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Document de Travail n° 2020 – 11

Mars 2020

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Fiscal transfers in a two-level fiscal framework: stabilizing properties according to the fiscal instrument

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March 23, 2020

Abstract:
In a two-country *Dynamic and Stochastic General Equilibrium* (DSGE) model, I document the stabilizing properties of fiscal transfers between currency union members according to the nature of public spending allowed by these transfers for the recipient economy. To do this, I model a two-level fiscal framework for the monetray union in which the central autority collects one share of national fiscal revenues and determine how these revenues are redistributed among countries following a simple fiscal transfer rule. We assume that the central autority is allowed to decide how the recipient economy use these funds. The main result of this paper is that the stabilizing properties of fiscal transfer schemes strongly depend on the way the recipient economy uses the funds following the fiscal transfer. Public consumption, transfers and VAT are more effective to stabilize macroeconomic differentials between both economies of the currency union when asymmetric demand shocks occur while the labor income tax and the social protection tax are more effective in the case of an asymmetric productivity shock.

Keywords : Fiscal policy, new-Keynesian model, fiscal transfer mechanism, currency unions

JEL classification : E62, F41, F42, F 45, J20

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1 Introduction

After achieving the single market and the implementation of a currency area, some economists argue nowadays that the next step would be to achieve a fiscal union for the Euro Area. The term "fiscal union" can relate to very different elements, such as the sovereign debt pooling, the creation of an economic government for the Eurozone or the implementation of fiscal transfers among member states.

Yet, the recent crisis has revealed the strong economic heterogeneity that exists between the Euro Area members, who have reacted very differently to the crisis episode. Also, despite the strong integration of the Euro Area economies since the creation of the Eurozone, asymmetric shocks still occur. In response to the existence of structural heterogeneities and of asymmetric shocks, many economists argue for the implementation of a risk-sharing mechanism through a fiscal transfer scheme. Such a fiscal transfer mechanism is already present in some fiscal unions, for instance in the US and Canada, or in federal countries like Germany or Switzerland. Several papers have attempted to estimate the stabilizing abilities of these insurance mechanisms, most of them for the USA and Canada.[1] If results vary according to the studies, fiscal transfer schemes would reduce the output growth rate differential between members by 20 % on average.

In recent years, the new-Keynesian framework has been used for investigating different facets of such insurance mechanisms. Evers (2012) for instance analyzes the stabilizing properties of different transfer rules according to the variables considered: transfers based on a differential of consumption, output or employment among others. Kim and Kim (2013) investigate the welfare effects of such transfers. The main finding is that in the absence of borrowing constraints, the transfers can reduce agents' welfare while the transfers are unambiguously welfare-enhancing when such financial constraints occur. Briefly speaking, a transfer scheme is fruitful when the financial markets cannot ensure a full risk-sharing within the monetary union.

Surprisingly, while transfers can be used in very different ways, such as increasing different sorts of expenditure or cutting taxes, the literature generally neglects this point. In most papers, transfers are either used as direct transfers to households, like in Fahri and Werning (2012) or as public consumption (Okano (2010), Kim and Kim (2013) or Evers (2012)) but the link between the use of the transfer and the effectiveness of the scheme is generally neglected. This is surprising since different sorts of spending and different sorts of taxes are available in the governments' tool kit and that the effects of fiscal policy in general very depends on the tools used by the governments. This is even more astonishing that Bajo-Rubio and Diaz-Roban (2003) highlighted already this statement: *"Only Majocchi and Rey (1993) propose that their discretionary mechanism would be financed in an ad hoc manner by the countries concerned, and that the amounts to be paid would be conditioned in order to assure its consistency with the Community's objectives. The rest of studies do*

[1] See for instance Sachs and Sala-i-Martin (1992), Von Hagen (1991), Italianer and Pisani-Ferry (1994), Goodhart and Smith (1993), Bayoumi and Masson (1995) or Melitz and Zummer (1999).

not examine this issue, although they recognize that the degree of stabilization attained will depend, in part, on how the funds are used".

However, Evers (2006) investigates explicitly the stabilizing properties of transfer schemes according to the nature of the transfers. In a medium-scale DSGE model, transfers between both economies are either transfers between home and foreign households, either inter-governmental transfers corresponding simply on a shift of public consumption between both states. One interesting element of this paper is that it focuses on the relative stabilizing properties of both kind of spending according to the nature of the asymmetric shock the monetary union. In the case of a demand shock introduced as a preference shock for the union-wide consumers towards the tradable goods produced in one economy of the union, Evers (2006) shows that intergovernmental transfers are fully efficient and remain the level of welfare similar to the welfare at the steady-state, thanks to a shift in demand that compensates the first shift in demand induced by the shock. Therefore, public consumption-based transfers can stabilize fully consumption, production and employment in both economies. In the case of a supply shock, Evers (2006) found that both kinds of transfers are necessary to achieve an efficient assurance. The transfers to households are necessary since the labor income is no longer the same between the two economies because of the inflation differential engendered by the productivity shock.

