Macroeconomic Implications of Greater Competition in the Euro Area*

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Abstract

We analyze the macroeconomic effects of reforms in the euro area services and labor markets by simulating EAGLE, a multi-country DSGE model of the euro area. To properly assess the role of cross-region spillovers, we consider reforms in Germany and the rest of the euro area. Reduction of markups in both German labor and services markets imply similar and large long-term domestic gains in output and employment. Spillovers on the euro area partners are always positive. They are bigger in the case of German labor market reforms, because the supply of German tradable goods increases more than in the case of services market reform. Benefits of reforms are bigger if reforms are synchronized across countries of the euro area, as spillovers related to movements in international relative prices are lower while export and import volumes increase more. Finally, spillovers of euro area reforms on the rest of the world and the US are positive, albeit low.

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1 Introduction

A leading explanation of the low trend-growth in Europe is the low degree of competition in the labor and product markets. Over-regulated markets and lack of flexibility imply a low growth rate of productivity and employment in the long run and thereby do not support the growth potential.

The Lisbon Strategy for Growth and Jobs – a wide ranging and ambitious reform agenda the European Council has launched with a view to enhance growth and employment in Europe – copes with the problems related to the market over-regulation in Europe. Among other objectives, the Lisbon Strategy aims to increase economic growth, productivity and labor utilization in the European economy by enhancing competition and flexibility in product and labor markets.[1]

The macroeconomic effects of the above strategy are clear from the perspective of Europe as a whole. However, once the multi-country dimension of Europe is taken into account several issues arise. The strong economic integration across member states of the European Union implies that spillovers from country-specific reforms can be sizeable. Reforms can potentially benefit main trade partners through favorable movements in international relative prices (terms of trade and real exchange) with respect to the country implementing the reforms. At the same time, however, the deterioration in relative prices can be a disincentive in implementing reforms in a stand-alone fashion, raising an issue of synchronization and coordination in implementing reforms. In countries belonging to the euro area, the issues is more complex, because the common monetary policy necessarily pursues an area-wide perspective and would not always accommodate the implementation of country-specific reforms.

In this paper we systematically assess the above issues by analyzing the macroeconomic implications of competition-enhancing reforms implemented in countries belonging to the euro area. Specifically, we analyze the domestic effects and spillovers (to trade partners) of reforms in Germany, the biggest country of the euro area. To that purpose we use a multi-country general equilibrium model of the euro area. The model, calibrated to Germany, rest of the euro area, US and rest of the world, is simulated to measure the domestic effects and international spillovers of increasing the degree of competition in the labor and services market in Germany and in the rest of the euro area. The two considered markets have a relatively low degree of competition (compared to the manufacturing sector, as we'll be shown) and,

[1] See European Commission (2002, 2005), IMF (2004), OECD (1997, 2003, 2006).

generally speaking, are particularly relevant for the economic performance of a country. Last but not least services and labor can be considered as nontradables, hence they are not strongly affected (at least not directly) by the competitive pressures coming from the european common market. The model, named EAGLE (Euro Area and Global Economy Model, see Gomes, Jaquinot and Pisani (2009)), posits monopolistic competition in product and labor markets and hence introduces a markup between the marginal cost (marginal rate of substitution between consumption and leisure) and prices (wages). Consistently with the monopolistic competition framework, the markups are inversely related to the degree of substitutability across goods (labor inputs), and hence the underlying level of competition. Given the presence of two types of goods, tradables and nontradables, we can analyze the effect of increasing the degree of competition in the services sectors, that traditionally are considered as nontradable. Given that the assumption of monopolistic competition holds also in the labor market, it is possible to measure the macroeconomic effects of deregulating that market. Because of the multi-country setup, we can compare the effects of German reforms when implemented isolate or simultaneously with other countries belonging to the euro area.

We simulate the model assuming that competition-enhancing structural reforms are implemented in Germany in a gradual fashion along a period of five years. We analyze both the long run (steady state) effects and the transitional dynamics. The latter is gradual because the implementation of reforms is gradual as well and because there is habit in households' preferences and standard adjustment costs on prices, wage and capital accumulation. Given the assumption of perfect foresight, reforms are fully credible, there is no uncertainty and agents anticipate the overall transition path and the final equilibrium.

Our main results suggest that increasing competition in German economy favors sizeable increases in the main macroeconomic variables. First, reforms stimulate consumption, investment and labor. Real output strongly increases. In the case of labor market reforms, labor would increase more than investment, as firms partially substitute labor for capital. Second, the effects of reform are stronger when reforms are jointly implemented. Third, international spillovers are positive, as main trade partners benefit from the depreciation of German real exchange rate and the higher supply of German tradeable goods. Finally, benefits of reforms are bigger when reforms are jointly implemented across countries belonging to the euro area. In this case the German economy benefits from a lower deterioration in the international relative prices.

The transition path is characterized by a smooth increase in production, consumption, investment and labor in correspondence of higher competition. Consistently, price, wages and related inflation rates follow a decreasing path. The excess supply makes German tradable product cheaper (the German terms of trade and real exchange rate deteriorate and depreciate, respectively) favoring net exports. Effects on the US and the rest of the world are relatively small. Effects on the rest of the euro area are positive and not negligible, in particular when reforms are implemented in the German labor market.

Our paper is related to several contributions analyzing the macroeconomic implications of structural reforms. Bayoumi, Laxton and Pesenti (2004) analyze the effects of greater competition in the euro area. However, they do not focus on member country-specific reforms nor distinguish between manufacturing and services sectors. Jonsson (2006, 2007) analyzes the macroeconomic implications of imperfect competition in the product and labor market using a closed economy dynamic general equilibrium model parameterized to fit the US and euro area economy, respectively.[2] Everaert and Schule (2008) compute a similar analysis focusing on the effects of synchronized structural reforms in the euro area. Differently from them, we focus on the German-based reforms and analyze their domestic effects and international spillovers. Forni, Gerali and Pisani (2008a) analyze the role of greater competition in the Italian services sector in a two country model of the euro area. They do not consider issues related to (lack of) synchronization of reforms. Finally, Coenen, McAdam and Straub (2008) analyze the impact of tax reforms on the euro area labor market performance.

The paper has the following structure. The next section briefly presents the theoretical background of the model. Section 3 contains the calibration. Section 4 reports results from simulation. Section 5 concludes.

2 Model setup

2.1 General Features

Similarly to the ECB New Area Wide model and the IMF Global Economy Model, EAGLE is microfounded and enriched with nominal rigidities (wage and price stickiness, indexation schemes), capital accumulation, inter-

[2]Several recent contributions have also focused on the macroeconomic effects of fiscal consolidation reforms in the euro area. See, among the others, Coenen, Mohr and Straub (2008) and Forni, Gerali and Pisani (2008b).

national trade in goods financial assets.[3] Explicit microfoundations allow to clearly identify structural parameters and to properly analyze the impact of structural changes. The general equilibrium frameworks allows to properly take into account the effects of agents' behavior.

Each country comprises households, firms and a public sector.

Each household is infinitely lived and consumes a final good and supplies labor to all domestic firms. Households decide how to allocate their time between work and leisure. They supply differentiated labor in a monopolistic manner, thus exerting limited bargaining power and charging markups over the marginal rate of substitution between labor and consumption. Wages contracts are subject to nominal rigidities. Some households do not have access to capital markets. They finance their consumption exclusively through disposable labor incomes. The remaining households own the portfolio of domestic firms and the domestic capital stock , which they rent to domestic firms. They also buy and sell two bonds. A domestic bond denominated in domestic currency, and an international bond issued in zero net supply worldwide. When households sell or purchase the international bond they pay a premium to financial intermediaries, whose size is a function of the aggregate net asset position of the country. In the case of the monetary union, there is a bond denominated in the common currency which is traded across the countries member of the union. Labor and physical capital are immobile internationally. The market for capital is competitive, and capital accumulation is subject to adjustment costs.

On the production side, firms produce the final goods, an array of differentiated intermediate goods, and provide intermediation services. In each country there are two final goods — a consumption good and an investment good — produced by perfectly competitive firms. The consumption good is consumed either by domestic households or by the government. Private agents also demand investment goods. Final goods are produced by using all available intermediate goods as inputs using a constant elasticity of substitution (CES) technology and allowing for home bias. There are many varieties of intermediate goods, each produced by a single firm under conditions of monopolistic competition. The market power implies that firms set prices. The latter are subject to nominal rigidities.

