Federal Fiscal Transfers in Monetary Unions: A NOEM Approach*

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This Version: October 9th, 2005

Abstract

In the debate over EMU, a widely accepted view is that a federal fiscal mechanism is needed for the participating states to cope with asymmetric shocks. In this paper, we explore the properties of federal fiscal transfer schemes with regard to their capability to stabilize national consumption, production and employment. We consider direct transfers among private sectors and indirect transfers among national fiscal authorities. We show that federal fiscal arrangements are capable to provide perfect insurance. Our analysis builds on the New Open Economy Macroeconomics framework which allows us to portray the transmission of shocks and the properties of transfers in detail.

JEL Classifications: E42, E63, F33, F42

*I owe special thanks to Jürgen von Hagen who encouraged this paper. I am grateful to Rafael Domenéch, Gernot Müller, Kenneth Kletzer and Stefan Niemann for valuable comments and helpful discussions. Financial support of the Deutsche Forschungsgemeinschaft (German Research Foundation) through SPP 1142 is gratefully acknowledged. The usual disclaimer applies.

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1 Introduction

The creation of a monetary union, as is often proposed by its advocates, enhances trade among member states since it reduces transaction costs and leads to higher economic, political and social integration. But creating a monetary union also means that its member states sacrifice their monetary policy autonomy. Furthermore, the member states abandon the flexibility of exchange rates that adjusts regionally asymmetric shocks among member states.

Building on the seminal work by Mundell (1961), the literature beginning with Kenen (1969) has argued that monetary unions must be embedded in adequate federal fiscal institutions that provide insurance against asymmetric shocks among the member states. This also forms the consensus in the debate over EMU. In a report, Delors (1989) argued that the lack of exchange rate flexibility would cause tensions within the monetary union that may even lead to a breakdown of the union if no such adjusting institution was installed. Delors recommended binding limits on national budget deficits and the coordination of national fiscal policies so as to establish a union-wide arrangement absorbing asymmetric shocks among the member states. The latter recommendation, however, was daffed aside in the Maastricht Treaty and only the limits on national budget deficits and public debts were anchored in the Stability and Growth Pact. To emphasize his concern about the missing of a fiscal arrangement dealing with asymmetric shocks, Feldstein (1997) claimed that

> "...on balance, a European monetary union would be an economic liability. The gains from reduced transformation costs would be small and might, when looked at from the global point of view, be negative. At the same time, EMU would increase cyclical instability, raising the cyclical unemployment rate."

It is even more astonishing that the Maastricht Treaty paid so little attention to an adjusting arrangement as more than 20 years before the Delors Report, the so-called MacDougall Report [1977], a study of the feasibility of EMU, already put forward the creation of a central or federal fiscal arrangement that would automatically redistribute taxes or transfers among the member states in order to absorb the effects of asymmetric shocks. In particular, it suggested that a system of built-in stabilizers should work through a federal or central budget that collects taxes from a prospering state and pays transfers to a state in recession. These transfers could either be among national governments or directly among private sectors, ie. households and firms.

The focus of this paper is to analyze federal fiscal transfers that are aimed to reduce economic fluctuations caused by temporary asymmetric productivity and preference shocks. We explore the properties of different transfer schemes with regard to their capability to stabilize national consumption, production and employ-

ment. Specifically, we consider the two types of transfers suggested by the MacDougall Report and which are existing in federal states: Federal transfers among the households of different member states and intergovernmental transfers that include payments between national fiscal authorities only. The difference in how the two transfer schemes affect the allocation is key to the analysis: Whereas federal transfers among households change current incomes of households directly and affect the allocation through choices made by the households, intergovernmental transfers change national public consumption and the allocation through the goods markets. Intergovernmental transfers affect households' current income indirectly through changes in goods and subsequently labor demand.

In case of preference shocks that shift the demand from goods produced in one region to goods produced in another region, intergovernmental transfers simply shift back the demand effect through a change in public consumption such that production and employment remain unaltered. This implies no change in labor income and thus no fluctuations in consumption, employment and welfare at all.

In contrast, if the member states are hit by asymmetric productivity shocks, changes in consumer prices lead to a further income effect and changes in the real interest rates prompt households to save. This comes in addition to the labor income effects caused by changes in demand. In this case, neither transfer scheme stabilizes consumption and employment fluctuations at the same time. A combination of federal transfers among households and intergovernmental transfers, however, will do. Whereas the intergovernmental transfers keep employment and thus labor income constant, the federal transfers among households redistribute private savings and the income effect due to the change in consumer prices. Consequently, both consumption and employment are stabilized.

As a result, we find that federal fiscal arrangements as suggested by the MacDougall Report indeed provide perfect insurance in the sense that fluctuations induced by asymmetric shocks can be completely prevented.

In light of the many times expressed concerns about the lack of a federal fiscal stabilization mechanism, it is surprising that researchers have rarely analyzed federal fiscal transfer mechanisms within a theoretical framework. The few theoretical approaches to federal fiscal institutions that employ federal transfers among states forming a monetary union are Kletzer and Buiter (1997), Kletzer (1999), and Kletzer and von Hagen (2001). The main part of the literature on federal fiscal institutions stabilizing economic fluctuations in monetary unions evolves around the empirical relevance of such institutions in existing unions. This academic debate was initiated by the contributions of Sachs and Sala-i-Martin (1991) and von Hagen (1992). They estimated the effects of federal fiscal transfer payments to offset asymmetric shocks in the U.S to be between 10% and 40%. An overview on the subsequent literature is provided by Kletzer and von Hagen (2001) and Mélitz and Zumer (2002).

Closest to our model is Kletzer and von Hagen (2001). They consider two regions forming a monetary union within a dynamic general equilibrium framework with rigid wages. Each region produces a final good for consumption using a set of intermediate input factors produced with labor. The regions are exposed to asymmetric productivity shocks. Kletzer and von Hagen show that asymmetric productivity shocks have no effects on consumption and employment as long as the economic structures of the two member states are similar. Only if the economic structures are sufficiently different, asymmetric productivity shocks cause fluctuations. In that case, a redistributive federal transfer scheme can stabilize either consumption, or production, or employment, but not two of them at the same time.

We extend their analysis in several aspects. First, we introduce preference shocks. This allows us to study shifts in demand directly and to revisit Mundell's original example. Second, we stress the importance of trade as a means of cushioning asymmetric demand and supply shocks. Specifically, we consider the degree of economic integration and structural differences of the member states to gain further insights into effectiveness and functioning of the different transfers. Third, we use welfare criteria to judge the insurance property of the fiscal arrangements. Fourth, we show that a combination of the two federal fiscal transfers will always provide perfect insurance.

Our model is set up in the tradition of the New Open Economy Macroeconomics (NOEM) and follows closely Obstfeld and Rogoff (1995, 1996)[1]. This allows us to embed the different federal fiscal transfer schemes into a dynamic general equilibrium setting with nominal rigidities. The great convenience of this approach is that we can jointly analyze immediate and long-run consequences of federal fiscal arrangements on consumption, production, employment and the current account in depth. This enables us to gain insights into the functioning and effectiveness of the different transfer schemes in response to asymmetric shocks. To conform the model to our purposes, we extend the model by Obstfeld and Rogoff along two lines. First, in our model, households provide different types of labor monopolistically. Final goods are produced by an aggregation technology over all different domestic types of labor. In this sense, technology shocks alter the aggregate labor productivity and subsequently shift marginal costs of producing market goods. This is in stark contrast to Obstfeld and Rogoff who model productivity as a preference parameter. As a consequence, since goods markets are assumed to be competitive in our model, temporary productivity shocks affect prices even though wages are rigid as it is emphasized in Obstfeld and Rogoff (2000). This enriches the dynamics of the model immensely. The underlying view is that wages are much more rigid than prices. Furthermore, it seems implausible that productivity shocks even though only transitory in nature have no impacts on prices at all. Second, we introduce tradable and non-tradable goods.[2] Therefore, we can describe the demand shock initially

[1] See also Lane (2001) and more recently Lane and Ganelli (2003) for excellent overviews.

