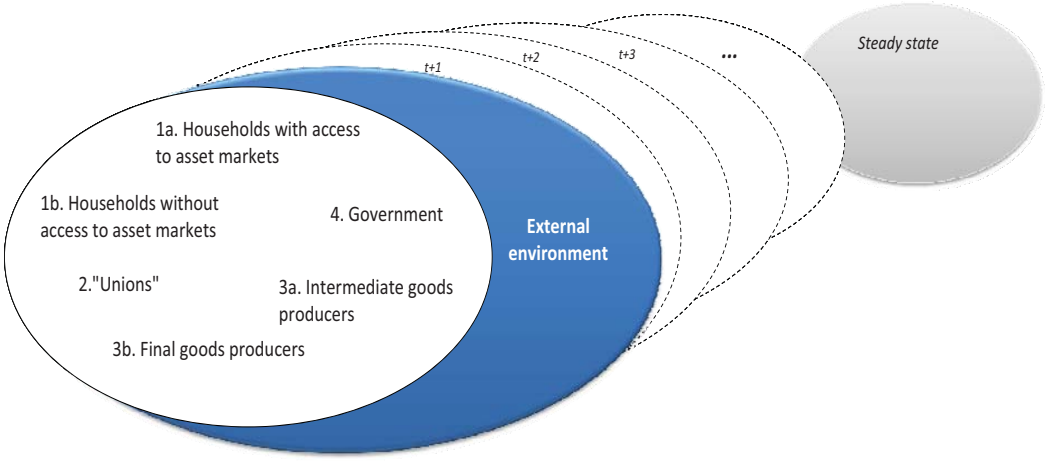
Chart 1 presents *PESSOA* in a stylised way, giving special attention to some key elements. On the one hand, the different economic agents that compose the domestic economy are presented (numbered from 1 to 4). These agents exchange among themselves labour services, intermediate and final goods, as well as income flows including labour income, firms dividends, tax payments and Government transfers to households.

On the other hand, Chart 1 highlights that decisions of agents 1 to 4 are conditioned by an external environment that, as already mentioned, is not influenced by any circumstance. For simplification, it is assumed that the external environment corresponds to the remaining euro area countries. The connection between the domestic economy and the rest of the world is achieved through imports and exports of goods and services, as well as the purchase of foreign assets/debt by domestic households, which are confined to households that have access to asset markets (1a. in Chart 1).

Chart 1 also illustrates the fact that *PESSOA* is a dynamic model that converges in the long run to a steady state. The growth of economic activity in the long run only depends on the deterministic increase of technological progress, in a context where it is assumed that there is no population growth. The steady state consists of a stable and long-lasting equilibrium of macroeconomic aggregates. Note that in a general equilibrium model, the economy is in equilibrium in all periods, including each and every adjustment period (since demand is equal to supply in all markets in all periods). However, after a shock, the economy goes through a transition period with a sequence of temporary equilibriums, until the stationary state is again reached. These transitory equilibriums are a result of an optimising behaviour

Chart 1

PESSOA



by agents 1 to 3, who use all information available and anticipate the future evolution of all relevant variables. More precisely, any change of policy in a given moment t, such as a tax reduction to stimulate the economy, implies a sequence of effects that implies that the economy has to go through a set of temporary equilibriums (at moments $t+1$, $t+2$, etc.) until it reaches a new steady state. In the case of changes of a temporary nature, after the adjustment period, whose duration fundamentally depends on the degree of real and nominal rigidity, the economy returns to its initial steady-state. The mechanisms that ensure the dynamic stability of the model, i.e., convergence to a new well-defined steady state, are essentially rooted in the adjustment of prices and wages, which determine in each and every moment the real exchange rate, and in the interaction of this adjustment with the goods and assets flows with the rest of the euro area.

Households have stochastic finite lifetimes, facing an instant probability of death in line with the overlapping generations scheme proposed by Blanchard (1985) and Yaari (1965). Through an insurance contract, the surviving households receive in every moment the assets of the households that die. This framework turns the behaviour of these agents intrinsically non-Ricardian. If the Government finances a fiscal stimulus program through public debt issuance, for example, the future generations will be charged with the necessary taxes to pay that debt (which was created before these generations were born). The surviving families, in turn, by receiving assets from households who died, accumulate more assets than their future fiscal responsibilities, which they consider net wealth, therefore affecting their consumption decisions. In the case of a fiscal stimulus program, households prefer that its financing is done by debt issuance instead of an immediate tax increase. The reason is simple: issuing debt implies that the fiscal program is partly financed by future generations. The existence of a non zero probability of death implies that households who benefit today from the effects of the fiscal program and survive will finance it in an amount that is inferior to their debt liabilities.[2]

PESSOA considers two types of households: the asset holders, who can access asset markets and perform both intra and inter-temporal optimisation, smoothing out their consumption over lifetime by trading

2 The "probability of death" seen as physical death is not the only classification used in the economic literature for this probability. Alternative designations include "economic probability of death" or "degree of myopia" of households (Frenkel and Razin 1996, Harrison, Nikolov, Quinn, Ramsay, Scott and Thomas 2005, Bayoumi and Sgherri 2006).

assets (called "1a. Households with access to asset markets"); and households that do not access asset markets and are, therefore, limited to intra-temporal optimisation (households 1b). Both types of households extract utility from consumption and leisure, through a constant relative risk aversion utility function. Furthermore, the existence of "unions" is admitted, on which households delegate wage negotiation. Labour market institutions generate monopolistic competition conditions, with "unions" using their market power to charge firms a wage higher than the marginal rate of substitution between consumption and leisure, generating a wage premium that is appropriated by households. Households with access to debt markets are able to accumulate wealth and hold debt in the course of their lives, contrary to families without access to asset markets. These are a second source of non-Ricardian behaviour, since that, by not being able to reaffect consumption intertemporarily, they limit themselves to consuming all of their income in each period, being therefore extremely sensible to the implementation of fiscal programs and their financing. The importance of this type of agents in the obtainance of realistic responses of private consumption to fiscal stimulus is presented in Galí, López-Salido and Vallés (2007).

Households behaviour in *PESSOA* contemplates a life-cycle income profile, although in a very rudimentary way. This translates into a wage income adjusted by the labour productivity level of each generation, admitting that the younger generations are more productive than the older ones (a constant labour productivity rate of decay is considered). This assumption amplifies the non-Ricardian effects, since a change in the labour income tax generates a differentiated effect between generations, yielding more revenues from younger generations, which are more productive and have, therefore, higher wage income than from older generations.

The Government can use a diversified set of fiscal policy instruments. Revenues and spendings are detailed in Table 1. Besides consuming a specific final good, highly intensive in non-tradable intermediate goods, the Government performs transfers to households. To finance its activity, the Government charges taxes over labour income (which includes not only the labour income tax but also contributions paid by employers), households consumption and firms dividends. In addition, the Government charges firms benefits from transfers from abroad. Taxes are distortionary, being an additional source of non-Ricardian behaviour. The policy options that will be evaluated in this article are based on the macroeconomic effects of five instruments: public consumption (G), transfers to all households (TRG), transfers to households without access to asset markets (TRG^B), taxes over labour income (Γ_l) and taxes over households consumption (Γ_c).

