

Macroeconomic effects of greater competition in the service sector: the case of Italy

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January 25, 2008

Abstract

In this paper we assess the effects of increasing competition in the service sector in one country of the euro area. We focus on Italy which, based on cross country comparisons, stands out as the country with the highest markups in non manufacturing industries among the OECD countries.

We propose a two-areas (Italy and the rest of the Euro area) dynamic stochastic general equilibrium model where we introduce non tradable goods as a proxy for services and we allow for monopolistic competition in labor, manufacturing and services markets. We then use the model to simulate the macroeconomic and spillover effects of increasing the degree of competition in the Italian service sector.

According to the results, reducing the markups in Italian services to the levels prevailing in the rest of the Euro area induces an increase in Italian GDP equal to 13 per cent and an increase in welfare (measured in terms of steady state consumption equivalents) of more than 4 per cent. Half of the GDP increase would be realized in the first two years. The spillover effects to the rest of the Euro area are limited: consumption, investment and GDP increases are relatively small.

JEL classification: C51; E31; E52.

Keywords: Competition; Markups, Monetary Policy.

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1 Introduction

The economic agenda of many European countries includes policies to increase the degree of competition in product and service markets. Especially in service sectors, competition is often limited by regulation, which provides for entry barriers and restrictions on prices. Excessive regulation can give firms market power and allows them to charge high markups over costs, limiting output and material wealth. As recommended by several international economic institutions, increasing competition in markets is a crucial policy goal.

In this paper we assess the macroeconomic and spillover effects of increasing competition in the service sector in one country of the Euro area. We focus on Italy. Based on cross country comparisons, Italy stands out as the country with the highest markups in non manufacturing industries among the OECD countries.¹ Italy has also experienced more than a decade of sluggish growth compared to its main partner countries², and one of the leading explanations for this development points to the lack of flexibility in the service sectors (mainly distribution, utilities and banking), both in absolute and relative terms.

A large literature has analyzed the effects of regulation, especially in service sectors, on the performance of the regulated sector and found that regulation reduces the level of output, investment and employment. For example, Alesina et al. (2005) show that regulatory reforms in sectors which were traditionally sheltered from competition (transport, communication and energy) have had a significant positive impact on their investment levels. Also the effect of service regulation on downstream industries, typically manufacturing, has recently been stressed. For example, Cingano and Barone (2007) show – using a large sample of sector and countries – that lower service regulation has non-negligible positive effects in terms of value added and average labor productivity on sectors that use services intensively. Overall, these analyses point to relevant effects from deregulation in the service sectors, both on the sector itself and on manufacturing. These papers, however, don't tackle the issue of the macroeconomic and general equilibrium effects of deregulation, which is the main focus of this paper. Specifically, we develop a quantita-

¹For markups estimates for different sectors and countries, see OECD (2005a) and OECD (2005b). Also, according to the IMF (2006), "...Italy has the most highly regulated product markets in the EU-15, and various cross-country reviews identify excessive regulation as a continuing problem in key sectors, accounting also for Italy's undersized services sector and high energy prices. In part due to these problems, Italy's ranking in cross-country surveys of the business environment is poor (and worsening). Significant labor market rigidities (notwithstanding important progress) also inhibit growth by slowing labor reallocation."

²The GDP average annual growth rate in Italy over the period 1996-2006 is equal to 1.4 per cent, compared to 1.5 in Germany and 2.3 in France. Estimates of the Italian potential output growth have declined from around 3.6 per cent in the early 1970s to about 1.3-1.4 per cent currently. Over the same period the German potential growth rate has decreased from 2.9 to 1.5 per cent. In France it has decreased from 3.0 to 1.8 per cent.

tive model of the Italian economy to measure the macroeconomic implications of greater competition in the Italian service sectors.³

We use a two-region currency union model, calibrated to Italy and to the rest of the Euro area.⁴ The model is akin to the Global Economy Model (GEM) developed at the IMF.⁵ It is a dynamic stochastic general equilibrium (DSGE) model, where we introduced non tradable goods as a proxy for services and we allow for monopolistic competition in labor, manufacturing and services markets. Imperfect competition is introduced through imperfect substitution between varieties, so that monopolistic firms (households in the case of labor) are able to set a markup over costs (marginal rate of substitution between consumption and labor). The lower the degree of substitutability, the higher are markups and the lower is output (labor supply). Therefore, modifying the parameter governing the degree of substitutability we can simulate the impact of structural reforms that raise competition. The model also includes real and nominal frictions to match the persistence usually found in the data as well as a feedback rule for the central bank.

The aim of the paper is to give a quantitative assessment of the macroeconomic implications of greater competition in key sectors of the Italian economy. It does not address the issue of which reform strategies would allow to achieve such an increased level of competition.

We use the model to run several simulations. We first calibrate the markups employed in the model to empirically plausible values, using data from manufacturing and service prices in Italy and the rest of the Euro area. We then investigate the long-run (steady-state) effects on the Italian economy and on the rest of the Euro area of reforms that permanently reduce the Italian markups in the service sector to the Euro area average level. For each reform scenario we compute the new steady state of macroeconomic variables as well as the welfare gains that accrue to the reforming country, both including and excluding short-run gains coming from the transition phase. To check our results for the service sectors, we compare them with alternative scenarios in which reforms foster competition only in the labor markets, or in both the labor and the service sectors simultaneously. We also compute the effects of synchronized reforms in Italy and in the rest of the Euro area. We do not limit the analysis to the long run, but also study the adjustments from one steady state to the other and the implications for the resilience of the Italian economy to exogenous shocks. Finally, we perform several robustness checks

³For an analysis of the implications of enhancing competition and productivity in the Italian service sectors see also OECD (2007).

⁴The choice of modelling Italy as a part of the Euro area allows to properly take into account spillovers from (and to) the rest of the area.

⁵See Bayoumi (2004) for a non-technical description of the GEM. Several central banks have developed DSGE models for policy analysis. Among the others, the Fed has developed SIGMA (see Erceg et al (2006)), the European Central Bank the New Euro Area Wide Model (see Coenen et al (2007)).

varying key preference and technology parameters.

We find the following results. First, reforms in services market have sizable long-run effects on output: the reduction of markup on services price to the level prevailing in the rest of the Euro area (i.e. from 61 to 35 per cent) allows a permanent increase in Italian GDP of 13 per cent and an increase in welfare (measured as the constant percentage change in consumption level that would deliver the same utility as the one achieved in the new steady state once the reform has been introduced) of more than 4 per cent. For comparison, a similar reform in the labor market is worth 8.8 per cent of GDP and around 2 per cent in terms of welfare. Second, the spillover to the rest of the Euro area of such reforms are modest, given the small relative size of the country; this also means that most of the benefits accrues domestically, given the reduced movements in international prices and the terms of trade.⁶ Third, when both reforms are jointly implemented, the effects are essentially additive (for example, GDP increases by roughly 22 per cent in the long-run). Fourth, looking at the transition dynamics, while the labor supply rises fairly quickly after both reforms, the behavior of real wages is different: they rise gradually after a service sector reform, while dropping rapidly, although by a smaller amount, after a labor market reform. Fifth, and consequently, the main policy implication from these results is that a joint implementation of both reforms is likely to soften the negative effect on real wage associated with a labor market reform. This policy prescription resembles a point made by Blanchard and Giavazzi (2003), who argue in favor of starting reforms with product market deregulation in order to raise employment and real wages and thus lower resistance to subsequent labor market reforms. Sixth, looking at the speed of implementation, it seems that the effects of the labor market intervention accrue faster: around half of the long-run increase in Italian GDP is already visible in the first year, as opposed to two years in the case of services. Seventh, structural reforms help to increase the resilience of the Italian economy to monetary policy (and, more generally, exogenous) shocks, but only if they are implemented across goods, services and labor markets. After such reforms, an increase in the short term nominal interest rate in the Euro area is accommodated via an higher reduction in inflation and a lower decrease in GDP. Reforms restricted to the service sector do not lead to an increased resilience. Finally, experiments varying the value of key elasticities indicate that the quantitative estimated impact of reforms on the Italian economy is relatively robust.

The paper is structured as follows. Section two provides a brief description of model, the calibration and the simulated scenarios. Section three presents the results of increasing competition in labor and services markets, both in terms of steady state effects and transition dynamics. Section four concludes.

⁶Similar results were obtained by Everaert and Schule (2006), who conduct a similar experiment for France and Belgium relative to the rest of the Euro area.

2 The model

In this section we briefly illustrate the model setup, the calibration and the simulation exercises.⁷

2.1 The setup

We use a simplified version of the Italian Economy Model (IEM), a large-scale neo-keynesian model of the Italy's economy developed at the Bank of Italy Research Department and incorporating economic linkages with the rest of the Euro area. The model merges microeconomic foundations with nominal price and wage rigidities, trade and international financial markets. Hence, it is well-suited to analyze the domestic and international impact of structural changes due to market deregulation and changes in the degree of competition.

There are two regions, Italy and rest of the Euro area, having different sizes and sharing the currency and the central bank. In each region there are households and firms. Each household consumes a final composite good made of nontradable, domestic tradable and imported intermediate goods from the rest of the area. Households have access to financial markets and smooth consumption by trading a short-term nominal riskless bond. They also own domestic firms and capital stock, which is rent to domestic firms in a perfectly competitive market. Households supply differentiated labor services to domestic firms and act as wage setters in monopolistically competitive markets by charging a markup over their marginal rate of substitution.

On the production side, there are perfectly competitive firms that produce the final goods and monopolistic firms that produce the intermediate goods. The three final goods (a private consumption, a private investment and a public consumption good) are produced combining all available intermediate goods in a constant-elasticity-of-substitution matter. Tradable and nontradable intermediate goods are produced combining capital and labor in the same way. Tradable intermediate goods are split in domestically-consumed and export goods. Because intermediate goods are differentiated, firms have market power and restrict output to create excess profits. We assume that Italy and rest of the Euro area are segmented markets and the law of one price for tradables does not hold.⁸ Hence, each firm producing a tradable good sets two prices, one for the domestic market and the other for the export market. Since the firm faces the same marginal costs regardless of the scale of production in each market, the different price-setting problems are independent

⁷The main equations are reported in the Appendix.