[2] Hau (2000) extends the original model by Obstfeld and Rogoff for tradable and non-tradable goods.

considered by Mundell (1961) as a shift of demand from tradable goods produced in one state to tradable goods produced in the other state. This also allows us to take into account how economic integration as measured by the fraction of tradable consumption goods affects functioning and effectiveness of different transfer schemes.

The rest of this paper is structured as follows. In the next section, we set up our model of the monetary union. In Section 3 we consider the solution of the log-linearized model. We portray the transmission of demand and supply shocks as well as changes in policies in depth. In Section 4 we turn to the analysis of the different transfer schemes. We conclude in Section 5.

2 The Model

We consider a monetary union that consists of two regions, referred to as "home" (H) and "foreign" (F). Each region is populated by a continuum of households with measure one. Each household within a region provides a specific type of labor which is used as an input factor for the production of two goods, a tradable and a non-tradable good. Altogether we have four different goods, two tradable and two non-tradable ones. We assume the goods markets to be perfectly competitive, but labor is supplied monopolistically. Wages are sticky and set one period in advance. The only asset households trade across regions is a nominal bond. There are two local governments, one within each region, a federal government and a central bank. Local governments collect lump-sum taxes from their inhabitants to finance government expenditures. In addition, local governments receive or pay transfers within the federal budget. The federal government acts as a balance sheet for transfers among households of the different regions and between the two local fiscal authorities.

The notation we stick to throughout this paper is as follows: Superscripts denote where a variable belongs to, foreign variables are distinguished by an asterisk $*$, and union wide aggregates by MU. Subscripts identify the characteristics of that variable, e.g. whether it's a non-tradable or the home tradable good. Households and their specific input factors are denoted by $i \in [0, 1]$.

2.1 Goods Production

The technologies to produce the tradable and the non-tradable goods are identical within the region:

$$y_{j,s} = a_s \left(\int_0^1 l_{j,s}(i)^{\frac{\theta-1}{\theta}} di \right)^{\frac{\theta}{\theta-1}}, \tag{1}$$

where $\theta > 1$, for $j \in \{H, N\}$ being either the home tradable good H or home non-tradable good N. The CES technology simply aggregates all different types of labor

i within a region which are substitutable at a constant elasticity θ. The aggregate productivity of labor a_s is subject to shocks. Foreigners share the same aggregation technology but with a different productivity level. Factor cost minimization implies

$$l_{j,s}(i) = \frac{1}{a_s}\left(\frac{w_s(i)}{W_s}\right)^{-\theta} y_{j,s} \tag{2}$$

to be the optimal demand for labor input of quality i at wage $w_s(i)$ and an overall wage level

$$W_s = \left(\int_0^1 w_s(i)^{(1-\theta)} di\right)^{\frac{1}{1-\theta}}. \tag{3}$$

With perfectly competitive goods markets, the prices for home tradable and non-tradable goods are

$$P_{H,s} = P_{N,s} = \frac{W_s}{a_s}, \tag{4}$$

respectively. Total aggregate output of the home tradable good is $Y_{H,s}$ and of the home non-tradable good $Y_{N,s}$. For the foreign region the corresponding expressions apply.

2.2 Households

Households within the same region have identical preferences over consumption, real balances and labor effort. They are described by

$$U_t(i) = \sum_{s=t}^{\infty} \beta^{s-t}\left(lnC_s(i) + \chi ln\left(\frac{M_s(i)}{P_s}\right) - \frac{1}{2}L_s(i)^2\right), \tag{5}$$

where $0 < \beta < 1$, and $\chi > 0$. The real consumption index for person i, $C_s(i)$ is given by

$$C_s(i) = \left(\gamma^{\frac{1}{\rho}} C_{T,s}(i)^{\frac{\rho-1}{\rho}} + (1-\gamma)^{\frac{1}{\rho}} C_{N,s}(i)^{\frac{(\rho-1)}{\rho}}\right)^{\frac{\rho}{(\rho-1)}}, \tag{6}$$

$0 < \gamma < 1$, and is identical for all persons within a region. Following our notation, $C_{N,s}(i)$ denotes i's consumption of the home non-tradable good. $C_{T,s}(i)$ is a real consumption index over the two tradable goods $C_{H,s}(i)$ and $C_{F,s}(i)$ with

$$C_{T,s(i)} = \left(\alpha^{\frac{1}{\rho}} C_{H,s}(i)^{\frac{\rho-1}{\rho}} + (1-\alpha)^{\frac{1}{\rho}} C_{F,s}(i)^{\frac{(\rho-1)}{\rho}}\right)^{\frac{\rho}{(\rho-1)}}, \tag{7}$$

$0 < \alpha < 1$. Foreign households have the same preferences over tradable goods but differ with respect to their own non-tradable good. Individual optimization yields for any person i the following composition of the home real consumption index between the tradable commodities index and the non-tradable good

$$C_{T,s} = \gamma\left(\frac{P_{T,s}}{P_s}\right)^{-\rho} C_s, \qquad \text{and} \qquad C_{N,s} = (1-\gamma)\left(\frac{P_{N,s}}{P_s}\right)^{-\rho} C_s, \tag{8}$$

and between home and foreign tradable commodities

$$C_{H,s} = \alpha \left(\frac{P_{H,s}}{P_{T,s}} \right)^{-\rho} C_{T,s}, \qquad \text{and} \qquad C_{F,s} = (1-\alpha) \left(\frac{P_{F,s}}{P_{T,s}} \right)^{-\rho} C_{T,s}. \tag{9}$$

The parameters γ, α, and ρ will play a crucial role in our analysis. By our assumption of CES consumption indices, γ determines together with the price ratio of tradable and non-tradable goods the composition of tradable and non-tradable goods in the overall consumption basket. In fact, as γ reaches zero, households demand only non-tradable goods and no trade in goods will occur. As γ reaches unity, both foreign and home households prefer tradable goods only. Since we assume that preferences over tradable-goods are identical for home and foreign households, preferences coincide. Therefore, γ captures the difference in preferences. This implies that γ also displays differences in price levels and real interest rates, too. On this account we will interpret γ to indicate the degree of economic integration of the two member states.[3] The parameter α gives the consumption composition of the two tradable goods. Since home and foreign households share identical tastes with respect to the composition of the two tradable commodities, we can consider a shift of demand from one region to the other. This is Mundell's original case when he analyzed optimum currency areas. The elasticity of substitution ρ determines in combination with γ and α how private households' demand responds to changes in relative prices. In particular, in our setting ρ accounts for the expenditure switching effect following changes in relative prices.

The corresponding home consumption-based price indices are

$$\begin{aligned} P_s &= \left(\gamma P_{T,s}^{(1-\rho)} + (1-\gamma) P_{N,s}^{(1-\rho)} \right)^{\frac{1}{(1-\rho)}} \\ \text{and} \quad P_{T,s} &= \left(\alpha P_{H,s}^{(1-\rho)} + (1-\alpha) P_{F,s}^{(1-\rho)} \right)^{\frac{1}{(1-\rho)}} . \end{aligned} \tag{10}$$

Home household i's optimization problem is to maximize (5) subject to its budget constraint with respect to $\{C_s(i), M_s(i), L_s(i)\}_{s=t}^{\infty}$

$$\begin{aligned} & B_{s+1}(i) + M_s(i) + P_s C_s(i) \\ & \leq \quad (1+i_s) B_s(i) + w_s(i) L_s(i) + M_{(s-1)}(i) + T_{loc,s} + T_{hh,s} \qquad \forall s \geq t, \end{aligned} \tag{11}$$

where i_s is the nominal interest rate, and subject to the labor demand functions for household i's specific variety of labor

$$l_s(i) = \frac{1}{a_s} \left(\frac{w_s(i)}{W_s} \right)^{-\theta} (Y_{H,s} + Y_{N,s}) . \tag{12}$$

[3] In a common sense, economic integration suggests also factor mobility. In fact, following our assumption of production processes, even though labor is completely mobile, it is only demanded domestically. Thus, viewing γ as the degree of economic integration seems plausible.