To postpone the necessary tax collection to finance expenditures, the Government can issue one period bonds, paying an interest rate over the stock of bonds held by households (type 1a in Chart 1). It is assumed that all bonds issued by the Government are held by domestic households, which can, however, buy debt from the rest of the world. The domestic interest rate differs from the rest of the euro area interest rate due to the existence of a risk premium, which can fluctuate with the degree of Government debt relative to its long-run level. Since the domestic economy is sufficiently small, changes in the international investment position (IIP) of the small open economy have no impact on the interest rate of

Table 1

PUBLIC SECTOR IN *PESSOA*	
Spending	**Revenues**
Government consumption (G)	Consumption taxes (Γ_c)
Transfers to all households (TRG)	Labour income taxes (Γ_l)
• Without access to asset markets (TRG^B)	
• With access to asset markets	
Interest outlays	Contributions paid by employers
	Dividends tax
Fiscal Balance (Global Balance)	Transfers from the EU

Notes: Government consumption (G) includes public sector investment spending; interests are on the stock of public debt.

the euro area. Contrary to models where households are infinitely lived, the long-run IIP is determined endogenously in models with finite lifetime households (Frenkel and Razin 1996, Harrison *et al.* 2005).

Modelling a small open economy combines the necessary complexity that allows the model to be useful for the conduction of economic policy with sufficient simplicity for the model to be analytically and computationally tractable. For example, the determination of the various macroeconomic equilibriums is conditioned by a strong budgetary discipline, which, although allowing authorities to choose between several options, eliminates the possibility of unsustainable trajectories of public debt. Notwithstanding, *PESSOA* is – like any economic model – a simplified representation of the real world. The assumption of perfect foresight by households and firms (agents 1 to 3 in Chart 1) may be seen unrealistic, since there are limits to the formulation and solution of complex problems, either due to the quantity of necessary information, or to the incapacity of processing and computing the utility of each alternative action in order to guarantee the optimal choice. Furthermore, the absence of a financial block that interferes with the decisions of economic agents, the inexistence of involuntary unemployment, or of externalities associated with distinct public expenses (for example in the justice, health and education sectors), as well as the impossibility of considering effects over the distribution of households income, are other examples of the model limitations.

2.2. A stylised fiscal program

Chart 2 presents a sequence of dates and economic policy measures that illustrate the fiscal programs presented in the next sections of this article. As an example, an increase in public consumption (G) is considered.

Chart 2 presents three relevant dates: t_0, t_1 and t_2. By assumption, all dates are separated by four quarters. The first date - t_0 - indicates the quarter in which the authorities announce and implement the fiscal program. Before t_0 it is considered that public consumption was at its stationary level, which is defined in Chart 2 as G^{SS}. If the program is temporary, then there is a date, t_1, after which public consumption goes back to its initial level, G^{SS}. On the contrary, if the increase in public consumption is permanent, then nothing happens in t_1 and the new level is given by $G^{SS}+\Delta$. The level Δ represents the dimension of the stimulus program. The obtained macroeconomic effects are conditional on the assumed profile of the fiscal program.[3]

The method usually used to evaluate the macroeconomic effects of fiscal instruments is centered in the impact multiplier (Blanchard 2002, Canova 2007). This indicator, hereafter designated by impact multiplier, is defined as the ratio between the change in the variable of interest in the first year (which corresponds to the time period between t_0 and t_1 in Chart 2) and the ex ante change in the same period of the fiscal balance. Without loss of generality it has been considered that the dimension of the stimulus always represents 1 per cent of the *ex ante* GDP stationary state, independently of the fiscal instrument used by the authorities.

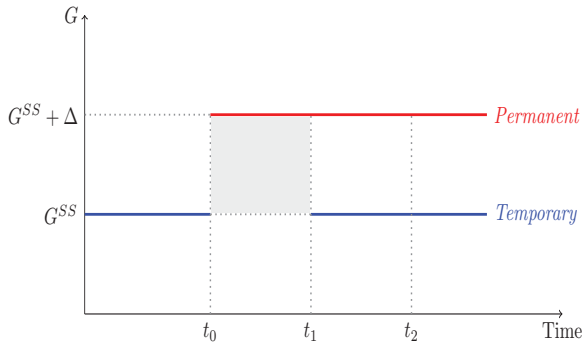
The context of a general equilibrium analysis requires the maintenance of a sustainable trajectory of public debt. To ensure this trajectory, *PESSOA*, like most general equilibrium models with Government, includes a fiscal policy rule that determines in each period the public sector fiscal balance. The rule used in this article is based on the assumption that the Government sets clear and credible fiscal goals to which it is commited. In line with Kumhof *et al.* (2010), the rule has the following functional form:

$$Fiscal\ balance = Fiscal\ balance^{LR} + d_1 \times Revenue\ gap + d_2 \times Debt\ gap$$

3 There are other options in the literature, such as an increase in G at t_0, followed by a gradual reversion or a profile that represents a program that has effectively been announced (Furceri and Mourougane 2010, Cogan, Cwik, Taylor and Wieland 2009).

Chart 2

A FISCAL STIMULUS BASED ON PUBLIC CONSUMPTION



where d_1 is the parameter that characterizes the pro-cyclical or contra-cyclical nature of fiscal policy and d_2 is the parameter that determines the velocity of reestablishment of the long-run fiscal objectives. A value of parameter d_1 below (above) one determines a pro-cyclical (counter-cyclical) fiscal policy, while a higher value of d_2 implies a lower tolerance by the authorities to deviations relative to the fiscal objectives and consequently has a faster exit strategy. While in practice the Government performs adjustments that tend to affect several items, it is usual to assume in this type of models, for clarity and simplicity, that only one item is adjusted. In this article, it has been chosen to endogenize the labour income tax rate τ_l, in light of what has been done in other models (Kilponen and Ripatti 2005, Kumhof and Laxton 2007). Holm-Hadulla, Leiner-Killinger and Slavík (2011) present empirical evidence that establishes a positive correlation between public debt (and interest payment) and labour taxes.

In a general equilibrium and perfect foresight context, all agents in the economy know and take as credible that the tax rate will only reach its stationary level when the two gaps in the rule are zero. This rate is therefore changed every time that cyclical conditions determine fiscal revenue levels that deviate from the levels that would prevail if the tax bases were in their stationary long-run values or when the public debt to GDP ratio deviates from its values in the stationary state. The existence of this rule ensures that in the stationary state the public debt to GDP ratio stabilises in a level pre-defined by the authorities and that the public sector fiscal balance is determined univocally, for each level of the interest rate and of nominal GDP growth.

Whether we are dealing with a temporary or permanent increase of public consumption, an adjustment of the public sector account will always have to occur (see Table1), to guarantee the return to a stationary state (see Chart 1), consistent with the objectives previously announced by the authorities. In the fiscal programs considered in this article it has been admitted that the fiscal policy rule is deactivated until date t_2 of Chart 2, i.e., eight quarters after the beginning of the implementation of the program (in t_0). In the case of a temporary stimulus, this date occurs after the period in which the program is in place in order to avoid an eventually paradoxal situation where the Government on the one hand promotes a fiscal stimulus and on the other hand, simultaneously, takes measures to correct the unbalance generated by that stimulus.

3. Macroeconomic impacts of fiscal policy

This section addresses the following questions under the assumption of perfect credibility: how effective is fiscal policy in a small open economy of the euro area? What instrument should be used to stimulate economic activity or the major components of demand, for example, household consumption? What are the medium and long-term effects of fiscal policy? Should the fiscal stimulus measures be permanent or temporary?

