

FISCAL POLICY SPILLOVERS IN THE EURO AREA WHERE ARE THEY?

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Fiscal Policy Spillovers in the Euro Area: Where are they?

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Abstract

What impact would a fiscal expansion in Germany have on the rest of the euro area? It has been generally suggested that it could go in either of two opposite directions, depending on the relative strength of two effects: the direct trade linkage and the financial market repercussions. A review of the results from four major macroeconomic models shows that the cross-country spillover effects of fiscal policy are indeed of uncertain sign and magnitude. Different models give quite different results if used in standardised simulations in terms of the sign, magnitude and time profile of the impact of a fiscal expansion in one member country (e.g. Germany) on other euro area countries. Fewer results are available concerning the potential spillover effects of structural policies, but they are similar to the ones concerning a budgetary stimulus: the magnitude of the spillover is small and varies across countries and over time.

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Fiscal Policy Spillovers in the Euro Area: Where are they?

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1. Introduction

It is generally assumed that in a highly integrated area like the EU national economic policies should have large international spillover effects. This is why the Treaty on European Union says that member countries should treat their economic policy as a ‘common concern’. In other words the Treaty calls implicitly for a coordination of economic policies in order to force member countries to take the external effects of their policies into account. And indeed, EU countries have developed an extensive policy coordination framework (see Bini Smaghi and Casini, 2001; and von Hagen and Mundschenk, 2001). This web of committees and official fora has been strengthened recently, but it is still widely perceived to be insufficient for a monetary union. Leading political figures and academics (Jacquet and Pisani-Ferry, 2001) repeatedly call for more policy coordination within the euro area.

Policy spillovers should be the key arguments for the institutional arrangements for policy coordination, but there seems to be very little systematic up-to-date empirical evidence in this field. The proposals to strengthen economic policy coordination assume implicitly that spillovers are important, whereas others consider the size of the international spillovers in the EMU to be uncertain (Gros and Thygesen, 1998 and European Commission, 2000). These considerations are based on theoretical analyses of cross-border externalities. The purpose of this paper is to collect the results from a large number of comparable simulations done with four of the major large-scale macroeconomic models.

The empirical economic literature on international economic policy cooperation dealing with spillovers has in the last two decades concentrated on estimating the gains of coordination. It has extensively employed the game theoretic approach (for comprehensive surveys, see McKibbin, 1997, and Mooslechner and Schuerz, 1999). The studies in this field can be divided into two broad categories.

First, the researchers used small demonstration models, with a few equations per economy, to analyse the difference between the outcomes with and without cooperation. The results of these studies usually conclude that the gains from coordination are small. However, the structure of the models themselves might be too simplified to allow for robust conclusions.

The second approach involves the use of large multi-country macromodels. An important stream of literature is concerned with the alternative policy regimes (money targeting, interest rate targeting and very often exchange rate targeting) and their performance in the face of various shocks. In the case of a monetary union, a more relevant stream of literature would be the one that applies the explicit optimisation techniques under the assumption that there is a given policy regime in place. These studies then compare optimal cooperative and optimal non-cooperative policies and thus determine the potential gains from policy coordination. In most studies the gains of coordinated approach are found to be relatively small. However, as McKibbin (1997) points out, the gains might be considerably larger when uncertainty (asymmetric information, uncertainty about the true model of how the economy works, and uncertainty among policy-makers about the correct model among the available ones) is taken into account.

This literature focuses on policy optimisation to reap the gains from coordination and should thus be relevant to the design of new institutions. Unfortunately, however, all of the simulation results surveyed by McKibbin (1997), and Mooslechner and Schuerz (1999) deal with coordination on the global scale (i.e. primarily among the G-3). It is thus difficult to draw any conclusions for the euro area. There seems to be a general presumption that the spillover within the EU, or the euro area, should be stronger because economic integration is more advanced in Europe (trade among member countries amounts to 18% of GDP, against about 11% of GDP for extra-EU trade). Moreover, 12 EU member countries share the same currency (and thus monetary policy), whereas the exchange rates among the G-3 are floating.

This paper provides evidence on intra-euro area spillovers.¹ The approach used in this paper is simple and transparent. The analysis of spillovers provides an indication of size and nature of the transmission of policies between EMU countries. Moreover, the studies based on the game theoretic approach mentioned above assume the existence of cross-border spillovers. This study deals with their actual nature. The paper shows what the major models predict in terms of the intra-euro area spillovers of fiscal policy.

For this purpose it presents results of simulations of four macroeconomic models (QUEST, MULTIMOD, Marmotte and NiGEM), which were prepared for the workshop on ‘Simulation properties of macroeconometric models’ organised by the Centre d’Etudes Prospectives et

¹ To our knowledge this is not available yet.

d'Information Internationales (CEPII) in July 2001.² Moreover, use will be made of further extensive simulations undertaken with the QUEST model of the European Commission's Directorate General for Economic and Financial Affairs (in't Veld, 1999).

The focus will be on fiscal policy spillovers as the coordination of national fiscal policies has been on the top of the European economic agenda since the start of EMU. Moreover, attention will be predominantly paid to the impact of an increase in government spending in the eurozone's major economy – Germany – which is due to the restricted scope of data available. Where possible, extensions and generalisations will be made.

The structure of the paper is as follows: Section 2 offers some theoretical considerations concerning the cross-border externalities. Section 3 summarises the assumptions of simulations undertaken by the teams of modellers. The multi-country macromodels which are referred to in the paper are introduced in Section 4. Section 5 then presents the summary of domestic impact of a fiscal expansion as predicted by the models and is followed by the analysis of the cross-border impact in the remaining EMU countries in Section 6. Section 7 extends the analysis as it considers the fiscal expansion to be undertaken by the three biggest EMU countries and subsequently by the eight small ones. Sections 9 and 10 are focused on what the cross-border spillovers would be under different assumptions concerning the way in which the expansion is undertaken and the alternative monetary policies followed by the ECB, respectively. Section 11 deals with the question whether the introduction of EMU has increased the size of international spillovers, and section 12 offers conclusions.

2. Anatomy of fiscal policy spillovers transmission in a monetary union

From a theoretical point of view, fiscal policies of a country can have an impact on the foreign country variables through two basic channels: trade linkages and financial market linkages. Let us consider the implications of a fiscal expansion (namely an increase in government spending³) in an EMU country on domestic output and on the output of its partners in the monetary union.

² If not mentioned otherwise, the tables and figures in the paper make use of the data prepared for the workshop.

³ Alternative ways of executing a fiscal expansion f.e. through changes in composition and size of government revenues will have an impact on the other countries through the same channels, although the relative importance of the channels may change due to different forces coming into play. A case of reduction in labour income taxes is described further in the paper.