Each intermediate good is produced by using domestic labor inputs and domestic capital. They are combined according to a Cobb-Douglas technol-

[3]On GEM see Bayoumi (2004) and Pesenti (2008). On the New Area Wide Model see Coenen, Christofell and Warne (2008).

For an early model, not microfounded, of the euro area see Fagan, Henry and Mestre (2001). For a DSGE model of the US see Erceg, Guerrieri and Gust (2003).

ogy. Intermediate goods are either nontraded or traded internationally. The nontraded intermediate goods, the domestic and imported traded goods are used in the production of the final goods. Imports are subject to short-term adjustment costs that temporarily lower the response of demand to changes in relative prices. There is international price discrimination given that firms set prices in the currency of the importing country. The government purchases the final consumption good. It finances its expenditures with public debt and taxes on the domestic private sector. There are lump-sum and distortionary taxes. The latter are on the price of consumption, the rental rate of capital, wages. Standard fiscal rules that target the level of public debt ensure the stability of the model.

The central bank sets the national short-term nominal interest rate. In the case of the monetary union, the central bank sets the interest rate for all the member countries. Monetary policy is specified in terms of a credible commitment to target price stability by managing the domestic nominal short-term interest rate. The model uses standard functional forms, which allows firms and consumers to be aggregated as if they were a representative entity. Adjustment costs for real variables and nominal rigidities enable EAGLE to mimic the typical hump-shaped reaction of macroeconomic variables to shocks observed in reality. There are investment and import adjustment costs and external habit formation in consumption. Prices and wages are sticky (Calvo 1984) and indexed to a weighted average of previous period CPI inflation rate and current period central bank's inflation target.

2.2 Markups in Labor and Product Markets

Monopolistic competition is a crucial feature of the model for the type of analysis we want to perform. Let's consider the labor market setup. Each household offers a specific kind of labor services that is an imperfect substitute for services offered by other households. The lower the degree of substitutability, the higher will be the markup, and the lower employment in terms of hours. Hence, markup reflect imperfect competition in the labor market. In the (flexible-price) steady state, the following first order condition holds for labor supply L:

$$\frac{W}{P} = \frac{\theta_L}{\theta_L - 1} k \lambda^{-1} L^{\tau} \tag{1}$$

where W/P is the real wage (expressed in units of domestic consumption), λ is the marginal utility of consumption. The parameter θ_L measures the elasticity of substitution between labor varieties and the the ratio $\theta_L / (\theta_L - 1)$

represents the related markup. The parameter τ is the inverse of the Frisch elasticity of labor supply.

The intermediate good market setup is similar. There is a large number of firms offering a continuum of different products that are imperfect substitutes. Each product is made by one monopolistic firm, which sets a markup over costs. The elasticity of substitution of demand between products of different firms determines the market power of each firm, which sets prices to maximize profits. In steady state, in each sector (tradables and services sectors)a first order condition for price setting like the following one holds :

$$\frac{P_G}{P} = \frac{\theta_G}{\theta_G - 1}\frac{MC}{P}$$

where P_G/P is the relative price of the generic intermediate good G and MC/P is the real marginal cost of producing G. The parameter θ_G measures the elasticity of substitution between different good varieties and the the ratio $\theta_G/\left(\theta_G - 1\right)$ represents the related markup.

In EAGLE and other similar models based on the monopolistic competition framework, markups are modeled by a single parameter in each of the markets. Modifying these markup parameters can simulate the impact of structural reforms affecting the degree of competition in the considered market. The higher the elasticity of substitution between varieties, the lower the markup and the closer the market is to perfect competition. For example, a permanent increase in the degree of competition in the labor market is represented by a permanent increase in the value of θ_L in equation (**??**). Similar considerations hold for formalizing reforms in the product markets.

3 Calibration

In this section we illustrate the calibration of the model. We illustrate the markup values for labor, manufacturing and services, the values of parameters affecting the relevant steady state great ratios and the dynamics.

3.1 Markup values

Table 1 reports initial markup values. We identify the nontradable and tradable sectors in the model with the services and manufacturing sectors in the data, respectively. We assume that markups in the euro area services and labor markets are higher than the corresponding values in the US and rest of the world. We also assume that in each region the markup in the nontradable sector is higher than that in the labor market and that the

latter is higher than the markup in the manufacturing sector. In other word, the degree of competition is particularly low in the services sector, followed by the labor market. Specifically, we assume that the (net) price markup in the Germany and rest of the euro area is set to 40, 30, 20 percent in the services , labor and manufacturing sectors, respectively. In the US and in the rest of the world the corresponding markups are set to 28, 16, 20 percent. Our values are in line with other existing similar studies, such as Bayoumi, Laxton and Pesenti (2004), Farouqee et al. (2008), Everaert and Schule (2008).Many, if not all, of these studies refer to Jean and Nicoletti (2002) and Martins et al. (1996) for estimates of markups on the basis of OECD data. Some additional empirical evidence for the euro area is provided by Christopoulou and Vermeulen (2008). Their estimates suggests that German markup for the services sector is similar to the correspondent value for the euro area. and that markup in German manufacturing sector is relatively low with respect to the domestic services sector.

3.2 Great Ratios

Tables 2-6 report the parametrization of the four blocks in the simulations. The steady-state ratios have been set to match actual national accounts data and the key behavioral parameters have been chosen using information from the existing literature.

In the version of EAGLE used here, the world is split into four blocks: the Germany (GER), the rest of the euro area (REA), the US and the rest of the world (ROW). The real GDP (in purchasing power parity) shares of the four specified blocks sum to 100 percent. Trade (in percent of GDP) covers intra and extra euro area flows. Overall trade shares cover goods and services. Trade flows are based on the ECB statistics. Behavioral parameters were taken from the literature, some of which are invariant across countries, while others have been modified to match country-specific great ratios.[4] The discount factor, the habit persistence and all elasticities of substitution have been specified at the same value for all countries (Table 1). In the baseline calibration, the elasticity of intertemporal substitution is set equal to 1.66, the elasticity of substitution between imports and domestic tradable goods at 2.5, while the elasticity of substitution between composite tradables and nontradables at a relatively low value, equal to 0.5. Hence, consistently with existing literature, we assume that the degree of substitutability between tradables is higher than that between tradables

[4]See Batini, N'Diaye and Rebucci (2005).

and nontradables. A sensitivity analysis with respect to the elasticity of substitution between domestic and imported tradables will be conducted, given the relevance of the parameter for the transmission of international spillovers. Following Evaert and Schure, we set the elasticity of labor supply with respect to wages at 0.66. The parameter is crucial for the size of the response of hours worked to labor market reforms. For that reason, we will perform a sensitivity analysis. Home bias and the weight of nontradable goods in the consumption and investment baskets assume different values across countries. They are set to match the shares of imported and services goods in the considered economy, given the values of the intratemporal and intertemporal elasticities of substitution.

3.3 Monetary Policy

Monetary policy authorities are assumed to target inflation. The interest rate rule is specified as follows for each of the blocks:

$$\left(\frac{R_t}{\bar{R}}\right)^4 = \left(\frac{R_{t-1}}{\bar{R}}\right)^{4\rho_R} \left(\frac{\pi_{4,t}}{\bar{\pi}_4}\right)^{(1-\rho_R)\rho_\pi} \left(\frac{gdp_t}{gdp_{t-1}}\right)^{(1-\rho_R)\rho_y}$$

where R is the (quarterly) nominal interest rate, $\bar{R}$ its steady state value, π_4 is the year-over-year euro area-wide CPI inflation rate, $\bar{\pi}_4$ is the central bank CPI inflation target, gdp is the domestic gross domestic product. Similar Taylor rules hold in the US and in the rest of the world. In the euro area, π and gdp are defined as geometric average of Germany and rest of the area CPI inflation rates and gross domestic product, respectively:

$$\pi_{4,t}^{EA} = \left(\pi_{4,t}^{GER}\right)^n \left(\pi_{4,t}^{REA}\right)^{1-n}$$

$$gdp_t = \left(gdp_t^{GER}\right)^n \left(gdp_t^{REA}\right)^{1-n}$$

where n and $1-n$ represent the population sizes of Germany (GER) and rest of the euro area (REA) in the euro area, respectively.

For all blocks, the inflation target is set at 2 percent. Note that in the case of the countries belonging to the monetary union, changes in the bilateral relative prices (real exchange rate and terms of trade) are due to inflation differentials only, given that the nominal exchange rate is fixed. The inflation differential also affect the region-specific real interest rate, because the nominal interest rate is common and set by the central bank of the union.