In this paper I follow Evers (2006) since we focus on the stabilizing properties of a fiscal transfer mechanism in a monetary union prone to both asymmetric demand and supply shocks. The added value of this work is twofold.

First, I introduce in the model different types of sepnding and taxes which can be used by the recipien government wihtin the fiscal transfer scheme: public consumption, social transfers to households and three different taxes, a VAT, a labor income tax and a social protection tax.

Second, and more importantly, I do not consider only stabilization of output but also look at the gap between home and foreign unemployment and at the stabilization of the term of trade between both economies. One current challenge within the Euro Area is to deal with increasing macroeconomic imbalances and to provide effective policy answers to this macroeconomic issue. We will see throughout this paper that a federal transfer mechanism is able to reduce inflation differential between economies and therefore to help to reduce current account imbalances between economies. However, we will see that the reduction in the term of trade is possible if the "good" fiscal instruments are used within the fiscal transfer scheme.

The model represents a monetary union with two symmetric economies. The modeling of each economy follows benchmark medium-scale DSGE models. We introduce a fiscal union in which coexist national fiscal policies, a central budget and fiscal transfers between both countries. The contribution of this paper is to test the effectiveness of a transfer mechanism to stabilize both output and unemployment according to how the recipient uses the transfer and according to the nature of the shock.

The key point is that a negative demand shock triggers a decrease in output and a rise in unemployment. However, a supply shock generates in the short-run a comovement of output and unemployment. As pointed out in Barnichon (2012) among others, a positive supply shock tends to produce a rise in unemployment in the short-run. A reason is that production rises more strongly than the aggregate demand in the short-run so that demand for capital and labor fall. We point out in this paper that the different fiscal instruments that can be used in the case of the fiscal transfer mechanism affect differently output and unemployment. Especially, some fiscal instruments are more effective for stabilizing both output and unemployment in both economies in the occurrence of a demand shock while other fiscal instruments are more effective when asymmetric supply shocks hit one economy of the union.

The rest of the paper is organized as follows: a second section presents the key assumptions of the model and its structure and the fiscal union into details. A third section the simulations and the results and a fourth section concludes.

2 The new-Keynesian framework

2.1 The monetary union

I use in this paper a DSGE model which describes a two-country monetary union. Except the fiscal side of the model, I use the model in Barbier and Betti (2020).[2]

2.2 Introduction of the fiscal union

The fiscal union introduced in this paper allows for the coexistence of national governments and of a central authority. Different policy scenarios can be introduced thanks to this modeling. For instance, a fully decentralized case in which the two national governments implement fiscal policy without any intervention at the central level. The other polar case is the fully centralized case in which fiscal receipts are levied entirely at the central level and then used in different ways. Finally, with alternative calibrations, we can also implement scenarios where both levels coexist. One will see throughout this section that, for our purposes, we need to use the alternative with both the national and the federal governments.

Variables with a superscript "H" correspond to the home economy, those with a superscript "F" to the foreign country and finally variables with a superscript "EMU" concern central government and aggregate variables for the EMU.

National governments

The budget constraint of the home economy can be expressed as, in nominal terms:

$$(1-\tau^{EMU})[(P_t^H C_t^H)\tau_t^{c,H} + (W_t^H N_t^H)(\tau_t^{w,H} + \tau_t^{sp,H})] + T_t^H + D_t^H = C_t^{g,H} + Tr_t^H \quad (1)$$

[2]See Barbier and Betti (2020) for a complete description of the model.

and similarly for the foreign economy:

$$(1-\tau^{EMU})[(P_t^F C_t^F)\tau_t^{c,F} + (W_t^F N_t^F)(\tau_t^{w,F} + \tau_t^{sp,F})] + T_t^F + D_t^F = C_t^{g,F} + Tr_t^F \quad (2)$$

For the budget constraint of the home country (and similarly for the foreign country), P_t^H defines the consumer price index for the domestic households, C_t^H consumption in the home economy, W_t^H is the nominal wage and N_t^H represents employment. In Equations (1) and (2) appear the different fiscal instruments introduced in the model, for the home economy: public consumption $C_t^{g,T,H}$, social transfers to households Tr_t^H, and the three taxes, namely VAT, a labor income tax and a social protection tax, respectively $\tau_t^{c,H} \in [0;1]$, $\tau_t^{w,H} \in [0;1]$ and $\tau_t^{sp,H} \in [0;1]$. $\tau^{EMU} \in [0;1]$ defines the level of taxation by the central autority on national fiscal revenues.