In the standard neo-Keynesian framework, which assumes short-run stickiness of prices and positive output gap, an increase in government spending will stimulate both consumption and investment, which implies an increase in the domestic demand and overall output. The higher demand will be to a certain extent covered by intra-EMU imports. The increase in demand for goods from abroad benefits the other EMU countries as they increase their production of export goods. However, the positive trade spillover tends to be cancelled out by the working of the financial market channel. As the government finances the increase in its spending by an issue of bonds, the money supply in the euro area rises, which brings about inflationary pressures. In response, the central bank increases the euro area-wide interest rate. The higher interest rate then depresses consumption and investment and works in the opposite direction than the trade linkages. Moreover, the increase in interest rates creates pressure for appreciation of the common currency, which has negative implications for the trade balance of the whole euro area and further diminishes or even eliminates the potential positive effect of trade flows. (See Appendix II for a simple model demonstrating the transmission of fiscal policies in a monetary union)

A similar situation arises in the case of structural policies. An increase in productivity, for example, will lead to a gain in competitiveness of the home country, thus lowering, *ceteris paribus*, the export prospects of the other member countries. But the increase in productivity will also lead to an increase in production and demand at home, part of which will go on imports from other member countries. This second effect goes thus in the opposite direction and it is difficult to say *a priori*, what the net impact will be.

This would suggest that it is reasonable to expect the absolute size of the international spillovers to be rather small, at least relative to the domestic impact. Moreover, the eventual sign of the cross-border externalities is difficult to determine as it depends on which one of the effects prevails.

If one goes beyond the simply Keynesian framework and takes into account the need for the sustainability of fiscal policy, this introduces an additional channel of transmission, which complicates the picture even further. The impact of a fiscal expansion at home is to a large extent determined by the expectations of the public and financial markets as to how long it can be sustained and when, and by how much, taxes have to be increased eventually.

3. Assumptions of simulations

The simulations prepared for the CEPII workshop assume a fiscal shock that takes the form of a permanent increase in German government purchases of 1% of baseline GDP. For the first five years following the initial shock, the debt/GDP stabilising function in the models is switched off and allowed to start working only after this period. The ECB and other central banks are expected to follow inflation-targeting policy.

Additional results are reported by in't Veld (1999) who considers two different sources of fiscal expansion: a standard shock to government expenditures of 1% of GDP and a permanent reduction in tax on labour income of approximately 1% of GDP. The government expenditure increase lasts 10 years after which it is gradually reduced. The debt/GDP ratio is also allowed to increase during 10 years after which the stabilising function is activated. Mr. in't Veld extends the simulations by examining the short-run spillovers of budgetary policies of not only Germany but also of the three largest EMU countries (GER, FRA, ITA) and of the eight small EMU members (AUT, BEL, FIN, IRE, LUX, NED, POR, SPA).⁴ The ECB is first expected to target inflation. An alternative – interest rate targeting – is considered in turn. In all the simulations in't Veld assumes that the countries outside the euro zone follow the ECB and keep the interest rate differential constant.

The differing assumptions of various simulations need to be borne in mind when a comparison of the results is undertaken.⁵ In fact, the data would not be comparable in a strict sense, but the assumptions seem to be compatible to an extent allowing a basic comparison relying on general trends rather than on numeric accuracy. Also, due to the above reason, from a methodological point of view it is dubious to call the changes in GDP caused by the budgetary expansion fiscal policy multipliers or cross-border multipliers. However, for the sake of simplicity, such an imprecision will be committed.

4. Models

4.1 QUEST II

QUEST II is a new version of the macroeconomic model used by the European Commission. It is a multi-country model which includes structural submodels for the EU member states, the

⁴ The simulations consider EMU 11.

⁵ Moreover, the simulations of in't Veld (1999) start in 2000, whereas the simulations prepared by the modelling teams for the workshop take as the initial period 2001.

US and Japan and further distinguishes 10 additional countries/regions. It is a forward-looking model that can be characterised as a modern version of the Neoclassical-Keynesian Synthesis. The behavioural features are based on microeconomic principles. Both households and firms intertemporally optimise. In the short-run the prices and wages are rigid. The supply side is based on the neo-classical production function.

4.2 Marmotte

Marmotte is the multi-country model of CEPII. It is an intertemporal model with agents holding a perfect foresight. The model is based on the optimising behaviour of agents, rational expectations and identification of structural rigidities. It includes structural models of all the EU member states (Belgium and Luxembourg are aggregated), the US, Japan, Canada and the rest of the world. The model assumes full flexibility of output prices, and the instantaneous equilibrium of goods markets, which leads to an absence of the Keynesian effects (as compared to the other models).

4.3 NiGEM

NiGEM is the macroeconomic model of the National Institute of Economic and Social Research. It is a multi-country model with separate models for all the OECD countries and China. It also includes regional blocs in East Asia, Latin America, Africa and also OPEC and miscellaneous developing countries and developing Europe. The model is based on the New-Keynesian approach as the agents are forward-looking, but nominal rigidities slow down the adjustment. The model has complete demand and supply sides and there is a forward-looking monetary and financial sector.

4.4 MULTIMOD Mark III

Multimod is a dynamic multi-country macro model of the world economy constructed by the team of IMF modellers. It includes explicit country submodels for the seven largest world economies and many smaller industrial countries. The rest of the countries are divided into two separate blocs of developing and transition economies. The model exhibits important short-run Keynesian dynamics that result from significant inertia in the inflation process. MULTIMOD assumes that behaviour is perfectly forward-looking in asset markets and partially forward-looking in goods markets.

5. Impact of fiscal policies on domestic economy

Before turning to the question of spillovers themselves, it might be useful to describe the domestic impact of a fiscal expansion.

The simulations give rather an ambiguous picture as the results vary considerably. As expected, the fiscal expansion results in most simulations in an increase in the German output. However, an important feature to notice is the low and in the case of Marmotte even negative value of the domestic fiscal policy multiplier. This is a characteristic of the latest macroeconomic models, which are based on intertemporal optimisation and which employ rational expectations. As McKibbin (1997), notes the fiscal policy multipliers usually obtained from simulations done with the use of earlier versions of various macromodels were on average higher.

An increase in the German government spending of 1% baseline GDP leads in the first year to an overall change in GDP between minus 0.07%⁶ to plus 1.20% (see Table 1a). Most, if not all, of the fiscal expansion is crowded out through a rise in interest rates or leaks abroad through higher exports.

Table 1a. Time profile of the domestic impact of fiscal expansion in Germany on German GDP

Model	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Marmotte	-0.07	-0.12	-0.18	-0.19	-0.19	-0.18	-0.17	-0.16	-0.15	-0.14
MULTIMOD	1.20	0.88	0.46	0.09	-0.19	-0.38	-0.41	-0.36	-0.25	-0.07
NiGEM	0.96	0.51	0.36	0.31	0.28	0.19	0.06	-0.03	-0.09	-0.15
QUEST	0.41	0.05	0.02	0.0	-0.02	-0.03	-0.04	-0.05	-0.05	-0.02
Average	0.63	0.33	0.17	0.05	-0.08	-0.10	-0.14	-0.15	-0.14	-0.10
Variance	0.32	0.21	0.09	0.04	0.06	0.06	0.04	0.02	0.01	0.00

⁶ The decline in German GDP points to total ineffectiveness of the fiscal expansion. The result is due to a fact that Marmotte assumes full flexibility of output prices which causes the absence of Keynesian effects in the short run. Despite the fact that such a case is possible and was the experience for example in Italy, in general, the practical experience shows that the fiscal policy multipliers are positive, although rather small. Moreover, the Marmotte team is planning to introduce some degree of short-term price inertia in the next version of the model.