The calibration of the fiscal policy rules is standard. The parameter measuring the reaction of taxes to public debt is set to maker debt sustainable and hence model stability. Taxes and public expenditures do not have any active role in our simulations. Their are value are set to match great ratios such as investment-to-gdp ratio or public expenditure-to-gdp ratio.

3.4 Scenarios

The simulations measure the effects of increasing competition in the German and euro area labor and services. Since EAGLE does not allow for interactions between markups in various markets, the effects of the reform in the long-run steady state as well as in the transition dynamics are additive. Reforms are also considered whether they are implemented in stand-alone fashion by Germany, or synchronized with the rest of the euro area. We assume that markups are reduced gradually over a period of five years to a permanently lower value. We also assume that agents have perfect foresight, thus eliminating any uncertainty about the credibility and path of these reforms.

4 Results

In this section we reports the results of our simulations. We analyze the macroeconomic effects of structural reforms in the German labor and services markets. We report both long run (steady-state) values of the variables and transition dynamics. We compare results when reforms are implemented in Germany only and simultaneously in the whole euro area. Finally, we perform robustness analysis by appropriately changing the values of some key parameters.

4.1 Long-Run Effects of Structural Reforms

Table 7 reports long-run results of reducing (gross) markup in the German services sector by 5, 10, 15 percent points. The effects on the real activity are sizable. Output rise by 5 percent when markup is reduced by 15 percentage points. The increase in mainly driven by investment (+7.7 percent) and consumption (+2.4 percent). Firms increase not only capital stock, but also employment. Hours worked and real wage increase, respectively by 3.8 and 7.2 percent. The excess supply of German services induces a depreciation of the (multilateral) real exchange rate and a deterioration of the (multilateral)

terms of trade, favoring an increase in the volume of exports.[5] The amount of imports increases as well, driven by the higher investment (whose import content is relatively high). Overall, investment and consumption greatly benefit from the higher competition. The welfare, measured in consumption equivalent terms, improves. Note that the increase in economic activity is higher when reducing the markup from 1.5 to 1.45 and from 1.45 to 1.40 then in the case of a reduction from 1.40 to 1.35, suggesting that reforms have a bigger effect when initial distortions are higher.

Spillovers on the rest of the euro area are not big. Output, consumption and increase do not greatly increase. Both exports and imports increase. The former increase because of higher German aggregate demand. The latter increase to a bigger extent, thanks to the improvement in international relative prices. The welfare effect is positive, albeit small.

Finally, spillovers on the rest of the world and the US are negligible. This is not surprising, given the German small size, the German trade flows (that are mainly oriented towards the rest of the euro area and the rest of the world) and that services are nontradables.

Table 8 shows results of reducing markups in the German labor market. Effects of real output are only slightly stronger than in the case of reforms in the services sector. However, there are also some differences. First, the excess labor supply (hours worked increase by 5.9 percent when reducing markup by 15 percent points) favors a reduction in real wages (-1.0 percent). In the case of services reforms, real wages increase, thanks to the higher competition in the product market.

Second, firms partially substitute labor for capital, inducing an increase in investment similar to that in labor effort (in the case of reforms in the services sectors, firms have a stronger incentive to accumulate cheaper capital).

Third, export increase more, because the lower real wage translates into a lower marginal cost and hence in lower prices (the terms of trade deteriorate to a greater extent). Finally, imports increase more because of higher consumption (its import content is lower than that of the investment, but its share in the aggregate demand is higher). Also in this case welfare effects are sizeable.

[5]The real exchange rate of a region is defined as the ratio of the foreign to domestic CPI index, both expressed in the domestic currency. An increase represents a depreciation. The terms of trade of a region is the ratio of import to export prices, both expressed in domestic currency. An increase corresponds to a deterioration. The gross domestic product, the trade balance, exports, imports are measured in "real" terms, using the initial steady state prices.

Spillovers on the rest of the euro area are bigger than in the case of reforms in the services sector. Higher German demand favors higher exports. The improvement in the terms of trade makes the imported goods cheaper. Both effects stimulate consumption and investment. Real output and welfare increase.

Spillovers on the rest of the world are also bigger than in the case of reforms in the services sector. As for the rest of the euro area, the stimulating effect is due to the combination of higher exports and the improvement in the international relative prices. Spillovers to the US are also in this case negligible.

Table 9 shows results of simultaneously lowering markup by 10 percentage points in both labor and services markets, starting from the corresponding initial values. The effects are more or less additive. Real wage increases because the increase in labor demand more than counterbalances the increase in labor supply due to the reform in the labor market. Both exports and imports increase, favored by the real depreciation. Welfare improves.

Spillovers on the rest of the euro area and the rest of the world are sizeable and positive. They are qualitatively similar to those obtained when implemented in an isolated manner.

Table 10 shows results of implementing simultaneous reforms in both Germany and rest of the euro area. Both regions reduce markup by 10 percent points in services and labor markets. The effects on the economy of the rest of the euro area are strong. The economy activity increases. Germany also benefits from the coordination, because the lower deterioration in German international relative prices makes imports cheaper. Both consumption and investment are stimulated, while labor is not much affected. Overall, the increase in the economy activity is more equally spread across the two regions, and the spillovers due to changes in international relative prices are limited. Welfare in both regions strongly increases.

Spillovers on the rest of the world are now stronger. The region benefits from the improvement in international relative prices and higher exports. Spillovers on the US are also positive, albeit small.

Finally, Tables 11, 12, 13 reports some robustness analysis on German-based coordinated reforms in the labor and services sectors. Table 11 considers the case of lower intertemporal elasticity of substitution (set equal to one), Table 12 reports results in correspondence of lower Frish labor elasticity (set to 0.33). Finally, Table 13 shows the implications of higher elasticity of substitution between tradable goods (set to 5.5).

The main message is that results are quite robust. Compared to the benchmark scenario (Table 9), the economic expansion continues to be size-

able. The impact of lower elasticities on the effects of structural reforms is not particularly strong. Regarding the higher elasticity of substitution between tradables, the spillovers are stronger, given that now agents can substitute in a easier way across tradables. Fluctuations in the terms of trade are lower, while the impact on the amount of German imports is amplified. Also in this case main results do not strongly change.

4.2 Short-Run Effects of Structural Reforms

Figures 1-6 reports the dynamic adjustment paths of main macroeconomic variables in correspondence of the different reforms. The transitional dynamics are driven by the gradual implementation of the reforms, the anticipation of the overall path of the shocks by the agents, the adjustment costs in accumulating capital and prices and by habit in consumption.

Figures 1 and 2 show the domestic effects and spillovers of reforms in the German services sector, respectively. In Figure 1 German households anticipate that services will be cheaper in the future, when the supply will be higher. Given the high services content of consumption, household prefer to consume more in the future, when consumption is cheaper. The drop is hump-shaped because of the assumption of external habit. At the same time, households start to slowly increase labor supply and accumulate physical capital, so that a higher stock of capital is available when the production level must be increased. The increase in investment drives up demand for tradables. Similarly, the real wage follows an increasing path, given that firms increase labor demand when the price markup become lower. After three-four quarters the German output starts to monotonically to the new long run level. The postponement of consumption contributes to reduce domestic CPI inflation. Consistently, the real exchange rate depreciates and the terms of trade deteriorate, favoring the improvement in the trade balance to gdp ratio, measured at constant prices. The real interest rate increases, given that the nominal interest rate, set at the union level, slightly increases while German inflation decreases. Figure 2 reports the spillovers on the rest of the euro area. The increase in German investment activity drives up the demand for tradables. Tradable production increases in the rest of the euro area, inducing higher labor demand (both hours and real wage increase) and physical capital accumulation. Given the higher demand, firms also increase prices. The real interest rate becomes negative (the nominal interest rate reaction is relatively low, because of the lower inflation in Germany), stimulating consumption. Higher consumption stimulates production of services. Overall, economic activity increases, driving the trade

balance towards deficit, because higher imports are needed for investment purposes. The real exchange rate initially depreciates, given the higher supply of goods and services produced in the euro area relatively to the US and the rest of the world. The rest of the euro area terms of trade improves, for two reasons. First, firms set prices in local currency, reducing the degree of pass-through of exchange rate into import prices. Second, prices of tradables produced in the rest of the euro area increase relatively to those of other countries, because of the relatively higher demand. The terms of trade improve in the short run.