In addition, T_t^H and T_t^H denote transfers from the central autority to, respectively, the home and the foreign government. The ammount of transfers for each economy are set by the central government as described later on in this section. Finally, national governments are allowed to create a deficit, respectively D_t^H and D_t^F in the domestic and the foreign economy. Accordingly, the dynamic of national debts are described by:

$$B_t^F = (1+R_t)B_{t-1}^H + D_t^H \quad (3)$$

and for the foreign government:

$$B_t^F = (1+R_t)B_{t-1}^F + D_t^F \quad (4)$$

with B_t^H and B_t^F the national debts and R_t the nominal interest rate.

National governments pursue an objective of public debt sustainability and I assume, to keep the framework simple, that governments adjust VAT at each period following this simple rule:

$$\tau_t^{c,H} = (\tau_{t-1}^{c,H})^{\rho^c} \left(\frac{B_{t-1}^H}{P_t^H}\right)^{\rho^b} \quad (5)$$

and similarly for the foreign government:

$$\tau_t^{c,F} = (\tau_{t-1}^{c,F})^{\rho^c} \left(\frac{B_{t-1}^F}{P_t^F}\right)^{\rho^b} \quad (6)$$

National governments thus adjust VAT following the evolution of public debt. ρ^c is the parameter of the AR(1) process and ρ^b captures the stregth of the reaction of governments to changes in public debt.

The central government

The central government collects a share of the national fiscal revenues and therefore has the following budget constraint:

$$\tau^{EMU}[(P_t^H C_t^H)\tau_t^{c,H}+(P_t^F C_t^F)\tau_t^{c,F}+(W_t^H N_t^H)(\tau_t^{w,H}+\tau_t^{sp,H})+(W_t^F N_t^F)(\tau_t^{w,F}+\tau_t^{sp,F})] = T_t^{EMU} \tag{7}$$

where T_t^{EMU} defines the total budget of the central authority. If $\tau^{EMU} = 1$, the whole tax receipts are gathered at the central level. At the opposite if $\tau^{EMU} = 0$, the fiscal policy is fully decentralized. In the case where $0 < \tau^{EMU} < 1$, both levels coexist.

The central government allocates the transfers to both economies according to the output and unemployment differentials such as:

$$T_t^H = \frac{T_t^{EMU}}{2} - Tr_t^{EMU} \tag{8}$$

and

$$T_t^F = \frac{T_t^{EMU}}{2} + Tr_t^{EMU} \tag{9}$$

Equations (7), (8) and (9) indicate that the transfer scheme is balanced each period and finally the transfers to national governments are determined such as:

$$\frac{Tr_t^{EMU}}{\bar{Tr}^{EMU}} = \left(\frac{Y_t^H}{Y_t^F}\right)^{\alpha^{y,tr}} \tag{10}$$

with $\alpha^{y,tr} \in [0;1[$. Consequently, the central fiscal autority allocates transfers to national governments by taking into account the evolution of output in both economies.

Monetary policy

Monetary policy is introduced in a standard way. The monetary authority sets the nominal interest rate following this version of the Taylor rule:

$$R_t = (R_{t-1})^{\rho^r}(Y_t^{EMU})^{\rho^y}(\Pi_t^{EMU})^{\rho^\Pi} \tag{11}$$

with Y_t^{EMU} and Π_t^{EMU} define output and inflation at the currency union level. ρ^r reoresents the parameter of the AR(1) process and ρ^y and ρ^Π capture the weight given by the monetary authority to the stabilization of output and inflation respectively.

2.3 Calibration of the model and description of the simulations

Except the fiscal block of the model, parameters' values are taken from Barbier-Gauchard and Betti (2020).[3] In the latter, we use posterior means form Smets, Warne and Wouters (2013) who estimate the Gali-Smets-Wouters model for the Eurozone as a single economy. Parameters related to the monetary union structure are extracted from Rabanal (2009) who estimated a standard two-country model of a monetary union with Euro-Area data.

[3]As said previously, I invite the reader to refer to Barbier-Gauchard and Betti (2020) for a detailed presentation of the modelling of the rest of the currency union and for the calibration of parameters not presented in this paper.

For our purposes, we set $\tau^{EMU} = 0.3$. This calibration corresponds to an intermediary case in which the central government collects one significant share of the national fiscal revenues. In addition, $\alpha^{y,tr}$ is set to 0.5. The reader should see the values for τ^{EMU} and $\alpha^{y,tr}$ as chosen randomly. However, alternative values would not change the mechanisms I hoghlitht in this paper. For instance, increasing the value of τ^{EMU} would intensify the size of the transfers but the transmission mechanisms and results would not be altered.

Finally, for ρ^c and ρ^g, *i.e.* parameters which drive the adjustment of VAT by governments following changes in public debt, I use estimates for these parameters from Forni, Monteforte and Sessa (2009) who estimates a similar fiscal rule for the Euro Area. Accordingly, I set $\rho^c = 0.96$ and $\rho^b = 0.25$.