Table 1b. Price level in Germany

Model	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Marmotte	0.71	0.69	0.66	0.62	0.58	0.53	0.50	0.46	0.43	0.40
MULTIMOD*	0.68	0.78	0.60	0.32	0.04	-0.18	-0.31	-0.36	-0.37	-0.35
NiGEM	0.02	0.31	0.65	0.87	1.01	n.a.	n.a.	n.a.	n.a.	n.a.
QUEST	0.09	0.13	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.17

* Core inflation.

The increase in government expenditures leads to an increase in the domestic demand which then exceeds the supply, thus pushing price level upwards (see Table 1b). The consequent rise in the interest rates has important implications for the levels of consumption and investment. In the models, households are assumed to optimise intertemporally and therefore the response of total private consumption is the result of several effects. The proportion of the lifetime income which is used for consumption today is determined by the interplay of substitution and income effects. The increase in interest rates, on the one hand, induces the individuals to save more and postpone consumption; on the other, it increases the feasible consumption set and raises the present consumption. Moreover, the effect of the interest rate increase on the life-time income is negative as it raises the discount rate (in't Veld, 1999). Forward-looking agents also expect the future rise in taxes to compensate for today's increase in government spending which further works against current consumption. As a result, the overall private consumption drops. The increased cost of capital makes firms reduce their investments.

Fiscal expansion leads to an appreciation of the euro. As a consequence, the deteriorating trade balance, with imports increasing and exports falling, further decreases the domestic impact of government spending.

Thus, the fiscal policy has relatively significant short-run implications for the level of output, though they fade away quite quickly. The results of simulations of the QUEST and MULTIMODE models suggest that in the fifth year after the expansion had taken place the positive impact of fiscal stimulus is exhausted and the economy experiences a drop of the GDP level under its baseline. In the case of NiGEM, the breaking point occurs two years later. Marmotte estimates the level of GDP to range between 0.07 and 0.19% under the baseline and to follow a relatively stable path. In the long-term, GDP in all the models would converge close to its baseline level.

6. Spillover effects of government consumption shock

The results of simulations seem to confirm the original hypotheses that their absolute size is rather small. The comparison has shown that the average spillover⁷ in the EMU area ranged between -0.03% (QUEST) and 0.04% (Marmotte) of the baseline GDP in the first year following the fiscal expansion (see Table 2). The average spillover in the whole EU in the MULTIMOD simulations reached -0.10%.⁸ It is apparent that the size and often the sign of spillovers in the EMU vary. Nevertheless, a similar pattern can be found in the case of QUEST and NiGEM and probably also MULTIMODE. The spillovers identified by the QUEST and NiGEM models are largely consistent as the correlation coefficient between the two sets reached a rather high value of 63%. The results obtained from Marmotte cannot be easily interpreted and compared to the other results due to the substantial differences in the composition of the model as described above. The correlation coefficient between the Marmotte spillovers and those of the two other models was 51% in the case of QUEST and -8% for NiGEM. Especially the latter result fails to indicate any common pattern.

*Table 2. Impact in Germany and spillovers in the year of fiscal expansion
(% of baseline GDP)*

	QUEST ^a	Marmotte ^b	NiGEM	Average
DE (home country)	0.33	-0.07	0.96	0.41
FR	-0.05	0.04	-0.03	-0.01
IT	-0.07	0.06	-0.01	-0.01
ES	-0.10	0.07	-0.11	-0.05
NL	0.04	0.09	0.01	0.05
BE	0.02	0.22	-0.04	0.07
IR	-0.03	0.02	0.03	0.01
PO	-0.08	n.a.	-0.02	-0.05
OS	0.02	n.a.	0.00	0.01
SF	-0.08	0.01	-0.07	-0.05
GR	-0.10	0.08	-0.07	-0.03
Average spillover – eurozone	-0.03	0.04	-0.02	0.00

^a Data source: in't Veld (1999).

^b Due to the missing data for Austria and Portugal, the average spillover in EMU does not take into account the impact on these countries.

⁷ Average spillover in the euro area is computed as a weighted average of the cross-border spillovers in the EMU countries. As a weight the relative size of economy in the euroarea is used.

⁸ Data for euro area were not available.

Three out of the four⁹ used macroeconomic models predict negative average spillover in the EMU. Thus, the impact of capital linkages seems to have overridden that of the trade linkages. Both size and sign of spillovers in the individual countries vary to a large extent but the basic pattern confirms the predominance of the impact of interest rate and exchange rate. It seems that only the small economies adjacent to Germany which are bound to the largest EU economy by strong trade ties, were able to benefit from their neighbour's fiscal expansion. These were Austria, Belgium and the Netherlands. The share of their mutual trade with Germany as a percentage of GDP amounts to 23.3%, 23.6% and 24.8%, respectively. The only other country that would likely benefit from the German policy is Ireland which also exports heavily into the country. Since its share of exports to Germany amounts to 8.8% of the Irish GDP, the share of overall trade reaches 12.1%.

In order to assess the relative importance of the transmission channels, a simple regression was ran. As the dependent variable the set of cross-border multipliers was used (for both QUEST and NiGEM models). On the side of independent variables we used the share of trade of the respective country with Germany as a percentage of GDP as a proxy for the trade linkage, and the share of domestic credit as a percentage of GDP, which acts as a proxy for the interest rate channel. A share of trade with the non-EU countries was used to depict the impact of exchange rate changes on the national output (but this variable did not prove to add much explanatory value to the regressions). The results of regressions show that the used variables are capable of explaining of over 90% the variation in the cross-border multipliers in the case of QUEST. However, only the trade ties between the EMU economies and Germany are statistically significant. The explanatory value of the variables seems to be very low in the case of NiGEM, as they explain only 18% of the variation. Only after introducing a dummy variable for Spain, which is a clear outlier, the independent variables explain 67% of the variation and the proxy for the financial market channel turns significant. Thus, the regressions do not give an unambiguous answer regarding the importance of the channels of

⁹ As mentioned, in the case of MULTIMODE the average spillover in the whole EU is -0.10. However, the spillover in Great Britain is very low and despite the fact that it is positive (0.02) it cannot reverse the aggregate result. It is also highly improbable that the spillovers in Sweden and Denmark would be of such a significant positive size that they could influence the overall size of the average spillover considerably. Moreover, the relatively low weight of the two countries further diminishes this possibility. Therefore, one can assume that the average spillover in the euro area will not be much different from the one recorded in the whole EU.

transmission. It seems that the QUEST model gives priority to the trade flows, whereas in the NiGEM capital markets play a more important role.¹⁰

The spillover effects obtained from Marmotte are very small and positive. In the first year following the fiscal expansion the average spillover in the eurozone¹¹ reaches 0.04%. In the tenth year it amounts to only 0.01% above the baseline GDP level. Due to the decrease in German output following the demand shock, trade linkages could not have played a positive role compared to the other simulations. However, the appreciation of the common currency exchange rate had a rather significant deflationary impact on the other EMU countries caused by high flexibility of prices embedded in the model.

The time profile of the spillovers of German fiscal expansion on French GDP indicates that over the longer run the interest rate and euro exchange rate influence prevailed and led to a reduction in French GDP compared to the baseline (see Figure 1). The magnitude of the predicted impact differs considerably with the strongest one identified by MULTIMODE (-0.24), which after reaching its lowest level (-0.30) in the second year following the shock experiences a fast reduction in its absolute size. NiGEM expects the spillovers to be very small in the first year, but they are increasing rapidly and reach the largest absolute value (-0.25) in the fifth year after the fiscal expansion took place. The size of spillovers starts to decrease very slowly then. QUEST model predicts rather small implications for the French output, not exceeding -0.05%, without a clear trend.

