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THE EFFECTS OF STRUCTURAL REFORMS: EVIDENCE FROM ITALY

by Emanuela Ciapanna*, Sauro Mocetti* and Alessandro Notarpietro*

Abstract

This paper quantifies the macroeconomic effects of three major structural reforms (i.e., service sector liberalizations, incentives to innovation and civil justice reforms) undertaken in Italy in the last decade. We employ a novel approach that estimates the impact of each reform on total factor productivity and markups in an empirical micro setting and that uses these estimates in a structural general equilibrium model to simulate the macroeconomic impact of the reforms. Our results indicate that, accounting for estimation uncertainty, the increase in the level of GDP as of 2019 due to the sole effect of these reforms (ignoring all the other shocks that the Italian economy suffered in the same period) would be between 3% and 6%. The long-run increase in Italy's potential output would lie between 4% and 8%, with non-negligible effects on the labor market.

JEL Classification: E10, E20, J60, K40, L50, O30.
Keywords: structural reforms, DSGE models, liberalization, innovation, civil justice.
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Contents

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1 Introduction[1]

For the past twenty years, and particularly since the sovereign debt crisis, the importance of structural reforms, aimed at promoting sustainable and balanced growth, has been at the center of the economic debate, in Italy and in Europe, as well as in the agenda of G20-G7. Structural reforms are measures designed for modifying the very structure of an economy; they typically act on the supply side, i.e. by removing obstacles to an efficient (and equitable) production of goods and services, and by increasing productivity, so as to improve a country's capacity to increase its growth potential along a balanced path. This objective can be pursued by improving the environment in which companies operate: for example, removing cumbersome and anti-competitive regulation, easing the functioning of the labor market, increasing enforcement of contracts and protection of property rights, or even designing incentives to boost investment in research and development (R&D) and innovation.

The aim of this paper is to assess the macroeconomic impact of three major structural reforms carried out in Italy over the last decade. They include (i) liberalization of services, (ii) incentives to "business innovation" (included in the so-called "Industry 4.0" Plan) and (iii) several measures in the civil justice system aimed at increasing the courts efficiency.[2]

In order to provide a quantitative assessment of the impact of these three reforms, we adopt a novel approach that combines microeconomic empirical evidence with macroeconomic analysis. Specifically, we adopt a 3-step procedure:

1. description of the reform and selection of a synthetic indicator in order to produce a quantitative measure of the reform to be assessed;

2. estimation of the effects of the reform (i.e., the change in the synthetic in-

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[2]We do not consider other important reforms implemented in the last decade because of the lack of quantitative indicators (as in the case of, e.g., labor market reforms, increasing efficiency of the public administration and improving entry and start-up regulation) and/or because they were not effective in the temporal span considered in this paper (e.g. reform of the insolvency regime).

dicator) on some variables of interest, such as, e.g., total factor productivity (TFP), or firms' markup;

3. simulation of a structural dynamic general equilibrium model to evaluate how the change in the indicators estimated in steps 1 and 2 influences the macroeconomic variables of interest.

Our results indicate that the three reforms, introduced in different years and with different timing, starting in 2011 and up to 2017, have already begun to produce their effects on the main macroeconomic variables and on Italy's potential output. In particular, and taking into account the uncertainty surrounding our micro-econometric estimates, by 2019 GDP was between 3 and 6% higher than it would otherwise have been in the absence of these reforms, with the largest contribution being attributable to the liberalizations in the service sector. A further increase of about 2 percentage points would be reached in the next decade, due to the unfolding of the effects of all the reforms considered here. Therefore, the long-run increase in Italy's potential output would lie in between 4% and 8%. We also detect non-negligible effects on the labor market: employment would increase in the long term by about 0.4%, while the unemployment rate would be reduced by about 0.3 percentage points. These estimates are broadly in line with those obtained by the main international institutions (see Lusinyan and Muir (2013), OECD (2015), MEF (2016)), once differences in methodologies, scope and time horizon of the analyses are accounted for.

The main novelty of our paper is the joint analysis of the effects of a specific reform on some quantity of interest, via micro-econometric techniques that get as close as possible to the estimation of a causal impact, and the simulation of a macroeconomic model, which allows us to analyze the transition to the new steady state, and to assess the general equilibrium effects. We apply this methodology to study the macroeconomic effects of three specific structural reforms episodes that took place in Italy in the past decade. The existing literature typically provides two distinct approaches to the assessment of the economic impact of structural reforms. The first approach is based on reduced-form evidence. Among others, Lanau and Topalova (2016) examine the impact of liberalizations in Italy by exploiting the variation in the timing and degree of deregulation across sectors. Beyond direct effects, other papers have examined the impact on downstream industries that use the output of regulated network industries as inputs in their production function

(see Barone and Cingano (2011) and Bourlès et al. (2013)). However, these results do not account for general equilibrium effects, and the empirical setting does not allow to explore the transition of the economy towards its new (post-reform) steady state. The second approach is based on structural dynamic general equilibrium macroeconomic models. Forni et al. (2010), Lusinyan and Muir (2013), Varga et al. (2014) and Gerali et al. (2016) analyse a wide array of structural reforms in Italy. However, in these studies the size of the simulated reform is generally based on working assumptions (e.g. "what would happen if the gap vis-à-vis best practices is closed?"), usually without any underlying empirical estimate.

The paper unfolds as follows. Section 2 describes the three considered reforms; Section 3 illustrates the micro-econometric approach for the estimation of the effects of the reforms; Section 4 presents the model and the macro-level analysis; Section 5 shows the results and discusses them in a comparative fashion, with respect to those obtained by other institutions employing different methodologies. The final section offers some concluding remarks.

2 Structural Reforms in Italy: the institutional background

In this section, we provide a description of the three major structural reforms considered in the paper, within the Italian institutional framework. We start by analyzing the liberalization measures in the service sector; then we describe the "Industry 4.0" Plan providing fiscal incentives for innovative investments; finally we offer a description of the civil justice reforms.

2.1 Liberalization reforms

Reforming regulation in a way to enhance competition can have large macroeconomic effects (Griffith and Harisson (2004)). More competition is expected to reduce the level of economic rents, bring prices closer to marginal costs (i.e., reduce mark-up), improve resource allocation, and create incentives to undertake more productive activities and pursue efficiency (i.e., increase TFP).

According to the OECD Product Market Regulation (PMR) indicators, Italy was one of the biggest *de jure* reformers between the second half of the 2000s and the beginning of the 2010s. In this paper, we examine the liberalization of services

introduced with the Decree Law "Salva Italia" (L. 22 December 2011, n. 214). In particular, Title IV "Provisions for the promotion and protection of competition" removed several entry barriers in the service sector (e.g. liberalization of opening days and hours in retail trade; abrogation of restrictions on fees and advertising in the professional services; liberalization of the transport sector).

2.2 Incentives to innovation

R&D expenditure, product and process innovation and the adoption of new technologies are central to ensuring efficiency gains at the firm level and hence the growth of the economy as a whole (Bugamelli et al. (2018b)). Italy is characterized by under-investment in innovation and the so called "diffusion machine" seems to be relatively malfunctioning (Andrews et al. (2015)). On the one hand, there are few highly innovative, productive, and internationalized firms belonging to the "productivity frontier", on the other hand, the great majority of firms lags behind, apparently unable to benefit from knowledge spillovers and adopt innovation developed by leading firms.

Since the second half of the 2010s, several interventions have redesigned the industrial and innovation policy in Italy, aimed at boosting firms' productivity through fiscal incentives for investment in innovation. In line with international best practices, they were to intervene on the entire innovation chain: supporting start-ups and innovative small and medium-sized enterprises (SMEs), moving on to R&D tax credit for existing innovative companies, up to the Patent Box to prevent leaks abroad of the large multinationals in the most innovative sectors. These measures have been integrated with the "Industry 4.0" Plan, launched in 2016 and subsequently renewed, which, among the various initiatives, includes a series of fiscal incentives aimed at fostering investments (super-amortization, so-called "new Sabatini"[3]), and at boosting adoption of so called "Industry 4.0" technologies (hyper-amortization) and R&D expenditure (tax credit on R&D).

2.3 Civil justice reforms

The functioning of the civil justice crucially affects the legal protection of investment and trade, two key elements of economic activity. The available empirical

[3]The law carries the name of a politician, Armando Sabatini, who first promoted a law aimed at fostering technological innovation in small and medium-sized firms in 1965.

evidence shows that the functioning of the justice system has quantitatively significant effects on the economy along several dimensions.[4]

The Italian civil justice system has long suffered from considerable dysfunctions (Giacomelli et al. (2017)). Two notable examples are the enormous backlog of cases and the excessive length of trials. At the beginning of the current decade, about 3.5 million civil proceedings were pending before the Italian trial courts (*tribunali*), the highest amount ever; according to World Bank (2020), the resolution of a commercial dispute required 850 days, more than twice the time needed in the other advanced economies.

To address these issues, especially starting from the summer of 2011, the civil justice system underwent considerable reform. The actions undertaken, of diverse nature and importance, were designed, on the one hand, to reduce the number of legal disputes and, on the other, to improve the productivity of the courts. Concerning the demand side, conditions (i.e. rules and costs required to initiate a case) were modified and alternative dispute resolution instruments were introduced. Concerning the supply side, there was a geographical reorganization of the trial courts throughout the country; investments were made and rules introduced to encourage the use of information technologies; incentives for court managers to reduce their backlogs were introduced; finally, projects were launched to promote the spread of best practices.

3 Micro-econometric estimation of the effects of the reforms

In this section we provide micro-econometric estimates of the effects of the reforms. For each reform, we provide a quantitative assessment of the policy change and of the effects on the variable of interest, such as markup or TFP.