I follow different estimates of Taylor rules for the European Central Bank by giving the following values to the monetary parameters: $\rho^r = 0.9$, $\rho^y = 0.19$ and $\rho^{\Pi} = 1.25$

3 Stabilizing properties of the different transfer schemes

This paper aims at investigating to what extent the way the recipient economy uses the fiscal transfer affects the stabilizing properties of the fiscal transfer mechanism. More precisely, this section shows that the stabilizing properties of the fiscal transfers depend on the use of fiscal transfers by the recipient economy but also on the nature of the shock. Importantly, I focus not only on the stabilization of output but also on the stabilization of unemployment and of the differential of inflation between both economies (the term of trade).

This section presents the different simulations carried out. In order to resume, we simulate the model with two different shocks: an exogeneous, negative, shift in home demand (home consumers) and a negative supply shock in the home economy which consists in negative Total Factor Productivity (TFP, hereinafter) for domestic firms (both in the tradable and non-tradable sectors). Figures (1), (2), (3) and (4) display the impulse response functions of the key variables following the two shocks. In both cases, output in both economies are negatively impacted, but to a greater extent in the home economy so that the home government receives a larger transfer from the central autority than the foreign economy. In the case of the negative demand shock, home households consume less but, since they consume mostly home produced goods, the decline in demand is larger for domestic firms than for foreign firms. Similarly, inflation decreases in both economies but more strongly in the home economy. As a consequence, domestic firms benefit from a positive price-competitiveness effect. Foreign output thus declines, since foreign firms face a lower demand from domestic consumers and suffer from lowered price competitiveness.

In the case of the negative TFP shock, output also decreases in both economies. Production in the domestic economy is diminished and the rise in domestic firms' marginal cost triggers inflation in the home economy. Prices increase also in the foreign economy but to a lesser extent so that in this case, the foreign economy benefits from a rise in exports thanks to a positive price-competitiveness effect. However, with an active monetary policy, the

monetary autority reacts to inflation at the union level by increasing its policy rate. As a consequence, demand in the whole union is dampened, which generates a decline in output in the foreign economy.

It is interesting to note that according to the nature of the shock, if both output decrease and to a greater extent in the home economy, the evolution of the term of trade is different. We will see throughout this section that it will be crucial to explain the capability of transfers to stabilize inflation between both economies according to the fiscal instrument used by the recipient economy following fiscal transfers.

For comparison purposes we assume for the different simulations that the foreign government reacts to the degradation of output using public consumption, so that the only fiscal instrument equation (2) can be rewritten as:

$$(1-\tau^{EMU})[(P_t^F C_t^F)\tau_t^{c,F} + (W_t^F N_t^F)(\tau^{w,F}+\tau^{sp,F})] + T_t^F + D_t^F = C_t^{g,F} + Tr^F \tag{12}$$

where Tr^F, $\tau^{w,F}$ and $\tau^{sp,F}$ are therefore constant. $\tau_t^{c,F}$ remains variable since the government adjusts VAT to ensure public debt sustainability according to the rule in equation (6).

For the domestic economy, I simulate the model for each fiscal instrument. For instance, in the case where the domestic government uses the federal funds by increasing transfers to households, equation (1) becomes:

$$(1-\tau^{EMU})[(P_t^H C_t^H)\tau_t^{c,H} + (W_t^H N_t^H)(\tau^{w,H}+\tau^{sp,H})] + T_t^H + D_t^H = C^{g,H} + Tr_t^H \tag{13}$$

3.1 Response of the economy in the case of a negative supply shock

In this first case, the domestic economy faces a negative supply shock. The rise in firms' marginal cost triggers an increase in prices and output declines. Figures (1) and (2) display the impulse response functions following a 1% negative TFP shock. For comparison purposes, I compute in Table (1) standard deviations of the gap between domestic and foreign output, inflation unemployment and also the standard deviation of the real exchange rate (or, similarly, the term of trade), which take into account evolution of home and foreign prices. Standard deviations are computed for each scenario, *i.e.* for each fiscal instrument potentially used by the domestic government.

Following the negative supply shock, foreign output falls but to a lesser extent than in the home economy. The consumer price index increases also in the foreign economy and unemployment increases following the reduction in output.

