WORKING PAPER

ECONOMIA PUBBLICA
PUBLIC ECONOMICS

Department of Economics and Law

The macroeconomic impact of structural reforms: The case of Italy
Sara D'Andrea, Silvia D'Andrea, Giovanni Di Bartolomeo, Paolo D'Imperio, Giancarlo Infantino and Mara Meacci

The macroeconomic impact of structural reforms: The case of Italy [*]

Sara D'Andrea[(a)], Silvia D'Andrea[(b)], Giovanni Di Bartolomeo[(c)], Paolo D'Imperio[(b)], Giancarlo Infantino[(b)], Mara Meacci[(d)]

February 2024

Abstract. We propose a methodology to map structural reforms from granular data to an aggregate model, exploring their transmission mechanisms and their macroeconomic and social impacts. The study focuses on the rich case of the reforms associated with the Italian Recovery and Resilience Plan (RRP). We document a significant potential impact on medium- and long-term GDP and find that the labour market and education measures are the main drivers of the impact on GDP and employment. We also examine the reform distributional effects on the functional income distribution.

Keywords: Fiscal structural policies, government efficiency, potential output, functional income distribution.
JEL Classification: C54, E62, E65, F54, F47.

1. Introduction

Assessing the social and macroeconomic impact of structural reforms is a challenging task, especially when the reforms result from a complex set of heterogeneous and interrelated policy measures. This paper proposes a methodology to address this issue using the Italian Recovery and Resilience Plan (RRP) as a case study. From our point of view, the Italian case is attractive because the plan contains several heterogeneous policy measures grouped into a set of structural reforms. A further reason for interest is the size of the Italian Plan: in absolute terms,

with an overall allocation of 191.5 billion euros[1], Italy is the largest beneficiary of the European funds provided under the Recovery and Resilience Facility (RRF).

The Plan consists of massive public investment and reform packages to address the main structural weaknesses of the Italian economy.

We provide a model-based assessment of the macroeconomic impact of the structural reforms based on the RRP approved in 2021.[2] We group structural policy measures into five reform areas: i) Public Administration; ii) Justice; iii) Competition (including the reform of the public procurement system); iv) Education and research; v) Labour market and training.

The assessment is based on granular information contained in the official documents. The Plan implementation is supported by detailed monitoring and reporting mechanisms, defined in terms of time milestones and targets (M&Ts). Accordingly, we examined and catalogued detailed data from 482 milestones and 665 policy targets linked to measures described in the RRP Council Implementing Decision (CID) and related documents (European Council, 2021). This information is then used to map the selected structural reforms in our model and assess the impact of these measures, considering their direct and indirect effects over time.

Our methodology consists of three different approaches to map reforms in the model. First, we attempt to assign the reform targets and timing (M&Ts) directly to the model parameters. When a direct association is not possible, we use some indirect methods. Specifically, as a second option, we use a benchmarking approach to calibrate the shock size so as to align Italy with the best performers in a specific reform area. Finally, when the benchmarking solution is not feasible, we employ the results from empirical studies to translate the quantitative indicators derived from M&Ts into changes in the model parameters (judgemental approach). Once the policy measures are mapped, the assessments are carried out using the Italian version of the QUEST R&D DSGE model developed by the European Commission.

We examine whether the measures were effective in achieving the objectives for which they were designed, obtaining a quantitative assessment of their impact on selected macroeconomic variables and uncovering the transmission mechanisms and possible policy trade-offs. Our main findings document that the structural measures analysed have a

---

[1] This amount refers to the version of the Plan prior to the inclusion of the RePowerEU instrument. In the new version, the Italian RRP amounts to 194,4 billion euros.

[2] Note that the introduction of the RePowerEU in 2023 has not modified the main targets of the reforms analysed.

significant impact on GDP in the medium and long term. It must be noted that the implementation of each reform is strictly linked to its timing and expected efficiency. At the end of the Plan, in 2026, GDP would be 3.4% higher than in the alternative scenario where no reform is implemented. However, the full impact of the reforms emerges in the long run. In 2050, the additional effect on GDP would be around 10%. The labour market and education measures are the main drivers of the impact of the overall reform package on GDP, especially those aimed at increasing labour market participation and improving the skills of the workforce.