The transfers in (11) consist of the usual net lump-sum transfer from the local fiscal authority, $T_{loc,s}$, and the private transfer from foreign households to domestic households, $T_{hh,s}$ (read 'households to households'), that is part of the federal fiscal arrangement. Transfers are identical for all households within a region. Therefore we skip indices.

The optimality conditions are the standard consumption Euler equation

$$C_{s+1}(i) = C_s(i)\beta(1 + r_{s+1}), \tag{13}$$

optimal money demand

$$\frac{M_s(i)}{P_s} = \chi C_s(i)\frac{1 + i_{s+1}}{i_{s+1}}, \tag{14}$$

and the optimal wage setting

$$w_s(i) = \frac{\theta}{\theta - 1} L_s(i) C_s(i) P_s. \tag{15}$$

The nominal interest rate is given by

$$1 + i_{s+1} = (1 + r_{s+1})\frac{P_{s+1}}{P_s}. \tag{16}$$

Note that with a common currency the nominal interest rate is the same in both regions. Of course, the real interest rates differ as purchasing power parity need not hold. Optimality conditions for foreign households are accordingly.

2.3 Local Governments and Federal Fiscal Arrangements

Local governments distribute lump-sum transfers to local households $T_{loc,s}$ and purchase government expenditures, G_s. Local governments only consume local nontradable goods and public consumption is purely dissipative.[4] In addition, local governments receive or pay intergovernmental transfers, $T_{gg,s}$ (read 'government to government'), through the federal budget and obtain payments from the central bank, $T_{cb,s}$. The local governments' budget constraints are

$$\begin{aligned} T_{loc,s} + P_{N,s} G_s &= T_{gg,s} + T_{cb,s} \\ \text{and} \qquad T^*_{loc,s} + P^*_{N,s} G^*_s &= T^*_{gg,s} + T^*_{cb,s}. \end{aligned} \tag{17}$$

The payments by the central bank are the seignorage revenues from issuing new money. Consequently, the payments sum up to

$$T_{cb,s} + T^*_{cb,s} = \left(M^{MU}_s - M^{MU}_{s-1}\right), \tag{18}$$

[4] In principle, national public consumption could have been assumed to be useful. However, we do without this assumption as we will consider only the temporary deviations of allocations. Furthermore, since we evaluate the stabilization property of different transfer schemes, we want to concentrate on effects on consumption and employment only.

where M_s^{MU} denotes the union wide money supplied by the common central bank.

In our model, the federal government serves only as a balance sheet. The two constraints for transfers among private households across regions and for transfers between the two local governments are

$$T_{hh,s} + T^*_{hh,s} = 0 \qquad \text{and} \qquad T_{gg,s} + T^*_{gg,s} = 0, \tag{19}$$

respectively.

2.4 Market Clearing, Terms of Trade, and the Real Exchange Rate

All households within a region are identical. In particular, they have identical initial wealth and thus they choose the same actions. As a consequence, per capita levels coincide with national aggregate levels since each of two regions is of size one.

In equilibrium, the markets for tradable and non-tradable goods clear. For the home tradable good we thus have that total production $Y_{T,s}$ must meet the sum of total home demand for the home tradable good, $C_{H,s}$, and total foreign demand of the home tradable good, $C^*_{H,s}$, i.e.

$$Y_{T,s} = C_{H,s} + C^*_{H,s}. \tag{20}$$

We can substitute the optimal fraction of total consumption expenditures that is allotted to consumption of the home tradable good in (8) and (9). Total home and foreign production of tradable goods in terms of home and foreign total consumption levels are

$$\begin{aligned} Y_{T,s} &= \alpha\gamma \left(\frac{P_{H,s}}{P_s}\right)^{-\rho} \left(C_s + RER_s^{-\rho} C^*_s\right) \\ \text{and} \quad Y^*_{T,s} &= (1-\alpha)\gamma \left(\frac{P_{F,s}}{P_s}\right)^{-\rho} \left(C_s + RER_s^{-\rho} C^*_s\right), \end{aligned} \tag{21}$$

respectively. The real exchange rate, RER_s, is defined as the price of a foreign consumption basket in terms of the home consumption basket, ie.

$$RER_s = \left(\frac{P_s}{P^*_s}\right). \tag{22}$$

The terms of trade, ToT_s, are defined as the price of home imports in terms of home exports, ie. in money prices

$$ToT_s = \left(\frac{P_{H,s}}{P_{F,s}}\right) = \left(\frac{a^*_s}{a_s}\frac{W_s}{W^*_s}\right), \qquad \text{and} \qquad RER_s = ToT_s^{(1-\gamma)}. \tag{23}$$

The second equation in (23) stems from the definition of consumption-based price indices and simply states that in case of no trade in goods, ie. if $\gamma = 0$, the real exchange rate and the terms of trade must coincide, and if households consume tradables only ($\gamma = 1$), the real exchange rate must be unity, since then preferences are identical and the law of one price holds. This is another motive for interpreting γ as measure of economic integration. Together with the market clearing conditions for non-tradable consumption goods, $Y_{N,s} = C_{N,s} + G_s$, we arrive at the total aggregate demand for home goods, namely

$$Y_s = (1 - \gamma(1-\alpha)) \left(\frac{P_{H,s}}{P_s}\right)^{-\rho} C_s + \alpha\gamma \left(\frac{P_{H,s}}{P_s}\right)^{-\rho} RER_s^{-\rho} C_s^* + G_s, \tag{24}$$

and for the total aggregate demand for foreign goods we get

$$Y_s^* = (1-\alpha)\gamma \left(\frac{P_{F,s}}{P_s}\right)^{-\rho} C_s + (1 - \alpha\gamma) \left(\frac{P_{F,s}}{P_s}\right)^{-\rho} RER_s^{-\rho} C_s^* + G_s^*. \tag{25}$$

Written as above, the composition of total aggregate demand has a straightforward interpretation. Take for example home aggregate demand. In (24) the first terms denotes home private consumption. It is overall home private consumption evaluated at relative prices of home goods $\left(\frac{P_{H,s}}{P_s}\right)^{-\rho} C_s$ less the fraction $\gamma(1-\alpha)$ private households demand from abroad. In turn, the second term denotes the fraction of home goods in foreign private consumption. The last term is domestic public consumption which is completely home-biased.

The asset market clearing conditions for the bond and the money markets are

$$B_s + B_s^* = 0, \qquad \text{and} \qquad M_s + M_s^* = M_s^{MU}. \tag{26}$$

Together with home current account identity we get the global equilibrium

$$Y_s^{MU} = C_s^{MU} + G_s^{MU}. \tag{27}$$

It states that aggregate income within the union is equal to the union-wide aggregate public and private consumption.

In order to analyze the effects of unanticipated temporary productivity and demand shocks, we take log-linear approximations of the model around a completely symmetric steady state. In this initial steady state we have $\bar{B} = \bar{B}^* = 0$, $\bar{G} = \bar{G}^*$, $\bar{a} = \bar{a}^*$, and $\bar{\alpha} = \frac{1}{2}$. We delegate all derivations to the appendix that is available upon request. Instead, we directly turn to the solution of the log-linearized model.

3 Solution of the log-linearized Model

Our model exhibits nominal rigidities as households have to set their wages one period in advance. As a consequence, when defining the equilibrium conditions,

we have to distinguish between long-run equilibrium conditions, i.e. the long-run flexible wage equilibrium conditions, and the short-run equilibrium conditions with fixed wages.

The long-run equilibrium is given by the per capita versions of the Euler condition (13), optimal money demand (14), Fisher parity (16), optimal labor supply, i.e. the wage setting equation (15), aggregate production $Y_s = a_s L_s$, aggregate demand (24), the price level (10), all the foreign counterparts of these conditions, the home intertemporal budget constraint (11), and market clearing for the nominal bonds and for money (26).