A first observation is that a decrease in the labor income tax and in the social protection tax following the fiscal transfer triggers the most important decrease in volatility between

	$C_t^{g,T,H}$	Tr_t^H	$\tau_t^{c,H}$	$\tau_t^{w,H}$	$\tau_t^{sp,H}$
Output differential	0.0063	0.012	0.0078	0.00026	0.0004
Inflation differential	0.002	0.0037	0.0064	0.00095	0.0012
Unemployment differential	0.0023	0.0026	0.004	0.0021	0.0021
Real exchange rate	0.0068	0.013	0.0084	0.032	0.0047

Table 1: Standard deviations in the case of a 1% (negative) TFP shock.

both economies. At the opposite, the demand-enhancing fiscal instruments (a drop in VAT, a rise in government consumption and in transfers) trigger a lower stabilization in the case of the supply shock. The drop in the labor income tax and in the social protection tax generate a better stabilization of home output but also the spillover effects on foreign output are significantly positive.[4] Public consumption, VAT and transfers also reduce the output differential but to a lesser extent. One can notice that transfers reduce less the difference in output between the two economies than public consumption. Indeed, a rise in transfers to households in one member state triggers a strong leakage effect since home households will consume more home goods but also more foreign goods since one share of goods are perfectly tradable in the monetary union. Thus, a rise in transfers to households in the home economy triggers a positive spillover effect on the foreign economy so that the output differential between the two economies is more volatile than in the case of a rise in public consumption following the fiscal transfer.

As said previously, the negative productivity shock puts an upward pressure on home and foreign prices. However, the rise in prices is more important in the home economy. One interesting observation is that when the fiscal transfer is used for rising public consumption and transfers to households or for decreasing VAT, it triggers additional upward pressures on prices in the domestic economy. These demand-enhancing instruments thus increase the volatility of home inflation so that the inflation differential between the two economies is greater than without any fiscal intervention. At the opposite, a drop in the social protection tax in the home economy triggers a decrease in inflation in the short-run and a slightly positive response of prices in the long run. A drop in the labor income tax generate weak pressures on home inflation and decreases slightly foreign prices. As a consequence, these two taxes are more effective for stabilizing inflation between member states, as indicated on Table (1) and Figures (1) and (2).

When a negative supply shock occurs in the home economy, it tends to reduce unemployment. This decrease in unemplouyment following a negative TFP shock is rather standard in a DSGE model: The drop in production following the TFP shock is slower than the drop in productivity. Consequently, labor demand increases in the short-run, which triggers a lowered unemployment rate.[5] As a consequence, the implementation of a fiscal policy in

[4]See Barbier-Gauchard and Betti (2020) in which we document the spillover effects of these different fiscal instruments in a currecy union.

[5]See Barnichon (2012) for a detailed review of the short-term effects of productivity shocks on unemployment

order to boost output will tend to enhance this drop in unemployment in the home economy. In this case, a labor income tax cut is the most effective fiscal tool to stabilize unemployment in the home economy since it produces a rise in output but a mitigate effect on home unemployment. More precisely, a labor income tax cut in the home economy boosts output and employment but also the labor force participation since marginal utility of labor for the households increase. Thus, as shown in Table (1), the labor income tax cut stabilizes unemployment more than the other fiscal instruments.