Section 3.1 presents the short-term macroeconomic impacts of temporary fiscal policy measures based on the instruments identified in Table 1. Section 3.2 focuses on the medium-term effects. Section 3.3 analyzes the macroeconomic effects of permanent fiscal policy measures, assuming that the budget deficit and public debt objectives remain unchanged.

3.1. Temporary program: short-run effects

Table 2 reports the impact multipliers obtained with *PESSOA* for a relatively diverse set of macroeconomic variables, based on: (i) a temporary and fully credible fiscal stimulus program, (ii) an ex ante deterioration of the budget balance of 1 percent of the initial steady state GDP, and finally, (iii) a fiscal policy rule that, relying exclusively on the endogenization of the tax rate on labor income Γ_l, guarantees that the public debt goes back to the level that prevailed before implementing the program.

The results show that all options have a positive impact on GDP, as well as on private consumption. The outcome thus suggests that fiscal policy in a small open economy integrated in the euro area can be effectively used for the purpose of macroeconomic stabilization. Additionally, a fiscal stimulus that represents 1 percent of GDP in the first year causes an increase in GDP, in most cases, less than 1 percent. This result implies that a reduction in revenues or an increase in government expenditures may end up being channeled in the first year for an increase in savings or imports. In contrast with the traditional Keynesian multipliers, the reported below unity multipliers are in line with several DSGE models (Cwik and Wieland 2010). Hall (2009) argues that the Keynesian assumption of no restrictions in the aggregate supply of the economy helps to explain the multipliers associated with those traditional models.

All impact multipliers on households consumption are positive, regardless of the fiscal program, in contrast to what happens in models with purely Ricardian households. This is partly explained by the use

Table 2

IMPACT MULTIPLIERS OF ALTERNATIVE FISCAL PROGRAMS | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE; INFLATION, IIP AND PUBLIC DEBT, DIFFERENCES IN PERCENTAGE POINTS

	Government consumption (G)	Transfers to all households (TRG)	Target transfers (TRG^{tt})	Labour income tax rate (Γ_l)	Consumption tax rate (Γ_c)
GDP	1.02	0.24	0.57	0.37	0.38
Private consumption	0.90	0.78	1.86	0.71	0.96
Public consumption	4.37	0.00	0.00	0.00	0.00
Private investment	-0.62	-0.18	-0.40	0.06	-0.09
Exports	-0.66	-0.32	-0.78	0.06	-0.19
Imports	0.65	0.29	0.71	0.29	0.37
Hours	1.66	0.23	0.63	0.48	0.40
Real wage	0.94	0.42	1.04	-0.79	1.56
Real exchange rate	-0.27	-0.13	-0.31	0.02	-0.08
Inflation	0.29	0.09	0.22	-0.03	-1.62
IIP	-0.02	-0.03	-0.08	0.69	-1.07
Public Debt	0.12	0.46	0.18	-0.11	1.21

Source: Authors calculations.

Notes: The real exchange rate is an indirect quotation and is calculated based on the prices of tradable goods. Inflation used to calculate the real wage, is calculated based on prices of consumer goods paid by households. The results are conditional on the values used to calibrate *PESSOA*.

of public debt issuance to finance the fiscal program. Given the probability of death of households, some of this debt is paid only by future generations. Since these future generations have to pay more income taxes in the future, current generations have an incentive to consume that would not exist if they had to bear the taxes needed to pay the entire debt that has been issued. The multipliers on consumption are slightly amplified by the existence of families that, in each period, consume all disposable income.

The highest impact multiplier on GDP is the one based on public consumption. In this case, a fiscal balance deterioration of 1 percent of GDP, which implies an increase of about 4.5 percent of government consumption ex ante, has an impact of around 1 percent of GDP. In the case where the stimulus is based on transfers to households without access to asset markets the impact is 0.6 percent. If based on a reduction of taxes on income or consumption, the impact is 0.4 percent. Finally, the smallest impact is achieved through an increase in transfers to all households (0.2 percent). The results thus suggest that if the goal of authorities is to stimulate GDP, the fiscal instrument that is more efficient to achieve it is public consumption. This result will justify the use of this instrument in the subsequent sections of this article.

A major reason behind the different magnitudes of the impact multipliers is the fact that stimulus associated with transfers or taxes have an effect on aggregate demand that is largely indirect. The main transmission channel of transfers and taxes is associated with the evolution of disposable income and households wealth. The effect on GDP is reduced in these two cases because, on the one hand, in the case of households with access to asset markets, part of this income will be saved and used to cope with higher taxes in the future. On the other hand, a greater flow of real imports should be expected, since the import content of final goods consumed by households is greater than that associated with public consumption. If public consumption is used as an instrument to stabilize the cycle, the effect on demand is direct. Additionally, there is an indirect effect that results from the increase in labour income due to rising wages associated with higher demand for labour-intensive goods.

If the goal of authorities is to stimulate private consumption, not GDP, results presented in Table 2 suggest that the most effective instrument to achieve it is to increase transfers to families who lack access to asset markets (which will also have a noticeable effect on GDP). The increase in transfers to all families has less impact, as part of the increased income of households with access to the asset markets will be saved in the period when the public expenditure is made.

The effects on investment are imminently negative, except in the case of a temporary reduction of the labour income tax Γ_l [4]. This development mainly reflects a reduction in investment expenditure in a context in which agents anticipate a fall in prices of capital goods and realize the temporary nature of the shock after the initial inflationary impact. Additionally, the increase in prices of domestic production determines a real appreciation, which negatively affects competitiveness and medium-run perspectives, despite the initial impact. Investment is subject to real adjustment costs and therefore tends to react more to developments in the medium and long term than to temporary increases in demand.

The authorities responsible for the conduct of fiscal policy in a small open economy integrated in the euro area cannot ignore the effects that their different options have on prices. Thus, measures to increase government spending tend to lead to price increases, while tax reduction measures involve less relevant impacts on prices and on competitiveness. It should be noted that although a reduction in taxes on consumption implies a significant decline in consumer prices, its impacts on other prices and on competitiveness are limited.

4 The negative impact on investment is in line with the results obtained in other DSGE models (Cwik and Wieland, 2010). However, in most DSGE models monetary policy is available, since the economy does not integrate a monetary union and the fall in investment reflects an increase of the real interest rate driven by an increase of the nominal interest rate. In *PESSOA*, the increase of the real interest rate reflects expectations of price decreases, after an increase in the very short-run.

Fiscal stimulus measures that put upward pressure on future inflation of consumer goods amplify the impacts on aggregate demand due to the reduction of the real interest rate. This effect is also present in economies with autonomous monetary policy, if the lower limit of zero percent interest rate is reached (Eggertsson 2009, Christiano *et al*. 2009), or if monetary policy is fully accommodative (Freeman *et al.* 2009). However, on the other hand, if the policy measures put upward pressure on prices of tradable goods and ultimately on the price of exports, it will result in contractionary effects resulting from a fall in exports and an increase in the imported content of domestic production.

3.2. Temporary program: medium run effects

Although the usual method of measuring the effectiveness of fiscal policy is to focus on the impact multiplier, the macroeconomic effects are clearly not limited to this horizon. Beyond the fact that the temporary nature of the program implies a return of the policy instrument to its initial level, it will always be necessary to ensure the payment of the issued debt, which occurs in a gradual way in *PESSOA*.