In the short-run, however, households cannot adjust their wages to unanticipated shocks. With preset nominal wages, employment will be completely determined by the domestic labor demand. Thus, in the short-run, the equality of the marginal utility derived from consuming additional income and the disutility from labor need not hold. Consequently, the set of short-run equilibrium conditions is the same as the set of long-run equilibrium conditions but without (15) and its foreign counterpart.

Since we consider unanticipated temporary shocks to productivity and to the preferences for tradable consumption goods, changes in the long-run equilibrium result only from the short-run current account imbalances. As households want to smooth their consumption over time, they distribute the effects of the shocks over time. Consequently, the households have to adjust their net foreign asset positions accordingly. It is instructive to begin the analysis of the transmission of temporary shocks by looking at the impact of changes in the net foreign asset positions on long-run consumption, production, and employment.

3.1 Long-run implications of productivity and demand shocks

The aggregate long-run changes in the monetary union are the population weighted sum of national changes for consumption, production and labor. By assuming the two regions to be completely symmetric initially, the log-linearization around the symmetric steady state implies locally that national deviations exactly offset each other, ie., we have that $\hat{\bar{C}}^{MU} = \hat{\bar{Y}}^{MU} = \hat{\bar{L}}^{MU} = 0$.[5] Consequently, domestic and foreign deviations are exactly of opposite signs. We therefore discuss the effects on domestic variables only.

[5]On the notation: Long-run percentage deviations from the steady state levels are marked by $\hat{\bar{X}}$, short-run percentage deviations by $\hat{X}$. Deviations of variables that are zero in steady state are expressed in terms of steady state consumption expenditures, eg. $\hat{B} = \frac{dB}{P\bar{C}}$. To alleviate the economic interpretation of the transmission processes, we introduce notation for the constant terms that stem from the log-linear approximations. Each constant is dubbed $\Lambda_{\hat{X},\hat{Y}}$ and its two indices indicate the effect of a change in the latter on the former. I.e. $\Lambda_{\hat{X},\hat{Y}}$ is the constant for $\hat{X} = \Lambda_{\hat{X},\hat{Y}}\hat{Y}$.

3.1.1 Consumption

The shift of home private steady state consumption to the new steady state level in response to a shift in the net foreign assets reads

$$\hat{\bar{C}} = \frac{1+\rho(2-\gamma)}{2\left(\rho(2-\gamma)-(1-\gamma)\right)}\delta\hat{\bar{B}} = \Lambda_{\hat{\bar{C}},\hat{\bar{B}}}\hat{\bar{B}}, \tag{28}$$

where $0 < \Lambda_{\hat{\bar{C}},\hat{\bar{B}}}$[6]. An increase in home net foreign assets increases steady state income by the annuity $\delta\hat{\bar{B}}$. Higher permanent income leads to a higher consumption level. This, in turn, causes higher wage claims and, subsequently, an increase in prices of domestic final goods for two reasons: First, the opportunity cost of labor supply increases. Second, the demand for labor rises due to the higher consumption level. The foreign households perceive exactly the opposite effect. Consequently, the terms of trade rise and cause an expenditure switching effect. Whether or not this expenditure switching will dampen the effect of higher permanent income depends on the degree up to which consumption goods are substitutable.

3.1.2 Production and Employment

As the mechanism described above works through the overall goods demand and optimal wage setting, the relation between consumption and production is

$$\hat{\bar{Y}} = \frac{(1-\gamma)-\rho(2-\gamma)}{1+\rho(1-\gamma)}\hat{\bar{C}} = \Lambda_{\hat{\bar{Y}},\hat{\bar{C}}}\hat{\bar{C}}, \tag{29}$$

with $-1 \leq \Lambda_{\hat{\bar{Y}},\hat{\bar{C}}} \leq 0$.

From these considerations we deduce that an increase in home per capita net foreign assets leads to a change in production and employment by

$$\hat{\bar{Y}} = \hat{\bar{L}} = -\frac{\delta}{2}\hat{\bar{B}}. \tag{30}$$

3.2 Short-run implications of productivity and demand shocks

Now, we consider the short-run implications of unanticipated temporary innovations of the terms of trade, of the demand for tradable goods, of federal transfers among households, and of intergovernmental transfers and portray the transmission process in detail. The union-wide aggregates of consumption, production, and employment are invariant to fully asymmetric shocks. They are only affected by a change in the union-wide money supply and the proximate change in the nominal interest rate

[6] We assume throughout the analysis that the elasticity of substitution between two goods suffices $\frac{1-\gamma}{2-\gamma} < \rho$. This is quite innocuous as empirical studies suggest and much less restrictive than the assumption in the NOEM literature that $1 < \rho$ when consumption goods are supplied monopolistically to ensure well-behaved demands.

common to both regions, ie. $\hat{C}^{MU} = \hat{Y}^{MU} = \hat{L}^{MU} = \hat{M}^{MU}$. This reason leads us to consider only completely asymmetric shocks that bear no aggregate effects since the common component in shocks can be targeted by adjusting the union-wide money supply. An immediate consequence is, as above, that foreign per capita variables change by exactly the opposite magnitude.

3.2.1 Consumption

In order to ease the illustration of the impact of shocks on the consumption level, we separate the direct equilibrium response induced by the change in exogenous variables from the indirect equilibrium effects induced by the change in the consumption level itself. The short-run implication of the domestic consumption level to the different exogenous innovations can be expressed by[7]

$$\hat{C} = \Lambda_{\hat{C},\hat{DI}} \left(\frac{1}{2} \Lambda_{\hat{DI},\widehat{ToT}} \widehat{ToT} + \Lambda_{\hat{DI},\hat{\alpha}} \hat{\alpha} + \hat{T}_{hh} + \hat{T}_{gg} \right), \tag{31}$$

$0 < \Lambda_{\hat{C},\hat{DI}}$. In the equation above, the terms in brackets depict the change in income due to direct equilibrium responses to exogenous innovations. We define this income as 'consumption-disposable-income' (subscripted by DI) as it denotes the part of income that is dedicated to consumption purchases only. It will be explored in more detail below. $\Lambda_{\hat{C},\hat{DI}}$ captures the equilibrium feedback effect of a change in consumption on consumption-disposable-income. It consists of the net income effect caused by the change in the consumption level and the savings effect in response to a change in the consumption level today as households smooth their consumption path.

(Innovations to the Terms of Trade) The response of contemporaneous home consumption-disposable-income to changes in the terms of trade can be separated into a net income effect and a savings effect:

$$\Lambda_{\hat{DI},\widehat{ToT}} = (1 - \rho(2 - \gamma))\,\gamma - \Lambda_{\hat{S},\widehat{RER}}(1 - \gamma) \tag{32}$$

The first part in (32) denotes the net income effect induced by a change in relative prices. It is the difference between the change in labor income and the change in consumption prices. The non-tradable goods do not appear as the labor income effect is exactly offset by the change in private and public expenditures for non-tradables which leaves labor demand unchanged. Clearly, if no good is traded, the

[7] In the following expression we have already incorporated the assumption that national fiscal authorities cannot adjust their national lump-sum taxes in the short-run, i.e. $\hat{T}_{loc} = \hat{T}^*_{loc} = 0$, and that transfers within the federal fiscal arrangement must net out, ie. $\hat{T}_k - \hat{T}^*_k = 2\hat{T}_k$ with $k = \{hh, gg\}$. Regarding concerns about keeping national taxes temporarily fixed, this assumption serves only to distinguish the two different transfer schemes since we want to concentrate on the role and effectiveness of different federal fiscal transfers. Otherwise, intergovernmental transfers might be redistributed to households via regional lump-sum taxes and is thus equivalent to federal transfers among households.

net income effect is zero. For the opposite case, when all goods are traded, the net effect obviously depends on the elasticity of substitution among home and foreign tradable goods. The second part in (32) depicts the change in wealth, ie.savings, in response to the innovations to the terms of trade that alter the real exchange rate, namely

$$\Lambda_{\hat{S},\widehat{RER}} = \Lambda_{\hat{\tilde{B}},\hat{\tilde{C}}} \frac{\gamma}{1+(1-\gamma)\Lambda_{\hat{\tilde{Y}},\hat{\tilde{C}}}} + \frac{\chi}{1-\beta} = \Lambda_{\hat{\tilde{B}},\hat{\tilde{C}}} \Lambda_{\hat{\tilde{C}},\widehat{RER}} + \Lambda_{\hat{M},\widehat{RER}}, \tag{33}$$

where $0 \leq \Lambda_{\hat{\tilde{B}},\hat{\tilde{C}}} \Lambda_{\hat{\tilde{C}},\widehat{RER}} \equiv \Lambda_{\hat{\tilde{B}},\widehat{RER}} \leq \frac{1}{\delta}$. Two effects are collected in (33): First, an increase in the real exchange rate causes a differential of domestic and foreign real interest rates that prompts the households to alter their net foreign assets. Second, a shift in the real exchange rate and thus in the ratio of the two national price indices implies a change in relative money holdings.