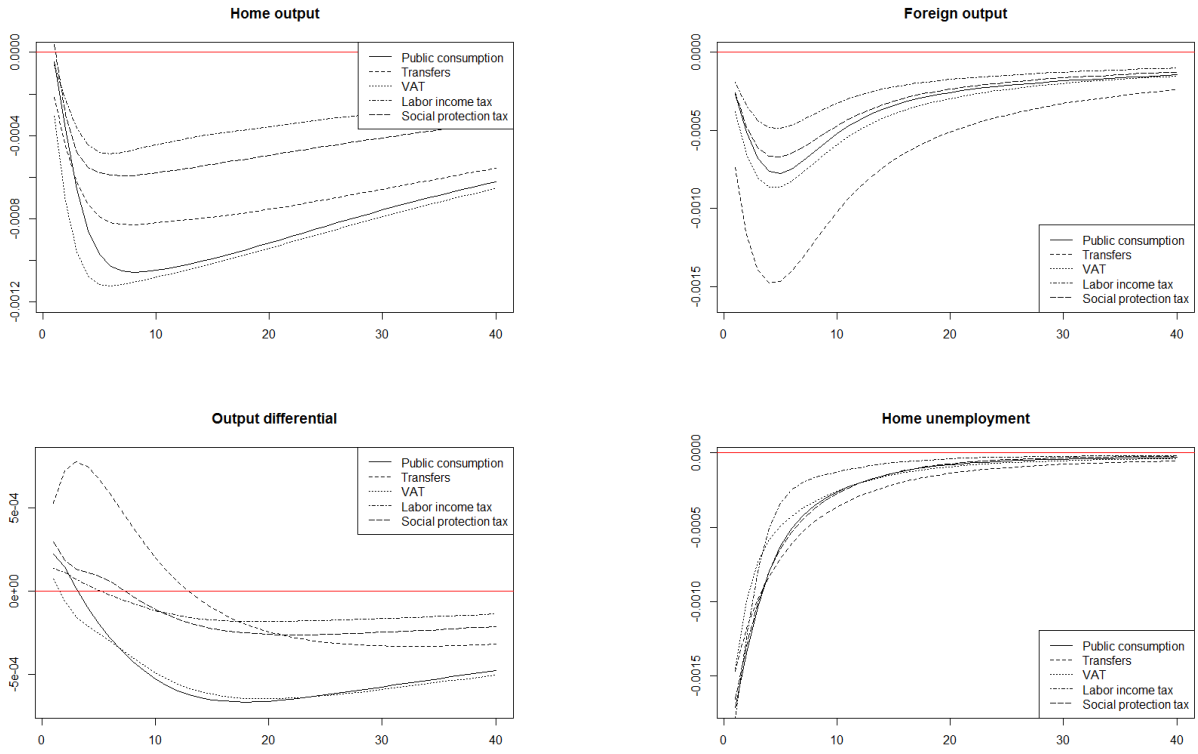

Figure 1: Response to a negative supply shock in the home economy I

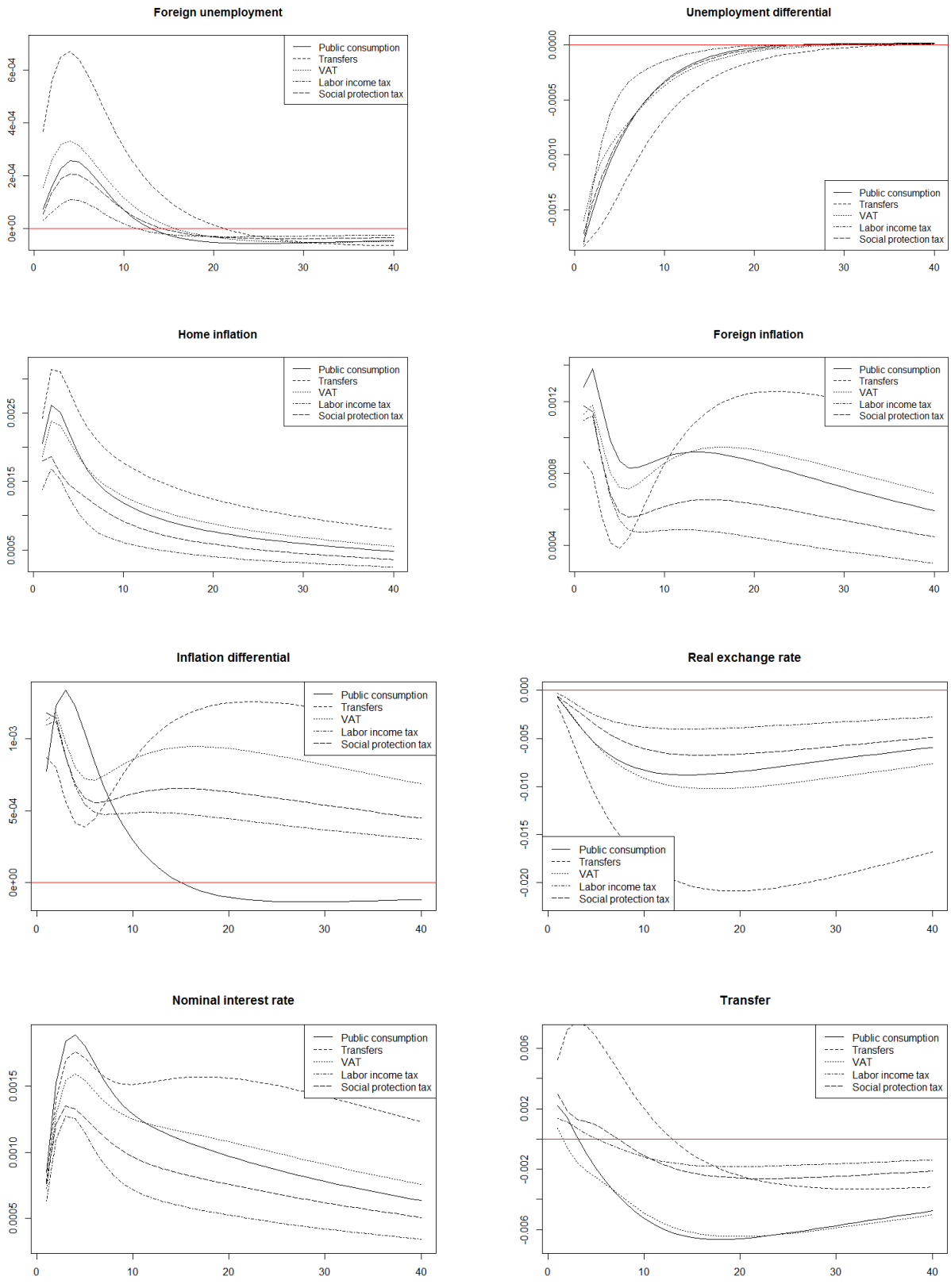

Figure 2: Response to a negative supply shock in the home economy II

3.2 Response of the economy in the case of a negative demand shock

In the case of a negative preference shock for the domestic households, home output falls. In contrary to the effects of a supply shock, a negative demand shock triggers a fall in prices and a rise in unemployment in the home economy, as shown in Figures (3) and (4). Since home households consume a significant share of foreign goods, the drop in consumption in the home economy impacts also negatively the demand for goods in the foreign economy so that output and prices fall in the foreign economy.