Regarding the impact on other macroeconomic variables, the demand components roughly follow the GDP dynamics, except for a limited initial crowding out of private investments due to the expectations of productivity increases that cause investment postponements. In the long run, investments, consumption, and exports grow proportionally to GDP. Prices decrease as the structural reforms operate as a positive supply shock. In the long run, productivity increases lead to a rise in the average real wage of about 6%, while labour market reforms increase employment by about 4%. The social impact assessment suggests that, thanks to the increase in GDP, both wage and profit earners would be better off after the implementation of the structural reforms.

Our study fills a number of gaps in the literature. Although several works now assess the macroeconomic impact of the Next Generation EU (NGEU) by a model-based approach (Bańkowski *et al*., 2021; Pfeiffer *et al*., 2022, 2023; Di Bartolomeo and D'Imperio, 2022; Freier *et al*., 2022), their analysis is limited to the effects of public expenditures, without a detailed examination of the impact of the associated structural reforms.[3] To the best of our knowledge, the only exception is the study of Falavigna and Ippoliti (2021), which focuses on the potential efficiency gains of the judicial system offered by the reforms in the Italian RRP. In this respect, our paper complements their assessment. Of course, our paper is also related to the literature that evaluates the macro effects of stylised structural reforms.[4]

The rest of the paper is organised as follows. The next section outlines the methodology used. Section 3 explains the mapping of reform targets onto the model. Section 4 presents the main results. Section 5 assesses the social impact of the reforms. Section 6 concludes.

---

[3] The role of structural reforms within the Next generation EU is however discussed in Corti and Núñez Ferrer (2021) and Freier *et al*. (2022).

[4] See Anderson *et al*. (2014), Roeger *et al*. (2008), D'Auria *et al*. (2009), and Campos *et al*. (2020).

2. Methodology

The macroeconomic impact of the reforms is investigated via a model-based assessment. Structural reforms are mapped onto changes in structural parameters of the QUEST-III R&D general economic equilibrium model.[5] Our approach provides information about the reforms' long-run outcomes, transmission mechanisms, and transition dynamics. It naturally accounts for structural reforms' static and dynamic impacts and direct and indirect effects.[6]

The main challenge of model-based evaluation is to, first, measure the expected impact of a complex set of structural policies using a synthetic indicator, and next to incorporate variations of this indicator into the model. Three alternative approaches are used to deal with the first issue.

The first strategy is a "bottom-up approach". The measures are translated into a synthetic indicator exploiting the explicit targets associated in the official documents to each specific reform. For example, the Justice reform foresees a certain reduction in the length of civil and criminal proceedings, which we use as the synthetic indicator for this area of reform.

The normative contents of structural reforms, however, do not always provide targets suitable for the simulations. A top-down approach (the "benchmarking" strategy) can be used in this case. That is, we consider a set of comparable economies and define structural reforms as changes in structural indicators to close (all or a part of) the gap with the best-performing economies (alternatively, it is possible to consider closing a gap to an efficient frontier).[7]

Finally, when information to identify numerical targets or cross-country data to assess the gap between the economy under analysis and a benchmark is unavailable, we assume a target based on a subjective and conservative assessment of the reform, based on the qualitative information from the documents (the "judgemental" strategy).[8]

The bottom-up strategy is our preferred choice, as it uses official numerical targets to map the reforms, thus minimising the level of discretion of the proposed exercise. The best alternative is the top-down strategy, when direct or indirect reform mapping from the

---

[5] The QUEST-III R&D model has been developed at the European Commission Directorate General for Economic and Financial Affairs (DG ECFIN). We used the large-scale multi-country R&D version calibrated and routinely updated by DG ECFIN for the Italian economy. See D'Auria *et al.* (2009) and Roeger *et al.* (2022).