(Shift in Demand) Suppose that home and foreign households temporarily prefer home tradable goods to foreign tradable goods. This shock simply shifts consumption-disposable-income by $\Lambda_{\hat{DI},\hat{\alpha}} = \gamma$ as additional labor income since the total production of home private consumption goods increases by exactly that ratio of tradable goods.

(Federal Transfers among private households) Obviously, changes in federal transfers among private households of the two member states of the union directly shift the disposable income without deterioration since they directly enter private households' budget.

(Intergovernmental Transfers) Intergovernmental transfers change relative public consumption between the two regions as they cannot be directly redistributed to domestic households through local lump-sum transfers. However, intergovernmental transfers shift labor income between the regions indirectly by altering the demand for domestic and foreign non-tradable goods.

Note that the two transfers in (33) affect consumption-disposable-income equally as we express all steady state deviations relative to steady state consumption expenditures. Nevertheless, the two transfers differ with respect to their impact on production and thus labor demand as we will see below.

The important lesson to be learned here is that as both transfers, the federal transfers among private households and the intergovernmental transfers, and the private wealth adjustments in response to unanticipated changes in relative prices affect the consumption level equally through consumption-disposable-income. Thus, to keep the consumption level unaltered, transfers have to target the wealth adjustments in response to unexpected deviations of the real exchange rate, $\Lambda_{\hat{S},\widehat{RER}}(1-\gamma)$, but not equilibrium net savings. Equilibrium net savings also include adjustments in

wealth due to changes in the consumption level in order to smooth the consumption path over time.

3.2.2 Production and Employment

In the short-run, employment is completely determined by labor demand since wages are preset. Labor demand itself is driven by two forces: It is increasing in domestic goods demand and it is decreasing in labor productivity. Deviations of the employment level are given by

$$\hat{L} = \hat{Y} - \hat{a}. \tag{34}$$

Total home production responds to shocks and policy innovations by

$$\hat{Y} = \frac{1}{2}\Lambda_{\hat{Y},\widehat{ToT}}\widehat{ToT} + \Lambda_{\hat{Y},\hat{\alpha}}\hat{\alpha} + \Lambda_{\hat{Y},\hat{T}_{gg}}\hat{T}_{gg} + \Lambda_{\hat{Y},\hat{T_{hh}}}\hat{T}_{hh}. \tag{35}$$

(Innovations to the Terms of Trade) Asymmetric productivity shocks affect output in the short-run only through the effect of the shift in the terms of trades because output markets are perfectly competitive and wages cannot be adjusted,

$$\Lambda_{\hat{Y},\widehat{ToT}} = \Lambda_{\hat{C},\widehat{ToT}}(1-\gamma)(1-\bar{g}) - \rho(2-\gamma)\gamma(1-\bar{g}) - \bar{g}, \tag{36}$$

where $\Lambda_{\hat{C},\widehat{ToT}} = \Lambda_{\hat{C},\widehat{DI}}\Lambda_{\widehat{DI},\widehat{ToT}}$. We encounter three effects in (36): First, as described above, the innovations to the terms of trade shift domestic consumption-disposable-income and thus overall domestic consumption by $\Lambda_{\hat{C},\widehat{ToT}}$. Consequently, the demand for domestic non-tradable goods changes by its fraction of overall consumption expenditures. Second, the shift in the terms of trade leads to an expenditure switching effect for the relatively cheaper tradable good. This is the only effect on tradable goods demand since there is no aggregate change in the demand for tradable goods in response to changes in aggregate consumption expenditures as opposed to the case for non-tradable goods. Recall that foreign overall consumption changes by exactly the opposite magnitude of domestic overall consumption. By assuming that domestic and foreign households prefer domestic and foreign tradable goods alike, the change in domestic demand for domestic tradable goods offsets the change in foreign demand for the domestic tradable good. What remains is only the consumption expenditure switching effect as this effect is common to both domestic and foreign demand. As the first two effects stem from the private households reaction, they have to be evaluated by the initial steady state fraction of private consumption in output $(1-\bar{g})$. The third effect depicts the change in national government consumption. Public consumption changes exactly by its initial fraction of output, namely $\bar{g}$, as national budgets must balance.

(Shift in Demand) The preference shocks shift home total production by

$$\Lambda_{\hat{Y},\hat{\alpha}} = \Big(\gamma + \Lambda_{\hat{C},\hat{\alpha}}(1-\gamma)\Big)(1-\bar{g}). \tag{37}$$

Clearly, since $\bar{\alpha}\gamma$ denotes the fraction of the home tradable good in private consumption, an increase in that fraction home and abroad changes total production directly by $2(1-\bar{g})\bar{\alpha}\gamma$. In addition, this creates an labor income effect which implies an increase in domestic non-tradable goods consumption depicted by the second term in (37).

(Federal Transfers among private households) Federal transfers among private households affect production only through the change in private consumption,

$$\Lambda_{\hat{Y},\hat{T}_{hh}} = \Lambda_{\hat{C},\hat{DI}}(1-\gamma)(1-\bar{g}). \tag{38}$$

Federal transfers among private households lead to an increase only in the demand for non-tradable goods. By the same token as the innovations to the terms of trade lead to no impact of changes in consumption-disposable-income on net tradable goods demand, federal transfers among households have no impact on the net tradable goods demand. The net effect on tradable goods demand is zero because households in one region pay the transfers that households within the other region receive. As a consequence, the effect of federal transfers vanishes as we reach the full-trade scenario. If $\gamma = 1$, half of home private consumption is produced at home, half of it is imported from abroad. But the same is true for the foreign households. Since the transfers must balance, these opposing effects cancel out. Federal 'households to households' transfers are incapable to correct output.

(Intergovernmental Transfers) The important difference between federal transfers among households and intergovernmental transfers is the direct effect of changing public consumption on demand, namely $(1-\bar{g})$:

$$\Lambda_{\hat{Y},\hat{T}_{gg}} = \Lambda_{\hat{C},\hat{DI}}(1-\gamma)(1-\bar{g}) + (1-\bar{g}). \tag{39}$$

Since production is completely demand determined in the short-run, intergovernmental transfers shift production and employment in the first instance. But as changes in production and employment result in changes in labor income and thus consumption-disposable-income, the effect of private consumption deviations comes in addition. This has two immediate consequences. First, recall that both transfers are expressed as deviations relative to the steady state consumption expenditures. It follows that intergovernmental transfers need less transfer volume to achieve the same correction in output and employment fluctuations. Second, in sharp contrast to federal transfers among private households, intergovernmental transfers never lose bite to correct demand. Thus, even if we are in the full trade scenario, intergovernmental transfers are still fully capable to correct output and employment because they directly affect demand.

3.2.3 Net Foreign Asset Positions

The adjustment of net foreign asset positions can be obtained from the adjustment in consumption and production. The current account imbalances are solely motivated

by the changes of private households' savings. To prevent us from repeating the effects, we skip the discussion.