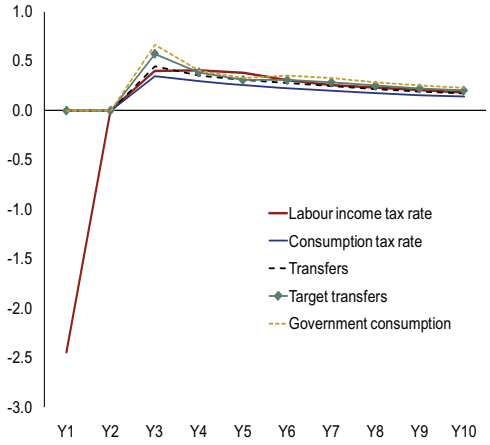
Chart 3 presents the evolution of the labour income tax that ensures in the long run a return to the initial fiscal stance. As can be seen, all fiscal programs presented require an increase of this rate after the second year, after which the fiscal rule starts to be active, and a gradual reduction to the long-run stationary levels over the simulation horizon. The abrupt reduction of this rate in the first year occurs when the fiscal authority uses it as the instrument of the fiscal program.

Chart 4 presents the impacts in *PESSOA* for a relatively diverse set of macroeconomic variables over a time horizon of 10 years. These effects are associated with the return of the fiscal instrument to its initial level, as well as the activation of the fiscal rule. Assumptions (i) to (iii), which were in the origin of the results presented in Table 2, remain unchanged. The results illustrate from the outset that the macro-economic effects of fiscal programs entail a relatively intricate set of real and income flows between the different economic agents, until the stationary state is reached again. It is up to the fiscal authority, to take stock of the obtained results, to politically value them and, accordingly, take the decision that is more adequate to its goals. According to OECD (2009), countries implemented economic policies in 2009 that were based on instruments both on the expenditure and revenue sides.

Among the results, note first that, due to the temporary nature of the stimulus and the way it was designed, one should expect in all cases a reduction or households consumption and of GDP, between

Chart 3

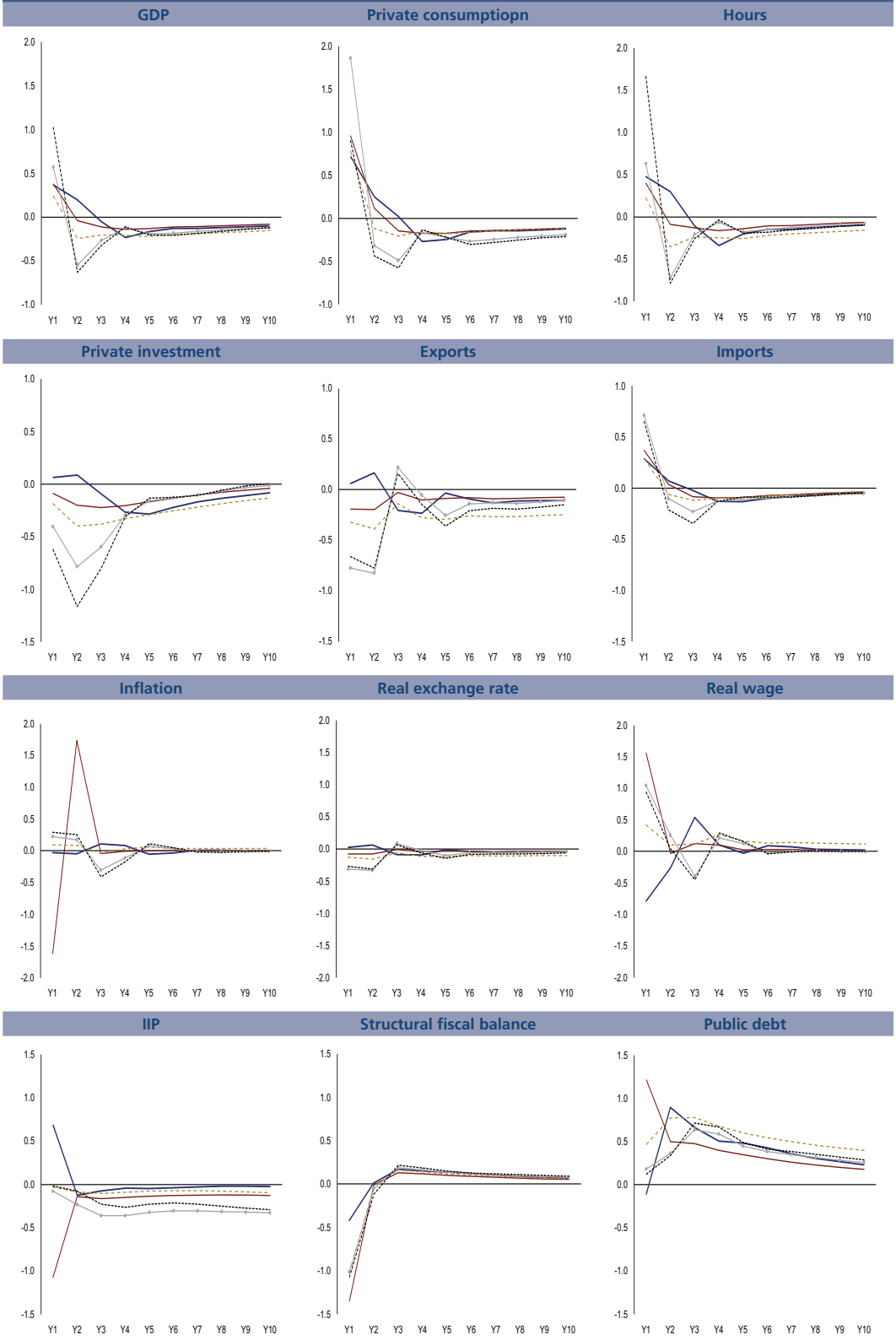
LABOUR INCOME TAX RATE | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE



Source: Authors calculations.
Note: The periodicity is annual.

Chart 4

IMPACTS OF FISCAL PROGRAMS | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE; INFLATION, IIP, FISCAL BALANCE AND PUBLIC DEBT DIFFERENCES IN PERCENTAGE POINTS



Source: Authors' calculations.

Notes: The periodicity is annual. The structural fiscal balance may differ from the effectively registered since it is computed with the tax bases at their stationary level. The real exchange rate is an indirect quotation and is calculated based on the prices of tradable goods. Inflation used to calculate the real wage is calculated based on prices of consumer goods paid by households

the first and second years. The decision to place the fiscal instrument back to its initial level implies a reduction in GDP that, in most cases, goes beyond the levels that characterized the initial state.

Secondly, debt consolidation will always involve an improvement of the fiscal balance relative to its steady state value. The Government structural fiscal balance assumes values higher than the initial steady state from the third year onwards, ensuring that public debt converges to the target, which is assumed to be exactly the same as the one prevailing before the program.

The comparative analysis of the different effects over time associated with the different fiscal instruments shows that the labour income tax should also be considered by the fiscal authority as a stimulus measure. While, on the one hand, it does not produce the higher impact multipliers on GDP or private consumption, it does not produce, on the other hand, a recessive effect similar to the one of the remaining options in the year in which the tax rate is repositioned at the initial level. Unlike other instruments, the second year remains a year in which GDP, household consumption, private investment and exports remain above the steady state (although at a lower level than in the first year). From the third year onwards, the effects associated with the different options are more similar.

The evolution of investment stems from a relatively complex set of interactions, where the foresight of the future plays a key role. The final result is determined inter alia by the temporary nature of fiscal measures, the evolution of the real interest rate and the relative price of investment goods. Thus, the temporary increase of the price of investment goods, in a context where agents anticipate the temporary nature of fiscal policy measures and where investment is subject to real rigidity, determines a reduction of spending on capital goods. With the exception of the use of labour income tax, all other options analised in Chart 4 imply in fact a further reduction of private investment in the second year of the program.