[4]With reference to Italy, inefficiencies of the judicial system worsen financing conditions for households (Fabbri and Padula (2004)) and firms (Jappelli et al. (2005), Magri (2010)) and have negative effects on the participation of firms in global value chains (Accetturo et al. (2017) and on their size (Giacomelli and Menon (2017)).

3.1 Effects of liberalization reforms

To quantitatively assess the extent of the liberalization reforms, we resort to the OECD sectoral regulation indicators (NMR).[5] These indices provide a measure of how restrictive the regulation is in five sectors (energy, posts, telecommunications, air transport, land transport, retail and professional services) in 34 advanced countries. They cover information in four main areas: state control, barriers to entry, involvement in business operations and, in some cases, market structure. The information summarised by the indicators is objective, as opposed to survey-based, and consists of rules, regulations and market conditions. All of these regulatory data are vetted by Member country officials and/or OECD experts. The indicators are calculated using a bottom-up approach in which the regulatory data are quantified using an appropriate scoring algorithm and then aggregated into summary indicators by sector of activity in each of the four areas or across them. They range from 6 (fully regulated sector) to 0 (perfectly liberalized sector) and are available for the years 1998, 2003, 2008 and 2013 (for a more detailed description see Conway and Nicoletti (2006)). The weighted average value for Italy of the indicators in the service sector drops from 3.9 to 3.2 in the period 1998-2013 (Figure 1).[6]

The less restrictive regulation and the greater openness to competition in services, as reflected by the indices, has essentially two effects: on the one hand, it directly compresses the monopoly rents; on the other hand, it induces a general recovery of efficiency. The latter results from a selection and reallocation process of market shares towards productive companies, and from the higher average degree of efficiency in production within firms that prove able to stay in the market. Overall, these adjustments induce a lowering of average costs and an increase in TFP.

We estimate the effects of liberalization on markup and TFP, by exploiting the temporal and country and sector variation of the OECD regulatory indicators.[7] To this aim, we combine NMR information with data on (current and constant price)

[5] https://www.oecd.org/governance/regulatory-policy/indicators-sectoral-regulation.htm.

[6] Notice that in the graph the sectors Posts and Telecommunication and road and air transport are aggregated for the sake of simplicity in presentation, whereas they are considered separately in the estimation procedure.

[7] It is worth noting that the regulation indicator might be plagued by measurement errors, whose effect on the estimation of the coefficient of interests are not clear. Moreover, given the very nature of the composite indicator, we cannot credibly explore potential non-linear impact of regulation.

value added, intermediate inputs, capital stock and employment at the country-industry-year level contained in the OECD Structural Analysis (STAN) dataset.[8] These data have been assembled complementing member countries' Annual National Accounts with information from other sources, such as national business surveys and censuses, and classified according to the International Standard Industrial Classification, Revision 4 (ISIC Rev. 4). Table 1 provides a short description of the main data sources used in the paper.

Regarding the effects on markup, we use the Lerner index (or price-cost margin) as a proxy. This is a synthetic measure of the degree of market power, defined as the ratio of the difference between final sales prices and the marginal costs over the price itself, in line with Griffith and Harisson (2004) and Høj et al. (2006). It takes values between zero (in case of perfect competition) and 1 (in a monopolistic market). Given the difficulties in retrieving data on marginal costs, these are approximated by average variable costs, accounting for materials and labor costs. Thus, we can compute the Lerner index as the ratio between gross operating surplus (corrected for the cost of self employed workers) and gross output, sourced from the STAN dataset.[9] Within the considered period, the Lerner index associated to regulated services in Italy is decreasing, partly reflecting liberalization policies undertaken over the years, (Figure 2). Empirically, the relationship between Lerner indices and degree of regulation (as reflected in the OECD indicators) is estimated as follows:

$$L_{ijt} = \beta Reg_{ijt} + \eta_i + \eta_j + \eta_t + \gamma X_{ijt} + \epsilon_{ijt} \tag{1}$$

where L_{ijt} is the Lerner index in country i, sector j at time t; Reg_{ijt} is the regulatory indicator observed at the same unit of analysis; the η variables capture fixed effects of country, sector and year, respectively, and the X_{ijt} is a vector of controls, which we include in the full model, containing TFP and its square, to account for the effects passing through a variation of firm's productivity (Table 2).

The results of our full model indicate that a reduction of one point in the regulatory indicator is associated with a 1.8 percentage point decrease in the Lerner index (Table 2, second column).[10]

[8] http://www.oecd.org/sti/ind/stanstructuralanalysisdatabase.htm

[9] This approximation, though imposing non negligible restrictions, is widely employed within the literature. See Boone (2000) for a complete survey.

[10] The estimates do not seem to be influenced by the measure of market power adopted: using

To assess the impact of the reform on the Lerner index of the service sector in Italy, we use the estimated value of β and the observed variation in Reg Italy. Namely:

$$\Delta L_{ITAjt} = \beta \sum_{j} (\omega_{ITAjt} \Delta Reg_{ITAjt}) \tag{2}$$

where ΔReg_{ITAjt} measures the variation (reduction) of the OECD regulation indicator relating to sector j between 2008 and 2013; ω_{ITAjt} is the weight of sector j within the whole service sector. Using simple algebra, we find that the total effect of the liberalization package on the Italian Lerner index in the service sector as a whole is estimated at around -0.7 percentage points.[11] Regarding TFP dynamics, within the considered years, we can observe a decreasing pattern for the regulated service sectors on average (Figure 3). This is a common feature in the Italian economy as a whole, reflecting several context factors. Nevertheless, reforms as those treated in this work have helped to contain the drop in productivity, as we will illustrate in the econometric analysis.[12] To measure the impact of reforms on TFP in the service sector, we follow a similar approach. We compute TFP as the Solow residual, i.e., the difference between the logarithm of value added in real terms and the logarithms of the factors of production (labor and capital), weighted by the respective share in value added. In the regressions, TFP is normalized with respect to the so-called "production frontier": the value observed in each country-sector-year is divided by the corresponding value measured in the country with the highest average productivity in the period considered (in our sample, Denmark, which was therefore excluded from the estimation). We estimate the elasticity of TFP with respect to regulation using (the logarithm of) TFP as a dependent variable, similarly to equation (1):

$$tfp_{ijt} = \beta Reg_{ijt} + \eta_i + \eta_j + \eta_t + \gamma X_{ijt} + \epsilon_{ijt} \tag{3}$$

where tfp_{ijt} is the log of TFP in country i, sector j at time t, the η variables capture fixed effects of country, sector and year, respectively, and X_{ijt} is a vector

the mark-up constructed according to the methodology proposed by Roeger (1995) the results do not change substantially.

[11] This result is in line with the estimates of Griffith and Harisson (2004) regarding the impact of liberalization reforms on markups.

[12] For a more extensive discussion of productivity dynamics in the service sector, see Bugamelli et al. (2018a)

of controls included in the full model, containing markup and its square.

The aggregate impact for Italy is then calculated using an expression similar to equation (2):

$$\Delta tfp_{ITAjt} = \beta \sum_{j} (\omega_{ITAjt} \Delta Reg_{ITAjt}) \tag{4}$$

The results indicate that a reduction of one point in the regulatory indicator is associated with an increase in TFP of around 11% (Table 2, fourth column). In this case, the coefficient remains fairly unchanged when we include the markup and its square among the controls. As a result, at the aggregate level the reforms imply a permanent increase in the service sector TFP of 4.3 percent.

3.2 Effects of the incentives to innovation

To provide a quantitative assessment of the effects of incentives we use data sourced from the Survey on Industrial and Service Firms (INVIND), yearly conducted by the Bank of Italy, which includes firms with more than 20 employees, as well as balance sheet data from Cerved Group.

We build, from balance sheets data, a measure of TFP and we merge this information with data from INVIND where we observe whether the firm used the incentives for innovation or not.

About 70% of the 4,200 firms in the sample declared to have used at least one of the available incentive schemes (so-called "new Sabatini", tax credit on R&D, super-amortization and hyper-amortization). Moreover, among the companies that have benefited from the incentives, about one out of four considers them fundamental for their investment decisions (considering both the extensive and the intensive margins).

The propensity to use these incentives was highly heterogeneous across firms (see Table 3, columns I and II). This share was below 60% for smaller firms (below 50 employees) and nearly 80% for larger ones. Beyond size, the firms using incentives (treated firms) were also more productive, more likely to be in the manufacturing sector and less likely to be located in the South of Italy with respect to other firms (control firms).

The aim of the empirical analysis is to estimate the impact on TFP of the incentives to invest in innovation, due to improvements in production processes

and, in general, efficiency gains in the use of inputs. By employing a difference-in-difference (DID) approach, we exploit the temporal variation of TFP before and after the introduction of the incentive itself and the cross-sectional variation between the group of firms declaring the use of incentives (treated firms) and the other firms (control firms). Our temporal window includes years from 2010 to 2018. The empirical specification is the following:

$$TFP_{it} = \beta I_{it} + \eta_i + \eta_t + \epsilon_{ijt} \tag{5}$$

where TFP_{it} is the TFP of firm i in year t; I_{it} is an indicator equal to 1 if the firms used the incentive to innovate and 0 otherwise; the η terms capture structural differences in the TFP across firms and common shocks, respectively. The parameter of interest is β, which provides the effect of the incentive on TFP.