	$C_t^{g,T,H}$	Tr_t^H	$\tau_t^{c,H}$	$\tau_t^{w,H}$	$\tau_t^{sp,H}$
Output differential	0.00048	0.0012	0.001	0.0008	0.001
Inflation differential	0.00024	0.0007	0.0004	0.0013	0.0023
Unemployment differential	0.00042	0.0013	0.001	0.003	0.0011
Real exchange rate	0.00066	0.002	0.001	0.0034	0.0042

Table 2: Standard deviations in the case of a 1% demand shock.

In Table (2) are reported the standard deviations in the case of the negative demand shock in the home economy. The main result is that when a negative demand shock occurs, the demand-enhancing fiscal instruments, namely public consumption, transfers to households and VAT are more effective to stabilize macroeconomic differentials between economies than the labor income tax and the social protection tax, in opposition with the case of a supply shock.

Similarly to the previous case, transfers to households and cut in VAT are less effective to reduce output differential than public consumption since the shift in demand produced by the transfers and VAT is limited by a leakage effect in favor of the purchase of foreign goods.

In the case of a demand shock output and inflation are positively correlated, the demand-enhancing fiscal instruments are thus effective for reducing inflation differential between both economies. Also, the degradation of output is followed by a rise in unemployment in both economies. As a consequence, transfers used on public consumption stabilize in this case home unemployment and the unemployment differential between both economies.