The time development of the overall spillovers in the EMU follows a similar pattern and the absolute values of spillovers remain at levels that seem to be under the threshold of policy-makers' attention. For the results obtained from NiGEM model, see Figure 2. Despite the fact that the figure exhibits a rather distinctive hump, the maximum values do not fall much lower than -0.14% of the baseline GDP. The average spillover in the EMU of -0.02% of baseline GDP in 2001 amounts approximately to 1.4 billion euro, which is not much more than the resources earmarked in the EU budget for the activities regarding economic and financial affairs, including the administrative costs of coordination itself. In 2004 when the average spillover in the EMU, according to the NiGEM output, reaches its peak, the impact expressed in money units would amount to roughly 10.8 billion euro, which is twice as much as the

¹⁰ It cannot of course be excluded that the used variables are not appropriate proxies for the respective channels of fiscal policy transmission.

¹¹ The average spillover in the case of Marmotte does not cover all EMU countries as the data was available only for GER, FRA, ITA, BEL, FIN, GRE, IRE, NED, SPA.

overall administrative resources of the EU. Neither these figures seems to be large enough to be the only justification for designing and operating a more profound system of policy coordination.

Figure 1. Time profile of spillovers of German fiscal expansion on GDP in France

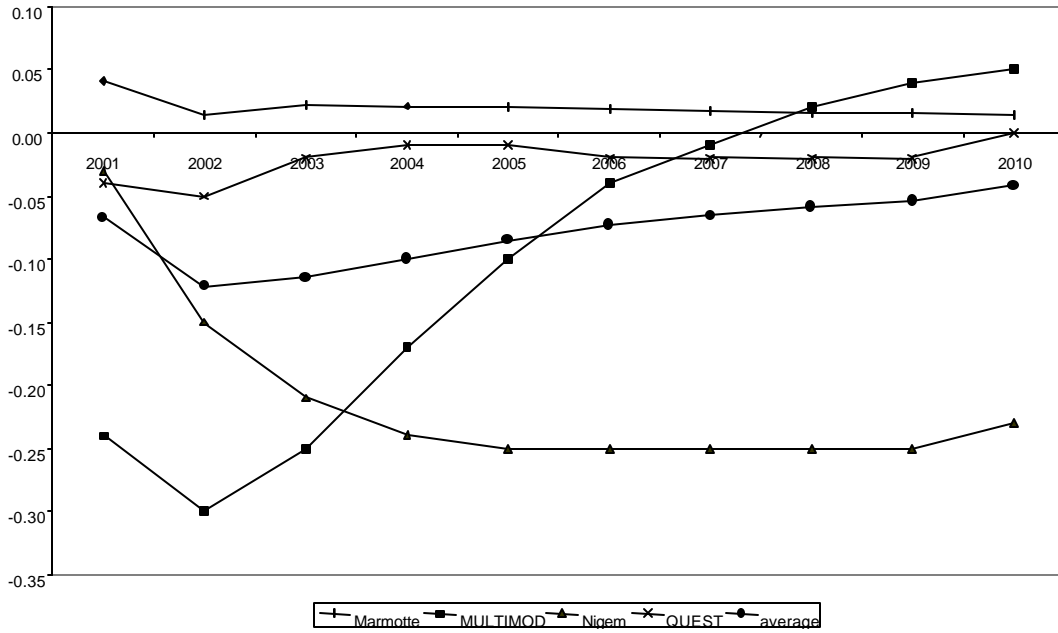
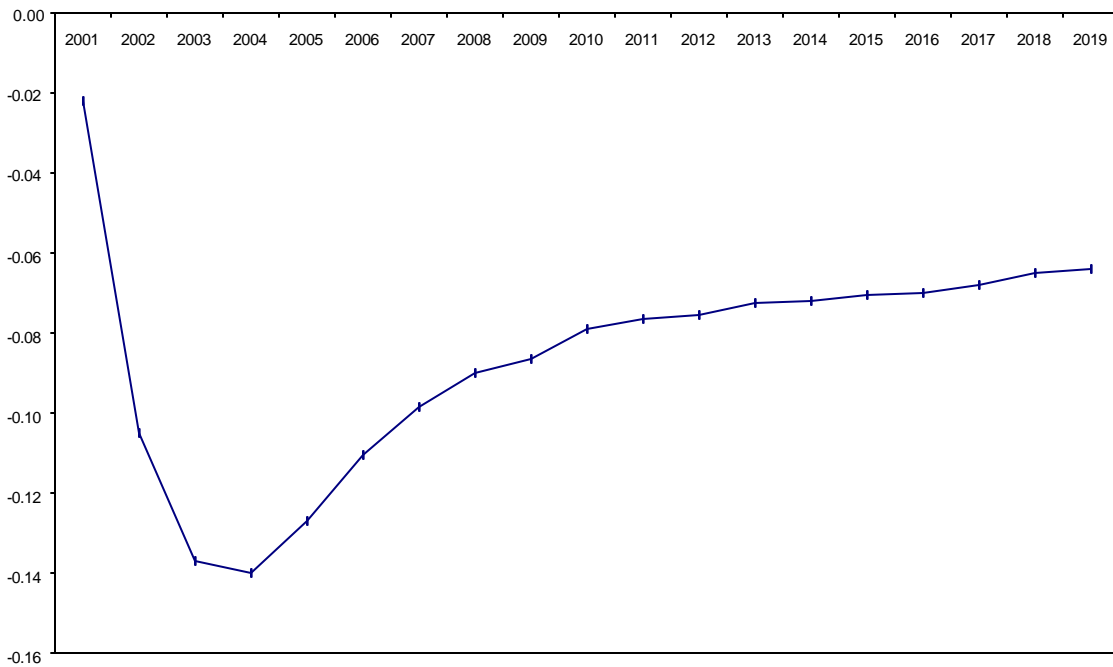


Figure 2. Time profile of average spillover in EMU (NiGEM)



However, a slightly different picture can be obtained when one considers the relative importance of spillovers¹² (see Table 3). The QUEST and NiGEM model still report relatively low relative spillovers. The average response of EMU countries' GDP to a German fiscal expansion amounts to -10% (QUEST) and -2% (NiGEM) of that experienced in Germany itself. According to the data generated by Marmotte, the average spillover reaches 59% of the absolute change in German GDP. The results are due to a high response of the German GDP to the fiscal shock in the case of QUEST and NiGEM and, on the contrary, the modest drop in the case of Marmotte. However, as the impact on German output fades away rather quickly, the relative size of spillovers increases considerably (see Table 4). These results are rather representative and indicate that a fiscal expansion in one country can have a consequence on cross-border externalities whose size may at times even exceed the domestic change in GDP. This fact is of no big significance, in the current situation, which is characterised by a very low absolute size of spillovers. However, if the domestic fiscal policy multiplier under any circumstances at a certain time in the future increased, the absolute size of spillovers could grow considerably.