⁸Fabiani et al (2005) provide empirical evidence for pricing-to-market in the Euro Area.

of each other.

Fiscal policy is managed at country level. The fiscal authority consumes final non-traded goods, financed through lump-sum exogenous taxes. Hence, in each period the public sector budget constraint is balanced. The public expenditure is introduced in the model only for calibration purposes.

To capture the empirical persistence of the aggregate data and generate realistic dynamics, we include adjustment costs on real and nominal variables, ensuring that, in response to a shock, consumption and production do not immediately jump to a new long-term equilibrium. On the real side, quadratic costs prolong the adjustment of the capital stock. On the nominal side, quadratic cost make wage and prices sticky.⁹

Imperfect competition in product and labor markets is reflected in markups over marginal costs. The elasticity of substitution between products of different firms determines the market power of each profit-maximizing firm. The setup in the labor market is similar. Each worker offers a differentiated kind of labor services that is an imperfect substitute for services offered by other workers. The lower the degree of substitutability, for example because of skill differences or anti-competitive regulation, the higher is the markup and the lower employment in terms of hours. Hence, markups are modeled by a single parameter that can be appropriately modified to simulate the impact of structural reforms raising competition in product and labor markets.

2.2 Calibration

We calibrate the model on a quarterly basis to match steady-state great ratios and consistently with the existing DSGE modeling literature on the Euro area.¹⁰ In Table 1 we report values of markups for Italy and the rest of the Euro Area. The markups for tradables (nontradables) in Italy and in the rest of the Euro area were computed on the basis of estimated markups in the manufacturing (service) sector as reported in OECD (2005a, 2005b).¹¹ We were not able to find data on Italian and rest of the Euro area wage markups. Hence we calibrated it using estimates for France and the rest of the Euro area as reported in Everaert and Schule (2006). The numbers in the table are gross markups over marginal costs and are related to the demand elasticity parameter θ by the following relationship:

$$Price_t = markup_t * marginal\ cost_t \quad \text{or} \quad p_t = \theta / (\theta - 1) * mc_t$$

⁹See Rotemberg (1982).

¹⁰Specifically, we set parameters to values in the range used to calibrate the Euro area block of IMF's GEM model. See Bayoumi et al. (2004), Batini et al (2005), Everaert and Schule (2006).

¹¹See also European Central Bank (2006).

For example the value of 1.61 reported in the table for the Italian nontradables markup means that in the service sector prices are on average 61 per cent higher than their "perfect competition" counterparts. Looking at the table, we see that in each region markups in the manufacturing sector are lower than in the services and labor markets. Moreover, Italian markups in the labor and service sectors are higher than their Euro area counterparts, by approximately 25 percentage points. In Table 2 we report other parameters. Discount factors and elasticities of substitution have the same value across the two regions. The discount factor β is set to 0.9926, so that the steady state annualized real interest rate is equal to 3.0 per cent.¹² The intertemporal elasticity of substitution, $1/\sigma$, is set to 1. The parameter τ , ($1/(\tau - 1)$ is the labor Frisch elasticity) is set to 1.5. The depreciation rate of capital is set to 0.025. The elasticity of substitution between capital and labor is set to 0.92 in the production functions of tradables and nontradables. The bias toward capital in the production functions are set to match the private investment-to-GDP ratios. In the final consumption and investment composite baskets, the elasticity of substitution between domestic and imported tradables is set to 1.5, while the elasticity of substitution between tradables and nontradables to 0.5. As these elasticities are crucial for cross-region spillover of the structural reforms, we also conduct a sensitivity test with respect to these parameters. The bias for the Italian-produced (vis à vis rest of Euro area) tradable good and that for tradable (vis à vis nontradable) goods are chosen to match the bilateral (Italy-Euro area) import and export shares to GDP. The size of the Italian population is set to 0.2. We set to the same value the number of Italian firms operating in each of the two intermediate sectors. Table 3 contains parameters that affect the dynamics. Quadratic adjustment costs on capital are set to 1. The adjustment costs on prices and wages are set to levels that imply, at the pre-reforms values of markups parameters, an average frequency of price and wage adjustment equal to four quarters.

Parameterization of systematic feedback rule followed by the monetary authority is reported in Table 4. The short term nominal interest reacts to its value in the previous period, the Euro area-wide CPI inflation rate and GDP growth rate.¹³

Table 5 reports the model-based and actual steady-state great ratios. Given the chosen calibration, the private consumption-to-GDP ratio is 60 per cent in Italy (57 in the rest of the area), in line with the data, which are averages from national accounts statistics over the period 1999-2006. Investment-to-GDP ratios are respectively 20 and 23 per cent in Italy and in the rest of the area (21 per cent in the data). Italian bilateral imports and export with the rest of the Euro area are both set, as a ratio to the Italian GDP, to 26

¹²For simplicity we assume that in steady state the gross CPI inflation rate is one, there is no technology trend and the net asset position of Italy against the rest of the Euro area is zero.

¹³The Euro Area-wide CPI inflation rate is a weighted (by the size of each region) geometric average of regional inflation rates. The Euro Area-wide GDP is the sum of regional GDPs, both denominated in terms of Italian consumption.

per cent of Italian GDP (26 per cent, for both flows, in the data). Public consumption expenditure share is equal to 20 per cent in Italy and in the Euro area, essentially as in the data.

2.3 Scenarios

We consider fully credible and fully anticipated reforms. We compare reductions in the markups of several sizes. The reforms are evaluated along three dimensions. First, we look at the long-run effects, by comparing steady state equilibria that differ in terms of markup values. Next, we study the transitional dynamics from one long-run equilibrium to the other by running perfect-foresight simulations in which a fully credible (and fully anticipated) reform is implemented at the beginning of the simulation (via a one-shot permanent reduction in the correspondent markup) and then study the adjustment paths of endogenous variables towards their new steady state level. We also report two measures of welfare: the first one (steady state) is simply a comparison of the level of utility in the pre-reform and after-reform steady states; the second one expresses utility in present discounted value terms (using the agents' discount factor) and includes also the transition phase to the new steady state. Both measures are expressed in term of consumption equivalents, that is the constant percentage change in consumption level that would deliver the same utility as the one achieved in the reform scenario. Finally, we look at the consequences of the reform for the resilience of the Italian economy, by studying the dynamic responses of the economy after a negative external shock.

3 Results

In this section we report the results of the scenarios we simulated. We start by showing the long-run macroeconomic implications of the reforms. Next, we comment on the transition dynamics from one long run equilibrium to the other, and we conclude with a discussion of the implications of reforms for the resilience of the Italian economy.

3.1 Long-run effects

In what follow we describe the domestic and spillover effects of greater competition in Italian services. As a check we also present results for similar simulations regarding the labor market. We initially consider increasing competition separately in each market. We then compare these outcomes with those of increasing competition simultaneously in both

markets in Italy, and simultaneously in both areas.¹⁴

3.1.1 Greater competition in the Italian services sector

The impact of changing service sectors markups on the long-run (steady-state) levels of economic activity are shown in Table 6. We show the percent changes of main variables when the markup is reduced from its actual estimated value (1.61, as reported in Table 1) to one of the values reported in the first row of the table. All other parameters are set to their baseline values. A lower markup implies an increase in domestic GDP and consumption. As a reference point, consider the third column of table 6, corresponding to the case of a reduction of the Italian markup to the level prevailing in the Euro area (1.35). The increase in GDP, consumption and investment are respectively equal to 13.0, 9.4 and 24.0 per cent. Hours worked also increase, by 9.7 per cent. The rise in the capital stock triggers higher real wages, that increase by 14.6 per cent as labor becomes relatively scarce. So the effects of the reform are substantial in this scenario, mainly because the starting point of the Italian economy along this dimension is particularly weak, and thus the reform implies a sizeable 40 percent markup reduction. A decrease of the markup to a level even lower than that prevailing in the Euro area (1.25) would produce an even bigger increase of GDP equal to 19.1 per cent, with consumption and investment increasing, respectively, by 13.5 and 36.1 per cent.

International spillover are mainly determined by movements in the real exchange rate and the terms of trade. Both relative prices increase as competition and the relative availability of Italian (with respect to foreign) goods and services increase.¹⁵ The increase in the terms of trade is lower, because the higher supply of Italian tradables is driven only by greater availability of productive inputs (capital and labor) and not also by a structural reform in the sector. The increases in GDP, consumption, investment and labor hours in the rest of the Euro area are relatively small, which is to be expected on account of the relatively small size of the Italian economy.

For comparison, Table 7 reports results from a scenario where the reforms only impact on the labor markets. More specifically, the Italian wage markup is reduced by the same amount as in the case of the services sector reform. The effects on Italian GDP, consumption, investment and welfare are still substantial, but lower than those obtained from a similar reduction in the services markup. In particular, when Italian wage markups are

¹⁴In this section each reform acts independently from the other in the sense that, even when both are implemented at the same time, the model does not have a role for interaction effects. For an empirical assessment of the importance of such effects see Jean and Nicoletti (2002).

¹⁵The Italian real exchange rate is defined as the ratio of the Euro area CPI to that of Italy. Hence, an increase corresponds to a depreciation. The Italian terms of trade are defined as the Italian import prices-to-Italian export prices ratio, both expressed in Italian consumption units.

reduced to the Euro area level (1.35), GDP increases by 8.8 per cent, while consumption, investment and labor hours increase respectively by 8.6, 9.3 and 12.4 per cent. The higher labor supply lowers the real wage by 3.2 per cent. The reason for such lower impact on real activity is the double layer of markups that exists in the production side of the economy. In fact, since labor is used in the production of goods and services, once the reforms make it a cheaper input, part of the overall benefit gets appropriated by the monopolists producing these goods and services, who charge an higher price and produce a lower amount than under perfect competition. When instead the reforms operate on the markups at the final pricing level, all the benefits are passed on directly to consumers.