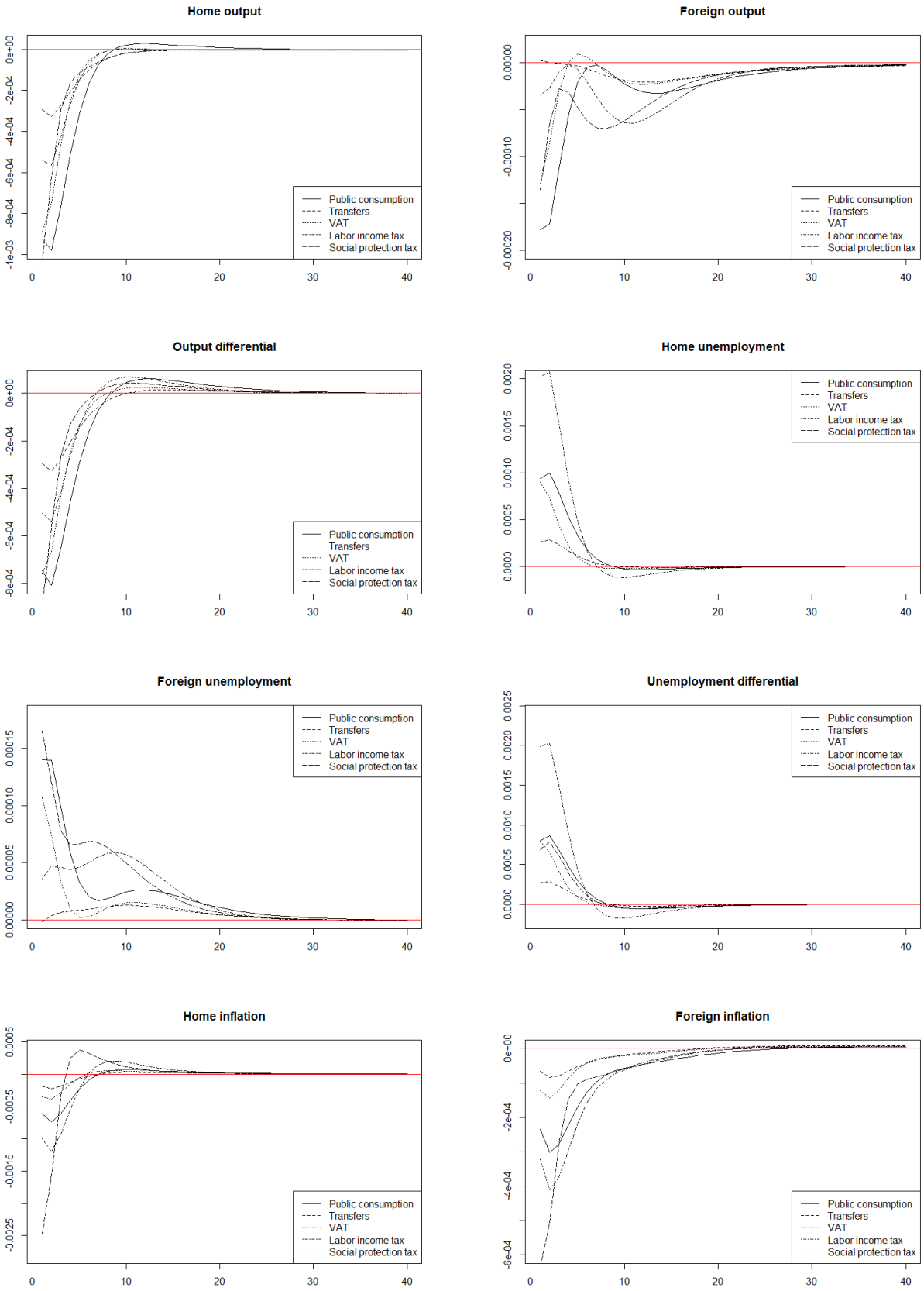

Figure 3: Response to a negative demand shock in the home economy I

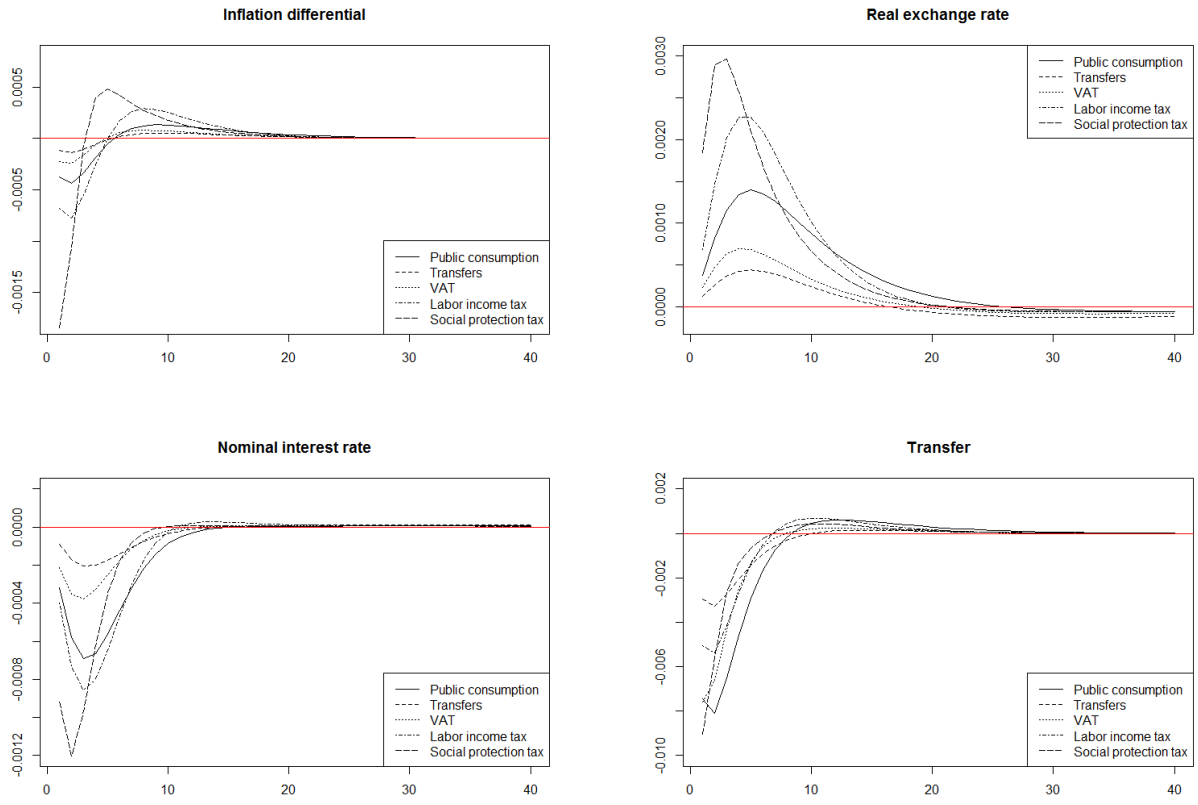

Figure 4: Response to a negative demand shock in the home economy II

4 Conclusion

The main result of this paper is that the stabilizing properties of a fiscal transfer mechanism strongly depend on the way the recipient economy uses the transfers. Public consumption, transfers to households and VAT are more effective to stabilize macroeconomic differentials in a monetary union when asymmetric demand shocks occur while the labor income tax and the social protection tax are more effective in the case of a asymmetric supply shock.

Also, transfers to households and a VAT cut do not seem to be very effective even in the case of a demand shock since these fiscal instruments trigger a large leakage effect so that the output differential is less reduced than in the case of public consumption.

This paper argues for the implementation of a fiscal transfer mechanism in the Euro Area. This kind of fiscal transfers improve the macroeconomic stabilization within (non-optimal) currency unions. More importantly, this paper shows that the central authority (the European commission for example in the case of the Euro Area) could urge the member states as to the use of these fiscal transfers.

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