If the fiscal authority chooses to stimulate the economy with a temporary increase in government consumption, which has the highest impact multiplier on GDP (see Table 2), there will be an increase in demand for one type of goods with a high non-tradable content and very labour intensive. The increase in demand for these intermediate goods results in an increased demand for labor, which implies an increase in wages for all families. Despite the compression of profit margins, domestic prices increase and there is an appreciation of the real exchange rate, with negative impact on exports. Following the increase in income, households without access to the asset market react immediately and increase their consumption, while households with access to asset markets increase savings, but also the level of private consumption, as part of the increase in public debt is taken as an increase in wealth.

In line with the other expenditure components, imports show a decline to levels below the steady state after the year in which the stimulus is removed, gradually converging in the subsequent years to levels that prevailed before the stimulus. This evolution has a high positive correlation with the behavior of economic activity.

Among the most significant effects shown in Chart 4 is the one of inflation, in case the fiscal program is based on changes in the consumption tax rate. This fact is explained by the direct impact that the tax reduction has on consumer prices in the first year, followed by the decision to place the same rate back in the second year.

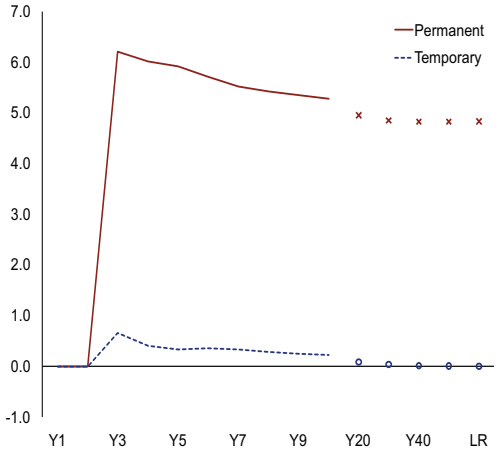
3.3. Permanent program: increase of public consumption

The temporary nature of the stimulus in all cases analyzed above implies a reduction of household consumption or GDP in the second year. This result, independent of the fiscal instrument that is used, can create an incentive to implement programs of a more permanent nature, which justifies the presentation in the different time horizons of an economic policy with these features.

This subsection presents an example of the impact of a fiscal measure with permanent nature: an increase in government consumption financed entirely by an increase in the labour income tax. It should be noted

Chart 5

LABOUR INCOME TAX RATE | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE



Source: Authors' calculations.

Notes: The chart presents annual values between years 1 and 40. The long-run is defined as "LR". The remaining definitions, as well as the interpretation of results were presented in chart 4.

however that the results are qualitatively very similar to any program of permanent increase in public spending financed by distortionary taxes, notwithstanding the fact that the impacts can be quantitatively different for some variables.

The evolution of the labour income tax rate associated with a permanent increase of public consumption is presented in Chart 5. As can be seen, a permanent increase of 1 percent of GDP ex ante implies an expressive and permanent increase of the tax rate in order to maintain unchanged the deficit and debt objectives. This evolution, which ensures the return to the initial fiscal stance, will have particularly negative effects on economic activity. Chart 6 shows the impact over several macroeconomic variables in different time horizons, including those that can be obtained in the very long run. These impacts are compared to those presented in Chart 4, where a temporary program was considered.

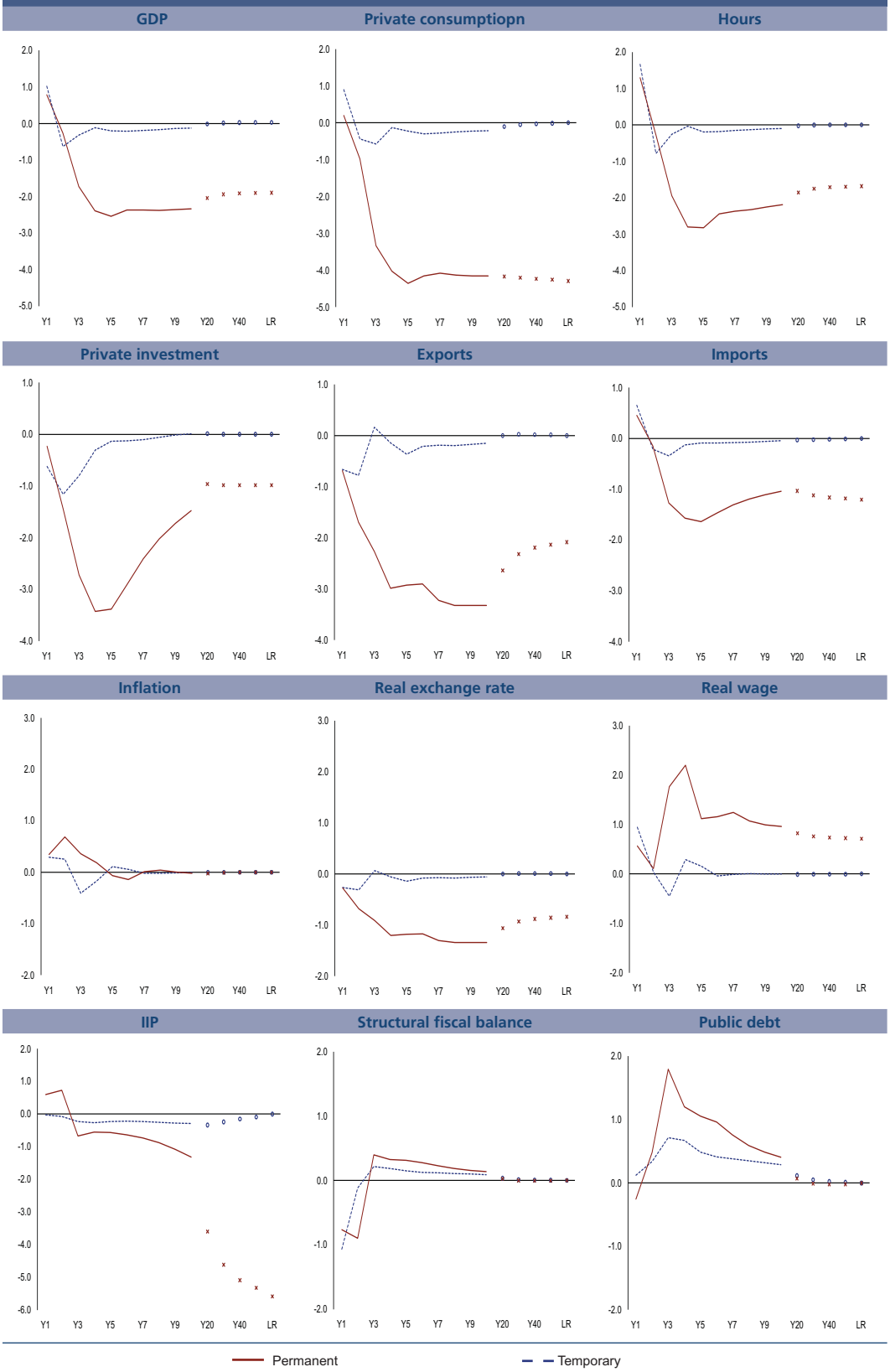
The impact multipliers over GDP or consumption remain positive, although lower than those of the temporary program. The reduction of these multipliers is explained by the anticipation of recessionary effects associated with the need to increase, in an equally permanent way, the labour income tax in the medium and long term. The need to finance a permanent increase in government consumption implies that all generations, present and future, will pay more taxes. In the case of households with access to the asset markets, these savings increase more than in the case where the program is temporary.