The credibility of this strategy crucially relies on the assumption that, in the absence of the incentives, the TFP for the treated and the control firms would have followed parallel paths over time. This assumption may be implausible if the two groups are structurally different (and therefore likely exposed to different macro shocks). To account for this concern, we adopt a combination of matching with DID, as proposed in Heckman et al. (1997), thus pairing each treated firm with "similar" control firms. Specifically, we adopt the kernel matching, thus giving larger weight to controls with closer "propensity score" (i.e., treatment probability conditional on the observables). The control variables include sector of activity (NACE sections), geographical area (NUTS2), firm's size (in terms of employees), TFP and its average growth rate (with the latter three variables observed in the first half of the decade, i.e., before the treatment). In the propensity score matching (PSM) sample, the variables are much more balanced and the differences between treated and control units are not statistically significant (table 3, columns III, IV and V).

A first graphical evidence shows that TFP increased more in the groups of firms who benefited of the incentives from 2016 on (Figure 4), while they displayed a similar patterns in TFP before the treatment.

This visual evidence is confirmed in the regression setting. According to our preferred specification, i.e., the one with the PSM sample, the effect of the incentives on TFP is 0.06 (table 4, column II). [13] This figure, multiplied by the

[13] A similar impact has been found in Griffith et al. (2006). See also Hall (2011) for a review

fraction of firms that considers the incentives fundamental for their investment decisions implies an effect on TFP of 1.4 percent. The impact is heterogeneous between firms of different size, being larger for small firms (table 4, columns III and IV); however, the implied effect is homogeneous between the two groups of firms because the incentives were more widely used by larger firms.[14]

3.3 Effects of the civil justice reforms

Simple descriptive evidence suggests that, in the current decade, the civil justice system has improved. The total number of pending proceedings before the trial courts fell by 27% between 2010 and 2018 (Figure 5A). In the same temporal window, the estimated length of civil cases (ordinary and commercial disputes) decreased from 15 to 13 months (Figure 5B).[15]

Moreover, descriptive evidence shows that firms located in the courts experiencing a larger decrease in civil proceedings have been characterized, on average, by a better performance in terms of TFP (Figure 6). The aim of the empirical strategy is to confirm the visual evidence in a regression setting and, more importantly, to get the elasticity of TFP with respect to the length of civil proceedings. First, we compute the TFP using data from Cerved group. Second, we use an aggregate indicator as simple average across firms. The geographical unit of analysis is a partition of the territory in areas corresponding to cluster of municipalities referring to the trial courts. The period of observation is the current decade (with

of the literature on the relationship between innovation and productivity.

[14]In unreported evidence we have also enriched the set of variables included in the matching process adding indicators on the property structure of the firm (i.e. family-owned firms and public company), the age of the firm, the export orientation and the utilization of the available physical capital. All these variables are plausibly correlated to the propensity to invest and innovate and also to the TFP patterns. However, and quite reassuringly, we find that the estimated coefficient is very stable, thus suggesting that it is less likely that the estimated effect is fully driven by unobservables.

[15]The length of proceedings is estimated as follows:

$$length_{it} = \frac{365(pending_{it-1} + pending_{it})}{(incoming_{it} + resolved_{it})} \tag{6}$$

A decrease in the length of proceedings is confirmed also by the World Bank's Doing Business indicator – i.e. time needed to resolve a specific type of commercial dispute – and by effective length measured on the resolved cases by the Ministry of Justice. However, the former is available only at the national level while the latter is observable only for the more recent years (i.e. after the reforms).

2017 being the last available year in which TFP is estimated). Formally:

$$tfp_{it} = \beta length_{it} + \eta_i + \eta_t + \epsilon_{it} \tag{7}$$

where tfp_{it} is the log of TFP in the area referring to court i, at time t; $length_{it}$ is the estimated length of civil cases in the same area and year; and η_i and η_t capture structural differences in the TFP across areas and common shocks, respectively. The parameter of interest is β, which represents the elasticity of the TFP with respect to the length of civil cases.[16]

Table 5 shows the results. In the odd columns, we use the TFP and the length of the proceedings in the same year while in the even columns we consider a 2-year moving average, to capture some lagged effects of the length of proceedings on the TFP. In the first two columns, we use the average TFP of the firms located in each court-year while in the latter two columns the average TFP is obtained after controlling for sector fixed effects, to account for variations in the sector composition of the local economy. According to our results, the elasticity is around 0.03 and is fairly stable across specifications. According to these results, the 15% decrease in the length of proceedings (i.e. that observed in our sample period) has lead to an increase in TFP by around 0.5%.

3.4 Summary of the estimates

Table 6 summarizes the estimation results. The service liberalization reforms induce positive effects both on service sector productivity and on the degree of competition. Estimates indicate a permanent increase in the service sector TFP of 4.3% and a permanent reduction in the services sector markup of 0.7 percentage points. Incentives to innovation lead to a permanent efficiency (TFP) gain of 1.4%. Finally, civil justice system reforms would lead to a permanent increase in TFP of 0.5%.

The final column of Table 6 reports the speed of implementation of each reform. The assumption about the length of each reform episode will play a role in the simulations illustrated in the next section. For the service liberalization, we

[16] Although this specification is not immune from endogeneity concerns, it is worth noting that much of the variation in the length of the proceedings is attributable to measures (e.g., introduction of alternative dispute resolution instruments, a redistribution of the trial courts throughout the country, etc.) that had a heterogeneous impact over the territory for reasons that are orthogonal with respect to the trend of the TFP.

assume that the implementation takes 7 years to fully materialize. Annicchiarico et al. (2013) consider the implementation of a package of reforms including service liberalization and make two alternative assumptions on their implementation, i.e. 5 and 10 years. Lusinyan and Muir (2013) consider the same reform episode and assume a 5-year implementation. Finally, MEF (2016) assume an 8-year implementation period for markup reduction in the service sector. We take a conservative approach and make an assumption on the implementation length that lies approximately in between those of existing studies. Concerning incentives to innovation, we assume a 4-year length, consistent with the official announcements about its implementation. Finally, about the civil justice reforms, we assume a 3-year horizon as an average over several reform interventions. As clarified in the following section, our assumptions about the implementation speed of the reforms only affect the short-to-medium term dynamics, but have no impact on the long-run effects, including those on potential output.

4 The macroeconomic effects of the reforms

In this section we document our model-based analysis of the macroeconomic effects of the reforms. The micro-econometric estimates of the impacts on markup and (sector-specific or aggregate) TFP are used as exogenous shocks to quantify, through the simulation of a structural model, the corresponding macroeconomic effects. In the following, we first provide a short description of the model and its main transmission mechanisms, and subsequently describe the simulated scenarios.

4.1 Overview of the model

We simulate a multi-country dynamic general equilibrium model. The world economy is composed of three blocs. Two blocs, Home (calibrated to Italy) and rest of the EA (REA), are members of the EA, modeled as a monetary union. The two countries have a common nominal exchange rate and a common monetary policy rate. The third bloc, representing the rest of the world (RW), has its own monetary policy rate and nominal exchange rate. The model is New Keynesian and features nominal price rigidities, capital accumulation, and international trade in goods and bonds.

Importantly for our analysis, the model includes two key building blocks that

allow us to evaluate the effects of the reforms on the productive structure of the Italian economy.[17]

First, the model includes final consumer and investment goods and intermediate goods. The latter are produced in two sectors, manufacturing and services, using capital and labor, with exogenous TFP. There are many varieties of intermediate goods all of which are imperfect substitutes. Each variety is produced by a single firm operating under conditions of monopolistic competition and setting nominal prices as a markup over marginal costs. The markup can therefore be interpreted as an indicator of the degree of market power in each intermediate sector. As shown later, reforms aiming at increasing the degree of competition in one sector will be modelled as affecting the corresponding markup.

Second, there are search and matching frictions in the labor market, which allow for a characterization of the dynamics of hours worked per employee (intensive margin) and the number of employees (extensive margin). The presence of real rigidities in the labor market creates a wedge between the real wage and marginal labor productivity. A complete characterization of labor market dynamics is essential for evaluating the effects of the reforms on the productive capacity of the economy.

The New Keynesian structure of the model, based on nominal price rigidities, allows for a proper distinction between demand and supply effects of the different shocks (i.e., reforms) and, in line with the literature, for the measurement of potential output using a model-consistent definition of "natural" output.[18] The latter is the level of output that is obtained by simulating the model under the assumptions that prices are fully flexible and (net) markups are greater than zero.

In the following, we summarize the most relevant model features. In each country, there are a representative household, a representative firm in each production sector, and a public sector. The household is infinitely lived. It consumes a final good. In every period the household rents workers to domestic labor firms. At the end of the period, the representative household receives labor income (wages and unemployment benefits) from workers, dividend income from firms, and pays lump-sum taxes. The household decides the amount of consumption, which is equally shared across its members. It owns the portfolio of domestic firms and

[17] See Gerali et al. (2015) for a detailed description of the production side of the model and Burlon et al. (2019) for details on the labor market structure.

[18] See, among the others, Justiniano et al. (2013)

the domestic capital stock. The latter is rent to domestic firms in a competitive market. The household also buys and sells two bonds: a domestic bond issued by the local public sector denominated in domestic currency, and an international bond (denominated in euro) issued in zero net supply worldwide.

Fiscal policy is conducted at the regional level. Each country sets government consumption, unemployment benefits (assumed to be equal across sectors), lump-sum taxes, labor taxes (on both firms and employees), capital income taxes, and consumption taxes. In all simulations, tax rates are kept constant at their steady-state levels. Public debt is stabilized through a fiscal rule that induces an endogenous adjustment of lump-sum transfers. Specifically, whenever the current-period public debt as a ratio to GDP is above (below) its target, the rule commands a reduction (increase) in lump-sum transfers.