Table 3. Relative spillovers in EMU countries in the year of German fiscal expansion (as % of change in German GDP)

	QUEST	Marmotte	NiGEM	Average
FR	-15	-55	-3	-24
IT	-21	-82	-1	-35
ES	-30	-90	-11	-44
NL	12	-118	1	-35
BE	6	-292	-4	-97
IR	-9	-25	3	-10
PO	-24	n.a.	-2	-13
OS	6	n.a.	0	3
SF	-24	-12	-7	-14
GR	-30	-113	-7	-50
Average spillover – eurozone*	-10	-59	-2	-24

* Average spillover for Marmotte does not include Austria and Portugal as the data were not available.

Source: Own calculations based on the data from the CEPII workshop; data from QUEST: in't Veld (1999).

¹² Measured as a size of a spillover effect divided by the size of the domestic effect of the fiscal shock.

Table 4. Time profile of relative average spillover in EMU (NiGEM)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Average spillover	-2	-21	-38	-45	-45	-58	-164	300	96	53
	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Average spillover	40	34	30	29	28	28	27	27	28	

Source: Own calculations based on the data from the CEPII workshop.

The spillovers are somewhat larger both in absolute and relative terms in the case of consumer prices than in the case of GDP (see Table 5). However, their size and also the sign are strongly influenced by the structure of the respective models. In the case of Marmotte, one would intuitively expect that the size of spillovers will be rather high due to the immediate adjustment of prices in the goods markets. And the results indeed confirm this. Moreover, the price spillovers in the Marmotte simulations exhibit significant persistence. In the first year, the price level in the EMU countries (except Germany) decreases on average by 0.21% compared to the baseline. Over ten years the average spillover increases modestly by 0.24% above the baseline. As far as the impact on French consumer prices is concerned, most models predict a drop. However, according to NiGEM, consumer prices in France would keep increasing in the first couple of years and only in the long-run would return to the baseline.

Table 5. Consumer price spillovers

	QUEST		Marmotte	
	Absolute	Relative	Absolute	Relative
FR	-0.05	-63	-0.28	-39
IT	-0.06	-75	-0.35	-49
ES	-0.07	-88	-0.25	-35
NL	-0.06	-75	-0.43	-60
BE	-0.08	-100	-0.41	-57
IR	-0.14	-175	-0.17	-24
PO	-0.08	-100	n.a.	n.a.
OS	-0.01	-13	n.a.	n.a.
SF	-0.07	-88	-0.22	-31
GR	-0.09	-113	-0.33	-46
Average spillover	-0.05	-57	-0.21	-29

Source: Own calculations based on the data from the CEPII workshop.

An important fact that one needs to keep in mind is the strong influence of assumptions under which the simulations are run on the eventual results. These concern the way in which the fiscal expansion is executed and financed, the economic importance of the country/ies undertaking the expansion, the strategy followed by the monetary authorities, etc. A change in one of the assumptions can generate significantly different results. Therefore, in order to assess the robustness of the findings described above, alternative scenarios will be considered taking into account the impact of different conditions under which the fiscal expansion is executed on the size of cross-border externalities.

7. Spillovers when more countries undertake fiscal expansion

As already mentioned, in't Veld (1999) did not limit himself in his simulations to a government expenditure shock in Germany. He also provided data on domestic and foreign implications of fiscal expansion undertaken simultaneously by the three largest EMU countries (Germany, France and Italy), and then the eight small EMU members.

In general, the results are similar to those obtained when a fiscal expansion only in Germany is considered. When the central bank targets inflation the 'own' effect of a joint fiscal expansion in the three large countries is smaller. It is apparently because the ECB is forced to react to the rise in budget spending of the three EMU economies which account for over 70% of the euro area by higher increases in interest rates, which depresses investment and consumption. This move also leads to a stronger appreciation of the euro which works against the expansion through worsening of trade balance.

Although the spillover effects are larger for individual countries and predominantly negative – as only in the case of Belgium does the strong positive trade effect exceed the dampening influence of increased interest rates – the average spillover in the euro area is even slightly lower due to the rather low weight of these countries.

The spillovers further decrease when expansion in the eight small (BE, LX, SP, NL, IR, PO, AU, FI) euro countries is considered. This goes together with their small size. Moreover the home effects of fiscal expansion are in general very low due to the high openness of these countries combined with their high sensitivity to interest rate changes.

Different assumptions do not change the overall picture significantly. If the authorities decide to execute fiscal expansion through tax cuts instead of increasing spending, the average spillovers on the rest of the euro area will turn positive but their magnitude remains

unchanged (0.04, 0.04 and 0.02 in the case of German expansion, expansion in three big EMU countries and the eight small countries, respectively).

Table 6. GDP spillovers

	ECB targeting CPI						ECB targeting IRs					
	Govt spending			Tax cut			Govt spending			Tax cut		
	D	D+F+I	8 S	D	D+F+I	8 S	D	D+F+I	8 S	D	D+F+I	8 S
DE	0.33	0.2	-0.01	0.27	0.32	0.04	0.45	0.52	0.1	0.22	0.23	0.01
FR	-0.05	0.23	0.02	0.06	0.31	0.04	0.05	0.49	0.11	0.02	0.24	0.02
IT	-0.07	0.26	-0.05	0.05	0.31	0.01	0.03	0.53	0.04	0.01	0.24	-0.01
ES	-0.1	-0.23	0.27	0.04	0.07	0.17	0.02	0.08	0.37	-0.01	0	0.14
NL	0.04	-0.01	0.16	0.09	0.16	0.17	0.15	0.27	0.25	0.05	0.09	0.14
BE	0.02	0.04	0.05	0.1	0.19	0.13	0.14	0.35	0.15	0.05	0.12	0.1
IR	-0.03	-0.11	0	0.08	0.14	0.09	0.1	0.21	0.11	0.03	0.06	0.07
PO	-0.08	-0.21	0.21	0.03	0.04	0.12	0.01	0.01	0.28	0	-0.02	0.1
OS	0.02	-0.1	0.11	0.08	0.11	0.12	0.13	0.18	0.2	0.04	0.04	0.1
SF	-0.08	-0.26	0.35	0.07	0.1	0.23	0.05	0.07	0.46	0.02	0.02	0.2
GR	-0.1	-0.27	-0.09	0.02	0.02	-0.01	-0.01	-0.02	-0.01	-0.01	-0.03	-0.03
UK	-0.08	-0.21	-0.01	0.04	0.07	0.03	0.02	0.06	0.08	0.01	0.01	0.01
EMU11	0.07	0.14	0.04	0.13	0.26	0.06	0.18	0.43	0.13	0.08	0.19	0.04
Average spillover	-0.03	-0.02	-0.01	0.04	0.04	0.02	0.04	0.06	0.05	0.01	0.02	0

Source: in't Veld (1999).