Unlike the case of temporary programs, the permanent increase of public consumption leads to a new steady-state in which the real increase of this variable does not compensate the permanent reduction in the other components of aggregate expenditure. GDP, in particular, presents a permanent fall. The dominant effect underlying this evolution results essentially from the increase in the tax rate in order to finance the fiscal program. Labour supply decreases, reflecting the strong disincentive to work stemming from the tax increase. This evolution contributes to reduce household consumption in a permanent way, relative to the initial steady-state, affecting households welfare in a significant way (Almeida *et al.*, 2010b).

The real wage paid by firms increases permanently to ensure the necessary labour supply, implying a permanent loss in competitiveness and a decrease in exports. The reduction of the capital stock desired by firms implies a downward adjustment of investment, which reaches a permanently lower level. The fall in exports, higher than the fall in imports, contributes to a deterioration in the long-run of the international investment position relative to the initial steady-state, which does not occur in the case of a temporary program.

Chart 6

A PERMANENT INCREASE OF GOVERNMENT CONSUMPTION | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE; INFLATION, IIP, FISCAL BALANCE AND PUBLIC DEBT DIFFERENCES IN PERCENTAGE POINTS



Source: Authors' calculations.

Note: The chart presents annual values between years 1 and 40. The long-run is defined as "LR". The remaining definitions, as well as the interpretation of results were presented in Chart 4.

As in temporary programs, there is a clear reduction path of public debt from the date when the fiscal policy rule is activated onwards. The maintenance of the fiscal goals that prevailed before the Government program is in this way ensured and only implies a recomposition of the Government balance presented in Table 1[5].

As mentioned above, it may further be noted that, in general, all fiscal programs involving both a permanent increase in expenditure and taxation in order to ensure the return to the initial fiscal policy stance, tend to produce undesirable medium and long-term effects in *PESSOA*, which are mainly due to the distortionary effects of these taxes.

4. Alternative exit strategies

The transmission mechanism of fiscal policy is conditioned by the exit strategy that agents expect that the authorities will have. It is assumed, in all cases that the exit strategy is perceived equally by all agents, who incorporate it in their decision making process. This strategy may be more or less rapid in bringing the fiscal stance back to its initial stance.

This section considers two alternative exit strategies identified as "Fast" and "Slow", which differ in the time gap that agents envision that the authorities consider desirable to return to the initial fiscal stance[6]. The results obtained with each alternative exit strategy are compared to those previously presented ("Reference" exit strategy).

Section 4.1 presents the macroeconomic impact of alternative exit strategies, in a context of maintenance of the risk premium on sovereign debt. Section 4.2 considers the possibility that these strategies can take place in a context where there is an increase in the risk premium, correlated with the deviation of public debt from the objective set by the fiscal authorities.

The simulations presented are based on the assumption that fiscal authorities announce exit strategies perceived by agents as credible. This assumption implies in particular that agents perceive the consolidation measures as being implementable within the announced timeframe. In this context, exit strategies whose trajectory involves extremely strong consolidation measures may not be taken as credible by agents.

In the simulations, government consumption is considered as the fiscal instrument used for business cycle stabilization and the fiscal rule is, as before, activated two years after the start of the program (t_2 in Chart 2).

4.1. Without change in the risk premium

Chart 7 shows the evolution of the labour income tax rate required for the fiscal balance and the public debt return to the levels pre-defined by the Government, which prevailed before the fiscal program. No change in the economy's risk premium is considered in any of the simulation exercises. As can be seen, the tax rate increases in a more significant way in the case of the Fast strategy and in a less visible way in the case of the Slow strategy.

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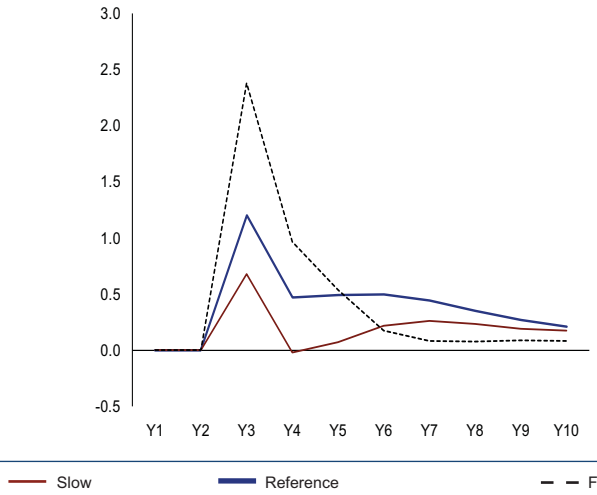
5 It is possible to find other possibilities in the literature. Röeger and Veld (2010), for example, evaluate the impact of a permanent deterioration of 1 per cent of the fiscal balance, which, according to the assumptions on long-run growth of nominal GDP implies in the DSGE model an increase in the ratio of public debt to GDP of 20 p.p. This deterioration of the fiscal balance would imply in *PESSOA* an increase in public debt of approximately 25 p.p., relative to the *ex ante* steady-state GDP.

6 Technically, the simulations implied an adjustment of parameter d_2 of the fiscal rule presented in Section 2 of this article. In the case of the Slow strategy, the parameter was reduced to practically zero; in the case of the Fast strategy, it was increased to around four times of the Reference strategy. Almeida *et al.,* (2010b) presents a set of simulations that differ in the instrument used in the fiscal rule.

Chart 7

LABOUR INCOME TAX RATE (WITHOUT INCREASE OF THE RISK PREMIUM) | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE



Source: Authors' calculations.

The macroeconomic impacts of the alternative exit strategies are presented in Chart 8. Firstly, it can be seen that the impact multipliers are almost the same. Thus, maximizing the impact on GDP in the first year depends only to a minor extent on the different exit strategies. The similarities are not limited to the first year, existing until the moment when the fiscal rule is effectively activated. After the first two years, the results begin to diverge significantly, which is an element that should be valued by the fiscal authorities in the selection of the speed of the fiscal consolidation process.

The Reference simulation represents an intermediate option when compared to the Fast and Slow strategies. The increase in the tax rate is so significant in the case of the Fast strategy that the public debt goes immediately to values close to the long-run target, producing a recessive effect on economic activity.