We now consider the case of simultaneously decreasing markups in Italian labor and services markets (Table 8, third column) to a level equal to 1.25. The main insight from this exercise is that the gains from implementing both reforms are essentially equal to the sum of the effects from each individual reform. GDP increases by 34.2 per cent, consumption and investment respectively by 27.7 and 54.0 per cent, while hours worked by 35.2 percent. All these increases are only slightly higher than those obtained when reforms are separately implemented. This scenario is also useful to answer another question. What happens in the labor markets, both in the short and in the long run, given that in this scenario the effects on real wages of the two reforms tend to offset each other? The overall effect on real wages is an increase of 15.6 per cent in the long run, (slightly below the simple sum of the two separate effects) and hence the positive (and bigger) impact from the service reform more than offsets the negative one coming from the labor market reform. This result might be connected to a general point about the "optimal" timing of reforms made by Blanchard and Giavazzi's (2003), who argue that structural reforms should generally start from the service sector because the ensuing increase in real wages helps to generate support for subsequent reforms in the labor market (which instead are going to decrease the real wages). Our simulations suggest that the two reforms, when implemented at exact the same time, imply that real wages increase overall, although along the transition they initially drop since the service reform is slower to operate.¹⁶ Obviously, the two reforms together imply stronger movements in international relative prices (the real exchange rate and terms of trade deteriorate), exported and imported volumes (that increase) and spillover (GDP, consumption and investment increase in the rest of the Euro area).

Finally, we consider the case of permanently and simultaneously reducing markups not only in Italy, but also in the rest of the Euro area. This scenario sheds light on the effect of movements in international prices in the baseline case. Remember that, when

¹⁶It follows that, if the service reforms were allowed to start earlier, as Blanchard and Giavazzi suggest, a scenario could be implemented in which real wages raise not only in the final outcome, but also all along the transition path.

a reform is implemented in one country, the relative abundance of its products (goods and services) increases and therefore international relative prices tend to move against the reforming country. This effect tends to disappear when both areas are undergoing the structural reforms at the same time. In the fourth column of Table 8 we show the case of a simultaneous reduction of service markups in both areas from their (respective) baseline levels to 1.25. Terms of trade and real exchange rate still deteriorate (essentially because the size of the reform in the Euro area is smaller), but to a lower extent. The smaller real exchange rate depreciation (compared to the benchmark) has a positive income effect on Italian households and stimulates GDP, that increases by 20.5 per cent, consumption and investment, that increase respectively by 14.8 and 37.5 per cent. Also, the welfare gains for Italy when the rest of the Euro area is joining into the reform effort are only marginally superior to the ones in the benchmark case. In the case of both reforms in both areas (Table 8, fifth column), the labor market is again the place where the combined effects are more interesting. Now hours worked in Italy increase but the extra effect coming from reforms in the Euro area is very limited, because now Italian households substitute domestic with imported goods, whose supply strongly increase. The increase in Italian export is also relatively small, because households in the rest of the Euro area have a smaller incentive, given the less favorable movement in international relative prices, to substitute domestic goods with Italian ones.

3.2 Transition dynamics

In this section we look at the transitional dynamics from one long-run equilibrium to the other. We run perfect-foresight simulations in which a fully credible (and fully anticipated) reform is implemented at the beginning of the simulation (via a one-shot permanent reduction in the correspondent markup) and then study the adjustment paths of endogenous variables towards their new steady state level. Figures 1a and 1b report the transition dynamics when the Italian services markup is reduced to Euro area level. Time is in quarters and variables are expressed as ratios with respect to the corresponding steady state values. Reforms in the services sector imply that most of the long run change in GDP and investment takes place in the first twenty quarters while consumption variation is equal to 25 per cent of its long run change. Production in the services sector rises significantly, accompanied by a sizable fall in the price of services relative to the one of tradables. Both employment and investment increase substantially. As employment and real wages rise, so do real disposable income and, after an initial decrease due to higher real interest rate in Italy, private consumption. The real marginal cost in the services sector also increases, because of the increase in both real wages and the rental rate of capital (the latter is not shown in the Figures). The drop in service prices leads to an

increase in import prices relative to the CPI. The terms of trade and the real exchange rate deteriorate. The deterioration of the terms of trade is lower, given that the increase in the marginal cost is not counterbalanced by a lower markup. Italian export quantities increase more than imports, given the decrease in Italian tradables international relative prices and the related shift of the Euro area demand.

The transitional dynamics for the case of a reduction in the labor markup are shown in Figures 2a and 2b. In this case most of the effects of the reforms seem to accrue in the first ten-twelve quarters. Real wages drop severely during this initial period (to a level below their new steady state) and then slowly rise. Meanwhile employment increases accordingly, although in this case without overshooting its long-run equilibrium level. Investment, production and consumption rise substantially (50 per cent of the long-run increase in the first ten quarters) after an initial small decline due to the higher Italian real interest rate. The relative price of services vs. tradables drops, mainly due to the higher share of labor input in the service sector as compared to the tradable sector together with the decrease in real wages. As in the case of the service sector reform, the terms of trade and the real exchange rate deteriorate, given the higher availability of Italian tradable and nontradable goods. The terms of trade deterioration is higher in the case of labor market deregulation because of lower wages. As in the case of the services sector reform, also reforms in the Italian labor market imply that Italian exported quantities increase more than imported ones, given the decrease in Italian tradables international relative prices.

3.3 Structural reforms and the stability of business cycle

Changes in product and labor market competition impact not only on the long run equilibrium of the Italian economy, but also on its cyclical behavior. The way prices and quantities react determines the resilience of the economy to exogenous shocks and changes in the centralized monetary policy. From a policy perspective, it is desirable to minimize output losses by allowing nominal and relative prices to change as much as possible. The experiment we conduct is to analyze the implications for the Italian CPI inflation rate and GDP of an exogenous 25 basis point increase in the Euro area interest rate lasting one quarter. Figure 3 reports results.

In the Figure we plot the response in the “pre reform” case, when the Italian price and wage markups are set to their actual values, and in the “post reform” case, when markup in the service sector is equal to their counterparts in the rest of the Euro area. The response of GDP and inflation is substantially unchanged. Increasing competition and lowering markups (from 61 to 35 per cent) in the service sector does not lead by

itself to a higher degree of price flexibility in the face of a monetary shock. We have also experimented changing the degree of competition in all three sectors of the economy: the tradeable, the non tradeable and the labor market. In the Figure the case labelled "overall higher monopolistic distortions" assumes 100% markups in all three markets; the case labelled "overall lower monopolistic distortions" assumes 5% markups, while the case "no monopolistic distortions" assumes no markups. The Figure shows that when changing the degree of competition in all three markets (and by a large amount) the resilience of the economy with respect to a monetary shock increases. The non zero - although modest - drop in GDP in the "no monopolistic distortions" case is a measure of the role of nominal rigidities: even in the absence of real rigidities, prices do not fully adjust to the shock.

Finally, we have performed a similar analysis with respect to a technology shock and found overall very similar conclusions.

One takeaway from this analysis is that, from the point of view of the ability of the economy to adjust to shocks in the least costly way, reforms should be implemented across the different markets. This result has a similar flavour to the one discussed above, that reforms in the goods and labor market should be jointly implemented.

4 Sensitivity analysis

In this section we investigate the robustness of our results against changes in the values of key parameters. We first report results from increasing the competition in the service sector assuming a value for the markup in the labor market lower than in the baseline. We then consider changes in the elasticity of intratemporal substitution between domestic and imported tradable goods, in the elasticity of substitution between labor and capital and in the labor Frisch elasticity. Finally, we perform some robustness exercises on the parameters of price and wage rigidities, that mainly determine the speed of adjustment toward the new steady state.

In the baseline simulation we have assumed a wage markup of 61%, mainly for symmetry with the value calibrated for the service markup, as we were not able to find reliable estimates for this parameter. Table 9 shows the results assuming a wage markup equal to 35%. The results are only marginally different for all the variables but for the welfare level. When wages markups are lower, the welfare from increasing competition in the service sector increases by a smaller amount, as the starting level of utility is higher.

Tables 10 and 11 report the results when the elasticity between domestic and foreign tradables is increased from the baseline value 1.5 to 3.0. Compared to the baseline case, the main effect of the higher substitutability is to induce, for a given reduction of price

or wage markup, a stronger increase in Italian GDP, consumption and investment and a lower depreciation of real exchange rate and terms of trade. Higher Italian demand implies a stronger increase in volume imports while exported quantities, because of the smaller deterioration of terms of trade, increase by a lower extent. Spillover to the rest of the Euro area decrease - increase in GDP, consumption, investment, labor and real wages are relatively lower - given the lower increase in Italian real exchange rate and terms of trade.

Tables 12 and 13 show the results from shifting the elasticity of substitution between labor and capital down from the baseline 0.92 to 0.80 in both Italy and the rest of the Euro area. In the case of services sector deregulation, the lower substitutability limits the increase in services and goods supply and hence, in equilibrium, the increase in consumption, investment, labor hours and real wage is reduced. As a consequence also the real GDP increase is lower. The real exchange rate and the terms of trade depreciate less than in the baseline and spillover on the rest of the Euro area are smaller. In the case of labor market liberalization, the labor supply increase is similar under the two alternative values of the elasticity, while the decrease in the real wage is reduced. The stronger complementarity between labor and capital favours now a stronger increase in investment and hence capital accumulation. GDP and consumption increases are also higher. The stronger increase in supply favours a higher deterioration of terms of trade and real exchange rate. In the rest of the area aggregate quantities and real wage increase less in the low elasticity case, given that the stronger deterioration of the Italian terms of trade favours a shift of world demand towards the Italian tradable goods.

Table 14 and 15 report the results from increasing the Frisch elasticity of labor supply to 100. Compared to the baseline case, the more elastic labor supply response increases the impact of changes in the wage or services markup on both domestic and foreign variables. Both quantities and relative prices increase more than in the baseline case, with the obvious exception of real wages.

These results suggest that changing key parameters in the model generally does not alter the qualitative message emerging from the base-case scenario, and in particular the size of domestic and cross-region effects of changes in competition in the Italian economy, given that changes in markups have a first-order effect which tends to dominate.