[6] As pointed out by Christiano *et al.* (2018), notwithstanding some limitations, DSGE models are the leading tool for making such kinds of assessments openly and transparently.

[7] See, among others, D'Auria *et al.* (2009) and Roeger *et al.* (2008, 2021).

[8] See, e.g., Annicchiarico *et al.* (2013, 2015).

documents is impossible. We adopt the third strategy (i.e. judgmental) only as a residual option when it is not possible to use the previous two.[9]

Moving on to the mapping of the synthetic indicator variation into the model, there are two possible cases. The simplest is when the synthetic indicator is an (exogenous) variable in the model. In this case, the expected improvements in the indicator due to the reforms can be mapped directly as an exogenous innovation in the model. In several cases, however, micro-econometric evidence is adopted to mediate the mapping between the synthetic indicator and the model parameters. For example, a competition reform can be expected to impact a specific market-competitiveness indicator linked to price markups, a parameter of the model. While the impact of the reform on the indicator can be evaluated using normative information, the elasticity between the competitiveness indicator and the structural parameter of the model needs to be based on external econometric studies.[10]

It is important to stress that mapping the reforms is subject to significant uncertainty. Therefore, we construct an "uncertainty interval" around our simulations, representing the uncertainty linked to our assumptions. Starting from a conservative (baseline) scenario about the effectiveness of the structural measures, we consider the possibility that structural policies may achieve their targets to different degrees. A mapping based on more optimistic values is used in the high-impact scenario to achieve the predetermined targets. In contrast, the low-impact scenario considers the achievement of minimum objectives.

Finally, we would like to emphasise the transparency, scalability, and comparability of our results. The first is guaranteed by associating the official and publicly available M&T of the reforms to well-defined parameters into the model. The second follows from the fact that we use a DSGE model available not only for Italy but also for the other EU economies. This ensures that our approach can be used to compare the effects of reforms across countries and that it can be adapted to analyse different structural policy measures in all members of the EU from the same methodological angle.

---

[9] It is important to stress that the first and second approaches also require increasing levels of discretion, e.g., in the choice of the exogenous variables for the simulation and the selection of the benchmark.

[10] See, among others, European Commission (2016), Pfeiffer *et al.* (2020, 2022), Di Bartolomeo and D'Imperio (2022), and Di Bartolomeo *et al.* (2022). Moreover, a detailed description of the model used for the simulations can be found in the working paper version of this paper (D'Andrea *et al.*, 2023).

3. Mapping the structural reforms

The 2021 Italian RRP contains 150 investment and 66 reform items, which should be completed following a detailed time path described in 482 milestones and 665 policy targets (European Commission, 2021).[11] We use this information to map the reforms into the model. The baseline mappings and the high and low-impact scenarios serving as upper and lower bounds for our assessments are described in the following subsections.[12]

3.1 Public Administration

The PA reform can be decomposed into three lines of action: i) increasing efficiency, ii) reducing bureaucratic costs, and iii) improving the level of human capital in PA.

Actions aimed at increasing efficiency are mapped into the model following Giordano *et al*. (2020), who investigate the effect of public sector efficiency on firm productivity. They find that closing the public sector efficiency gap would increase output by 3% on average. Accordingly, the increase in output is simulated through a positive exogenous shock to aggregate TFP.[13] Ideally, a precise mapping would require a reform target based on the distance from the efficient frontier. However, this specific information is not available in M&Ts. Therefore, in the baseline scenario, we simulate what we arguably consider a conservative goal: a reduction in the gap with respect to the efficient frontier equal to one-third. In the high-impact and low-impact scenarios, we assume the closure of 2/3 and 1/6 of the gap, respectively.

The decrease in bureaucratic costs is mapped onto the model through reductions in administrative costs and entry fees in the intermediate and final sectors (Roeger *et al*., 2008; D'Auria *et al*., 2009). Again, we simulate a conservative target, namely a gradual decrease in these costs by 10%. In the high-impact and low-impact scenarios, we assume a reduction of these costs by 20 and 5%, respectively.