3.3 Welfare

We analyze the life-time welfare effects according to Obstfeld and Rogoff (1995) and concentrate on the terms depending on consumption and employment. For simplicity we assume that households only barely utilize liquidity services from holding real money balances and take χ in (5) to be sufficiently small.[8] In our analysis of the different federal fiscal arrangements, we approximate home residents' life-time utility as

$$dU^R = \left(\hat{C} - \bar{L}^2\hat{L}\right) + \frac{\beta}{1-\beta}\left(\hat{\bar{C}} - \bar{L}^2\hat{\bar{L}}\right). \tag{40}$$

In order to see the welfare implications of stabilizing consumption and production, and thus employment, we rewrite (40) as

$$dU^R = \left(1 + \frac{\beta}{1-\beta}\left(1 - \bar{L}^2\Lambda_{\hat{\bar{Y}},\hat{\bar{C}}}\right)\Lambda_{\hat{\bar{C}},\hat{C}}\right)\hat{C} - \bar{L}^2\hat{L}. \tag{41}$$

While current employment fluctuations affect life-time utility only contemporaneously, consumption fluctuations disturb residents' welfare via three channels: Besides the direct contemporaneous effect, the desire to smooth consumption over time prompts a change of future consumption level and subsequently a change in employment. From (41) follows immediately that welfare fluctuations are stabilized and thus perfect insurance is provided if and only if both consumption fluctuations and employment fluctuations are deleted. Furthermore, since we only consider asymmetric shocks without aggregate risk, $\hat{C}^{MU} = \hat{Y}^{MU} = \hat{L}^{MU} = 0$, foreign welfare fluctuations follow $dU^{*,R} = -dU^R$. As a consequence, using a second-order approximation, the sum of national welfare deviations reads

$$dU^{MU,R} = dU^R + dU^{*,R} = -\left(1 + \frac{\beta}{1-\beta}\left(1 - \bar{L}^2\Lambda_{\hat{\bar{Y}},\hat{\bar{C}}}\right)\Lambda_{\hat{\bar{C}},\hat{C}}\right)\hat{C}^2 - \bar{L}^2\hat{L}^2. \tag{42}$$

Thus, it is optimal to completely delete fluctuations in consumption and employment resulting from unanticipated demand and productivity shocks.[9]

[8] Obviously, if we had motivated money holding by a cash-in-advance constraint, this restriction would have been obsolete. In the limit, if $\chi \to 0$, we enter a cashless economy as recently employed in open economy models by Benigno and Benigno (2003) and Benigno (2004).

[9] Note that it is in principle constrained optimal to delete consumption and employment fluctuations as monopolistic distortions on labor markets still prevail. However, as it is standard in the New Keynesian literature, this could be corrected by redistributing proportional labor income taxes lump-sum.

4 Federal Fiscal Arrangements

We now turn to the policy analysis itself. The aim of this analysis is to compare different arrangements of fiscal federal transfers whose function is to stabilize fluctuations of consumption and employment within the member states of the monetary union. It is useful for reasons of comparison to consider first the stabilization of demand shocks and to analyze then stabilization of productivity shocks.

4.1 Stabilizing Demand Shocks

Demand shocks disturb the composition of private tradable goods consumption. They have no impact on current prices because wages are fixed. Nevertheless, a shift in demand affects overall consumption level since it changes income disposable on consumption through changes in labor income.

4.1.1 Stabilizing Consumption

As the two transfer schemes affect consumption-disposable-income in (31) equally, consumption stabilization leads to identical transfer volumes

$$\hat{T}_{hh} = \hat{T}_{gg} = -\gamma\hat{\alpha}. \tag{43}$$

A shift in demand towards home tradable goods increases home households' labor income by $\gamma\hat{\alpha}$. Both transfers simply redistribute this income effect. Nevertheless, the two transfer schemes differ with respect to their effects on employment. The federal transfers among households lead to fluctuations in employment by

$$\hat{L}_{T_{hh}} = (1-\bar{g})\gamma\hat{\alpha}. \tag{44}$$

The federal transfers among households neglect the direct effect of changes in demand due to the different composition of tradable goods consumption. Only consumption-disposable-income has been redistributed and thus the overall consumption level is stabilized.

Since the intergovernmental transfers work through goods markets, they redistribute income by redistributing demand and earnings. As a consequence, we get

$$\hat{L}_{T_{gg}} = 0. \tag{45}$$

As opposed to the direct transfers among private households, the intergovernmental transfers correct fluctuations through the change in demand for non-tradable goods. To correct demand directly means to correct labor income and hence consumption-disposable-income. Overall fluctuations are thus stabilized through transfers between national fiscal authorities. As a result, the intergovernmental transfers provide both member states perfect insurance against demand shocks in the monetary union.

4.1.2 Stabilizing Employment

Since the above also holds true for stabilizing consumption, it must be true for stabilizing employment. We have that

$$\hat{T}_{gg} = -\gamma\hat{\alpha}. \tag{46}$$

Transfers among households are

$$\hat{T}_{hh} = \hat{T}_{gg} - \frac{(1-\bar{g})}{(1-\gamma)\Lambda_{\hat{C},\hat{DI}}}\gamma\hat{\alpha}. \tag{47}$$

Consequently, transfers among private households are not able to stabilize both consumption and production fluctuations at the same time. Moreover, these transfers face the problem that for states to be strongly engaged in trade, the volume of the transfer may grow very large. As direct transfers to households are always spent on domestic as well as on foreign tradable goods, they flow back as additional demand. The implication is that by ever redistributing the additional earnings, the transfers among households amplify the effect of demand shocks. Production and employment cannot effectively be stabilized.[10]

4.1.3 Perfect Insurance through Federal Transfer Scheme

From the above we can directly deduce that intergovernmental transfers alone provide perfect insurance. We summarize these findings in our first result:

Proposition 1 *In case of preference shocks that shift demand from the tradable good produced in one region to the tradable good produced in the other region, transfers between fiscal authorities are always capable to stabilize fluctuations in consumption, output and employment at the same time. Intergovernmental transfers thus eliminate welfare fluctuations and provide perfect insurance.*

4.2 Stabilizing Productivity Shocks

Let us next study the stabilization of productivity shocks. As we only consider completely asymmetric productivity shocks, we set $\hat{a} = -\hat{a}^*$. Due to sticky wages, productivity shocks alter marginal costs of producing tradable and nontradable goods and cause a shift in the terms of trade by $\widehat{ToT} = -2\hat{a}$.

[10]It is important to qualify this statement against the background of our assumption that wages are temporarily fixed. The amplifying effect of federal transfers among households implies that the impact of small demand shocks becomes too large so that both the assumption of fixed wages and thus demand determined labor supply as well as the accuracy of linearization are no longer justifiable.

4.2.1 Stabilizing Consumption

By the reason that the two transfers affect private consumption identically, they coincide in volume if they target consumption fluctuations. We get

$$\hat{T}_{hh} = \hat{T}_{gg} = \left((\rho(2-\gamma) - 1)\,\gamma + \Lambda_{\hat{\hat{S}},\widehat{RER}}(1-\gamma) \right)(-\hat{a}). \tag{48}$$

In order to stabilize the consumption level, both transfers correct the change in con-sumption-disposable-income that is due to the shift in productivity and relative prices. In contrast to demand shocks, however, transfers have to redistribute the income effect due to the change in consumption prices and the savings response to changes in the real exchange rate, too. This comes in addition to the labor income effect whose influence on consumption-disposable-income works equivalent to the effect of a demand shock. To gain more insight about what these transfers do to stabilize consumption fluctuations, it proves useful to look at the two polar cases of full economic integration and no economic integration at all. In case of full economic integration, when $\gamma = 1$, the consumer price levels in the two regions coincide as preferences do. As a consequence, domestic and foreign households experience the same incentive to adjust wealth in response to price level deviations because the real interest rates coincide. In equilibrium, no direct adjustment to changes in prices occur.[11] Furthermore, the income effect of consumer price deviations vanishes since the changes in domestic and foreign prices offset each other. Transfers then redistribute only the changes in labor income. In case of no economic integration, when $\gamma = 0$, a shift in the terms of trade induces the households only to adjust current consumption. In equilibrium, there is no effect on savings at all, neither on net foreign assets nor on money holding. The reason has to be seen in two completely different effects: First, households do not adjust their net foreign assets, and second, as no foreign assets are traded, and neither are goods, the balance of payments implies that money holdings remain unchanged. Since the labor-leisure trade-off is not binding in the short-run, households have to accommodate their consumption exactly to the change in prices.[12] Consequently, stabilizing consumption then implies that transfers have to relieve the tension of money holdings caused by the balance of payments.