Figures 3 and 4 show respectively the domestic effects and spillovers of higher competition in the German labor market. German firms foreseen that labor will be cheaper in the future and that employment will increase. They immediately start to adjust the stock of capital, inducing an increasing in the demand for investment. To produce more capital goods, firms need to increase labor demand. Given that labor supply is relatively low, real wages initially increase. Higher investments drive up higher production, higher inflation and moves the trade balance towards deficit. Consumption on impact does not change that much, to make room for higher investment. After the first 8 quarters, consumption starts to monotonically increase towards the new steady state level. The same is true for output. The real interest rate is negative on impact, while both the real exchange rate and the terms of trade deteriorate over time.

Figure 4 reports spillovers on the rest of the euro area. Higher German imports favors economic activity in the rest of the euro area. The inial increase in inflation rate is only partially counterbalanced by a higher nominal interest rate, inducing a lower real interest rate. This stimulates consumption, investment and total production. The real exchange rate depreciates on impact, while in the long run it appreciates and the terms of trade improve. Trade balance is persistently negative, because (higher) investments have a high import content and imported goods are cheaper. Hours worked increase on impact and then decrease, once the new higher level of capital is able to sustain the new higher level of production.

Figures 5 and 6 show the transition path when reducing simultaneously markup in the German services and labor markets. Overall results are similar to those obtained when implementing services market reform in a stand alone fashion. Notice in particular the real wage, that monotonically increases over time even if reforms in the labor market are implemented. Also spillovers on the rest of the euro area (Figure 6) are similar to those obtained in the case of German services reforms. The main difference is quantitative, given that on impact the response of the main variables in the rest of the

euro area is now stronger.

Finally, Figure 7 and 8 show the transition path when reforms are synchronized across the two euro area regions. In this case the trade balance in both region moves initially towards deficit, as both regions import cheaper tradable goods from the rest of the world (see the short run improvement in the terms of trade of both regions). Note also that the initial reduction in consumption is more equally split between the two regions. Germany needs to decrease less consumption on impact, because now also the rest of the euro area is strongly increasing physical capital accumulation. Finally, both regions face a strong reaction in the correspondent real interest rate, thanks to the higher initial increase in the inflation rate and the smoothed response in the nominal interest rate.

5 Conclusions

We have analyzed the macroeconomic implications of greater competition in the German product and labor markets by simulating a microfounded general-equilibrium model of the euro area economy. Increases in the levels of competition in the German markets are associated with strong increase in long run domestic output, consumption and employment. Spillovers on the rest of the euro area are positive and overall sizeable. The level of economic activity in rest of the euro area benefits from improved relative prices and higher German demand. Spillovers on the rest of the world and the US are positive, but relatively small.

We also find that sector-specific structural reforms have different macroeconomic implications. Reforms in the services sector induces a bigger increase in domestic output and investment, given the lower initial degree of competition. Also in the case of labor market reforms the macroeconomic effects are positive and sizeable. In this case, differently from the product market reforms, real wages decrease.

The analysis can be extended along several directions. First, there can be an issue of the appropriate sequencing the reforms. For example, as emphasized also by Alesina, Ardagna and Galasso (2008), reform in the product markets could imply, through a process of creative destructions, that some firms could be substituted by others. If labor, because of tightly regulated labor market, cannot be easily reallocated across firms, then the product market reform would have more muted effects. Second, it could be of interest to analyze if and to what extent regional fiscal policy can have a similar role. Temporary tax reductions can be implemented along the

transition paths in those countries implementing reforms in a stand alone fashion if, for example, reforms reduce the welfare level of rule-of-thumb households, that do not have access to financial markets and do not receive profits from domestic firms. We leave these interesting questions for future research.

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Table 1. Price and Wage Markups

	GER	REA	US	RW
Tradables Price Markup				
	1.20	1.20	1.20	1.20
Nontradables Price Markups				
	1.50	1.50	1.28	1.28
Wage Markup				
	1.30	1.30	1.16	1.16

GER=Germany; REA=Rest of Euro Area; US=United States; RW=Rest of World

Table 2. Households and Firms Behavior

	GER	REA	US	RW
Subjective discount factor	$1.03^{-0.25}$	$1.03^{-0.25}$	$1.03^{-0.25}$	$1.03^{-0.25}$
Depreciation rate	0.025	0.025	0.025	0.025
Intertemporal elasticity of substitution	0.60	0.60	0.60	0.60
Habit persistence	0.75	0.75	0.75	0.75
Inverse of the Frisch elasticity of labor	1.50	1.50	1.50	1.50
Tradable Intermediate Goods				
Bias towards capital	0.30	0.30	0.30	0.30
Nontradable Intermediate Goods				
Bias towards capital	0.30	0.30	0.30	0.30
Final consumption goods				
Substitution btw domestic and imp. goods	2.50	2.50	2.50	2.50
Bias towards domestic goods	0.20	0.20	0.85	0.20
Substitution btw tradables and nontrad.	0.50	0.50	0.50	0.50
Bias towards tradable goods	0.35	0.35	0.35	0.35
Final investment goods				
Substitution btw domestic and imp. goods	2.50	2.50	2.50	2.50
Bias towards domestic goods	0.20	0.20	0.85	0.20
Substitution btw tradables and nontr.	0.50	0.50	0.50	0.50
Bias towards tradable goods	0.80	0.80	0.80	0.80

Table 3. Steady-state National Accounts (In percent of GDP)

	GER	REA	US	RW
Private Consumption	0.63	0.63	0.65	0.66
Private Investment	0.20	0.20	0.20	0.20
Public Expenditure	0.20	0.20	0.16	0.16
Trade balance	0.00	0.00	0.61	−0.35
Imports	0.28	0.24	0.11	0.15
Consumption Goods	0.18	0.20	0.07	0.09
Investment Goods	0.10	0.04	0.04	0.06
Government Debt	60.0	60.0	60.0	60.0
Net Foreign Assets	−51.0	0.00	0.00	51.0
Share of World GDP (percent)	0.06	0.16	0.31	0.45

Table 4. Real and Nominal Rigidities

	GER	REA	US	RW
Real Rigidities				
Investment adjustment	3.00	3.00	3.00	3.00
Import adjustment (consumption)	5.00	5.00	5.00	5.00
Import adjustment (investment)	2.00	2.00	2.00	2.00
Nominal Rigidities				
Households				
Wage stickiness	0.75	0.75	0.75	0.75
Wage indexation	0.50	0.50	0.50	0.50
Manufacturing				
Price stickiness (domestically produced goods)	0.75	0.75	0.75	0.75
Price indexation (domestically produced goods)	0.50	0.50	0.50	0.50
Price stickiness (imported goods)	0.75	0.75	0.75	0.75
Price indexation (imported goods)	0.50	0.50	0.50	0.50
Services				
Price stickiness	0.75	0.75	0.75	0.75
Indexation	0.50	0.50	0.50	0.50

Table 5. International Linkages

	GER	REA	US	RW
Substitution between consumption imports	2.50	2.50	2.50	2.50
Imported consumption goods (%GDP) from				
GER	...	0.03	0.002	0.01
REA	0.09	...	0.008	0.04
US	0.01	0.005	...	0.04
RW	0.08	0.165	0.06	...
Substitution between investment imports from	2.50	2.50	2.50	2.50
Imported investment goods (%GDP) from				
GER	...	0.02	0.00	0.007
REA	0.04	...	0.004	0.023
US	0.02	0.007	...	0.03
RW	0.04	0.013	0.036	...
Net Foreign Liabilities	0.0	0.0	−51.0	51.0
Financial intermediation cost function	0.01	0.01	0.01	0.01

Table 6. Monetary Policy

	GER	REA	US	RW
Inflation target	1.02	1.02	1.02	1.02
Interest rate inertia	0.95	0.95	0.95	0.95
Interest rate sensitivity to inflation gap	2.00	2.00	2.00	2.00
Interest rate sensitivity to output growth	0.10	0.10	0.10	0.10

Table 7. Long-Run Effects of Reducing Markups in German Services Market
(Percent deviations from baseline)