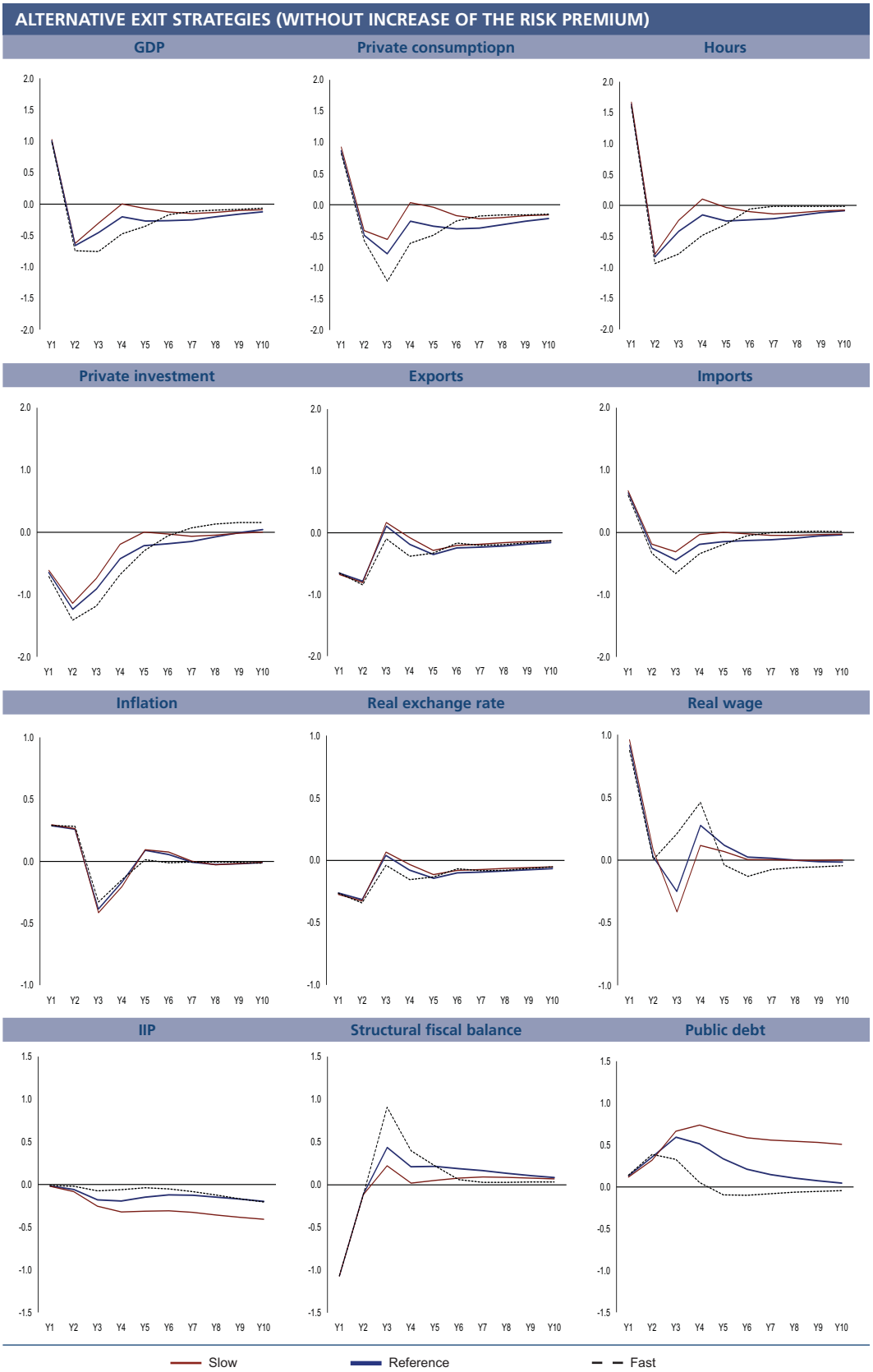
In the case of the Slow strategy, the increase in the tax rate is so smooth that the public debt reduces only gradually after the rule is activated. Due to the high inertia, the public debt remains well above its long-run value even after ten years. This result occurs in parallel with a faster return of the economy to values close to the stationary state, with GDP being almost at its steady-state value from the fourth year onwards.

In the absence of any movement in the economy's risk premium, results in Chart 8 indicate that there are several factors that favor the option of a Slow strategy, in which the fiscal consolidation process is very gradual. These results are in line with a large literature that suggests that the optimal fiscal policy corresponds to tax smoothing (Chari and Kehoe 1999, Chari *et al.* 1994). Besides not reducing the short-term effect on GDP or consumption, and not having the undesirable effects associated with a permanent increase of public consumption, this exit strategy is visibly less recessive in the medium-run than the Fast or Reference strategies. This conclusion, while justifying the creation of public debt that is consolidated only very gradually with tax increases is not, however, robust to a context in which the risk premium does not remain unchanged.

4.2. With change in the risk premium

The increase in the sovereign debt risk premium registered in the most recent period suggests the possibility of a relationship between risk premiums and the indebtedness level of the economies. This subsection analyses the three strategies considered (Slow, Fast and Reference) in a context where the risk premium is associated with the level of public debt, in contrast to the previous simulations where it was assumed to be constant.

Chart 8



Source: Authors' calculations.

Note: The interpretation of results were presented in Chart 4.

In this context, it was considered an increase in the risk premium of 6 basis points for each percentage point of increase in the public debt. This value was calibrated based on the existing literature, particularly in studies for the United States, which point to increases of the interest rate between 1 and 6 basis points for each percentage point of increase in public debt (Laubach 2003, Engen and Hubbard 2004, and Gale and Orszag 2004).

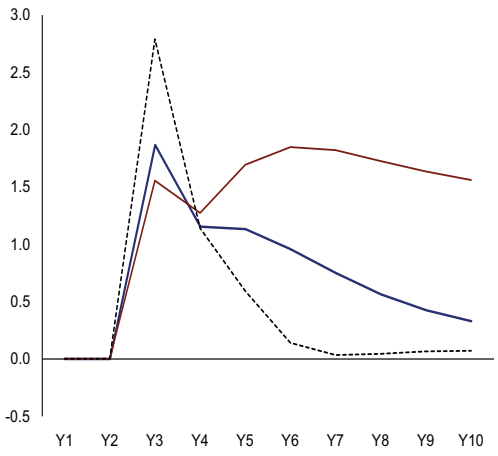
Charts 9 and 10 show the evolution of the labour income tax rate as well as the economy's risk premium. Until the activation of the fiscal rule, the tax rate remains unchanged in the three strategies considered (Slow, Fast and Reference). Thereafter, the tax rate increases sharply and in a more expressive way than before, i.e. in the case in which the various alternative exit strategies does not imply any impact on the risk premium.

The increase in interest rates in the small open economy creates a positive differential in relation to the interest rate that prevails in the euro area and implies an increase in interest outlays for the same level of public debt stock. The higher the interest rate the greater the increase in public debt during the period in which the fiscal policy rule is disabled. To return to the initial fiscal stance, it is now necessary to reduce the public debt from higher levels than in the case where there was no impact on the risk premium.

The macroeconomic impacts of the Fast, Reference and Slow exit strategies in the case in which the small open economy agents see an increase in the risk premium due to the increase in the public debt are presented in Chart 11. As can be seen, the impact multipliers are slightly lower than the ones previously reported, particularly in the case of the Slow strategy. The short-term multiplier of private consumption is even negative in the first year, reflecting to a large extent the more expressive increase of the domestic real interest rate. Additionally, the medium-run effects also seem to discourage the implementation of the Slow strategy. Both GDP and households consumption present in this case a higher period of time below the levels associated with the stationary state. On the contrary, the promotion of a Fast strategy is the one that puts the economy in the medium run more rapidly in the stationary state. However, it is crucial that the substantial fiscal policy measures necessary for this strategy are possible.