Recall from (32) that the sign of the savings response to changes in the real exchange rate is always positive and that the sign of the net income effect depends

[11] Changes in net foreign assets as well as changes in money holdings occur then in equilibrium only as to smooth the consumption deviations that are induced by the labor income effect. In case of Cobb-Douglas preferences over tradable goods, ie. $\rho = 1$, the deviation in consumption-disposable-income is zero because the expenditure switching effect exactly offsets the labor income effect. No adjustments in savings are made whatsoever the shock to the terms of trade is. Cole and Obstfeld (1991) were the first to make the point that financial markets are redundant if preferences over goods are Cobb-Douglas. More recently, the redundancy was employed in the context of NOEM for instance by Obstfeld and Rogoff (2000) and more prominently by Corsetti and Pesenti (2001).

[12] Note that $\Lambda_{\hat{C},\hat{DI}}\Lambda_{\hat{DI},\widehat{ToT}}|_{\gamma=0} = -1$.

on whether domestic and foreign tradable goods are substitutes or complements in consumption.[13] If tradable goods are substitutes in consumption, a positive shock to domestic productivity that lowers the terms of trade causes a positive net income effect. The increase in labor income due to the expenditure switching of tradable goods and the gain of the consumption price effect is larger than the loss in labor income due to the drop in labor demand directly caused by the shock. Consequently, the second term in (48) is positive, too. Since the transfers redistribute the effects on consumption-disposable-income, transfers are always negative if any trade in goods occurs or zero otherwise. In contrast, if the two tradable goods are complements, the surprising case might occur that the region hit by a positive productivity shock receives transfers from the region hit by a negative shock. This becomes most obvious in the full trade scenario where savings effects are shut off. Complementarity implies that domestic households respond to the negative change in labor income by reducing consumption of both domestic and foreign tradable goods. Foreign households respond to their positive change in earnings by increasing consumption of both domestic and foreign tradable goods. As a consequence, the expenditure switching to the domestic tradable good never offsets the change in home income. Equivalently, the foreign net income effect is never negative. Thus, to stabilize consumption the 'unlucky' region that has perceived a negative productivity shock has to pay the transfers. In summary we arrive at

Proposition 2 *In case of productivity shocks, stabilizing consumption implies the two transfer schemes to be of identical volume. Transfers are always negative for a region having perceived a positive productivity shock if goods are substitutes. Transfers might be positive if goods are complements and regions are close to full economic integration.*

To see the difference between the two transfer schemes, we have to consider employment. Employment changes under federal transfers among households by

$$\hat{L}_{T_{hh}} = (1 - \rho(2-\gamma)\gamma)\,(1-\bar{g})(-\hat{a}). \tag{49}$$

As the federal transfers among private households correct only the shifts in national consumption levels, the immediate impact of productivity shocks on labor demand, namely the expenditure switching effect and the change in public consumption on goods demand as well as the direct effect of the productivity shock on labor demand itself remain.

The reaction of employment when the intergovernmental transfers are imple-

[13] Two goods are said to be substitutes in consumption if the marginal utility from consuming one good is decreasing in consumption of the other good. The two goods are said to be complements if the marginal utility is increasing. A sufficient condition for substitutability is that the intratemporal elasticity of substitution is greater than the intertemporal elasticity of substitution. In our log-utility case it is the case if $\rho > 1$. If $\rho < 1$, then the two goods are complements in consumption. See, e.g., Svensson (1985) and Corsetti and Pesenti (2001).

mented can be stated as

$$\hat{L}_{T_{gg}} = \left(1 + \Lambda_{\hat{\tilde{S}},\widehat{RER}}\right)(1-\gamma)(1-\bar{g})(-\hat{a}). \tag{50}$$

Since the transfers are of identical volume, the resulting employment fluctuations differ exactly by the direct transfer induced shift in public expenditures evaluated in terms of private consumption. The direct shift in public expenditures, however, has two effects: First, as it was the case when stabilizing demand shocks, it completely offsets the direct labor demand effects. Second, it induces a new source of employment fluctuations, namely the price income effect and the savings response to changes in the real interest rate. The ranking of employment fluctuations implied by the two transfers is ambiguous. In particular, in case of trade autarky, ie. no economic integration at all, households would like to adjust money holdings but the balance of payments prevents money flows. Transfers that stabilize consumption fluctuations compensate for the desired flow in money holdings. But since intergovernmental transfers have to correct the desired money flow through a change in labor income, this additional element in national public demand for non-tradable goods leads to an additional fluctuation in employment. Thus, intergovernmental transfers lead to higher employment fluctuations than federal transfers among private households. In the full trade scenario, households do not want to adjust wealth in response to the change in the real exchange rate because they have the same preferences. The only resulting effects on employment are the direct effects of expenditure switching, of national public consumption, and of labor productivity. But these direct labor demand effects are exactly the effects targeted by the intergovernmental transfers so that no further change in consumption-disposable-income remains. As a result, and reminiscent of demand shocks, employment is fully stabilized.

Proposition 3 *In case of productivity shocks, stabilizing consumption fluctuations implies for employment, that transfers between national fiscal authorities dominate federal transfers among private households if* $\mid 1-\rho(2-\gamma)\gamma \mid > \left(1 + \Lambda_{\hat{\tilde{S}},\widehat{RER}}\right)(1-\gamma)$. *They lead to less fluctuations in employment and consequently in welfare.*

The intuition behind this finding is straightforward: Since federal transfers among private households are incapable to capture the direct labor demand effect, $\mid 1 - \rho(2-\gamma)\gamma \mid$, that leads to fluctuations in employment, it is the income effect due to changes in consumer prices and the savings response to changes in the real interest rate, $\left(1 + \Lambda_{\hat{\tilde{S}},\widehat{RER}}\right)(1-\gamma)$, which come as an additional source of employment fluctuation in case of intergovernmental transfers. Thus, intergovernmental transfers dominate transfers among private households as long as the direct labor demand fluctuations are sufficiently high. Note that if the two regions are relatively closely integrated, and the price income and savings effect vanish, the condition in the proposition above is satisfied.

4.2.2 Stabilizing Employment

We now turn to the analysis of employment stabilization. The transfers among private households to stabilize employment are

$$\hat{T}_{hh} = -\frac{\Lambda_{\hat{Y},\hat{TOT}} + 1}{\Lambda_{\hat{C},\hat{DI}}(1-\gamma)(1-\bar{g})}(-\hat{a}). \tag{51}$$

In contrast, transfers between the national fiscal authorities look

$$\hat{T}_{gg} = -\frac{\Lambda_{\hat{Y},\hat{TOT}} + 1}{\left(\Lambda_{\hat{C},\hat{DI}}(1-\gamma)+1\right)(1-\bar{g})}(-\hat{a}). \tag{52}$$

Both transfers have to offset the effect of productivity shocks on private consumption levels, the expenditure switching effect and the change in national government consumption as described in (36). Furthermore, they have to correct the direct impact of the shift in labor productivity. Comparing the two transfer schemes yields that they are of equal sign, but intergovernmental transfers are always smaller than federal transfers among private households. From (31) we know that both transfers affect consumption equally. Nevertheless, whether intergovernmental transfers lead to less fluctuations in consumption is again ambiguous. For federal transfers among households we get

$$\hat{C}_{\hat{T}_{hh}} = \frac{\rho(2-\gamma)\gamma - 1}{(1-\gamma)}(-\hat{a}). \tag{53}$$

As federal transfers redistribute consumption-disposable-income by more than the change in the national consumption level in order to offset the direct impacts of productivity shocks on labor demand, an additional source of consumption fluctuations needs to be created. When the two regions are in trade autarky and no substitution effect matters at all, fluctuations in public consumption following the change in domestic goods prices and the shift in labor productivity are the only source of private consumption deviations. In the full trade scenario, we encounter the effect equivalent to demand shocks where transfers among private households are not capable to stabilize output and employment. By the expenditure switching effect, each unit of payment received will be spent proportionately on both domestic and foreign goods. Since production is completely demand determined, stabilization cannot be achieved.