Markup Level	1.45	1.4	1.35
Domestic Effects			
Real GDP	1.48	3.33	5.12
Consumption	0.72	1.59	2.39
Investment	2.20	4.99	7.71
Hours Worked	1.09	2.46	3.79
Real Wage	2.08	4.70	7.24
Exports	0.50	1.12	1.71
Imports	0.29	0.64	0.97
Real Exchange Rate	1.96	4.42	6.82
Terms of Trade	0.21	0.47	0.72
Welfare (CV)	0.35	0.73	1.04
Spillovers on the REA			
Real GDP	0.02	0.03	0.05
Consumption	0.03	0.07	0.11
Investment	0.04	0.08	0.12
Hours Worked	0.00	0.01	0.01
Real Wage	0.02	0.05	0.08
Exports	0.03	0.08	0.11
Imports	0.10	0.22	0.33
Real Exchange Rate	−0.36	−0.79	−1.21
Terms of Trade	−0.05	−0.1	−0.16
Welfare (CV)	0.03	0.07	0.11
Spillovers on the RW			
Real GDP	0.00	0.00	0.00
Spillovers on the US			
Real GDP	0.00	0.01	0.01

Table 8. Long-Run Effects of Reducing Markups in German Labor Market
(Percent deviations from baseline)

Markup Level	1.25	1.2	1.15
Domestic Effects			
Real GDP	1.7	3.49	5.41
Consumption	1.46	2.99	4.63
Investment	1.43	2.93	4.54
Hours Worked	1.85	3.79	5.90
Real Wage	−0.33	−0.67	−1.03
Exports	1.57	3.22	4.99
Imports	0.85	1.74	2.67
Real Exchange Rate	0.43	0.87	1.34
Terms of Trade	0.65	1.33	2.05
Welfare (CV)	0.81	1.62	2.46
Spillovers on the REA			
Real GDP	0.05	0.09	0.15
Consumption	0.10	0.21	0.32
Investment	0.12	0.24	0.36
Hours Worked	0.01	0.02	0.03
Real Wage	0.07	0.15	0.24
Exports	0.11	0.22	0.33
Imports	0.30	0.61	0.95
Real Exchange Rate	−0.07	−0.15	−0.23
Terms of Trade	−0.14	−0.29	−0.45
Welfare (CV)	0.10	0.20	0.31
Spillovers on the RW			
Real GDP	0.01	0.03	0.04
Consumption	0.02	0.05	0.07
Investment	0.03	0.07	0.10
Hours Worked	0.00	0.01	0.01
Real Wage	0.02	0.04	0.06
Exports	0.07	0.15	0.24
Imports	0.14	0.29	0.45
Real Exchange Rate	−0.06	−0.13	−0.20
Terms of Trade	−0.08	−0.17	−0.26
Welfare (CV)	0.02	0.04	0.07
Spillovers on the US			
Real GDP	0.00	0.01	0.01

Table 9. Long-Run Effects of Lower Markups
in German Labor and Services Markets
(Percent deviations from baseline)

	GER	REA	RW	US
Real GDP	6.92	0.13	0.04	0.01
Consumption	4.62	0.28	0.06	0.02
Investment	8.05	0.32	0.09	0.00
Hours Worked	6.34	0.03	0.01	0.00
Real Wage	3.98	0.21	0.05	0.01
Exports	4.37	0.29	0.21	0.03
Imports	2.36	0.84	0.39	0.10
Real Exchange Rate	5.32	−0.94	−0.73	−0.27
Terms of Trade	1.80	−0.39	−0.23	−0.06
Welfare (CV)	2.29	0.27	0.06	0.02

Table 10. Long-Run Effects of Reducing Markups
in German and REA Labor and Services Markets
(Percent deviations from baseline)

	GER	REA	RW	US
Real GDP	7.26	7.30	0.14	0.02
Consumption	5.37	5.21	0.25	0.07
Investment	8.84	9.04	0.38	0.01
Hours Worked	6.42	6.38	0.04	0.00
Real Wage	4.55	4.39	0.22	0.04
Exports	4.90	4.13	0.85	0.04
Imports	4.08	2.86	1.63	0.29
Real Exchange Rate	2.65	4.11	−2.79	−0.87
Terms of Trade	0.70	1.28	−0.91	−0.16
Welfare (CV)	2.99	2.85	0.23	0.07

Table 11. Long-Run Effects of Reducing Markups in Germany
Low intertemporal elasticity (=1.0)
(Percent deviations from baseline)

	GER	REA	US	RW
Real GDP	6.19	0.07	0.00	0.02
Consumption	3.92	0.23	0.02	0.04
Investment	7.39	0.24	0.00	0.07
Hours Worked	5.58	−0.02	0.00	0.01
Real Wage	4.08	0.19	0.01	0.04
Exports	3.81	0.18	0.01	0.16
Imports	1.9	0.73	0.09	0.32
Real Exchange Rate	5.15	−0.9	−0.26	−0.69
Terms of Trade	1.57	−0.35	−0.05	−0.19
Welfare (CV)	1.86	0.24	0.02	0.04

Table 12. Long-Run Effects of Reducing Markups in Germany
Low Frisch elasticity (0.33)
(Percent deviations from baseline)

	GER	REA	US	RW
Real GDP	4.47	0.06	0.00	0.02
Consumption	2.53	0.14	0.01	0.03
Investment	5.95	0.15	0.00	0.04
Hours Worked	3.69	0.01	0.00	0.00
Real Wage	4.44	0.10	0.01	0.03
Exports	2.16	0.14	0.01	0.10
Imports	1.16	0.42	0.05	0.19
Real Exchange Rate	4.69	−0.78	−0.22	−0.61
Terms of Trade	0.90	−0.19	−0.03	−0.11
Welfare (CV)	1.17	0.14	0.01	0.03

Table 13. Long-Run Effects of Reducing Markups in Germany
High elasticity of tradables (=5.5)
(Percent deviations from baseline)

	GER	REA	US	RW
Real GDP	7.13	0.08	0.01	0.02
Consumption	5.35	0.17	0.02	0.03
Investment	8.62	0.17	0.01	0.04
Hours Worked	6.37	0.01	0.00	0.00
Real Wage	4.46	0.12	0.01	0.03
Exports	4.30	0.40	0.02	0.26
Imports	3.25	0.71	0.08	0.33
Real Exchange Rate	4.66	−1.37	−0.40	−0.84
Terms of Trade	0.81	−0.28	−0.04	−0.13
Welfare (CV)	3.11	0.17	0.02	0.03

Figure 1. Services Market Reforms in Germany
(domestic effects, percent deviations from baseline)