Finally, we performed some robustness check with respect to the parameters of wage and price stickiness. In the baseline simulation we set to one year the frequency of price adjustment in the three markets (tradables, non tradables and wages). Setting these parameters to different levels alters only the speed of adjustment toward the new steady state. If we set all prices and wage rigidities such that the frequency of adjustments is about two years, half of the effects on GDP would be realized in 11 quarters (instead of

6 quarters as in the baseline). On the contrary, setting the frequency of adjustment to one year and a half would speed up the adjustment: half of the GDP increases would be realized in the first year.

5 Conclusions

We have developed and simulated a DSGE model of Italian economy to quantitatively address the macroeconomic implications of competitive-enhancing reforms in the Italian services sector. Our simulations produce plausible effects of structural policies aimed at improving competition. Changes in services (and wage) markups significantly affect the economy. The long run spillover effects of reforms to the rest of the Euro area are limited because the increase in the Italian potential output is matched almost one to one in the long run by rises in domestic demand.

Benefits are relatively stronger when there are concurrent reforms in both labor and services markets. There is also a qualitative difference between implementing the reforms in isolation or jointly, given the different response of real wages and labor supply to the different reforms. Hence, reforms in the services sector can be used to generate support for labor market reform, a point recently emphasized by Blanchard and Giavazzi. Synchronization of reforms between Italy and the euro area would add further benefits to the Italian economy, stimulating production while at the same time limiting the deterioration of international relative prices. Finally, widespread reforms - comprising goods and labor markets - would improve the resilience of the Italian economy to exogenous shocks, such as exogenous changes in the monetary policy.

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Appendix

In what follows we illustrate the Home economy (Italy). The structure of the Foreign economy (the rest of the Euro area) is similar and to save on space we do not report it.

A1. Final consumption and investment goods

There is continuum of symmetric Home firms producing Home final nontradable consumption under perfect competition. Each firm producing the consumption good is indexed by $x \in (0, s]$, where the parameter $0 < s < 1$ is a measure of country size. Foreign firms producing the Foreign final consumption goods are indexed by $x^* \in (s, 1]$ (the size of the monetary union is normalized to 1). The CES production technology used by firm x is:

$$A_t(x) \equiv \left(a_T^{\frac{1}{\phi_A}} \left(a_H^{\frac{1}{\rho_A}} Q_{HA,t}(x)^{\frac{\rho_A-1}{\rho_A}} + (1 - a_H)^{\frac{1}{\rho_A}} Q_{FA,t}(x)^{\frac{\rho_A-1}{\rho_A}} \right)^{\frac{\rho_A}{\rho_A-1} \frac{\phi_A-1}{\phi_A}} + (1 - a_T)^{\frac{1}{\phi_A}} Q_{NA,t}(x)^{\frac{\phi_A-1}{\phi_A}} \right)^{\frac{\phi_A}{\phi_A-1}} \quad (1)$$

where Q_H , Q_F and Q_N are bundles of respectively Home tradable, Foreign tradable and Home nontradable intermediate goods, $\rho > 0$ is the elasticity of substitution between tradables and $\phi > 0$ is the elasticity of substitution between tradable and nontradable goods. The parameter a_H ($0 < a_H < 1$) is the weight of domestic tradable, a_T ($0 < a_T < 1$) is the weight of tradable goods.

The production of investment good is similar. There are symmetric Home firms under perfect competition indexed by $y \in (0, s]$, and symmetric Foreign firms by $y^* \in (s, 1]$. Output of Home firm y is:

$$E_t(y) \equiv \left(v_T^{\frac{1}{\phi_E}} \left(v_H^{\frac{1}{\rho_E}} Q_{HE,t}(y)^{\frac{\rho_E-1}{\rho_E}} + (1 - v_H)^{\frac{1}{\rho_E}} Q_{FE,t}(y)^{\frac{\rho_E-1}{\rho_E}} \right)^{\frac{\rho_E}{\rho_E-1} \frac{\phi_E-1}{\phi_E}} + (1 - v_T)^{\frac{1}{\phi_E}} Q_{NE,t}(y)^{\frac{\phi_E-1}{\phi_E}} \right)^{\frac{\phi_E}{\phi_E-1}} \quad (2)$$

Finally, we assume that public expenditure G has the same composition as that of private consumption.

A2. Intermediate goods

Demand

Bundles used to produce the final consumption goods are CES indexes of differentiated intermediate goods, each produced by a single firm under conditions of monopolistic

competition:

$$Q_{HA}(x) \equiv \left[\left(\frac{1}{s} \right)^{\theta_T} \int_0^s Q(h, x)^{\frac{\theta_T-1}{\theta_T}} dh \right]^{\frac{\theta_T}{\theta_T-1}}, \quad Q_{FA}(x^*) \equiv \left[\left(\frac{1}{1-s} \right)^{\theta_T} \int_s^1 Q(f, x)^{\frac{\theta_T-1}{\theta_T}} df \right]^{\frac{\theta_T}{\theta_T-1}} \quad (3)$$

$$Q_{NA}(x) \equiv \left[\left(\frac{1}{s} \right)^{\theta_N} \int_0^s Q(n, x)^{\frac{\theta_N-1}{\theta_N}} dn \right]^{\frac{\theta_N}{\theta_N-1}} \quad (4)$$

where firms in the Home tradable and nontradable intermediate sectors and in the Foreign intermediate tradable sector are respectively indexed by $h \in (0, s)$, $n \in (0, s)$, $f \in (s, 1]$. Parameters $\theta_T, \theta_N > 1$ are respectively the elasticity of substitution between brands in the tradable and nontradable sector. The prices of the nontradable intermediate goods are denoted $p(n)$. Each firm x takes these prices as given when minimizing production costs of the final good. The resulting demand for nontradable intermediate input n is:

$$Q_{A,t}(n, x) = \left(\frac{1}{s} \right) \left(\frac{P_t(n)}{P_{N,t}} \right)^{-\theta_N} Q_{NA,t}(x) \quad (5)$$

where $P_{N,t}$ is the cost-minimizing price of one basket of local intermediates:

$$P_{N,t} = \left[\int_0^s P_t(n)^{1-\theta_N} dn \right]^{\frac{1}{1-\theta_N}} \quad (6)$$

We can derive $Q_A(h, x)$, $Q_A(f, x)$, $G_A(h, x)$, $G_A(f, x)$, P_H and P_F in a similar way. Firms y producing the final investment goods have similar demand curves. Aggregating over x and y , it can be shown that total demand for intermediate nontradable good n is:

$$\int_0^s Q_{A,t}(n, x) dx + \int_0^s Q_{E,t}(n, y) dy + \int_0^s G_t(n, x) dx = \left(\frac{P_t(n)}{P_{N,t}} \right)^{-\theta_N} (Q_{NA,t} + Q_{NE,t} + G_{N,t}) \quad (7)$$

where G_N is nontradable component of the public sector consumption. Home demands for Home and Foreign tradable intermediate goods can be derived in a similar way.

Supply

The supply of each Home nontradable intermediate good n is denoted by $N^S(n)$:

$$N_t^S(n) = \left((1 - \alpha_N)^{\frac{1}{\xi_N}} L_{N,t}(n)^{\frac{\xi_N-1}{\xi_N}} + \alpha^{\frac{1}{\xi_N}} K_{N,t}(h)^{\frac{\xi_N-1}{\xi_N}} \right)^{\frac{\xi_N}{\xi_N-1}} \quad (8)$$

Firm n uses labor $L_N(n)$ and capital $K_N(n)$ with constant elasticity of input substitution $\xi_N > 0$ and capital weight $0 < \alpha_N < 1$. Firms producing intermediate goods take the prices of labor inputs and capital as given. Denoting W the nominal wage index and R^K

the nominal rental price of capital, cost minimization implies:

$$L_{N,t}(n) = (1 - \alpha_N) \left(\frac{W_t}{MC_{N,t}(n)} \right)^{-\xi_N} N_t^S(n), \quad K_{N,t}(n) = \alpha_N \left(\frac{R_t^K}{MC_{N,t}(n)} \right)^{-\xi_N} N_t^S(n) \quad (9)$$

where MC_N is the nominal marginal cost:

$$MC_{N,t}(n) = \left((1 - \alpha) W_t^{1-\xi_N} + \alpha (R_t^K)^{1-\xi_N} \right)^{\frac{1}{1-\xi_N}} \quad (10)$$

The productions of each Home tradable good, $T^S(h)$, is similarly characterized.

Price setting in the intermediate sector

Consider now profit maximization in the Home country's nontradable intermediate sector. Each firm n sets the price $p_t(n)$ by maximizing the present discounted value of profits subject to demand constraint (7) and the quadratic adjustment costs:

$$AC_{N,t}^p(n) \equiv \frac{\kappa_N^p}{2} \left(\frac{P_t(n)}{P_{t-1}(n)} - 1 \right)^2 Q_{N,t} \quad \kappa_N^p \geq 0$$

paid in unit of sectorial product $Q_{N,t}$ and where κ_N^p measures the degree of price stickiness. The resulting first-order condition, expressed in terms of domestic consumption, is:

$$p_t(n) = \frac{\theta_N}{A_t(n)} mc_t(n) \quad (11)$$

where $mc_t(n)$ is the real marginal cost and $A(n)$ contains terms related to the presence of price adjustment costs

$$A_t(n) \approx \theta_N - 1 + \kappa_N^p \frac{P_t(n)}{P_{t-1}(n)} \left(\frac{P_t(n)}{P_{t-1}(n)} - 1 \right) - \beta \kappa_N^p \frac{P_{t+1}(n)}{P_t(n)} \left(\frac{P_{t+1}(n)}{P_t(n)} - 1 \right) \frac{Q_{N,t+1}}{Q_{N,t}} \quad (12)$$

The above equations clarify the link between imperfect competition and nominal rigidities. As emphasized by Bayoumi et al (2004), when the elasticity of substitution θ_N is very large and hence the competition in the sector is high, prices closely follow marginal costs, even though adjustment costs are large. To the contrary, it may be optimal to maintain stable prices and accommodate changes in demand through supply adjustments when the average markup over marginal costs is relatively high. If prices were flexible, optimal pricing would collapse to the standard pricing rule of constant markup over marginal costs:

$$p_t(n) = \frac{\theta_N}{\theta_N - 1} mc_{N,t}(n) \quad (13)$$

We simulate structural reforms in the services sector by permanently changing the value of θ_N (nontradables are considered as proxy of services). Greater competition and lower

long-run (steady-state) markup correspond to permanently higher values of θ_N . A similar strategy, as illustrated below, is adopted to implement the labor market reforms.