Intergovernmental transfers induce consumption to fluctuate by

$$\hat{C}_{\hat{T}_{gg}} = -(1-\Phi)\,\Lambda_{\hat{C},\hat{DI}}\left(1+\Lambda_{\hat{\bar{S}},\widehat{RER}}\right)(1-\gamma)(-\hat{a}), \tag{54}$$

where Φ is a constant, $0 < \Phi < 1$.[14] In order to stabilize labor demand fluctuations, intergovernmental transfers redistribute the direct effects on labor demand as well as the change in national consumption level induced by the change

[14] It is defined as $\Phi = \frac{\Lambda_{\hat{C},\hat{DI}}(1-\gamma)}{\Lambda_{\hat{C},\hat{DI}}(1-\gamma)+1}$.

in consumption-disposable-income. As intergovernmental transfers directly shift labor demand, these direct effects are perfectly offset. What remains as consumption fluctuations is the additional shift in labor income in order to also offset the change in national consumption caused by the price income effect and the savings response to changes in the real interest rate. It is important to recognize that the magnitude of consumption fluctuations depends on the net equilibrium effects of savings and the price income effect. Whereas the emphasis in case of consumption stabilization lies completely on the response of the change in consumption-disposable-income, it is of course equilibrium net effect that determine the change in the consumption level itself.

Proposition 4 *In case of productivity shocks, stabilizing employment fluctuations implies that transfers between national fiscal authorities are always of lower volume than transfers among private households. Regarding consumption fluctuations, transfers between the national fiscal authorities dominate transfers among private households if* $\mid \rho(2-\gamma)\gamma-1 \mid > \Phi\left(1+\Lambda_{\hat{\hat{S}},\widehat{RER}}\right)(1-\gamma)$. *They lead to less fluctuations in consumption and consequently in welfare.*

To gain more intuition, let us again discuss the two extremes of economic integration. In trade autarky, there are no savings. As we know from the discussion about the impacts of terms of trade innovations on production, a productivity shock in autarky leads to an equal increase in production. The fall in prices leads households and national fiscal authorities to adjust their consumption by exactly the same magnitude. But since labor productivity prompts a one-to-one decrease in labor demand in addition to the goods demand effect, employment doesn't change. As a consequence, transfers are needless. In the full trade scenario, there are neither savings on account of deviations in relative prices and the real interest rate nor an income effect due to changes in consumption prices. The transfers have to redistribute changes in labor demand due to changes in goods demand in addition to the shift in labor productivity only and intergovernmental transfers do so directly via goods markets. Because consumption-disposable-income is altered by changes in labor income, intergovernmental transfer also implicitly stabilize consumption fluctuations. This case is again reminiscent of the intergovernmental transfer stabilizing demand shocks.

4.2.3 Perfect Insurance through Federal Transfer Scheme

By now the differences in working and effectiveness of the two transfer schemes have become clear. As we can deduce from the change in utility in (41), a transfer scheme that stabilizes consumption and employment also stabilizes welfare. In this sense this transfer scheme provides perfect insurance. Because neither transfer is individually able to fully stabilize consumption, production and employment at the same time, none of the two transfers generally provides perfect insurance. The differences between the two transfers, however, indicates that a combination of both will do.

Proposition 5 *In case of productivity shocks, we can find a combination of transfers between the fiscal authorities and among private households such that consumption and employment fluctuations are fully stabilized. Furthermore, fluctuations in welfare are extinguished and perfect insurance is provided.*

The combined use of transfers to stabilize welfare fluctuations imply that intergovernmental transfers correct the direct labor demand effect induced by the expenditure switching, change in national public demand as national budgets must balance, and the shift in labor productivity, namely

$$\hat{T}_{gg} = (\rho(2-\gamma)\gamma - 1)\,(-\hat{a}), \tag{55}$$

whereas the direct transfers among households correct the shift in consumption-disposable-income caused by the savings response to changes in the real interest rate and changes in consumer prices, ie.

$$\hat{T}_{hh} = -\Lambda_{\hat{DI},\widehat{ToT}}(-\hat{a}) - \hat{T}_{gg} = \left(\Lambda_{\hat{\bar{S}},\widehat{RER}} + 1\right)(1-\gamma)(-\hat{a}). \tag{56}$$

The insight of how the combination of federal transfers among households and intergovernmental transfers works is as follows: In combination, the sum of the two transfers must delete any change in consumption-disposable-income. This implies that the consumption level is stabilized. The division of transfers depend on the different working in the goods markets. Since the two transfers jointly correct deviations of the demand for non-tradable goods induced by changes in consumption-disposable-income, the direct impact of intergovernmental transfers on goods markets enables the correction of the fluctuations of labor demand resulting from the expenditure switching effects and the change in national government consumption as well as the direct shift of labor demand caused by the change in labor productivity. What thus remains to be redistributed by the federal transfers among households is the change in savings and the income effect due to the change in consumer prices.

5 Conclusion

The aim of this paper was to study the role of federal fiscal transfers as stabilizers in monetary unions. In particular, we considered two different transfer schemes already proposed by the MacDougall Report on the feasibility of EMU: A direct transfer among the households within different member states and an indirect transfer that involves payments between national fiscal authorities.

The properties of the two transfers differ with respect to their transmission. While direct transfers among private households enter households' budget directly and thus affect the allocation through the households' optimal choices, intergovernmental transfers affect allocations through the non-tradable goods markets. This implies a very important distinction between the effectiveness of the two transfers.

For the analysis of different federal transfer schemes we set up a dynamic general equilibrium model with preset nominal wages. The monetary union is exposed to unanticipated temporary asymmetric shocks. Specifically, we analyzed technology shocks that alter aggregate national labor productivity and subsequently prices as well as preference shocks that shift the demand from tradable goods produced in one region to tradable goods produced in the other region. This allowed us to revisit the example Mundell used in his seminal work.

The key insight of our analysis is that economic fluctuations can be best targeted by the type of transfer that directly affects the source of these fluctuations. To be more precise, consider first a shift in demand. Prices remain unaltered because wages are preset. The only disturbance thus stems from the shift in production and thereby labor income. As we have seen, channelling back the shift in demand through intergovernmental transfers that directly affect goods demand leads to perfect insurance. On the contrary, technology shocks lead to changes in labor productivity and subsequently alter prices. Now we encounter two effects. First, a change in productivity and relative prices leads to a labor income effect. Thus, similarly to the preference shock, labor demand is directly affected and can be targeted by the intergovernmental transfer. Second, a change in prices and thus in the real interest rates leads to changes in savings and to a consumer price effect that both change consumption-disposable-income and following private goods demand. Since federal transfers among households redistribute directly through private budgets, they are more suited to stabilize fluctuations than intergovernmental transfers. In fact, none of the two transfers alone is capable to stabilize national fluctuations induced by productivity shocks. An adequate combination of federal transfers among households and intergovernmental transfers, however, deletes fluctuations in employment and consumption. Welfare fluctuations are completely avoided and in this sense the combination of the two transfers provide perfect insurance against asymmetric productivity shocks to both member states.

Our results give a clear notion of the desirability of a federal fiscal arrangement consisting of federal transfers among private households and intergovernmental transfers among national fiscal authorities as proposed in the MacDougall Report since it is capable to stabilize economic impacts of asymmetric shocks. As such, this federal insurance scheme reduces fluctuations and in particular cyclical unemployment within the member states. As a consequence, a federal fiscal insurance arrangement definitely remedies potential tensions among member states.

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