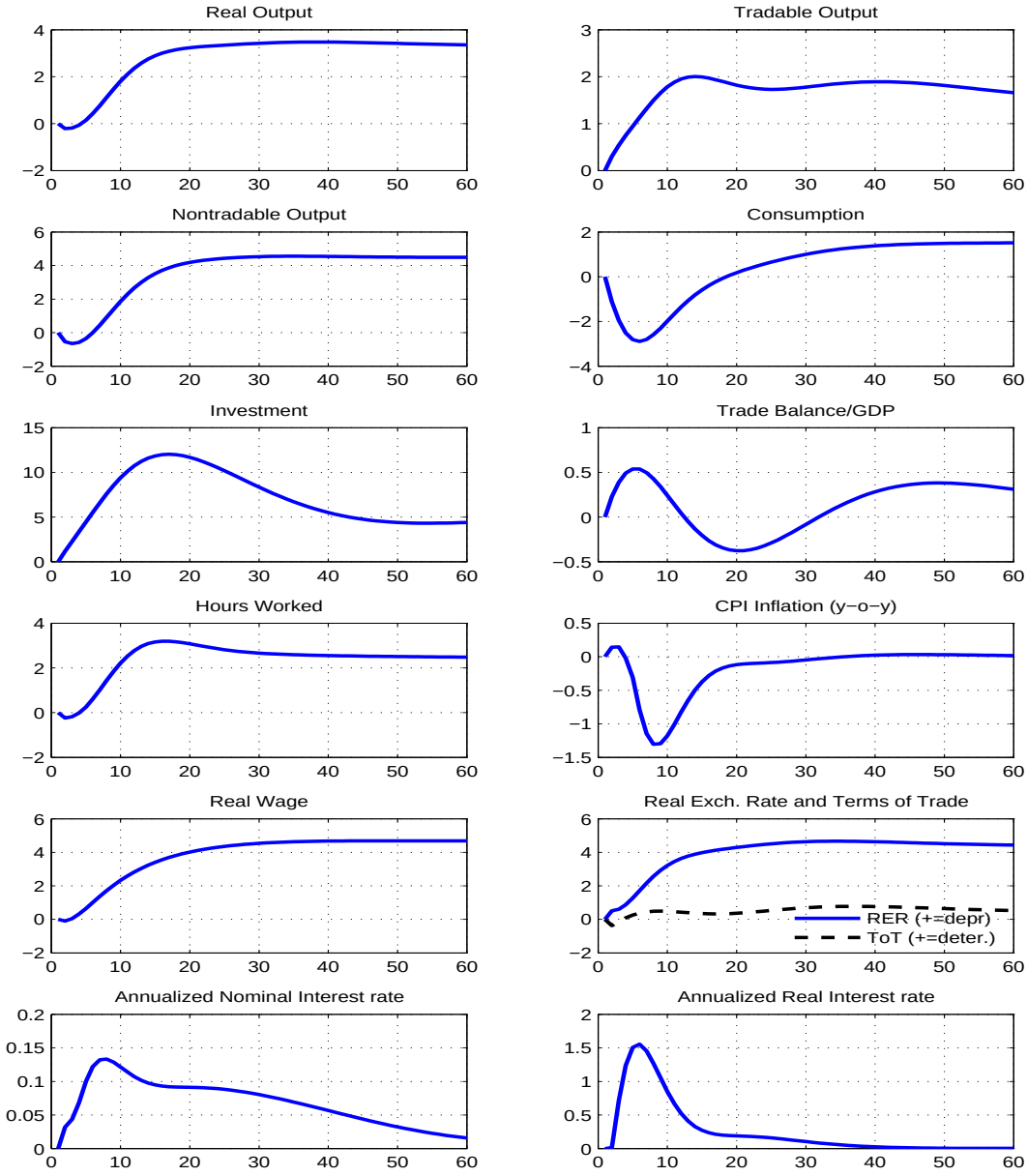

Figure 2. Services Market Reforms in Germany
(spillovers on the rest of the euro area, percent deviations from baseline)

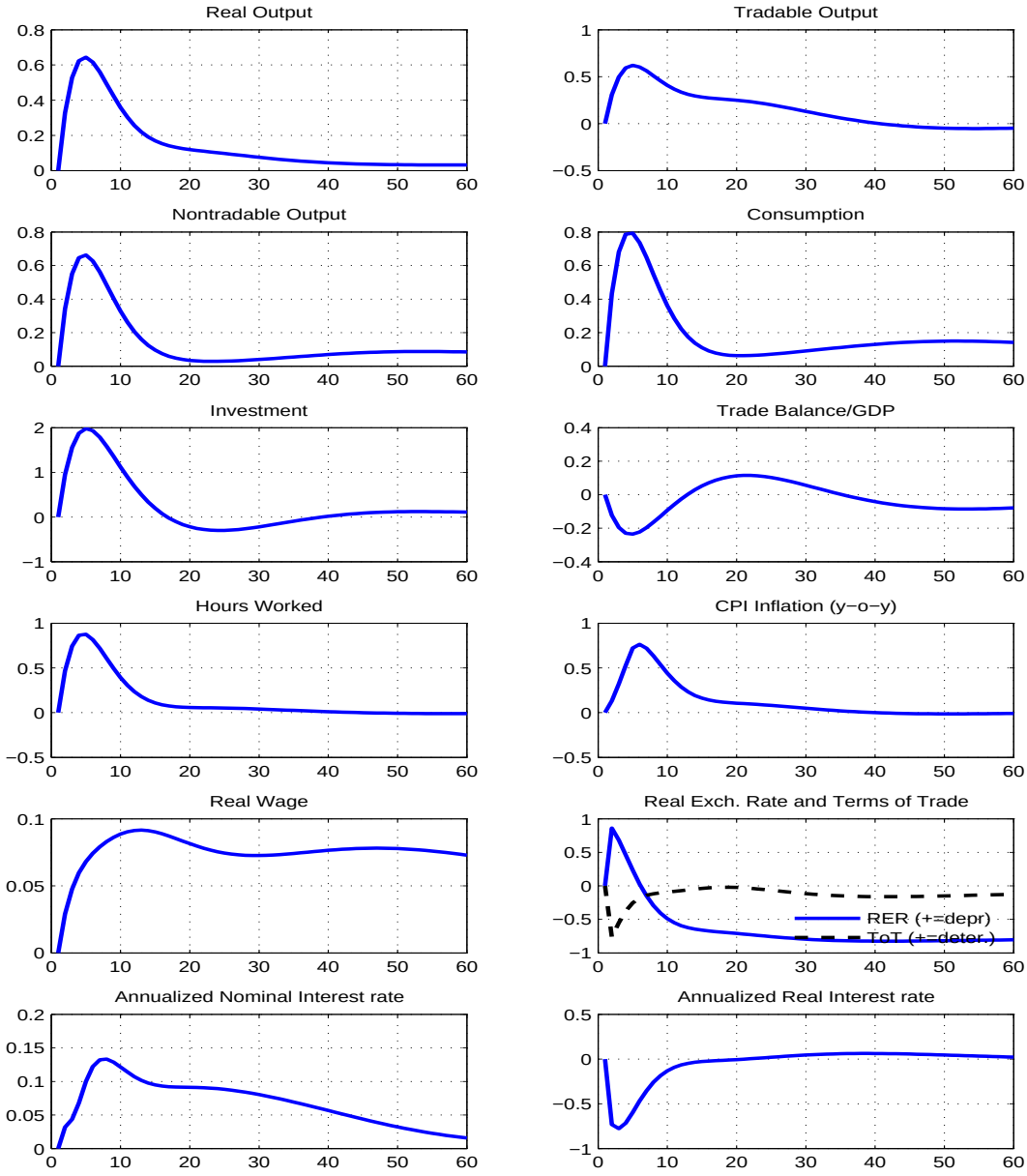

Figure 3. Labor Market Reforms in Germany
(domestic effects, percent deviations from baseline)

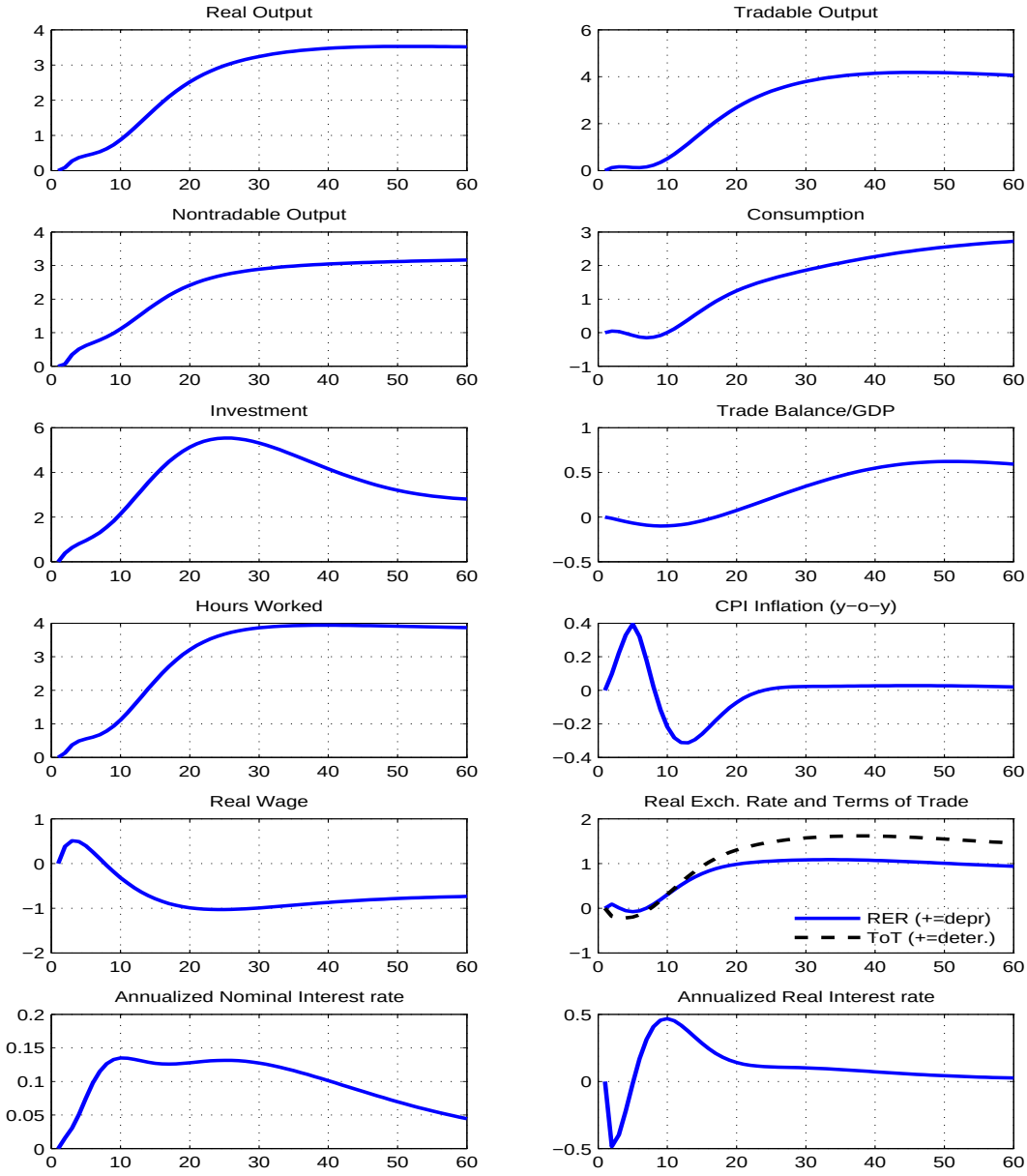

Figure 4. Labor Market Reforms in Germany
(spillovers on the rest of the euro area, percent deviations from baseline)