Concerning monetary policy, the central bank of the monetary union sets the short-term nominal interest rate according to a standard Taylor-type rule, by reacting to the domestic inflation rate and real activity.[19]

The model is calibrated at quarterly frequency. We calibrate the three blocs to Italy (Home country), REA, and RW. We set some parameters to match the great ratios and the trade matrix. The remaining parameters are in line with previous studies and estimates available in the literature.[20]

4.2 The transmission mechanism of the reforms

All the reforms considered imply an exogenous change in TFP, services markup, or both. The supply of each Home intermediate nontradable good n is denoted by $N_t^S(n)$

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

Firm n uses labor $L_{N,t}(n)$ and capital $K_{N,t}(n)$ with constant elasticity of input

[19] We abstract for simplicity from the presence of an effective lower bound (ELB) to the short-term policy rate. This assumption does not crucially affect our analysis. Reforms are implemented in a relatively small country, the GDP of which is about 20% of the overall EA GDP. As the monetary policy rate responds to movements in area-wide inflation and output, it should not move much in response to the reforms considered here. Hence, the presence (or absence) of the ELB does not crucially alter the main conclusions.

[20] See among the others, Bayoumi et al. (2004), Gomes et al. (2012), and Warne et al. (2008).

substitution $\zeta_N > 0$ and capital weight $0 < \alpha_N < 1$, for a given exogenous total factor productivity $TFP_{N,t}$. Firms producing intermediate goods take the prices of labor inputs and capital as given. Denoting W_t the nominal wage index and $R_{K,t}$ the nominal rental price of capital, the nominal marginal cost $MC_{N,t}(n)$ can be expressed as:

$$MC_{N,t}(n) = \frac{1}{TFP_{N,t}} \left((1-\alpha_N) W_t^{1-\zeta_N} + \alpha_N R_{K,t}^{1-\zeta_N} \right)^{\frac{1}{1-\zeta_N}} \tag{9}$$

The elasticity of substitution between services of different firms, θ_N, determines the market power of each firm. In the long-run flexible-price (symmetric) steady state, firms set prices according to the first-order condition

$$\frac{P_N}{P} = \frac{\theta_N}{\theta_N - 1} \frac{MC_N}{P} \tag{10}$$

where $\frac{P_N}{P}$ is the relative price of the generic service and $\frac{MC_N}{P}$ is the real marginal cost. The gross mark-up is $\frac{\theta_N}{\theta_N - 1}$ and depends negatively on the elasticity of substitution between different services, $\theta_N > 1$. The higher the degree of substitutability, the lower the implied mark-up and the higher the production level for a given price. Thus, the long-run mark-up reflects imperfect competition. In the short-run, sector-specific nominal rigidities (adjustment costs on nominal prices) determine deviations of the markup from its long-run level.

In the simulations we gradually and permanently increase: (i) the elasticity of substitution among Home intermediate nontradable goods (our proxy for services), to augment the degree of competition in that sector, and/or (ii) sectoral (or aggregate) TFP, according to our micro-econometric estimates. Reforms that permanently reduce market power and/or increase TFP have two main effects on the macroeconomy. First, the enhanced productive capacity (reflecting higher TFP and less market power) stimulates capital accumulation and makes both capital and labor more productive, thus increasing permanent income. The corresponding positive "wealth effect" favors a permanent increase in aggregate demand. Second, reforms also favor an increase in aggregate supply. Hence, and importantly for the purpose of our analysis, potential output increases. However, while the long-run positive effect on output is uncontroversial, some mildly negative effect may be observed in the short run, due to intertemporal substitution. As households anticipate that services will be cheaper in the future, when their supply will be larger, they therefore have an incentive to postpone consumption, given its large services

content. The corresponding short-term effect on inflation may thus be negative, if the increase in supply is sufficiently large to offset the increase in aggregate demand. However, a sufficiently large increase in expected future aggregate demand may induce an increase in the stream of future marginal costs, by favoring a rise in firms' demand of capital and labor, that may exceed the increase in the corresponding supplies, thus implying a positive effect on short-run inflation.[21] On the open-economy dimension, the excess supply of services favors a real exchange rate depreciation, which in the medium term implies an increase in exports. Imports initially decrease and subsequently increase, mimicking domestic aggregate demand.

4.3 Calibration

We calibrate the model at quarterly frequency. The three blocs are calibrated to Italy (Home country), REA, and RW. We set some parameters to match the great ratios and the trade matrix. The calibration of the remaining parameters is in line with models such as the GEM (Laxton and Pesenti (2003), Pesenti (2008)), the NAWM (Warne et al. (2008)), and the EAGLE (Gomes et al. (2012) and Jacquinot et al. (2018)). Further details on the calibration are reported in Burlon et al. (2019).

Table 7 reports the matched great ratios and tax rates. The steady-state ratio of Home government debt over (annual) output is larger than in REA.

Table 8 contains preference and technology parameters. We set the discount factor of households to 0.9926 (implying a steady-state annualized real interest rate of about 3%). The habit persistence parameter, the intertemporal elasticity of substitution, and the Frisch elasticity are respectively set to 0.70, 1, and 0.48, respectively. The disutility from work χ is set to 2.2 as in Jacquinot et al. (2018). We set the quarterly depreciation rate of capital to 0.025, consistent with a 10% annual depreciation rate.

On the production side, in the production functions of intermediate tradable and non-tradable goods the bias towards capital is set to values close to 0.5. In the final goods baskets, the degree of substitutability between domestic and imported tradables is higher than that between tradables and non-tradables, consistent with

[21] Gerali et al. (2014) show that, when the short-term rate is at its effective lower bound, the response of investment is key in determining the sign and size of the response of inflation to liberalization reforms in the service sector.

the existing literature (elasticities equal to 1.5 and 0.5, respectively). The biases towards the tradable bundle in the consumption basket are equal to 0.64, 0.35, and 0.35 in Home, REA, and RW, respectively; in the investment basket they are equal to 0.75 in each region. The weight of domestic tradable goods in the consumption and investment tradable baskets is different among countries, and is set to be consistent with multilateral import-to-GDP ratios.

The labor market calibration is reported in Table 9. We set the labor services production elasticity α_H to match a labor share of around 60%. The bargaining power of workers is set to the conventional value of 0.5, in line with the literature. The quarterly separation rate is equal to 5.2%, 6.0% and 4.8%, in Home, REA and RW to match the unemployment rates for Italy and the EA.[22] The resulting matching probabilities are lower in the case of the Home region than in those of the REA and RW. Unemployment benefits are calibrated so that the replacement rate is set to 65% for both regions of the EA, in line with the evidence for the EA provided by Christoffel et al. (2009), and the RW.

The markup in the Home non-tradable sector (a proxy for the services sector) is higher than the corresponding value in the REA (see Table 10). In all regions the markup in the tradables sector (a proxy for the manufacturing sector) has the same value.[23]

Table 11 reports nominal and real rigidities.

Table 12 reports parameters in the monetary rules and fiscal rules. The interest rate reacts to its lagged value (inertial component of the monetary policy), annual inflation, and quarterly output growth. In the monetary union, monetary policy reacts to the EA-wide variables. For fiscal rules, lump-sum taxes stabilize public debt.

4.4 Simulated scenarios

Each of the three reforms is treated as a separate exogenous shock. Specifically, the model is fed with information on (i) the estimated impact of the reform on the synthetic indicator considered (markup, TFP) and (ii) the timing of implementation of the reform itself. All reforms are assumed to be perfectly credible

[22]We assume that the RW has an unemployment rate similar to the REA.

[23]The chosen values are are in line with Bayoumi et al. (2004), Faruqee et al. (2007) and Everaert and Schule (2008).

at the time of the announcement and implemented without delays with respect to the announced path. Families and firms thus perfectly know the evolution of the variables directly affected by the reform and make their own consumption and investment decisions taking into account this information (perfect foresight hypothesis).

While the long-run effects of the reforms obtained by simulating the model are unaffected by assumptions concerning the implementation speed, the short-to-medium term adjustment of the main macroeconomic variables reflects, among other things, the length of the reform process. For the services liberalization, we simulate a gradual, permanent increase in the services TFP of 4.3% over a seven-year horizon and, contemporaneously, a gradual permanent reduction of 0.7 percentage points in the services sector markup over the same time window. For incentives to innovation, we impose a permanent increase in TFP of 1.4% in both sectors (services and manufacturing), taking place in a gradual way over a four-year horizon. Finally, for civil justice reforms, we simulate a permanent increase in TFP of 0.5% over three years.

A clarification is in order. Each reform episode is treated separately, as an orthogonal shock to the other two. The rationale behind this assumption is that each reform episode is considered as independent from the others. The overall macroeconomic impact of the reforms is therefore evaluated from an ex-post perspective, by summing up the effects of each reform, taking into account the differences in the implementation timing and horizon. In this way we can isolate the contribution of each reform and highlight the corresponding transmission channels. Clearly, interactions and synergies may arise among different reforms implemented over the same period. For instance, while liberalization in the service sector may already have started generating its expansionary effects on production, the introduction of incentives to innovation and investment may further amplify such expansionary effects. In the interest of clarity and in order to make the interpretation of our results more transparent, we do not consider such interactions here. We leave this issue for future research.[24]

[24]See e.g. Gerali et al. (2016) for an analysis of the effects of simultaneously implementing fiscal consolidation and competition-friendly reforms.

5 Results

This section illustrates the results of our model-based simulations, where the micro-econometric estimates are taken as input. We also compare our results to those provided by the main international institutions, obtained using different methodologies and focusing at times on different subsets of reforms over possibly different horizons.

5.1 Model-based simulation results

Figure 7 reports the effects of the reforms on the main macroeconomic variables. All reforms support GDP and have mild deflationary effects in the short run, reflecting the supply-side expansion induced by the increase in TFP and the reduction in market power in the service sector.