Simplification is one of the goals of the PA reform, based on a solid expansion of digital services in identity, authentication, healthcare, and justice. In the Plan, this goal is marked "de-bureaucratisation", designed to reduce costs and time wasted by businesses and

---

[11] The Plan was revised and updated in 2023 to introduce a REPowerEU. However, the revision has not changed either the main goals or the scopes of the reforms analysed. Hence, throughout the article, we refer to the RRP version approved in 2021, that does not yet include the RePowerEU and other revisions.

[12] A complete description of M&Ts considered for each area of reform is reported and documented in the working paper version of this article (see Appendix D and B in D'andrea et al., 2023).

[13] See Rios and Gianmoena (2020) for an in-depth analysis on the links between quality of government and regional resilience patterns in Europe.

citizens. However, measures related to PA digitisation can be considered as already captured through the previous two line of actions (increasing efficiency, reducing bureaucratic costs).

Finally, we simulate the measure designed to improve the quality of human capital. The reform provides that 525,000 public employees will earn a tertiary degree between 2024 and 2026. The target is mapped into the model by shifting employees inside the medium-skilled group from high-school graduates to tertiary graduates. This move proportionally improves the average efficiency of the medium-skilled group. In the low-impact scenario, we assume that only half of the targeted PA employees (262,500) obtain a degree. No alternative assumptions are used in the best-case scenario for this measure.

Regarding the timing, based on the information reported in the M&Ts, the first two lines of action are assumed to reach full implementation in ten and five years, respectively. The third line of action is assumed to have its first effects on the economy starting in 2024. The timeline is chosen considering that the first public employees should start training in 2021 and that the first graduation will be obtained after three years. The end date (2026) is also consistent with what is reported in M&Ts.

Our mapping is summarised in Table 1. The first column shows the lines of action of the reform area. The second and third column report, respectively, the synthetic indicator chosen to measure the improvements of each line of action and its expected variation in the alternative scenarios. The mapping column ("Map") refers to the previously described methodology to quantify the variation of each synthetic indicator: Bottom-Up (BU), Benchmarking (B), and Judgmental (J). "Model variable" refers to the model's variable that is shocked to simulate the variation of each synthetic indicator. Whenever the indicator and the model's variable do not correspond, external econometric studies or auxiliary calculations have been used to translate the change in the indicator into shocks to the model variables (e.g., from the efficient frontier gap reduction to the positive shock on TFP).

Table 1 – Public Administration mapping.

Line of action	Indicator	Indicator Variation			Timing		Model Variable	Map
		Low	Baseline	High	Start	End		
Efficiency	Efficient frontier gap	-15%	-30%	-60%	2022:Q2	2032:Q1	TFP	B
Bureaucratic cost	Entry costs	-5%	-10%	-20%	2022:Q2	2027:Q1	Entry costs	J
	Overhead costs	-5%	-10%	-20%	2022:Q2	2027:Q1	Overhead costs	

| Human capital | Tertiary graduates | +262,500 | +525,000 | +525,000 | 2024:Q1 | 2026:Q4 | Efficiency medium-skilled | BU |

Notes: Bottom-Up (BU), Benchmarking (B), and Judgemental (J).

3.2 Justice

The main goal of the justice reform is to improve the efficiency of the judicial system. Two explicit and measurable targets are envisioned in the RRP, i.e., a reduction in the length of civil proceedings and criminal trials by 40% and 25%, respectively, compared to the figures recorded in 2019.[14]

The length of proceedings is captured by the so-called disposition time, defined as the ratio between pending and resolved cases each year, where *pending cases* are the unresolved cases on 31 December, while *resolved cases* are finalised within the same year. The ratio is annualised by multiplying it by 365. The reduction in the disposition time is mapped into QUEST by exploiting the results reported by Ciapanna *et al.* (2023), who estimate the elasticity between the duration of civil proceedings and TFP. They find that decreasing the length of civil proceedings by one per cent increases TFP by 0.03%.[15] We exploit this elasticity for the civil proceedings, assuming that a 1% reduction in criminal trial length would increase TFP by 0.01%.[16]

The full achievement of M&Ts would thus imply a TFP increase of 1.45%. We use this value to simulate the reforms in the high-impact scenario, while in the baseline we halve the impact to 0.72%. The rationale for our conservative stance is twofold. First, the expected additional reduction might have a lower impact on TFP because of likely non-linearities. Second, it can not be excluded that reforms introduced before the RRP are still unfolding their effects (the length of proceedings was already decreasing before the introduction of the RRP, i.e., a reduction of 15 % between 2010 and 2018). In the low-impact scenario, the increase in TFP is assumed to be 0.36% (half of the baseline).