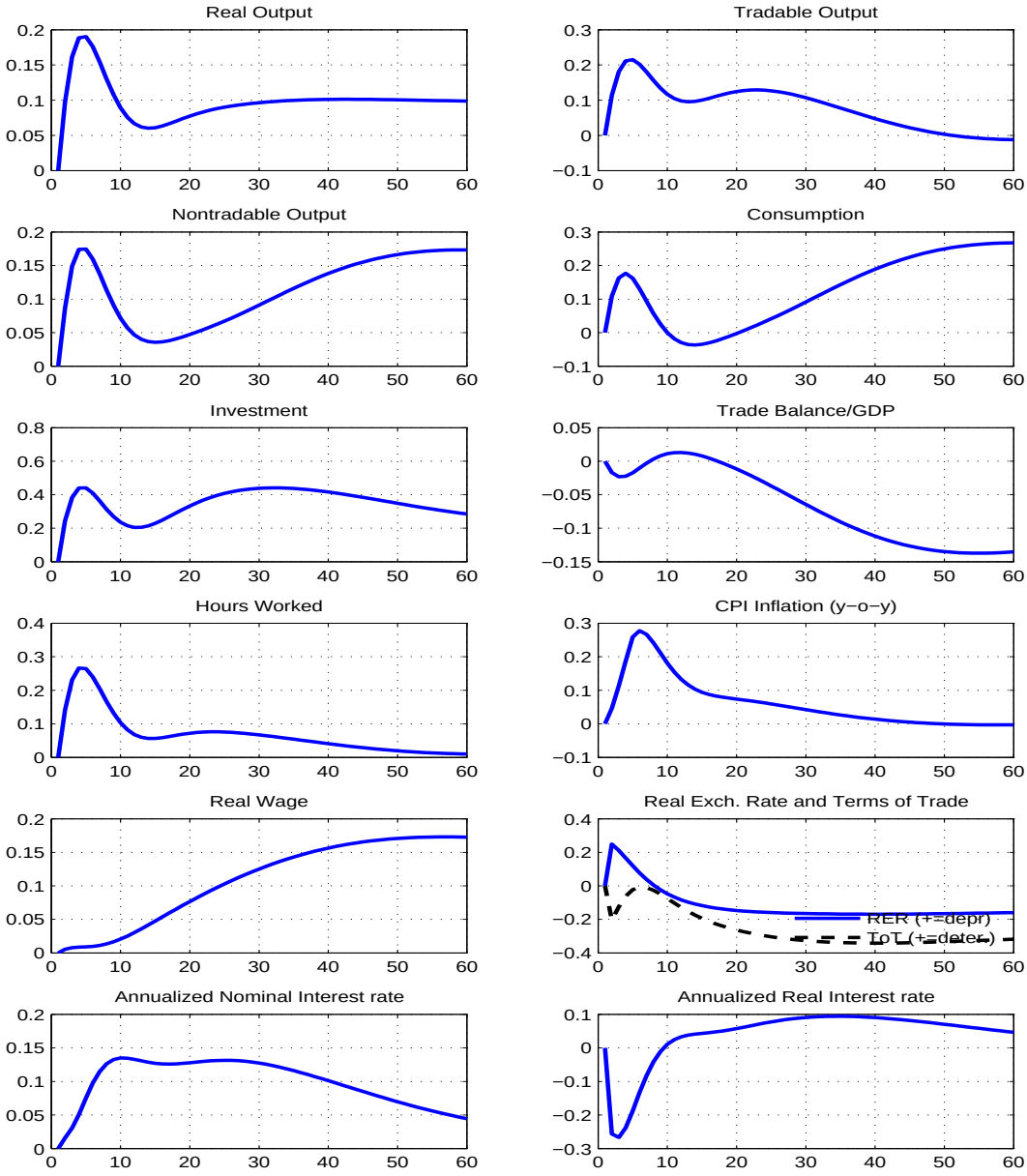

Figure 5. Labor and Service Market Reforms in Germany
(domestic effects, percent deviations from baseline)

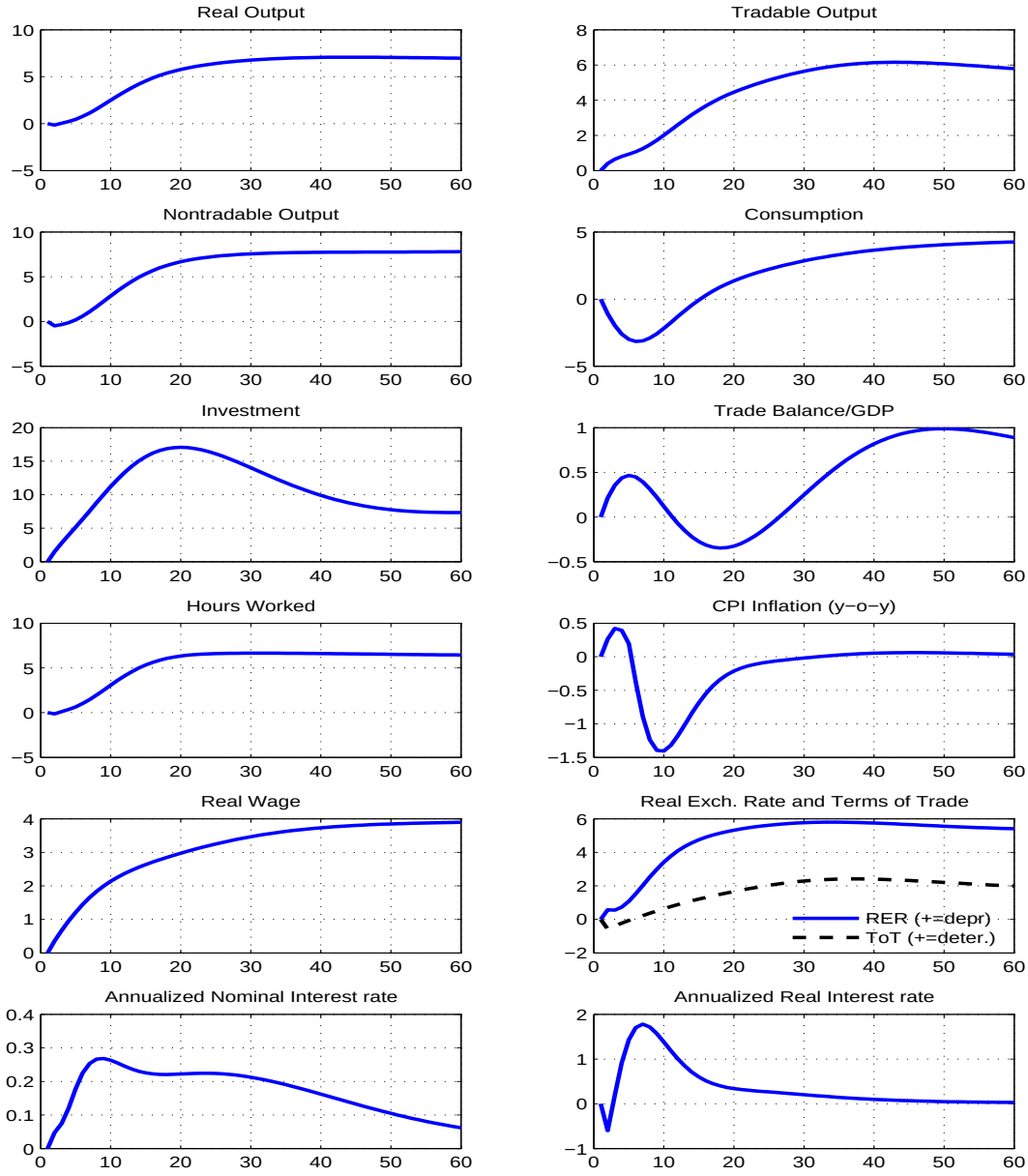

Figure 6. Labor and Service Market Reforms in Germany
(spillovers on the rest of the euro area, percent deviations from baseline)