Chart 9

LABOUR INCOME TAX RATE (WITH INCREASE OF THE RISK PREMIUM) | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE

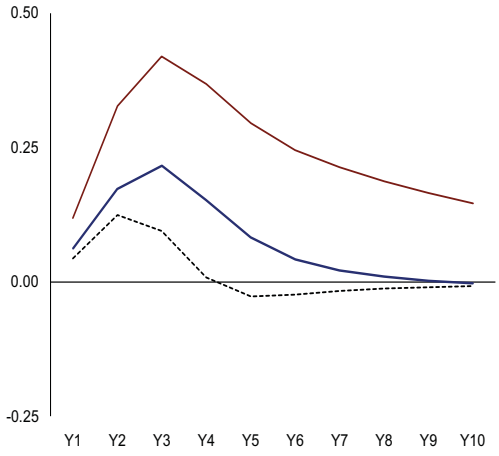


Slow Reference Fast

Source: Authors' calculations.

Chart 10

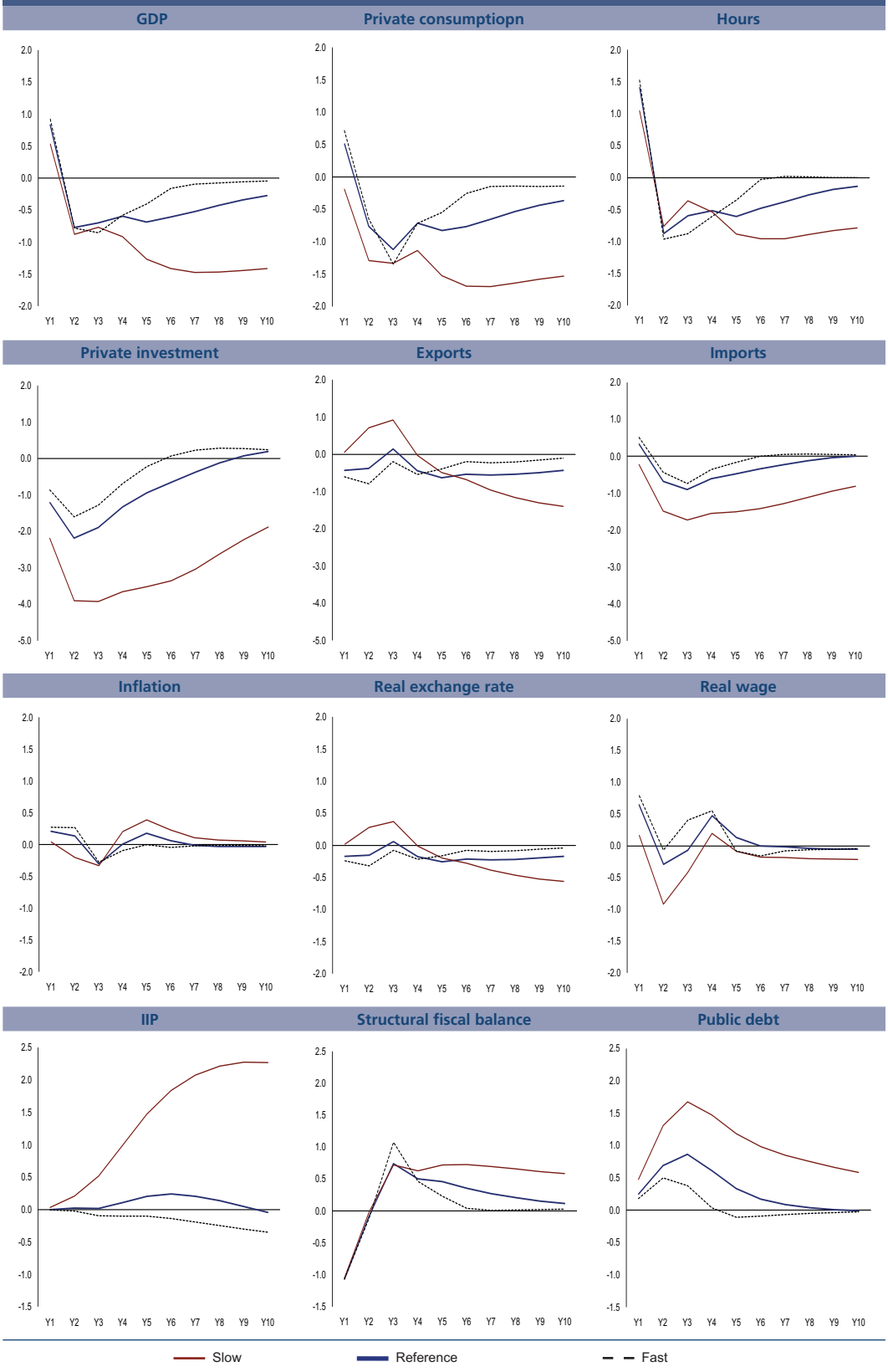
RISK PREMIUM | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE



Source: Authors' calculations.

Chart 11

ALTERNATIVE EXIT STRATEGIES (WITH INCREASE OF THE RISK PREMIUM) | PERCENTAGE DEVIATIONS FROM THE INITIAL STEADY-STATE; INFLATION, IIP, FISCAL BALANCE AND PUBLIC DEBT DIFFERENCES IN PERCENTAGE POINTS



Source: Authors' calculations.

Notes: The interpretation of results were presented in Chart 4.

5. Conclusion

This article discusses the role of fiscal policy for macroeconomic stabilization in a small open economy of the euro area. The analysis was conducted in a general equilibrium context in order to capture the transmission mechanisms that cannot be analysed in partial equilibrium contexts. The results suggest that fiscal policy can play an active role in stabilizing the business cycle, affecting several variables of interest, in particular GDP and households consumption. Fiscal programs should not however focus exclusively on the short-run effects and ignore the medium run impacts of the fiscal consolidation strategies, i.e., of the need to adequate public revenues and spendings after the end of the program such that the fiscal policy stance returns to its initial position.

The diversity of effects obtained showed that macroeconomic stabilization is clearly a multidimensional problem. It will always be up to the fiscal authority to set priorities and decide according to the objectives it desires to achieve. According to the results, if the objective is to stimulate economic activity, the most effective way of achieving it is by a temporary increase of public consumption. If the objective is to increase households consumption, the best way to achieve it is by an increase in transfers to households without access to asset markets, whose marginal propensity to consume is higher. The results further substantiate the perspective that a permanent increase in government consumption generates undesirable effects over time, particularly due to the financing needs implied by that decision.

The results obtained in this article are far from those suggested by the traditional Keynesian multipliers, which are typically obtained in a context of partial equilibrium and, in the most extreme cases, do not translate the impacts on supply conditions and its interaction with the sources of fiscal policy financing. Additionally, there are recessionary effects associated with the reversal of a fiscal stimulus that cannot be neglected and that stem from the need to consolidate after the stimulus programs, i.e., to return to the initial fiscal policy stance.

Finally, the effectiveness of stabilisation programs is not independent of the economy's risk premium attributed by agents participating in asset markets. If it is reasonable to assume that this premium remains constant, results tend to favour a slower and more gradual exit strategy. If the stimulus program entails an increase of the risk premium, due to the level of public debt, the results favour a faster exit strategy, since otherwise it can end up in a situation more undesirable and long-lasting than the initial one. However, it is crucial that the fiscal measures necessary to implement such a strategy are perceived as feasible.

The role of fiscal policy presented in this article is conditioned by the assumptions and calibration of *PESSOA* (Almeida *et al.,* 2010C). It is not considered, for example, policy options that involve structural changes in the economy or generate externalities, such as an improvement of the justice system or of education. The effects of these measures are beyond this article. The effects that may arise from fiscal policies more focused in the long-run are not evaluated as well, for example associated with a reduction of the predefined goals for public debt by the authorities, nor the impact of fiscal policy on income distribution.

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