The decrease in the service sector markup implied by the liberalization takes 7 years to fully materialize. As households and firms anticipate a future larger supply of services, two effects occur. First, households postpone consumption, given its large services content, to the future, when it will be cheaper. As a result, the liberalization *per se* would provide a mildly negative contribution to consumption dynamics in the first four years since its inception. Second, firms slowly start to increase investment, to build up a larger stock of capital for future production. As a result, the service sector liberalization starts contributing to increase GDP in the third year, while it mildly lowers inflation, reflecting the excess supply induced by the reduction in the markup. The service sector liberalization also brings about an estimated increase in services TFP of 4.3%, over the same 7-year horizon. Since services TFP is anticipated to increase to a large amount in the future, firms initially postpone investment to the next periods, when capital (and labor) will be more productive. From the fifth year onward, the liberalization-induced increase in TFP starts to sustain investment, contributing to capital accumulation. The increase in TFP also implies a fall in prices, reflecting an expected large increase in the productive capacity of the economy. Imports initially show a mild decrease, reflecting the dynamics of investment, which has a large import content. Subsequently, both the decrease in markup and the increase in TFP sustain import dynamics. Exports start increasing quite rapidly.

Incentives to innovation and civil justice reforms are both estimated to increase

overall TFP. The dynamics of GDP and its components are qualitatively similar to the case of an increase in the service sector TFP. The only exception is in the response of investment, which always increases, reflecting the shorter implementation phase of the two reforms (three and four years, respectively), compared to the liberalization case. Since the increase in TFP is smaller in size and takes a few years to fully materialize, the substitution effect is smaller and investment starts to increase immediately. In all cases, reforms imply in the medium-to-long run an increase in GDP (by around 6%) and all its components.

Figure 8 reports the effects on the main labor market variables. Two main results stand out. First, increases in TFP always imply an initial decrease in hours worked and a corresponding increase in the unemployment rate. The fall in hours worked is a typical result of the presence of sticky prices.[25] Since prices cannot completely adjust, aggregate demand does not increase enough to meet the expansion in supply, and firms require less labor input to produce the same level of output. Moreover, given the presence of real rigidities in the labor market, unemployment increases in the first years after the introduction of reforms that imply a higher TFP. Real wages initially remain constant, reflecting the responses of both labor and prices. Once prices adjust and the effects of the reforms begin to materialize, firms start to increase labor demand. As a result, there is a positive effect on the intensive margin. Hours worked increase in the long run in response to all reforms. Moreover, all reforms imply an upward adjustment on the extensive margin too: total employment increases by around 0.4% and the unemployment rate correspondingly falls, by approximately 0.3 percentage points (pp).

Finally, Figure 9 illustrates the overall effects on potential output. We measure potential output using the model-consistent definition of "natural" output, i.e. the level of output that is obtained by simulating the model under the assumptions that prices are fully flexible and (net) markups are greater than zero. The figure reports both the actual level of GDP (solid black line) and the level of potential output, in response to the three reforms considered. Clearly, the two measures tend to coincide in the long run. In order to take into account uncertainty around the point estimates obtained in the previous Section, we build two scenarios. The lower bound scenario is obtained by considering the 33th percentile of all the estimates, while the upper bound corresponds to the 66th percentile. We then

[25] See Gali (1999) for a seminal contribution on the negative effects of technology shocks on hours worked in New Keynesian models with nominal price rigidities.

simulate the two scenarios in the same way as described above. Specifically, we maintain the same assumptions about the timing and implementation horizon of each reform. Hence, the only differences compared to the central scenario (i.e. the simulations described above) are in the size of the estimated increases in service-specific TFP, services markup and overall TFP, respectively. The corresponding effects on GDP and potential output are reported in Figure 9 (dashed lines). The overall estimated impact on potential output lies in between 4% and 8%.

5.2 A comparison with existing estimates

Our model-based results, obtained using the novel three-step approach that we propose, are in line with estimates provided by the main international organizations. A systematic comparison is made difficult by differences in methodologies, in the type of reform considered and the time periods, which vary significantly across studies. OECD (2015) provides reduced-form estimates of the macroeconomic effects of the public administration (PA) and judicial system reforms. The estimated long-run effect on GDP is 0.9pp, which is broadly comparable to our estimated impact of the sole judicial system reform on potential output (0.7pp). The corresponding impact on productivity (TFP) estimated by the OECD is 0.8, about twice as large as our estimate (0.5), which possibly reflects the gains in productivity due to the PA reform. Similar estimates are reported by the Italian Ministry of Economy and Finance (see MEF (2016)). Concerning services liberalization, Lusinyan and Muir (2013) consider liberalizations taking place in Italy in 2008-2012 and assume that the reforms close roughly a half of the existing gap with respect to the rest of the euro area over a five-year period. The corresponding assumed reduction in the services markup amounts to 13pp (0.7pp in our case). The overall long-run effect on GDP is 6.9%. In order to facilitate the comparison, we calculated the corresponding standardized effect of a 1pp reduction in the service sector markup on potential (long-run) output. In Lusinyan and Muir (2013) it amounts to 0.5, while in our case it is 0.3. Hence, the estimated impact, for a given shock to the markup, is broadly in line with their estimates. MEF (2016) also reports estimates for the goods and services liberalization reforms occurring in 2012-2015. The estimated standardized impact of a 1pp markup reduction is quite larger than ours (1.2 vs 0.3), possibly reflecting a different transmission across the two sectors. The overall estimated impact of reforms in the 2012-2015 is 8.2%,

in line with the upper bound of our estimates. All in all, our estimates are in line with those provided by other institutions, once differences in time, scope and methods of analyses are accounted for.

Finally, it is worth stressing that our analysis focuses on Italian GDP and potential output of (a subset of) structural reforms implemented in the past decade, and it deliberately excludes all other factors (i.e., exogenous shocks) that contemporaneously hit the Italian economy in the same period. The results of our analysis are therefore meant to provide a quantification of the sole effects of these reforms on Italian output (both potential and observed GDP). A time-series approach would provide a quantification of the effects of a multiplicity of shocks hitting the economy. Such measurement is beyond the scope of our paper. Nonetheless, it is possible to provide an educated guess on which factors contributed to determine the dismal performance of the Italian economy over the past decade, despite the positive contribution provided by the reforms considered here. Italian economic growth was particularly weak after the Global financial crisis and the Sovereign debt crisis, lower than the pre-crisis average and lower than the euro-area average. Such performance may have reflected the interplay of global factors – both structural and cyclical – and idiosyncratic ones. Among the long-run factors affecting advanced economies, secular stagnation, demographics and, with specific reference to the euro area, weak labor productivity, all contributed to slow down economic growth. Among cyclical factors, uncertainty and the slow recovery that typically follow financial crises also weighed on output dynamics. Specific idiosyncratic factors characterizing the Italian economy include the impact of the two crises on the banking and financial system. The reduction in public investment (around 1% of GDP between 2008 and 2017) further contributed to slow down the recovery. On the other hand, the extraordinarily strong support of monetary policy between 2013 and 2019 contributed to support economic growth, along with the positive impact of structural reforms on productivity.

6 Conclusions

In this paper we have provided micro- and macroeconomic evidence on the effects of three structural reforms episodes occurred in Italy in the past decade. According to our micro-econometric estimates, liberalization in the service sector, incentives to innovation and civil justice reforms would imply a sizeable increase

in TFP (both service-specific and aggregate) and a reduction in service markup. Our structural-model based analysis, based on such estimates, suggests that the corresponding macroeconomic effects would be sizable. The increase in the level of GDP observed as of 2019 because of the sole effect of the considered reforms (and therefore ignoring all the other shocks that hit the Italian economy in the same period) would be in between 3% and 6%. A further increase of about 2% would be reached in the next decade, due to the unfolding of the effects of all the reforms considered here. Employment would increase in the long term by around 0.4%, while the unemployment rate would be reduced by about 0.3 percentage points. Taking into account the uncertainty surrounding our micro-econometric estimates, the overall increase in potential output in the long run would lie in between 4% and 8%.

Our analysis can be extended along several dimensions. Other major reform episodes could be analyzed, provided that sufficient data are available to estimate their quantitative impact on some relevant indicator. The interaction with monetary policy, in particular the presence of an effective lower bound and the implementation of unconventional measures, could be studied. More generally, allowing for a more sophisticated model setup could enrich the transmission mechanisms at play. For instance, allowing for entry (along the lines of, e.g., Cacciatore and Fiori (2016) and Cacciatore et al. (2016)) would provide additional insights in terms of firms dynamics and sectoral reallocation. Skill and knowledge accumulation is another interesting channel that may be explored in a model with endogenous or semi-endogenous growth. We leave these issues for future research.