Table 7. Consumption price spillovers

	ECB targeting CPI						ECB targeting IRs					
	Govt spending			Tax cut			Govt spending			Tax cut		
	D	D+F+I	8 S	D	D+F+I	8 S	D	D+F+I	8 S	D	D+F+I	8 S
DE	0.08	-0.03	-0.04	0.05	0.07	0.01	0.18	0.21	0.04	0.02	0.02	-0.01
FR	-0.05	0	-0.02	0.04	0.08	0.02	0.04	0.24	0.05	0.01	0.03	0
IT	-0.06	0.04	-0.05	0.04	0.1	0	0.03	0.27	0.02	0.01	0.05	-0.01
ES	-0.07	-0.18	0.02	0.03	0.04	0.02	0.02	0.05	0.1	0	0	0
NL	-0.06	-0.22	-0.04	0.06	0.08	0	0.06	0.09	0.06	0.02	0.01	-0.03
BE	-0.08	-0.24	-0.08	0.05	0.06	0	0.04	0.07	0.02	0.01	0	-0.03
IR	-0.14	-0.37	-0.12	0.04	0.04	-0.01	-0.01	-0.03	-0.01	0.01	-0.02	-0.04
PO	-0.08	-0.22	0.08	0.03	0.05	0.03	0.02	0.03	0.16	0	-0.01	0.01
OS	-0.01	-0.15	-0.02	0.05	0.07	0	0.1	0.12	0.07	0.02	0.01	-0.03
SF	-0.07	-0.21	0.07	0.04	0.06	0.02	0.03	0.03	0.15	0.01	0	0
GR	-0.09	-0.25	-0.09	0.03	0.04	-0.01	0.01	0.01	0	0	-0.02	-0.03
UK	-0.08	-0.21	-0.05	0.04	0.05	0.01	0.02	0.04	0.03	0.01	0	-0.01
EU11	-0.02	-0.06	-0.03	0.04	0.07	0.01	0.08	0.19	0.05	0.01	0.02	-0.01
Average spillover	-0.05	-0.06	-0.03	0.02	0.01	0.01	0.02	0.02	0.03	0	0	-0.01

Source: in't Veld (1999).

8. Alternative fiscal shocks

In most of the simulations used in this paper it is assumed that the fiscal expansion comes through an increase in government spending. But this is not the only way such an expansion can be undertaken. An obvious alternative might be a reduction in taxes. And indeed, under the current strict surveillance of the Growth and Stability Pact over the budgetary policies of the eurozone members, it seems that a reduction in taxes is a much more plausible scenario of fiscal expansion as it can be more easily justified. Thus, we may also consider how robust are the conclusions concerning spillover effects taking into account different origins of the fiscal easing.

in't Veld presented the spillover effects stemming from a fiscal expansion induced by a decrease in the tax burden on labour equalling approximately 1% of baseline GDP of the initiating country/ies. An important assumption is made concerning the unemployment benefits, which are supposed to be linked to gross wages. A reduction in taxes then leads to an increase in the domestic output through a rise in disposable income of households. This

'demand' effect is complemented by 'supply' effect which comes through an increase in employment. A reduction in labour taxes increases the difference between the net wages and reservation wages (due to the fact that unemployment benefits are linked to gross wages) and thus leads to much larger employment effects than under alternative assumptions. The increase in supply plays a positive role in limiting inflationary pressures induced by higher demand. Therefore, the interest rate increase is rather small and its dampening effect on private consumption and investment restricted.

Consequently, the international spillovers are somewhat larger and, above all, positive, compared to the case of the increase in government spending (0.04% compared to -0.03%). The positive trade effect is further strengthened by a slight depreciation of the euro exchange rate vis-à-vis the US dollar. The international transmission of fiscal expansion is much stronger when the three largest EMU countries cut their taxes. Thus, the eurozone GDP increases by 0.26% compared to 0.13% in the case of German cut. The spillover effects for individual countries are correspondingly higher. However, the average spillover in the whole eurozone remains on approximately the same level (0.04) due to the low weight of the countries not involved in the fiscal expansion. If the fiscal expansion takes place in the eight smaller EMU members, the spillovers are still positive but amount to roughly one half of those obtained from the preceding simulations.

The results indicate that the size and also the sign of spillover effects are strongly dependent on the form that the fiscal expansion takes. As demonstrated above, the cross-border externalities turned slightly larger and, above all, positive when fiscal expansion through a reduction in labour taxes was considered. If public authorities decide to pursue an expansive fiscal policy through different measures such as changes in corporate taxes, VAT or excise duties, the results will most likely be different. However, it seems probable that the absolute size of the spillovers will not change significantly, given their small magnitude.

Another relevant set of results is contained in Bénassy-Quéré and Fontagné (2001). They simulate a 10% reduction in income taxes, balanced by an increase in non-distortionary taxes. They show that if such a policy is implemented in Germany it would have a substantial positive impact on German production, but the impact on France would be negligible (and negative). In terms of inflation, however, the spillover seems to be more important, as their model predicts that prices would fall in Germany, but increase considerably in France and other euro area countries.

9. ECB strategy

As the above-described simulations indicate, the financial market channel of international spillover transmission is of the utmost importance. In most of the cases it seems to override the impact of changes in the trade flows. Therefore, the monetary strategy followed by the ECB will presumably have a significant impact on the size and also the sign of spillovers. Most of the simulations expect the ECB to target inflation, which is reasonable, taking into account the straightforward ECB mandate to look after price stability in the euro area. However, recent developments showed that the ECB may be at times too cautious to resort to interest changes, and therefore it might be useful to consider an alternative scenario in which the central bank keeps the interest rates untouched – at least in the short run.

It naturally follows from the foregoing that the output effects will be larger compared to the inflation targeting. Fiscal expansion under these conditions implies monetary loosening and a decline in real interest rates. Therefore, the demand effect, which induces larger imports from the trading partners, is much more pronounced as it is not strangled by the rise in interest rates. However, the increase in output is still being reduced by the negative influence of the appreciating euro on trade.

The negative average spillovers that were identified in the case of increased government consumption when the ECB targeted the inflation now turn positive and substantially increase in size as well. German fiscal expansion leads to the rise of 0.04% of the eurozone GDP in the remaining EMU members (compared to -0.03% drop under the inflation targeting). Similar results can be obtained when the expansion in the three largest EMU countries or the eight small ones is considered.

Table 8. Average spillover effect on GDP

		Country undertaking fiscal policy		
		D	D+F+I	8 small
ECB policy	Inflation targeting	-0.03	-0.02	-0.01
	Interest rate targeting	0.04	0.06	0.05

Source: in't Veld (1999).

10. Does EMU increase the spillovers?

Various studies on international economic cooperation indicate a very important role of the exchange rate regime for the size and sign of potential spillovers. In the discussion regarding

the need for policy coordination under EMU, it is usually assumed that the introduction of the euro increases the size of the spillovers, at least as compared to the EMS regime.

However, Roeger and in't Veld (1997) show that the cross-border spillovers can actually be larger under an asymmetric fixed exchange rate regime (such as ERM) than in a monetary union. An increase in government purchases of 1% of baseline GDP in Germany leads to a 0.32% drop in EU-15 GDP under the EMS, whereas under the monetary union the average increase is positive and reaches 0.07% of the EU GDP. The corresponding average EU-wide spillovers are -0.33% and 0.03%, respectively. This shows that the transition from the German-dominated EMS to the EMU in fact decreased the need for economic policy coordination rather than the opposite as it is usually perceived.

*Table 9. Impact and spillover effects on GDP of German fiscal expansion (1% increase in government spending of baseline GDP) **under the EMS**, with money targeting in Germany*

	Own country effect	Spillover effects										
	DE	FR	IT	ES	NL	BE	IR	PO	OS	GR	UK	EU15
EMS	0.03	-0.46	-0.47	-0.53	-0.31	-0.47	-0.48	-0.37	-0.24	-0.41	-0.43	-0.32
EMU	0.43	-0.06	-0.08	-0.09	0.08	0.03	-0.3	-0.06	0.09	-0.09	-0.08	0.07

Source: Roeger and in't Veld (1997).