Firms operating in the intermediate tradable sector solve a similar problem. We assume that there is market segmentation. Hence the firm producing the brand h chooses $p_t(h)$ in the Home market and $p_t^*(h)$ in the Foreign market as to maximize the expected flow of profits (in terms of domestic consumption units):

$$E_t \sum_{\tau=t}^{\infty} \Lambda_{t,\tau} [p_{\tau}(h) y_{\tau}(h) + p_{\tau}^*(h) y_{\tau}^*(h) - mc_{H,\tau}(h) (y_{\tau}(h) + y_{\tau}^*(h))]$$

subject to quadratic price adjustment costs similar to those considered for nontradables and standard demand constraints. The term E_t denotes the expectation operator conditional on the information set at time t , $\Lambda_{t,\tau}$ is the appropriate discount rate and $mc_H(h)$ is the marginal cost. The first order conditions with respect to $p_t(h)$ and $p_t^*(h)$ are:

$$p_t(h) = \frac{\theta_T}{A_t(h)} mc_t(h) \quad (14)$$

$$p_t^*(h) = \frac{\theta_T^*}{A_t^*(h)} mc_t(h) \quad (15)$$

where θ_T^* is the elasticity of substitution of tradable intermediate goods in the Foreign country, while $A(h)$ and $A^*(h)$ involve terms related to the presence of price adjustment costs:

$$A_t(h) \approx \theta_T - 1 + \kappa_H^p \frac{P_t(h)}{P_{t-1}(h)} \left(\frac{P_t(h)}{P_{t-1}(h)} - 1 \right) - \beta \kappa_H^p \frac{P_{t+1}(h)}{P_t(h)} \left(\frac{P_{t+1}(h)}{P_t(h)} - 1 \right) \frac{Q_{H,t+1}}{Q_{H,t}} \quad (16)$$

$$A_t^*(h) \approx \theta_T^* - 1 + \kappa_H^{p^*} \frac{P_t^*(h)}{P_{t-1}^*(h)} \left(\frac{P_t^*(h)}{P_{t-1}^*(h)} - 1 \right) - \beta \kappa_H^{p^*} \frac{P_{t+1}^*(h)}{P_t^*(h)} \left(\frac{P_{t+1}^*(h)}{P_t^*(h)} - 1 \right) \frac{Q_{H,t+1}^*}{Q_{H,t}^*} \quad (17)$$

where $\kappa_H^p > 0$ ($\kappa_H^{p^*} > 0$) measure the degree of nominal rigidity in the Home (Foreign) country. If nominal rigidities in the (domestic) export market are highly relevant (that is, if it is relatively large), the degree of inertia of Home goods prices in the Foreign market will be high. If prices were flexible ($\kappa_H^p = \kappa_H^{p^*}$) and $\theta_T = \theta_T^*$, then optimal price setting is consistent with the cross-border law of one price:

$$p_t(h) = \frac{\theta_T}{\theta_T - 1} mc_t(h) = p_t^*(h) \quad (18)$$

A3. Labor Market

In the case of firms in the nontradable intermediate sector, the labor input $L_N(n)$ is a CES combination of differentiated labor inputs supplied by domestic agents and defined over a continuum of mass equal to the country size ($j \in [0, s]$, $j^* \in (s, 1]$):

$$L_{N,t}(n) \equiv \left(\frac{1}{s}\right)^{\frac{1}{\psi}} \left[\int_0^s L_t(n, j)^{\frac{\psi-1}{\psi}} dj \right]^{\frac{\psi}{\psi-1}} \quad (19)$$

where $L(n, j)$ is the demand of the labor input of type j by the producer of good n and $\psi > 1$ is the elasticity of substitution among labor inputs. Cost minimization implies:

$$L_t(n, j) = \left(\frac{1}{s}\right) \left(\frac{W_t(j)}{W_t}\right)^{-\psi} L_{N,t}(j), \quad (20)$$

where $W(j)$ is the nominal wage of labor input j and the wage index W is:

$$W_t = \left[\left(\frac{1}{s}\right) \int_0^s W_t(h)^{1-\psi} dh \right]^{\frac{1}{1-\psi}}. \quad (21)$$

Similar equations hold for firms producing intermediate tradable goods. Each household is the monopolistic supplier of a labor input j and sets the nominal wage facing a downward-sloping demand, obtained by aggregating demand across Home firms. The wage adjustment is sluggish because of quadratic costs paid in terms of the total wage bill:¹⁷

$$AC_t^W = \frac{\kappa_W}{2} \left(\frac{W_t}{W_{t-1}} - 1 \right)^2 W_t L_t \quad (22)$$

where the parameter $\kappa_W > 0$ measures the degree of nominal wage rigidity and L is the total amount of labor in the Home economy.

A4. Households' optimization

In each country there is a continuum of symmetric households. Home households are indexed by $j \in [0; s]$ and Foreign households by $j \in (s; 1]$, the same indexes of labor inputs. Households' preferences are additively separable in consumption and labor effort. Households receive utility from consuming and disutility from working L_t hours. The expected value of household j lifetime utility is given by:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t(j)^{1-\sigma}}{(1-\sigma)} - \frac{\kappa}{\tau} L_t(j)^\tau \right] \right\}$$

where E_0 denotes the expectation conditional on information set at date 0, β is the discount factor ($0 < \beta < 1$), $1/\sigma$ is the elasticity of intertemporal substitution ($\sigma > 0$)

¹⁷See Kim (2000)

and $1/(\tau - 1)$ is the labor Frish elasticity ($\tau > 0$).

The budget constraint of agent j is:

$$\frac{B_t(j)}{(1+i_t)\mu_t} - B_{t-1}(j) \leq \Pi_t^P(j) + R_t^K K_{t-1}(j) + W_t(j)L_t(j) - P_t C_t(j) - P_t I_t(j) - AC_t^W(j) - TAX_t(j) - P_t AC_t^K(j)$$

Home agents hold a bond, B , denominated in the currency of the monetary union. The short-term nominal rates i_t is paid at the beginning of period t and is known at time t . It is directly controlled by the monetary authority. The bond is traded with Foreign agents. A financial friction μ_t is introduced to guarantee that net asset positions follow a stationary process and the economy converge to a steady state.¹⁸ Home agents accumulate physical capital which they rent to Home firms at the nominal rate R^k . The law of motion is:

$$K_t(j) = (1 - \delta) K_{t-1}(j) + I_t(j)$$

where δ is the depreciation rate. Capital accumulation is subject to adjustment costs:

$$AC_t^K(j) = \frac{\phi_K}{2} \left(\frac{I_t(j)}{K_{t-1}(j)} - \delta \right)^2$$

Home agents own all Home firms and there is no international trade in claims on firms' profits. The variable $\Pi^P(j)$ includes profits accruing to Home households. Finally, Home agents pay lump-sum (non-distortionary) net taxes $TAX_t(j)$. Similar relations hold in the Foreign country, with the exception of the intermediation frictions in the financial market. The Home household j chooses bond holdings, capital, investment, consumption and wage paths to maximize its expected lifetime utility subject to budget constraint, the capital accumulation law and the demand for labor by firms. The resulting Euler equation for consumption is:

$$C_t(j)^{-\sigma} = (1+i_t)\beta E_t C_{t+1}(j)^{-\sigma} \frac{P_t}{P_{t+1}} \quad (23)$$

The first-order conditions with respect to $I_t(j)$ and $K_t(j)$ are standard. The first order condition with respect to $W_t(j)$ involves terms related to the presence of wage adjustment costs. Absent these costs, the real (in units of domestic consumption) wage would be equal to a constant markup, $\theta_W/(\theta_W - 1)$, proportional to the elasticity of substitution between

¹⁸Revenue from financial intermediation are rebated in a lump-sum way to Foreign agents. See Benigno (2001).

labor varieties θ_W , over the marginal rate of substitution between consumption and labor:

$$\frac{W_t(j)}{P_t} = \frac{\theta_W}{(\theta_W - 1)} \kappa L_t^{\tau-1}(j) C_t^p(j)$$

As for services, we simulate structural reforms in the labor market by permanently changing the value of θ_W . Greater competition and lower long-run (steady-state) markup correspond to permanently higher values of θ_W .

A5. Public Sector

We assume that aggregate public expenditure G consists of consumption goods and is financed through net lump-sum taxes $TAX_t(j)$. For simplicity we assume that there is no public debt. The budget constraint of the Home government is:

$$P_t G_t = \int_0^s TAX_t(j) dj \quad (24)$$

The monetary authority controls the short-term rate according to a Taylor rule of the form:

$$\left(\frac{1 + i_t}{1 + i} \right) = \left(\frac{1 + i_t}{1 + i} \right)^{\rho_i} (\Pi_{MU,t})^{(1-\rho_i)\rho_\pi} \left(\frac{GDP_{MU,t}}{GDP_{MU,t-1}} \right)^{(1-\rho_i)\rho_{GDP}} \quad (25)$$

The parameter ρ_i ($0 < \rho_i < 1$) captures inertia in interest rate setting, while parameters ρ_π and ρ_{GDP} are respectively the weights of currency union's CPI inflation rate $\Pi_{MU,t}$ and GDP $GDP_{MU,t}$. The CPI inflation rate is a geometric average of CPI inflation rates in the Home and Foreign country (respectively Π_t and Π_t^*) with weights equal to the correspondent country size:

$$\Pi_{MU,t} \equiv (\Pi_t)^s (\Pi_t^*)^{1-s} \quad (26)$$

The union-wide GDP is the sum of the Home and Foreign GDPs (respectively GDP_t and GDP_t^*):

$$GDP_{MU,t} \equiv GDP_t + GDP_t^* \quad (27)$$

A6. Market Clearing

The model is closed by imposing the following resource constraints and market clearing conditions. The resource constraint for Home nontradable final consumption good is:

$$\int_0^s A_t(x) dx \geq \int_0^s C_t(j) dj + G_t \quad (28)$$

The resource constraint for Home nontradable final investment good is:

$$\int_0^s E_t(x) dx \geq \int_0^s I_t(j) dj \quad (29)$$

The resource constraint for good n is

$$N_t^S(n) \geq \int_0^s Q_t(n, x) dx \quad (30)$$

The Home tradable h can be used by Home firms or imported by Foreign firms:

$$T_t^S(h) \geq \int_0^s Q_t(h, x) dx + \int_s^1 Q_t(h, x^*) dx^* \quad (31)$$

The resource constraints for factor market are:

$$\int_0^s L_t(j) dj \geq \int_0^s L_t(n) dn + \int_0^s L_t(h) dh \quad (32)$$

$$\int_0^s K_{t-1}(j) dj \geq \int_0^s K_t(n) dn + \int_0^s K_t(h) dh \quad (33)$$

The bond market clearing condition is:

$$\int_0^s B_t(j) dj + \int_s^1 B_t(j^*) dj^* = 0 \quad (34)$$

A7. The equilibrium

We find a symmetric equilibrium of the model. In each country there is a representative agent and four representative sectorial firms (in the intermediate tradable sector, intermediate nontradable sector, consumption production sector and investment production sector). The equilibrium is a sequence of allocations and prices such that, given initial conditions and the sequence of exogenous shocks, each private agent and firm satisfy the correspondent first order conditions, the private and public sector budget constraints and market clearing conditions for goods, labor, capital and bond hold.