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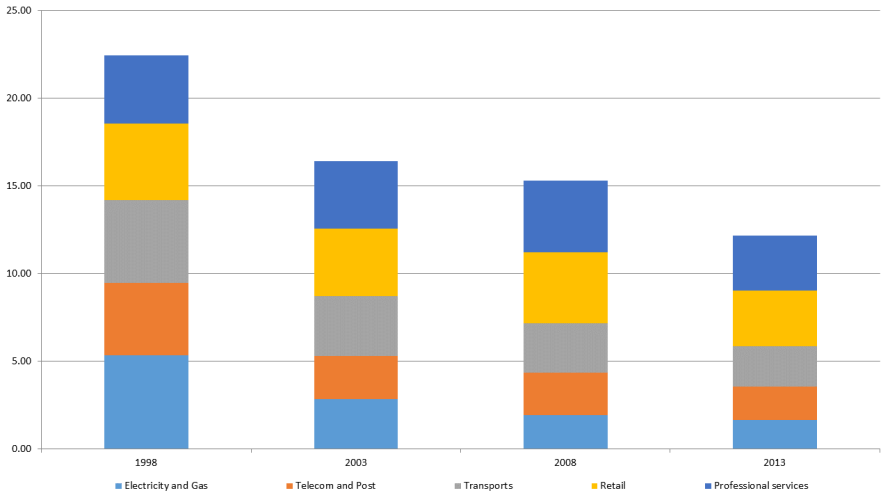
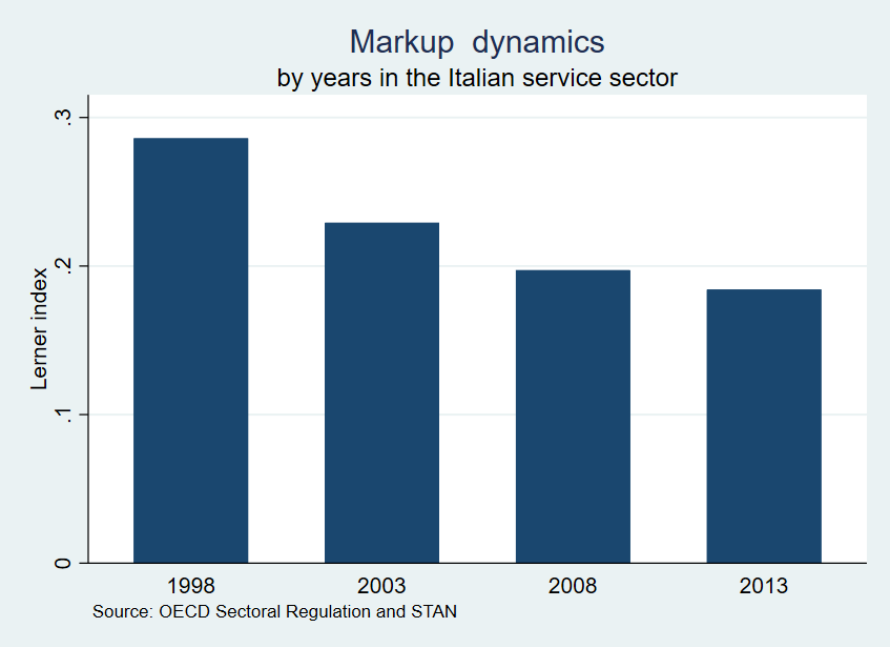
Figures and Tables

Figure 1: NMR Indicator for Italy, 1998-2013.



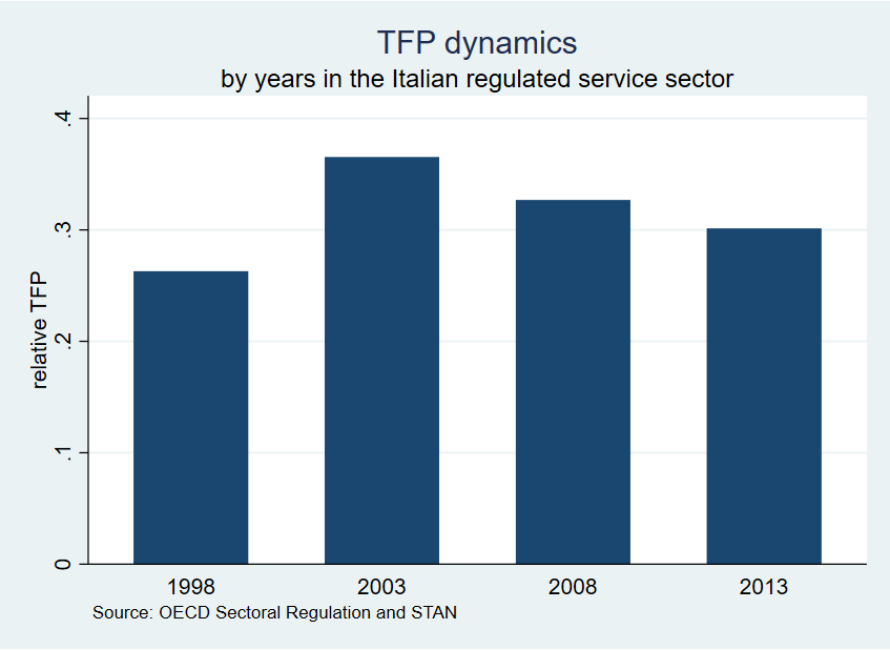
Data source: OECD.

Figure 2: Evolution of Markups



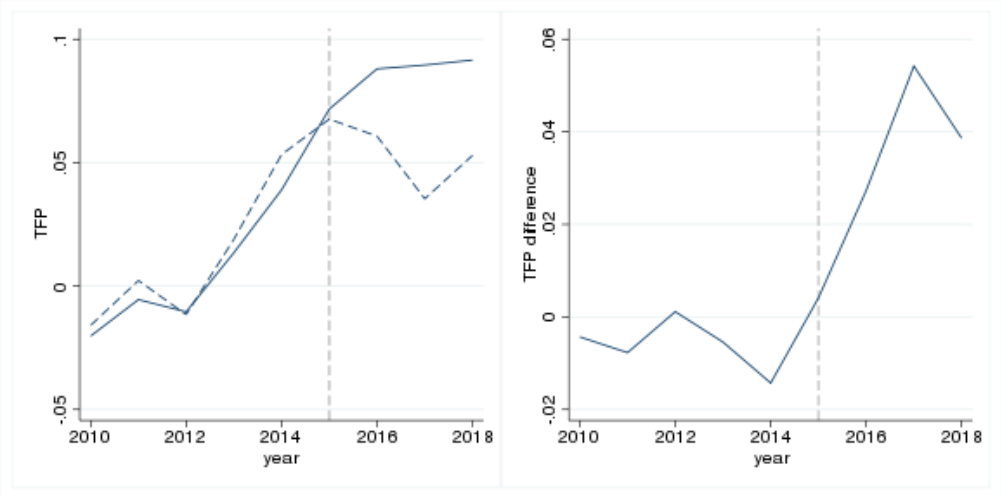
Data source: OECD STAN.

Figure 3: Evolution of Total factor productivity



Data source: OECD STAN.

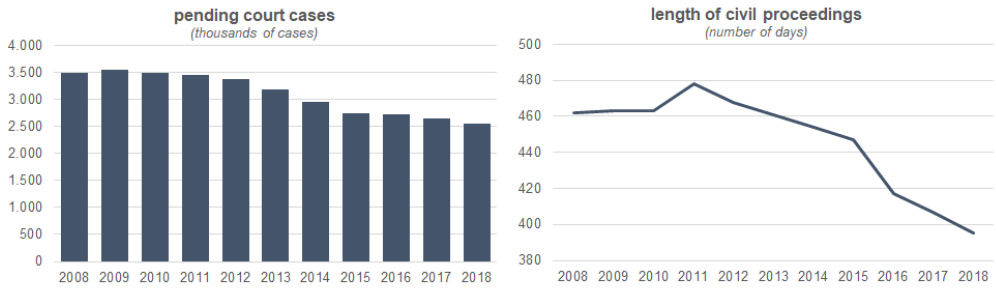
Figure 4: Evolution of the TFP between firms.



The solid (dash) line on the left shows the evolution of the TFP of firms (not) using incentives to innovate in 2016 and 2017; the solid line on the right shows the evolution of the difference in the TFP between the two groups of firms. Control firms are identified through propensity score matching.

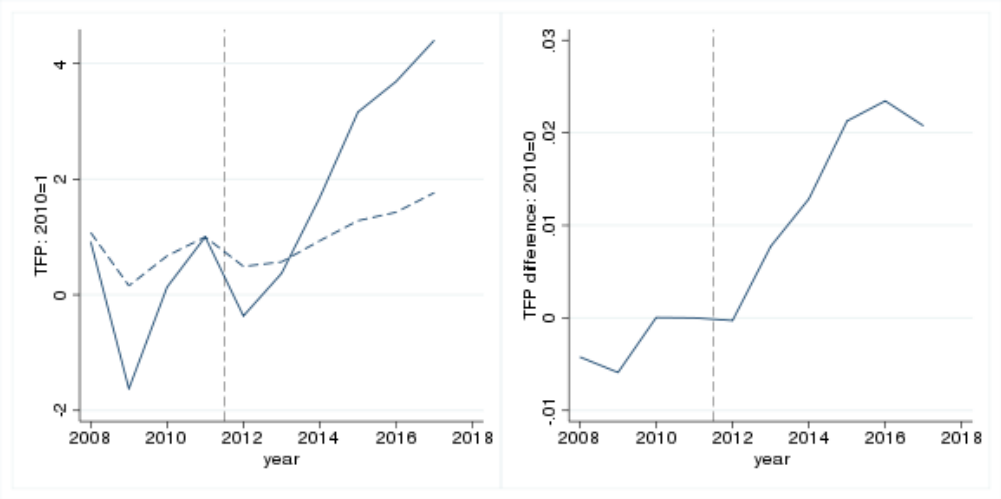
Data source: Invind-Cerved.

Figure 5: Performance of the civil justice system over time



Data source: Ministry of Justice.