This table suggests that under an asymmetric system of fixed exchange rates, the spillovers can be quite considerable in size and negative. The increase in German government spending which leads to upward pressure on prices induces the German central bank, under the assumption of monetary targeting, to increase the interest rates to prevent an increase in inflation. This move in Germany itself somewhat reduces the increase in demand, and partially crowds out investment but has certain adverse implications for the other EMS members as well. The increase in interest rates results in an appreciation of the Deutsche mark in relation to the US dollar. Given the dominance of Germany in the European economy all the other countries have to follow suit and resort to monetary contraction in order to keep the exchange rates fixed. The rise in interest rates eliminates the positive trade spillovers and results in a decline in GDP of European economies.

Under EMU, the negative impact of interest rate increases is reduced. The authority responsible for the conduct of monetary policy is the ECB, which targets the total money supply of all the members of the eurozone, of which the German GDP is approximately one third. Therefore, the interest rate increase following the German fiscal expansion will be

proportionately lower. The German domestic demand will thus be dampened to a lower extent and the positive trade effects will be able to play a more pronounced role.

11. Conclusions

The size and also the sign of intra-EMU spillovers of fiscal policies cannot be accurately determined since they are subject to a considerable number of uncertainties. First, the results of theoretical considerations do not provide a firm indication of the extent of spillovers. The trade linkages, which are a channel of positive transmission of increased government spending across the borders, are counteracted by the functioning of capital-market linkages which incorporate an influence of the euro area-wide interest rate and common currency exchange rate. As a result, the two effects usually work in opposite directions which diminishes the absolute size of the spillovers and creates uncertainty regarding the sign of the eventual effect.

Second, many particular circumstances pertaining to the fiscal expansion will have an impact on the direction and magnitude of spillover effects. As Laxton et al. (1998) point out “there is no such thing as a pure fiscal shock”. The short-term effect of fiscal policies will be strongly influenced by the monetary policy followed by the central bank, by the particular way in which the fiscal policy is executed and also by the way in which it is financed.

Third, one could argue, that under EMU, the spillovers would grow stronger as the interactions between countries become more intensive. For example, it is often expected that the role of intra-EMU trade will further increase as a consequence of declining of contract costs. However, it is difficult to assess whether the change will be significant enough to override the impact of interest rate movements. In the case of fiscal expansion, which takes place through government spending, the increase in intensity of trade links may reduce the negative impact of higher interest rates and thus even reduce the absolute size of the spillover effects. This indicates that the size of spillovers may even decline.

The fourth type of uncertainty arises from the structure of the models themselves which will necessarily influence the results of estimates. As shown, the results of simulations vary significantly which can be attributed to different preferences that the modellers had when building the models. The most obvious difference can be spotted in the case of the Marmotte model, which lacks short-term Keynesian dynamics. This leads to inefficiency of domestic fiscal policy and a different pattern of spillovers compared to the other models.

In general, the results of simulations confirm the theoretically-based hypothesis that the absolute size of short-run cross-border externalities is rather low. The two basic transmission channels working through trade and capital markets cancel each other out to a large extent. Any increase in German government spending equivalent to 1% of baseline GDP thus leads to an average demand spillover in the whole euro area between -0.03% and +0.04% in the first year following the demand shock. The size is decreasing quickly as the impact of the shock fades away. This seems to be a rather standard result. The spillovers of such a magnitude hardly pose any important threat to European economies and it is disputable whether they would call for a more extensive cooperation framework.

The relative size of spillovers is considerably higher given the rather small impact of the fiscal policies on domestic economies themselves. This indicates that a relatively large part of the shock passes through into the rest of eurozone. If, under any circumstance, the domestic impact of fiscal policies increased, the size of the shocks could increase correspondingly.

It also seems that there is not a linear relationship between the average spillovers in the euro area and the economic weight of country/ies undertaking the fiscal expansion. When the expansion takes place in more countries, the higher absolute size of individual spillovers in the remaining eurozone members is outweighed by their lower weight and thus the absolute size of an average spillover remains at approximately the same level.

The considerable variability of simulation results between the models relating to the size and, at times, also the sign of spillovers makes it impossible to determine the real impact of economic policies undertaken in one country on the economic variables of the others. This makes the coordination very complicated if not unfeasible as the policy-makers do not know the 'true' model according to which they could coordinate their economic policies. As some studies indicate (Mooslechner and Schuerz, 1999) a bad choice of the model can even have welfare-decreasing consequences. Moreover, the currently used models are calibrated with the use of historical data for the last couple of decades. If some structural characteristics of economies change as a result of functioning of the monetary union, the outcomes of the model simulations may be considerably different from the reality.

A large number of economic studies are concerned with the impact of the exchange rate regime on the cross-border externalities. Since monetary union has been in place for almost three years now, the question is not relevant in the EU context any more. However, a simple comparison of the spillover effects under the predecessor of the monetary union – the EMS –

may be useful in the discussion regarding the need for economic policy coordination in EMU as it indicates that the spillovers might in fact be lower under EMU than they used to be under the system of fixed exchange rates.

The recent results of large-scale macroeconomic models do not seem to provide conclusive evidence concerning the nature of the cross-border spillovers of fiscal policies in EMU. In general, their absolute size is indeed rather small. However, when one disaggregates the average figures, an extremely colourful picture appears. The absolute size of spillovers varies widely among countries. And so does their sign. Therefore, it seems improbable that the EMU members would take up the cross-border externalities as a serious argument for further development of fiscal policy coordination. It is also unlikely that the countries could agree on a concrete mechanism that would be advantageous for all.

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Appendix 1. Cross-border spillovers of structural policies

It is more difficult to arrive at general results in the area of structural policies for the simple reason that this term encompasses a very large set of potential policy measures. Budgetary policy can ultimately be defined in terms of the broad aggregates taxes, spending and the budget balance. By contrast structural policies could be shifts in the mixture of taxation (see below), changes in labour market regulations or just practices, product market reforms, etc.

Despite the difficulties to define ‘structural policies’, it might be useful to report some results because the European Union has also developed an ambitious framework for the coordination of structural policies following in particular the Lisbon European Council. Structural reforms in the member states are supposed to increase the potential of the European economy and thus contribute to achieving the ambitious Lisbon objectives. The final aim of the Lisbon process is to increase overall productivity (‘to make the EU the most competitive economy by 2010’). Therefore, as a proxy for structural reforms a positive productivity shock will be considered. The results of simulations prepared for the workshop on ‘Simulation properties of macro-econometric models’ organised by CEPII will be also used in this case. However, only a limited set of results is available and thus the analysis will be rather sharply limited to a productivity shock in Germany and its cross-border repercussions on the French and British economies.