Table 1. Price and Wage Markups (Base-Case Parameters)

Parameter	Italy	Rest of the Euro Area
Tradables (manufacturing)		
Markup $\theta_T/(\theta_T - 1)$	1.17	1.17
θ_T	7.00	7.00
Nontradables (services)		
Markup $\theta_N/(\theta_N - 1)$	1.61	1.35
θ_N	2.65	3.90
Wages		
Markup $\psi/(\psi - 1)$	1.61	1.35
ψ	2.65	3.90

Table 2. Parameterization of Italy and the rest of the Euro Area (Base-Case Parameters)

Parameter	Italy	Rest of the Euro Area
Rate of time preference $(1/\beta^4 - 1) * 100$	3.02	3.02
Depreciation rate δ	0.025	0.025
Intertemporal elasticity of substitution $1/\sigma$	1.00	1.00
Frisch elasticity of labor $1/(\tau - 1)$	2.00	2.00
Tradable Intermediate Goods		
Substitution between factors of production ξ_T	0.92	0.92
Bias towards capital α_T	0.50	0.50
Nontradable Intermediate Goods		
Substitution between factors of production ξ_N	0.92	0.92
Bias towards capital α_N	0.45	0.45
Final consumption goods		
Substitution between domestic and imported goods ρ_A	1.50	1.50
Bias towards Italian tradable goods a_H	0.40	0.35
Substitution between domestic tradables and nontradables ϕ_A	0.50	0.50
Bias towards tradable goods a_T	0.51	0.51
Final investment goods		
Substitution between domestic and imported goods ρ_E	1.50	1.50
Bias towards Italian tradable goods v_H	0.40	0.35
Substitution between domestic tradables and nontradables ϕ_E	0.50	0.50
Bias towards tradable goods v_T	0.51	0.51
Size	0.20	0.80

Table 3. Real and Nominal Adjustment Costs (Base-Case Parameters)

Parameter (“*” refers to rest of the Euro area)	Italy	Rest of the Euro Area
Real Adjustment Costs		
Capital accumulation ϕ_K, ϕ_K^*	1.00	1.00
Nominal Adjustment Costs		
Price of nontradables κ_N, κ_N^*	19.25	19.25
Price of domestically-produced tradables κ_H, κ_H^*	70.44	70.44
Price of imported intermediate goods κ_F, κ_F^*	70.44	70.44
Wages κ_W, κ_W^*	19.25	19.25

Table 4. Euro Area Monetary Rule

Parameter	Value
Lagged interest rate at (t-1) ρ_i	0.9
Inflation ρ_Π	1.7
GDP growth ρ_{GDP}	0.4

Table 5. Steady-state National Accounts Decomposition
(Base-Case Parameters)

Ratio of GDP	Italy		Rest of the Euro Area	
	data	model	data	model
Total Consumption	78.9	80.1	77.3	77.1
Private C	59.7	60.1	57.1	57.1
Public G	19.2	20.0	20.2	20.0
Private Investment P_{EI}	20.7	19.9	21.1	22.9
Export EXP	25.8	26.0	-	-
Imports IM	25.9	26.0	-	-
Share of Euro Area GDP (percent)	17.0	18.0	83.0	82.0

Table 6. Long- Run Effects of Different Italian Service Price Markups
(Base-Case Parameters)

Service Price Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.6	7.5	13.0	19.1
Consumption	1.9	5.5	9.4	13.5
Investment	4.5	13.6	24.0	36.1
Labor	1.9	5.6	9.7	14.4
Real Wages	2.9	8.4	14.6	21.4
Export Volume	1.9	5.7	9.7	14.2
Import Volume	0.5	1.5	2.5	3.6
Real Exchange Rate	3.0	8.8	15.3	22.6
Terms of Trade	1.4	4.1	7.0	10.2
Welfare steady state	1.0	2.7	4.4	5.8
Welfare transition	0.6	1.6	2.4	3.2
Rest of the Euro Area Long-Run Effects				
GDP	0.3	0.8	1.4	2.0
Consumption	0.3	0.9	1.5	2.1
Investment	0.3	0.8	1.3	1.8
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.3	0.9	1.5	2.1

Table 7. Long- Run Effects of Different Italian Wage Markups
(Base-Case Parameters)

Wage Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	1.7	5.1	8.8	12.9
Consumption	1.7	5.0	8.6	12.7
Investment	1.8	5.4	9.3	13.7
Labor	2.4	7.1	12.4	18.4
Real Wages	-0.7	-1.9	-3.2	-4.6
Export Volume	2.2	6.6	11.4	16.9
Import Volume	0.6	1.7	2.9	4.2
Real Exchange Rate	1.0	3.0	5.1	7.4
Terms of Trade	1.6	4.8	8.3	12.1
Welfare steady state	0.5	1.5	2.3	2.9
Welfare transition	0.4	0.9	1.3	1.5
Rest of the Euro Area Long-Run Effects				
GDP	0.3	1.0	1.7	2.4
Consumption	0.3	1.0	1.7	2.5
Investment	0.3	0.9	1.5	2.2
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.3	1.0	1.7	2.5

Table 8. Long- Run Effects of Stand-Alone and Synchronized Reforms
(Base-Case Parameters)

	Reforms in Italy			Reforms in Italy and the Euro Area	
	Wages	Services	Services and Wages	Services	Services and Wages
Italy Long-Run Effects					
GDP	12.9	19.1	34.2	20.5	37.8
Consumption	12.7	13.5	27.7	14.8	31.1
Investment	13.7	36.1	54.0	37.5	57.7
Labor	18.4	14.4	35.2	14.4	35.2
Real Wages	-4.6	21.4	15.6	22.8	18.7
Export Volume	16.9	14.2	33.1	14.6	34.1
Import Volume	4.2	3.6	7.9	6.7	15.6
Real Exchange Rate	7.4	22.6	31.1	16.2	21.7
Terms of Trade	12.1	10.2	23.4	7.3	16.1
Welfare steady state	2.9	5.8	6.7	7.1	9.6
Welfare transition	1.5	3.2	3.0	4.0	5.0
Rest of the Euro Area Long-Run Effects					
GDP	2.4	2.0	4.5	7.5	15.1
Consumption	2.5	2.1	4.7	6.1	13.7
Investment	2.2	1.8	4.1	11.1	18.7
Labor	0.0	0.0	-0.1	3.7	9.1
Real Wages	2.5	2.1	4.7	8.1	10.0

Table 9. Long- Run Effects of Different Italian Service Price Markups
(Lower Wage Markup)

Service Price Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.6	7.5	13.0	19.2
Consumption	1.9	5.5	9.3	13.3
Investment	4.6	13.7	24.3	36.8
Labor	1.9	5.6	9.7	14.4
Real Wages	2.9	8.4	14.5	21.2
Export Volume	1.9	5.7	9.8	14.3
Import Volume	0.5	1.5	2.5	3.6
Real Exchange Rate	3.0	8.8	15.2	22.4
Terms of Trade	1.4	4.1	7.1	10.3
Welfare steady state	0.8	2.2	3.3	4.2
Welfare transition	0.4	1.1	1.5	1.7
Rest of the Euro Area Long-Run Effects				
GDP	0.3	0.9	1.5	2.1
Consumption	0.3	0.9	1.5	2.2
Investment	0.3	0.8	1.4	2.0
Labor	0.0	0.0	0.0	0.0
Real Wages	0.3	0.9	1.5	2.2

Table 10. Long- Run Effects of Different Italian Service Price Markups
(High Intratemporal Elasticity)

Service Price Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.7	8.0	13.8	20.4
Consumption	2.1	6.0	10.3	14.9
Investment	4.6	13.6	24.1	36.4
Labor	1.8	5.3	9.3	13.7
Real Wages	3.0	8.8	15.3	22.6
Export Volume	1.7	5.0	8.5	12.4
Import Volume	1.0	3.0	5.1	7.4
Real Exchange Rate	2.4	7.1	12.3	18.0
Terms of Trade	0.7	1.9	3.2	4.7
Welfare steady state	1.2	3.4	5.5	7.5
Welfare transition	0.7	1.9	3.1	4.2
Rest of the Euro Area Long-Run Effects				
GDP	0.1	0.3	0.5	0.7
Consumption	0.1	0.3	0.5	0.8
Investment	0.1	0.3	0.4	0.7
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.1	0.3	0.5	0.7

Table 11. Long- Run Effects of Different Italian Wage Markups
(High Intratemporal Elasticity)