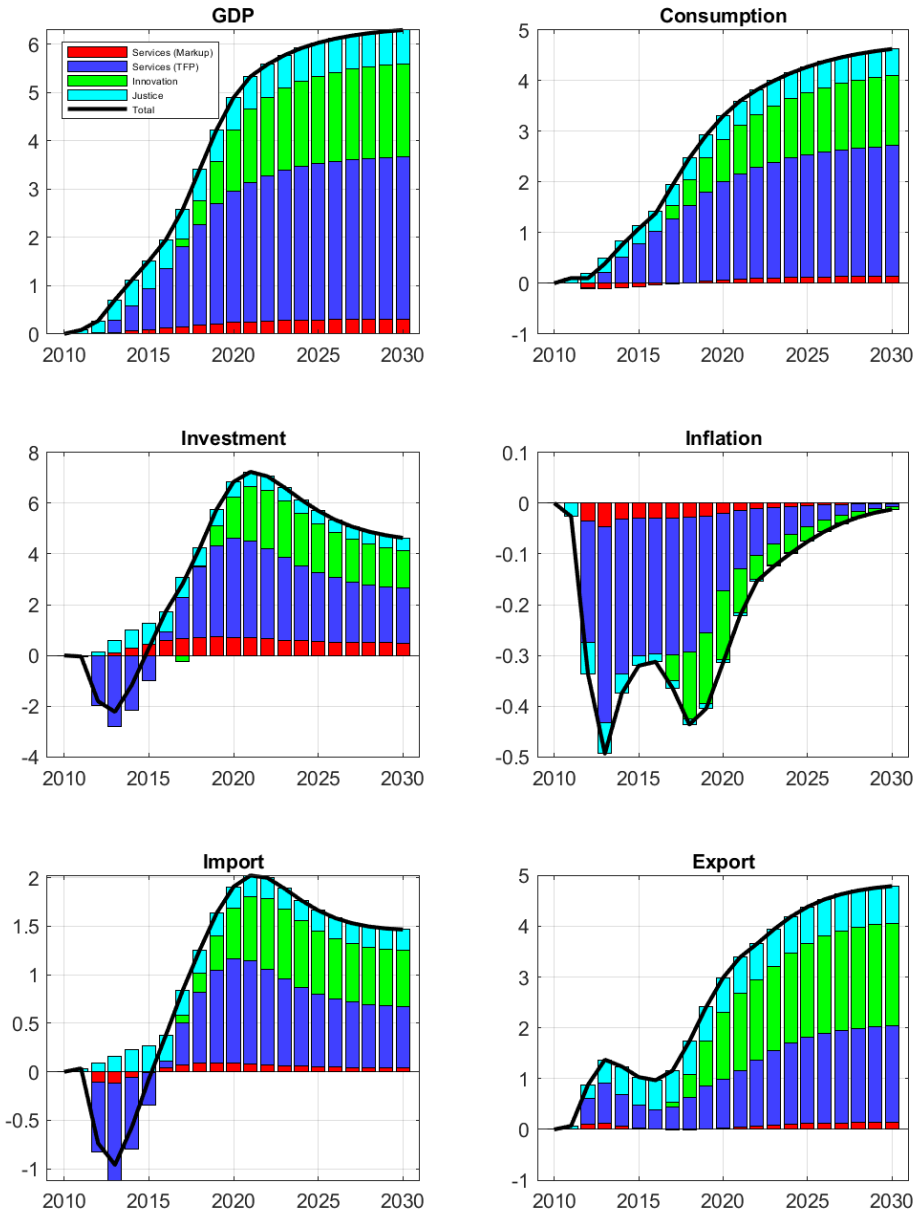
Figure 6: Evolution of the TFP between courts.



The solid (dash) line on the left shows the evolution of the TFP of courts experiencing a larger (lower) decrease of the lengths of civil proceedings, i.e. courts with a reduction above (below) the median; the solid line on the right shows the evolution of the difference in the TFP between the two groups of courts.

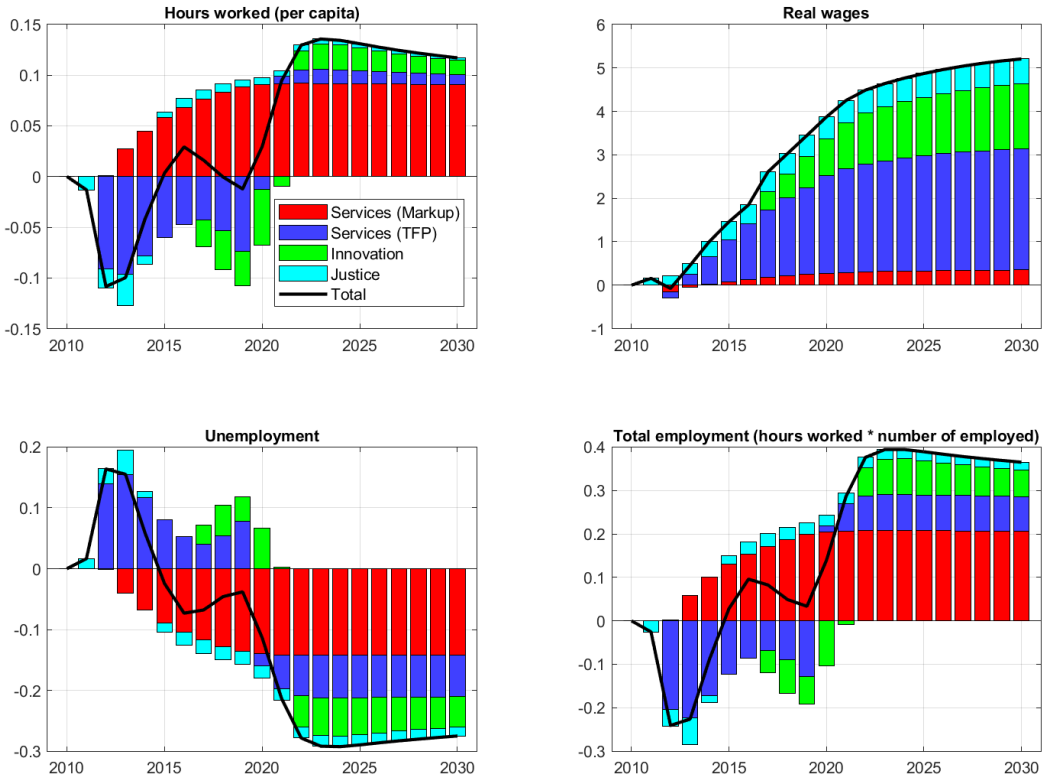
Data source: Cerved and Ministry of Justice.

Figure 7: Macroeconomic effects of the reforms.



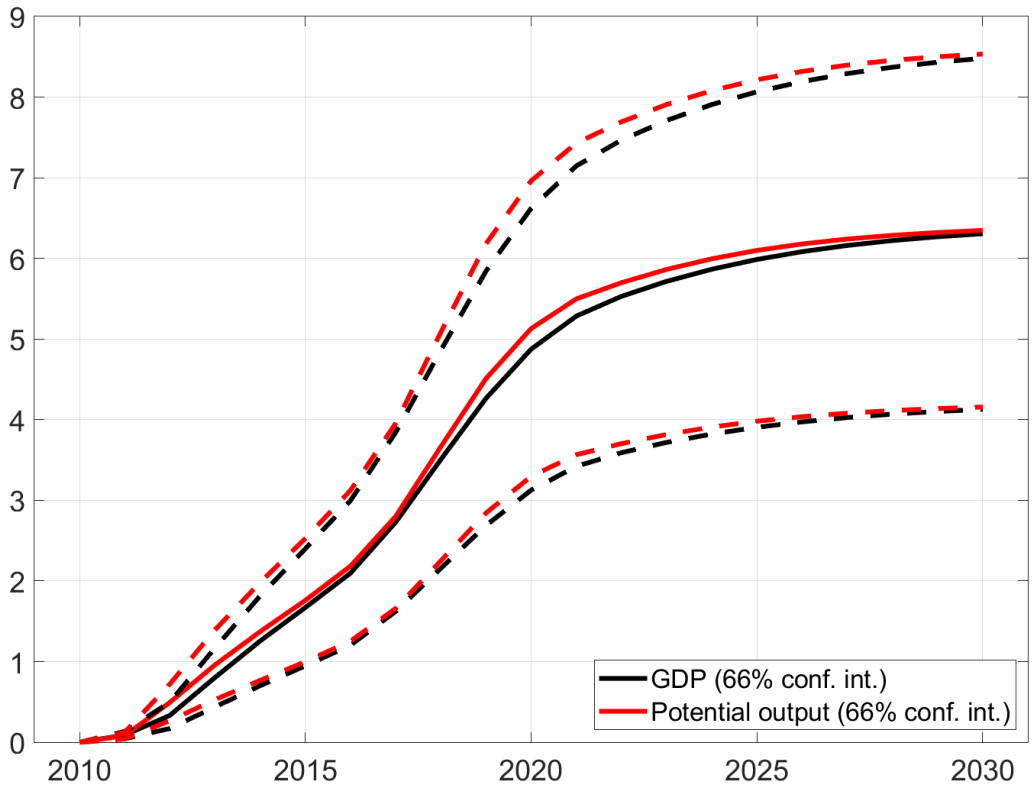
Horizontal axis: years. Vertical axis: % deviations from baseline; for inflation, annualized pp deviations from baseline. GDP and its components are evaluated at constant prices.

Figure 8: Effects of the reforms on labor market.



Horizontal axis: years. Vertical axis: % deviations from baseline; for unemployment, pp deviations from baseline.

Figure 9: Effects of the reforms on potential output.



Horizontal axis: years. Vertical axis: % deviations from baseline.

Table 1: **Data Sources**

Source	**Description**	**Coverage**
OECD	STructural ANalysis database OECD	34 countries, 1998-2013
OECD	Sector Regulation Indicators	34 countries, 7 sectors, 1998-2013
Invind	Bank of Italy survey	firms 20+, 2010-2018
Cerved	Balance-sheet incorporated firms	Universe, 2010-2018
Ministry of Justice	Stock and flows of civil proceedings	Courts, 2010-2018

Table 2: **The effect of liberalizations on markup and TFP**

Dependent variable:	Markup	Markup	TFP	TFP
	I	II	III	IV
Reg	0.010*	0.018***	-0.096**	-0.106***
	(0.006)	(0.008)	(0.004)	(0.004)
Controls	NO	YES	NO	YES
Country FEs	YES	YES	YES	YES
Sector FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES

Standards errors clustered at the country-sector level in parentheses. Markup is proxied by the Lerner index, computed as the ratio between gross operating surplus (corrected for the labor cost of self-employed) and gross output. TFP is the log of TFP as distance from efficient frontier. $^{***}p < 0.01$ $^{**}p < 0.05$, $^{*}p < 0.1$.