Table A1. Germany (own country effect)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MULTIMOD	0.32	0.49	0.65	0.78	0.88	0.94	0.95	0.94	0.93	0.9
QUEST	0.24	0.49	0.54	0.58	0.68	0.69	0.68	0.69	0.69	0.69
NiGEM	0.11	0.24	0.34	0.45	0.54	n.a.	n.a.	n.a.	n.a.	n.a.
Marmotte	1.34	1.23	1.19	1.17	1.15	1.13	1.11	1.09	1.07	1.05

Table A2. France (spillover effect within EMU)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MULTIMOD	0.09	0.09	0.06	0.03	0	-0.03	-0.04	-0.04	-0.03	-0.02
QUEST	0.11	0.08	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
NiGEM	0.06	0.12	0.15	0.18	0.22	n.a.	n.a.	n.a.	n.a.	n.a.
Marmotte	-0.09	-0.03	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04

Table A3. United Kingdom (spillover effect outside EMU)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MULTIMOD	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
QUEST	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NiGEM	-0.06	-0.04	-0.02	0.00	0.01	n.a.	n.a.	n.a.	n.a.	n.a.
Marmotte	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02

It is very difficult to draw any conclusions based on the available data as the results are extremely variable. Due to large differences between the models in their specification of production functions, it is extremely complicated to design the same shock. This further decreases the comparability of the data. NiGEM and Marmotte normalised the shock to productivity to a 1% increase in overall output. The QUEST team assumed a 1% increase in total factor productivity. In typical growth (neoclassical) models, such an increase would lead to a proportionate rise in output. However, this is valid under the assumption that there are no changes in the employment. In the QUEST model the assumptions concerning the indexation of unemployment benefits lead to some changes in employment and thus the increase in GDP will not be exactly 1%.

The models provide completely different pictures about size, sign and also trend of the spillovers. MULTIMODE predicts relatively low spillovers which drop from 0.09% in the first year to zero in fifth year. In the tenth year following the initial productivity shock in Germany, the French output is predicted to be 0.02% under the baseline. QUEST also identified a decreasing trend in the size of spillovers, which are expected to drop from 0.11 to 0.02 in the tenth year. NiGEM is the only model that generated somewhat more important spillovers. Their size increases from 0.06 in the year of shock to 0.22 in the fifth year. Marmotte predicts negative spillovers, which amount to 0.09 in the first year and then range between 0.03 and 0.05 under the baseline GDP. In the case of Great Britain, the models in general predict low spillovers. The British economy seems to be isolated from the eurozone by the relatively flexible exchange rate.

It is apparent that these results provide little reliable indication on the nature of international spillovers of a productivity shock in the euro area. The difference of results can be attributed to the different structures of the models. The differing approaches and preferences of modellers are much more pronounced on the supply side of their models. MULTIMODE and

QUEST use the Cobb-Douglas production function, NiGEM CES function and Marmotte putty-clay production function.

These results seems to indicate that the size of international spillovers is not substantially larger in the case of structural policies than in the case of demand management.

Appendix 2. Model of fiscal policy in a monetary union

A simplified model of fiscal policy in a monetary union can be used to demonstrate the possible spillovers:

$$y_t = -\mathbf{a}_t^e + f_t + \mathbf{b}y_t^* \quad (1)$$

$$y_t^* = -\mathbf{a}_t^{*e} + f_t^* + \mathbf{b}^* y_t \quad (2)$$

$$m_t^e = \mathbf{f}y_t + (1 - \mathbf{f})y_t^* - \mathbf{d}^{-1}i_t^e \quad (3)$$

where, as usual, y_t stands for income, f_t stands for the stance of fiscal policy and a starred variable refers to the foreign country (or the rest of the monetary union). The parameters \hat{a} and \hat{a}^* are the marginal propensities to import from the partner country.

The monetary supply, m_t , and the interest rate, i_t , have the superscript e because under EMU there is only one interest rate and one monetary policy for the entire area. Equations (1) and (2) represent conventional IS curves. \ddot{a} stands for the inverse of the interest elasticity of money demand. \ddot{o} and $(1 - \ddot{o})$ are the weights of the two countries in the overall EMU-wide money demand.

What are the spillover effects from fiscal policy in this environment? This can be discussed by solving the model for income in both countries. Using equation (3) in equation (2) yields:

$$y_t^e [1 + \mathbf{ad}(1 - \mathbf{f})] = (\mathbf{b}^* - \mathbf{adg})y_t + \mathbf{ad}m_t^e + f_t^* \quad (4)$$

Using equation (3) in equation (1) yields, *mutatis mutandis*, a similar equation for the home country. The solution for home income is then:

$$y_t [1 + \mathbf{adf}] = [\mathbf{b} - \mathbf{ad}(1 - \mathbf{f})]y_t^* + \mathbf{ad}m_t^e + f_t \quad (5)$$

Substituting out for foreign income yields a more complicated expression which contains only y_t :

$$y_t [1 + \mathbf{adf}] = \mathbf{ad}m_t^e + f_t + [\mathbf{b} - \mathbf{ad}(1 - \mathbf{f})][1 + \mathbf{ad}(1 - \mathbf{f})]^{-1} [(\mathbf{b}^* - \mathbf{adg})y_t + \mathbf{ad}m_t^e + f_t^*] \quad (6)$$

This can be solved to yield:

$$y_t = \frac{\{1 + \mathbf{ad}(1 - \mathbf{f})f_t + [\mathbf{b} - \mathbf{ad}(1 - \mathbf{f})]f_t^* + (1 + \mathbf{b})\mathbf{ad}m_t^e\}}{\{1 - \mathbf{bb}^* + (1 + \mathbf{b})\mathbf{adf} + (1 + \mathbf{b}^*)\mathbf{ad}(1 - \mathbf{f})\}} \quad (7)$$

This equation implies that the effect of an increase in the fiscal impulse abroad could be either negative or positive depending on the sign of the expression in square brackets that multiplies f_t^* . Given that the denominator of this expression is positive, the spillover effects are positive only if the direct demand effect, \hat{a} , is larger than the interest-rate effect, $\hat{a}\hat{a}(1-\bar{o})$. If these two effects are equal, there is no spillover, and hence no need for coordination – provided, of course, that only aggregate demand matters, not its composition, especially the contribution of investment and consumption. The relative strength of interest-rate effect depends on the size of the foreign country (or rest of EMU), $(1-\bar{o})$, multiplied by the product of the interest elasticity of money demand and the elasticity of final demand with respect to the interest rate. For a country that is only a small part of EMU, both \hat{a} (the marginal propensity to import from the rest of the EMU) and $(1-\bar{o})$ are likely to be large. These two parameters should thus vary in the same direction. Hence there is no presumption that the spillover effect changes sign with country size. However, an increase in the degree of intra-EU trade integration, i.e. an increase in \hat{a} (and \hat{a}^*), would increase the probability that the spillover effect becomes positive. The absolute value of the spillover effect is also influenced by the multiplier in the denominator, which is always positive since $\hat{a}, \hat{a}^* < 1$, and which is increasing or decreasing in \hat{a} depending on the size of the spillover effect.

The effect of fiscal policy in equation (7) is implicitly based on the assumption that the Union-wide money supply is held constant. This would correspond to money supply targeting by the ECB along the lines of that of the Bundesbank. If the ECB targeted interest rates, the spillover effect would of course be positive, since there would be no offsetting impact from higher rates. However, in this latter case there would be pressure on prices to rise throughout the euro area. Thus, it is likely that the ECB will increase interest rates if fiscal policy becomes expansionary even if it does not have a formal money supply target.

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