Wage Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.0	5.9	10.3	15.2
Consumption	2.0	5.9	10.2	15.0
Investment	2.1	6.1	10.6	15.6
Labor	2.4	7.1	12.4	18.3
Real Wages	-0.4	-1.1	-1.8	-2.6
Export Volume	2.0	6.0	10.3	15.1
Import Volume	1.2	3.6	6.2	9.0
Real Exchange Rate	0.5	1.4	2.4	3.4
Terms of Trade	0.8	2.3	3.9	5.7
Welfare steady state	0.8	2.3	3.7	5.1
Welfare transition	0.6	1.6	2.5	3.2
Rest of the Euro Area Long-Run Effects				
GDP	0.1	0.4	0.6	0.9
Consumption	0.1	0.4	0.6	0.9
Investment	0.1	0.3	0.5	0.8
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.1	0.4	0.6	0.9

Table 12. Long- Run Effects of Different Italian Service Price Markups
(Low labor-capital elasticity)

Service Price Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.0	6.0	10.2	14.9
Consumption	1.7	4.9	8.4	12.1
Investment	3.7	11.0	19.3	28.9
Labor	1.7	5.0	8.6	12.7
Real Wages	2.6	7.5	13.0	19.0
Export Volume	1.3	3.7	6.2	9.0
Import Volume	0.3	0.9	1.5	2.2
Real Exchange Rate	2.7	8.0	13.8	20.3
Terms of Trade	1.0	2.7	4.6	6.7
Welfare steady state	0.8	2.3	3.7	4.9
Welfare transition	0.6	1.6	2.7	3.6
Rest of the Euro Area Long-Run Effects				
GDP	0.2	0.5	0.8	1.1
Consumption	0.2	0.5	0.8	1.2
Investment	0.1	0.4	0.6	0.9
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.2	0.5	0.8	1.2

Table 13. Long- Run Effects of Different Italian Wage Markups
(Low labor-capital elasticity)

Wage Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	1.8	5.3	9.1	13.4
Consumption	1.8	5.2	8.9	13.1
Investment	2.0	5.8	10.0	14.7
Labor	2.4	7.1	12.4	18.4
Real Wages	-0.6	-1.7	-2.9	-4.2
Export Volume	2.4	6.9	12.0	17.7
Import Volume	0.6	1.7	2.9	4.1
Real Exchange Rate	1.1	3.1	5.3	7.8
Terms of Trade	1.8	5.1	8.9	13.0
Welfare steady state	0.5	1.4	2.1	2.7
Welfare transition	0.4	1.0	1.5	1.7
Rest of the Euro Area Long-Run Effects				
GDP	0.3	0.9	1.5	2.2
Consumption	0.3	0.9	1.6	2.3
Investment	0.2	0.7	1.2	1.7
Labor	-0.0	-0.0	-0.0	-0.0
Real Wages	0.3	0.9	1.6	2.3

Table 14. Long- Run Effects of Different Italian Service Price Markups
(High Frish Elasticity)

Service Price Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	3.3	9.7	16.9	25.1
Consumption	2.6	7.6	13.1	19.0
Investment	5.3	16.0	28.5	43.3
Labor	2.9	8.6	15.0	22.4
Real Wages	2.6	7.7	13.2	19.3
Export Volume	2.9	8.4	14.6	21.6
Import Volume	0.8	2.2	3.7	5.4
Real Exchange Rate	3.5	10.2	17.7	26.2
Terms of Trade	2.1	6.1	10.5	15.4
Welfare steady state	1.2	3.4	5.4	7.2
Welfare transition	0.7	2.0	3.1	4.0
Rest of the Euro Area Long-Run Effects				
GDP	0.4	1.2	2.0	3.0
Consumption	0.4	1.2	2.1	3.1
Investment	0.4	1.1	1.8	2.7
Labor	-0.0	-0.0	-0.0	-0.1
Real Wages	0.4	1.2	2.1	3.1

Table 15. Long- Run Effects of Different Italian Wage Markups
(High Frish Elasticity)

Wage Markup	1.55	1.45	1.35	1.25
Italy Long-Run Effects				
GDP	2.6	7.7	13.4	19.8
Consumption	2.6	7.6	13.2	19.4
Investment	2.8	8.1	14.2	21.0
Labor	3.7	10.9	19.2	28.5
Real Wages	-1.0	-2.8	-4.7	-6.7
Export Volume	3.4	10.1	17.7	26.2
Import Volume	0.9	2.6	4.5	6.4
Real Exchange Rate	1.5	4.5	7.7	11.2
Terms of Trade	2.5	7.3	12.6	18.6
Welfare steady state	0.8	2.2	3.4	4.5
Welfare transition	0.5	1.4	2.0	2.4
Rest of the Euro Area Long-Run Effects				
GDP	0.5	1.4	2.4	3.6
Consumption	0.5	1.5	2.5	3.7
Investment	0.4	1.3	2.2	3.2
Labor	-0.0	-0.0	-0.1	-0.1
Real Wages	0.5	1.5	2.5	3.7

Figure 1a. Reduction in the service sector markup(quantities)

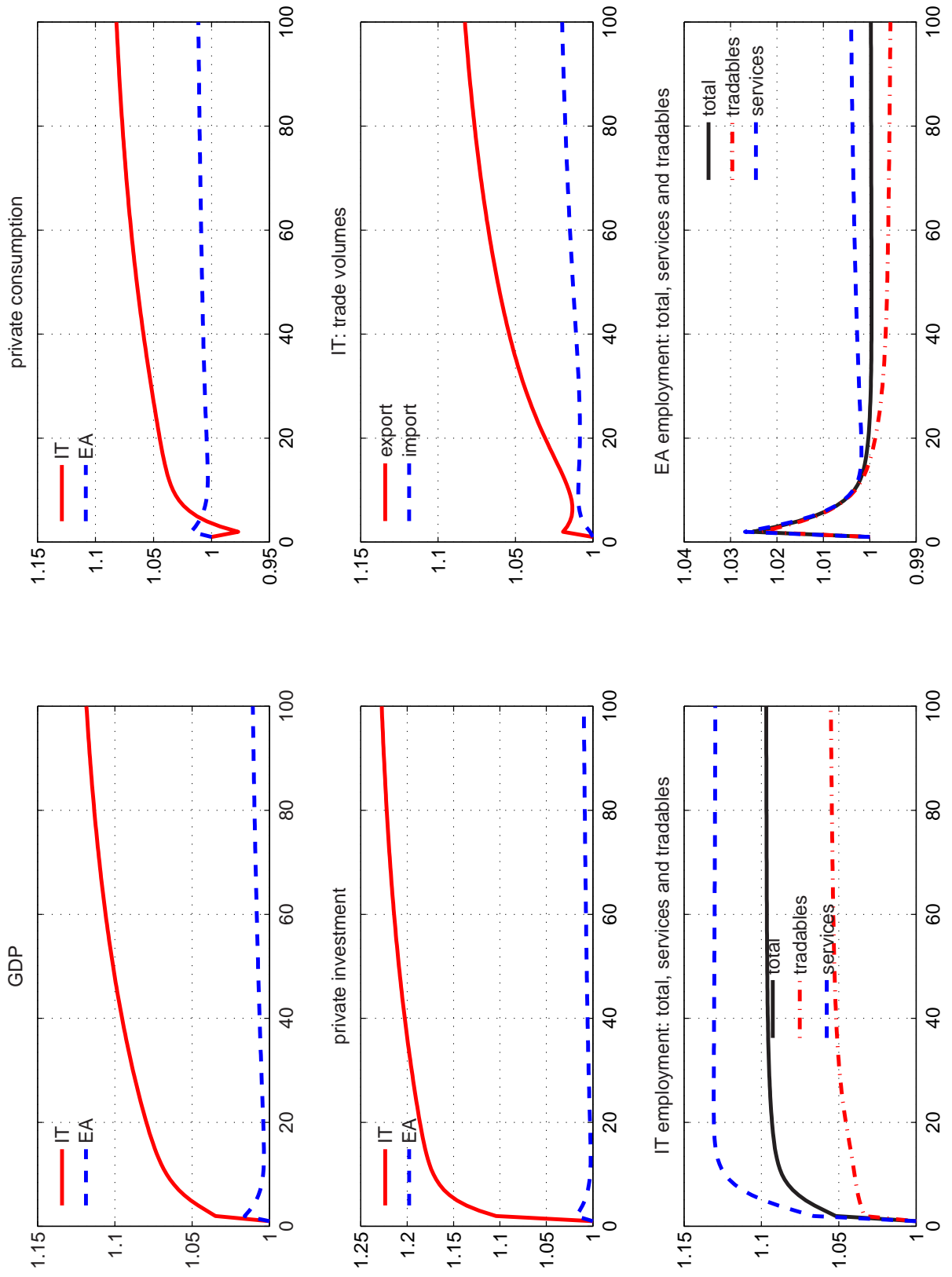


Figure 1b. Reduction in the service sector markup (prices)