Data source: OECD-StaN, OECD Sector Regulation database, 1998-2013.

Table 3: **Incentives to innovation: treated and control firms**

Sample:	Full sample		PSM sample		Difference
	Control	Treated	Control	Treated	in means
	I	II	III	IV	V
Log of employees	4.261	4.684	4.650	4.689	0.038 (0.056)
TFP	-0.083	0.018	0.017	0.019	0.001 (0.015)
TFP growth 2011-2015	0.003	0.020	0.022	0.020	-0.002 (0.004)
% Manufacturing	0.547	0.674	0.655	0.675	0.020 (0.018)
% South	0.389	0.242	0.248	0.241	-0.007 (0.015)

Full sample in the first two columns and PSM sample in the second two columns. The last column shows differences in means (between treated and control units) and a t-test for the PSM sample. $^{***}p < 0.01$ $^{**}p < 0.05$, $^{*}p < 0.1$.

Data source: Invind 2010-2018.

Table 4: **The effect of incentives on TFP**

Dependent variable: TFP				
	I	II	III	IV
I_{it}	0.046***	0.060***	0.070***	0.053***
	(0.008)	(0.012)	(0.015)	(0.016)
Firm FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
Model	DID	DID-PSM	DID-PSM	DID-PSM
Sample	All	All	≤ 50	>50
R-squared	0.709	0.691	0.723	0.696
Number of firms	4,182	4,093	1,669	2,843
% Incentive	0.712	0.712	0.614	0.766
% Compliers	0.230	0.230	0.222	0.235
Observations	35,889	35,583	12,487	22,881

The dependent variable is the total factor productivity at the firm-year level. Compliers are the firm finding the incentives crucial to innovate. Standards errors clustered at the firm level in parentheses. $^{***}p < 0.01$ $^{**}p < 0.05$, $^{*}p < 0.1$.

Data source: Invind 2010-2018.

Table 5: **The effect of civil justice reforms on TFP**

Dependent variable: TFP				
	I	II	III	IV
Length_{it}	-0.034**	-0.036*	-0.034**	-0.036*
	(0.017)	(0.020)	(0.017)	(0.020)
Court FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
Sector composition	NO	NO	YES	YES
R-squared	0.939	0.939	0.939	0.939
Observations	1,155	1,155	1,155	1,155

The dependent variable is the total factor productivity at the court-year level. The key explanatory variable is the log of length of civil proceedings (lagged values in even columns). Standards errors clustered at the court level in parentheses. $^{***}p < 0.01$ $^{**}p < 0.05$, $^{*}p < 0.1$.
Data source: Cerved and Ministry of Justice.

Table 6: **Summary of the estimated effects**

Reform	Shock	Year	Timing
Services liberalization	services TFP: +4.31%	2012	7 years
	markups: -0.72pp	2012	7 years
Innovation	TFP: +1.37%	2017	4 years
Civil justice system	TFP: +0.49%	2011	3 years

Table 7: **Main macroeconomic variables (% of GDP)**

	H	REA	RW
Private consumption	61.2	61.4	61.8
Public consumption	19.0	18.0	18.0
Investment	17.6	17.9	17.6
Imports	28.9	19.1	4.5
Net foreign asset position	0.0	0.0	0.0
Public debt	130.0	90.0	60.0
Consumption tax rate τ^c, τ^{c*}, τ^{c**}	0.18	0.20	0.20
Share of world GDP	3.3	17.5	79.2

Note: H = Home; REA = rest of the euro area; RW = rest of the world.

Table 8: **Parameterisation**

Parameter	H	REA	RW
Discount factor β, β^*, β^{**}	0.9926	0.9926	0.9926
Intertemporal elasticity of substitution $1/\sigma$, $1/\sigma^*$, $1/\sigma^{**}$	1.0	1.0	1.0
Inverse of Frisch elasticity of labor supply τ, τ^*, τ^{**}	2.1	2.1	2.1
Disutility of labor, χ, χ^*, χ^{**}	2.2	2.2	2.2
Habit ς, ς^*, ς^{**}	0.7	0.7	0.7
Depreciation rate of capital δ, δ^*, δ^{**}	0.025	0.025	0.025
Tradable intermediate goods			
Subst. between factors of production $\xi_T, \xi_T^*, \xi_T^{**}$	0.95	0.95	0.95
Bias towards capital $\alpha_T, \alpha_T^*, \alpha_T^{**}$	0.51	0.45	0.52
Non-tradable intermediate goods			
Subst. between factors of production $\xi_N, \xi_N^*, \xi_N^{**}$	0.95	0.95	0.95
Bias towards capital $\alpha_N, \alpha_N^*, \alpha_N^{**}$	0.51	0.45	0.52
Final consumption goods			
Subst. between domestic and imported goods $\phi_A, \phi_A^*, \phi_A^{**}$	1.50	1.50	1.50
Bias towards domestic tradable goods a_H, a_G^*, a_F^{**}	0.55	0.35	0.90
Subst. between tradables and non tradables $\rho_A, \rho_A^*, \rho_A^{**}$	0.50	0.50	0.50
Bias towards tradable goods a_T, a_T^*, a_T^{**}	0.64	0.35	0.35
Final investment goods			
Subst. between domestic and imported goods $\phi_E, \phi_E^*, \phi_E^{**}$	1.50	1.50	1.50
Bias towards domestic tradable goods $\upsilon_H, \upsilon_G^*, \upsilon_F^{**}$	0.55	0.35	0.90
Subst. between tradables and non tradables $\rho_E, \rho_E^*, \rho_E^{**}$	0.50	0.50	0.50
Bias towards tradable goods $\upsilon_T, \upsilon_T^*, \upsilon_T^{**}$	0.75	0.75	0.75

Note: H=Home; REA=rest of the euro area; RW= rest of the world.
"*" refers to REA, "**" to RW.

Table 9: **labor market**

	Home	REA	RW
Matching efficiency, ϕ_{mat}, ϕ^*_{mat}, ϕ^{**}_{mat}	0.50	0.70	0.70
Matching elasticity, μ_{mat}, μ^*_{mat}, μ^{**}_{mat},	0.50	0.50	0.50
Bargaining power, η, η^*, η^{**}	0.50	0.50	0.50
Break-up rate, δ_x, δ^*_x, δ^{**}_x,	0.052	0.060	0.048
Vacancy posting cost, ψ, ψ^*, ψ^{**}	0.70	0.013	0.0001
labor services production elasticity, α, α^*, α^{**}	0.60	0.60	0.60
Unemployment benefits, $uben$, $uben^*$, $uben^{**}$	11.4	0.76	3.23
Replacement ratio, $rrat$, $rrat^*$, $rrat^{**}$	0.65	0.65	0.65
Matching prob., workers, p^W, p^{W*}, p^{W**}	0.45	0.72	0.53
Matching prob., firms, p^F, p^{F*}, p^{F**}	0.56	0.68	0.92
Unemployment rate, un, un^*, un^{**}	10.9	8.1	8.7

Note: REA=rest of EA; RW=rest of world

Table 10: **Gross mark-up (implied elasticity of substitution)**

	H	REA	RW
Tradables	1.20 ($\theta_T = 6$)	1.20 ($\theta^*_T = 6$)	1.20 ($\theta^{**}_T = 6$)
Nontradables	1.30 ($\theta_N = 4.44$)	1.24 ($\theta^*_N = 5.19$)	1.50 ($\theta^{**}_N = 3$)

Note: H = Home; REA = rest of the euro area; RW = rest of the world.

Table 11: **Real and nominal adjustment costs**

Parameter	H	REA	RW
Real adjustment costs			
Investment ϕ_I, ϕ_I^*, ϕ_I^{**}	2.50	2.50	2.50
Adjustment costs on bonds			
Households' private bond positions			
ϕ_{b1}, ϕ_{b1}^{**}	0.01	–	0.01
Nominal adjustment costs			
H produced tradables κ_H, κ_H^* κ_H^{**}	50	50	50
REA produced tradables κ_G, κ_G^* κ_G^{**}	50	50	50
RW produced tradables κ_F, κ_F^* κ_F^{**}	50	50	50
Non-tradables κ_N, κ_N^*, κ_N^{**}	400	400	400
Indexation			
Prices α_P, α_P^*, α_P^{**}	0.5	0.5	0.5

Note: H = Home; REA = rest of the euro area; RW = rest of the world. "* " refers to REA, "** " to RW.

Table 12: **Fiscal and monetary policy rules**

Parameter	H	REA	EA	RW
Fiscal policy rule				
$\phi_1, \phi_1^*, \phi_1^{**}$	1.01	1.01	-	1.01
$\phi_2, \phi_2^*, \phi_2^{**}$	1.01	1.01	-	1.01
Common monetary policy rule	-	-		
Lagged interest rate ρ_R, ρ_R^{**}	-	-	0.87	0.87
Inflation ρ_Π, ρ_Π^{**}	-	-	1.70	1.70
GDP growth $\rho_{GDP}, \rho_{GDP}^{**}$	-	-	0.10	0.10

Note: H = Home; REA = rest of the euro area; EA = euro area; RW = rest of the world. "* " refers to REA, "** " to RW.

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