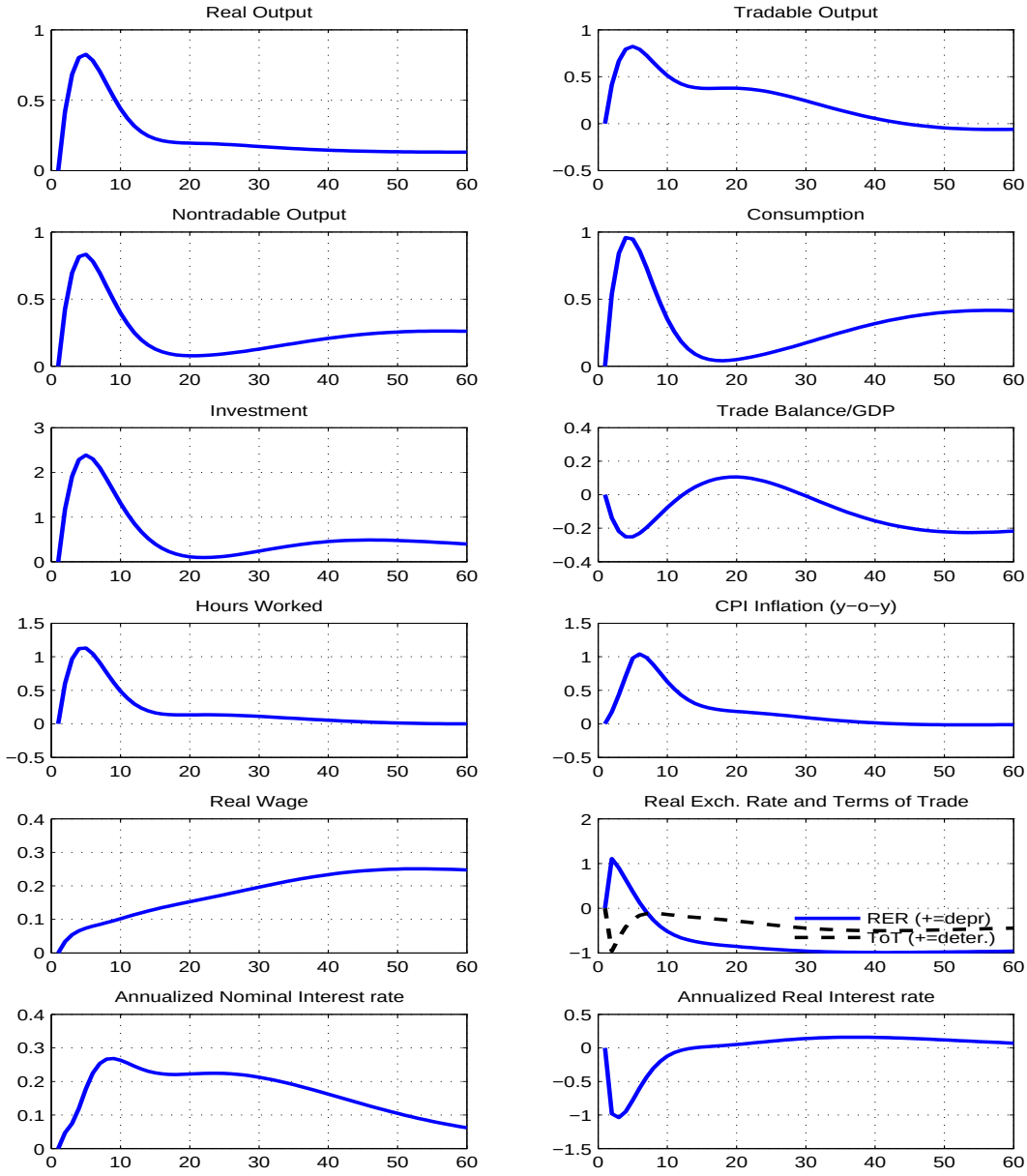

Figure 7. Labor and Service Market Reforms in the euro area
(effects on Germany, percent deviations from baseline)

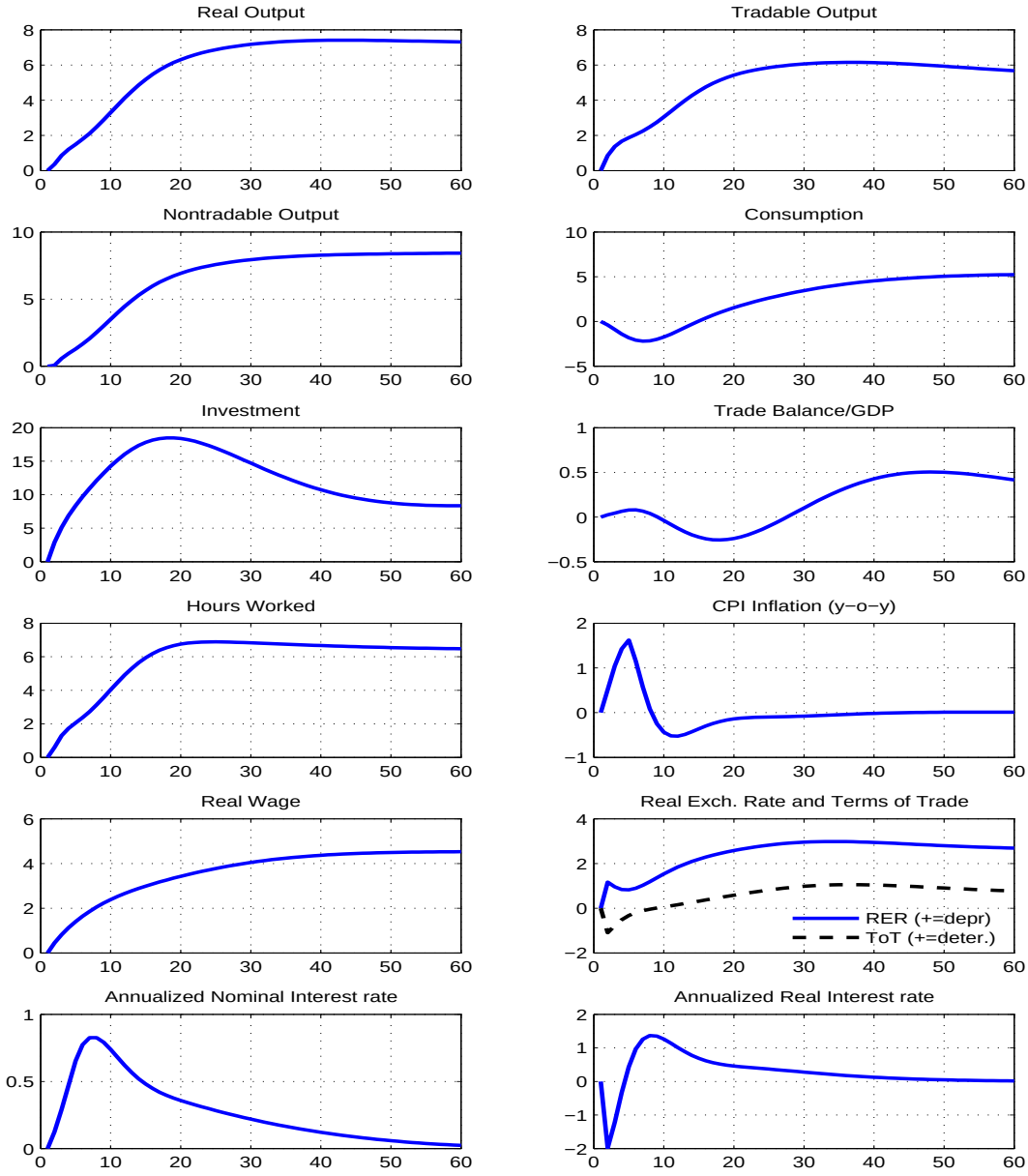

Figure 8. Labor and Service Market Reforms in the euro area
(effects on the rest of the euro area, percent deviations from baseline)