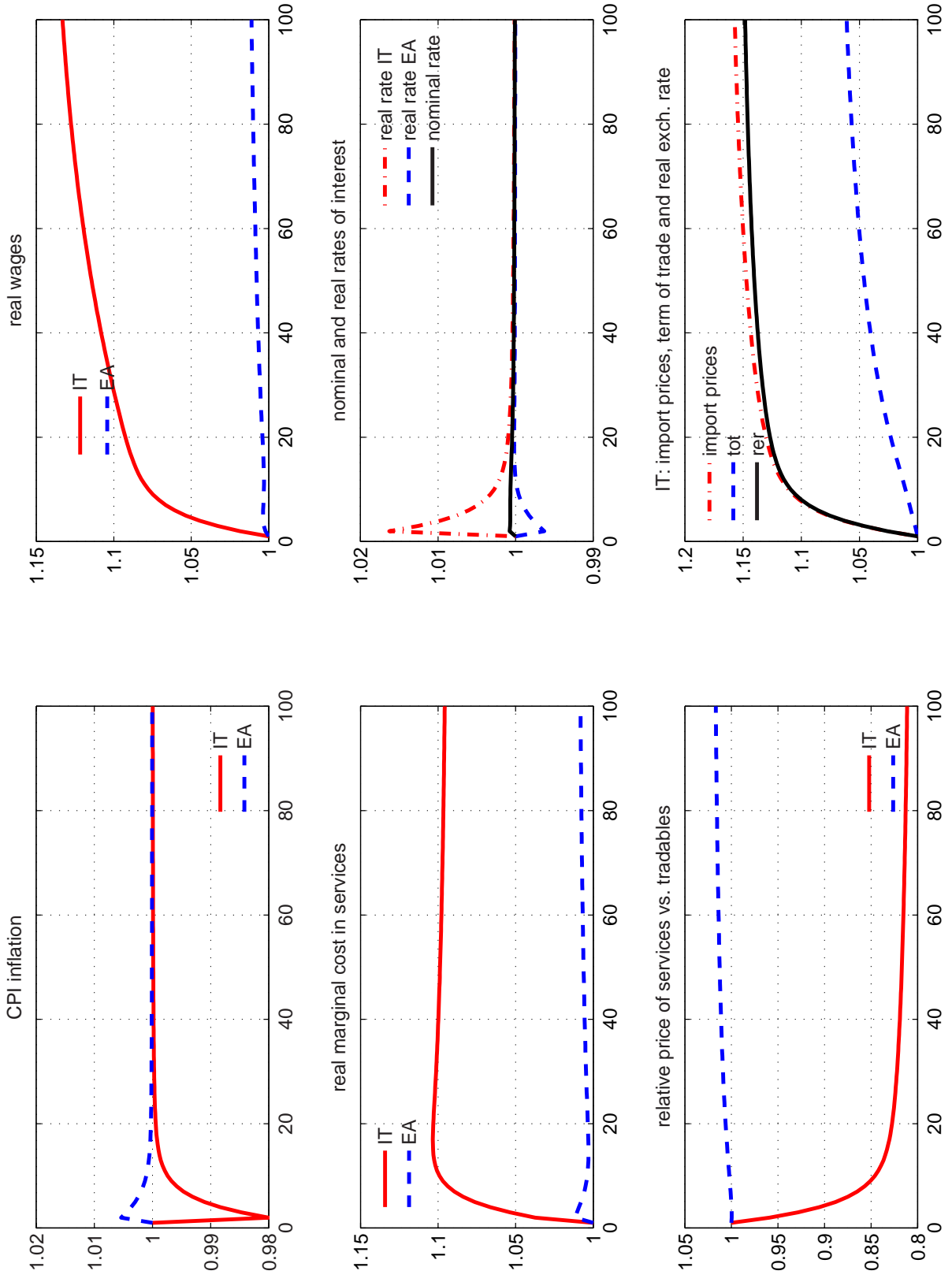


Figure 2a. Reduction in the labor market markup (quantities)

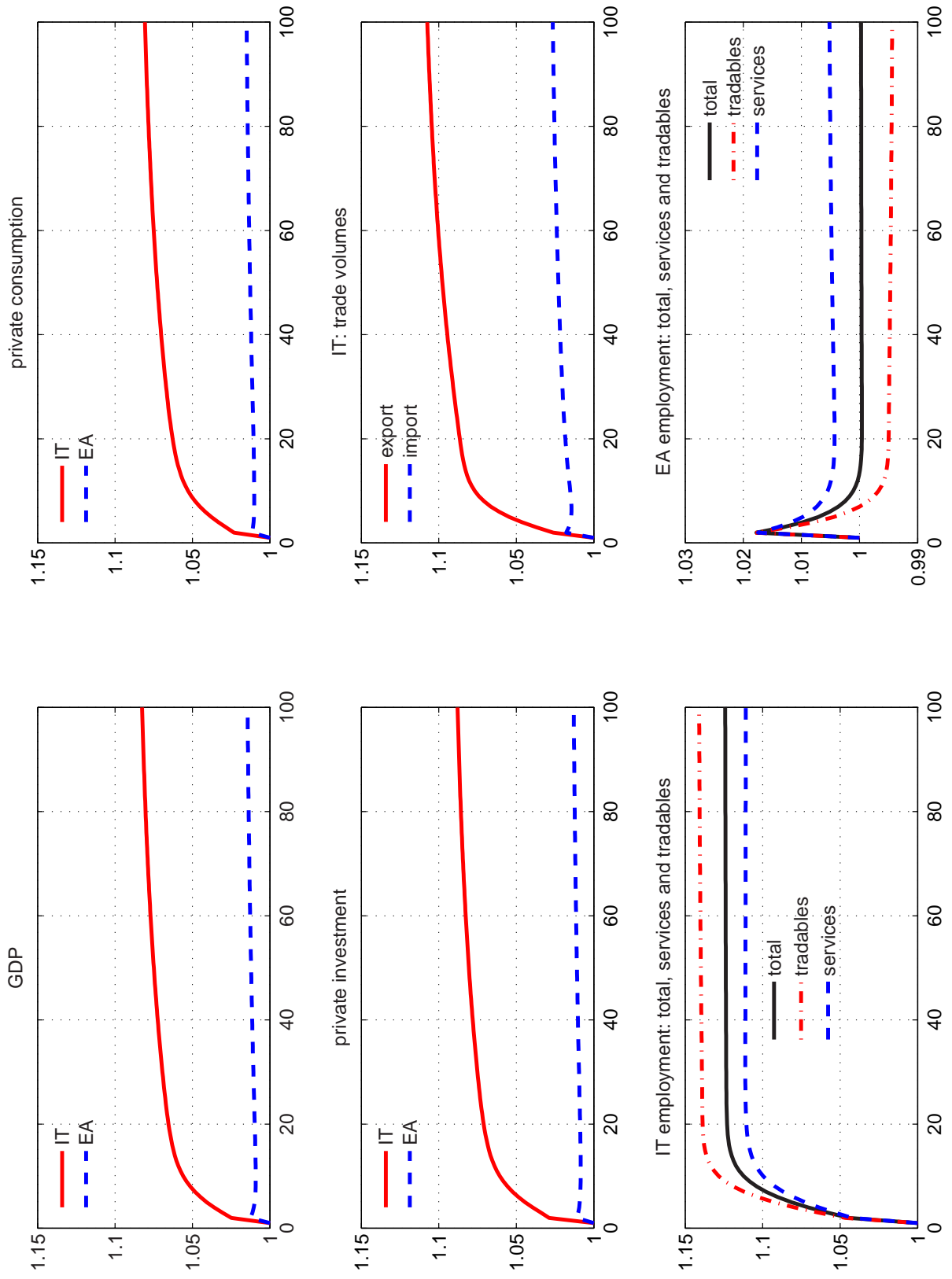


Figure 2b. Reduction in the labor market (prices)

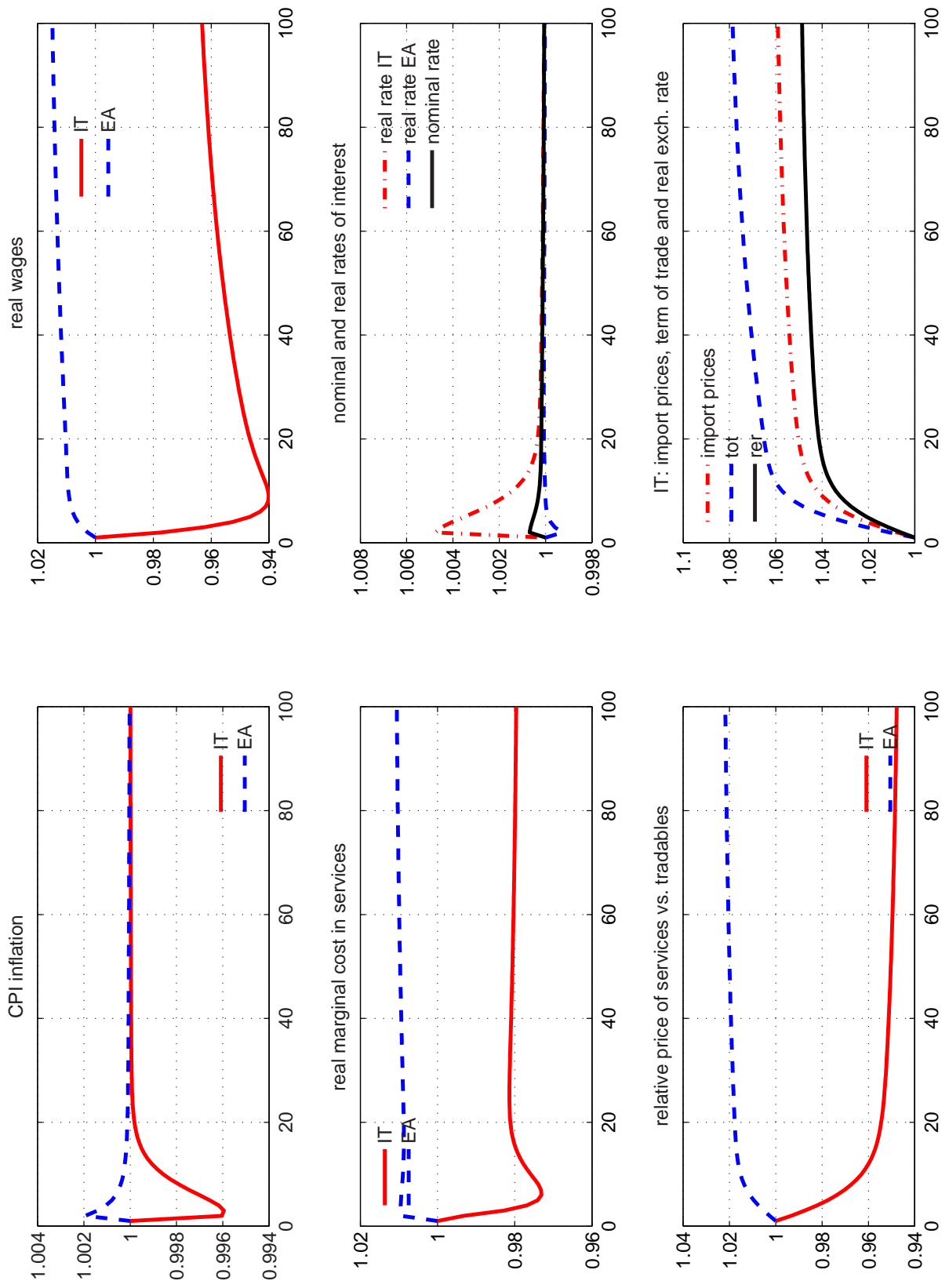


Figure 3. Response of the Italian economy to a contractionary MP shock varying the degree of real rigidities.