The reform is considered to start affecting the economy in the second quarter of 2022,

---

[14] The official targets for this reform also include a reduction in the backlog that we indirectly take into consideration when looking at the reduction in the length of trials.

[15] An alternative approach would assume that the impact on the economy is transmitted through more contestable markets and higher domestic and international investments because of the reduction in their returns. See European Commission (2014).

[16] Although discretional, the assumption is coherent with the fact that criminal proceedings are close to one-third of civil ones.

i.e. when, according to M&Ts, the first measures would have their initial impact on the efficiency of the judicial system. The end date is aligned with the reform targets. According to these, the length of the proceedings should be reduced by the end of 2026.

The Justice mapping is summarised in Table 2. As previously noted, in the baseline scenario, we are considering a reduction in the length of civil proceedings and criminal trials equal to 20% and 12.5%, respectively. Both lines of action are simulated coherently with the bottom-up approach.

Table 2 – Justice mapping.

Line of action	Indicator	Indicator Variation			Timing		Model Variable	Map
		Low	Baseline	High	Start	End		
Civil proceedings	Length	-10%	-20%	-40%	2022:Q2	2027:Q1	TFP	BU
Criminal trials	Length	-6.3%	-12.5%	-25%	2022:Q2	2027:Q1	TFP	BU

Notes: Bottom-Up (BU), Benchmarking (B), and Judgemental (J).

3.3 The reform of competition and of the procurement system

The competition reform is analysed in conjunction with the procurement system reform, since the latter also has the potential to increase competition. The impact of pro-competition interventions is simulated considering a measure of the impact that the reform will have on the OECD PMR index, which measures pro-competition regulation in the markets for goods and services (Vitale *et al*., 2020). According to OECD (2022), the changes in regulation provided by the Italian RRP would only improve Italy's score in rail transport from 3.29 to 2.86. The improvement translates into a reduction of the total transport sector's indicator from 1.33 to 1.22 (−8%).[17] According to Canton and Thum-Thysen (2015), the elasticity of the price markup to the transport network PMR index is equal to 0.013. The reduction in the PMR sub-index would thus be reflected in a 0.11 percentage point decrease in the final goods sector markup. In the low-impact scenario, we halve the improvement of the PMR to 4%.[18]

---

[17] In the Transport Sector, Italy has the third best PMR index among the OECD countries, following the United Kingdom and Iceland. Regulation changes are also expected to marginally decrease the Italian score in the "Barriers in Network Sectors" PMR indicator from 0.97 to 0.94.

[18] The annual competition law also fosters competition in the retail electricity market. However, Italy already reaches the maximum score in the retail price regulation in the electricity sector.

Regarding public procurement, policy interventions are mapped following Belhocine and Jirasavetakul (2020), who employ the public procurement performance indicator of the Single Market Scoreboard (SMS) developed by the European Commission to measure the procurement system's quality. The performance is measured according to a threshold calculated for each sub-indicator. In the case of the procurement system, the analysis of the normative measures contained in the RRP is expected to improve SMS sub-indicator 6, 'decision speed,' which reflects the speed of the public-buyer decision-making process, measuring the time between the deadline for receiving offers and the date the contract is awarded. According to the latest data, Italy's score is −1 since the decision time is longer than the threshold of 120 days. The draft legislation envisages reaching a decision time of 100 days, allowing Italy to score a +1 in this sub-indicator. Consequently, it would result in an improvement of the overall indicator from −3.33 to −1.33.

According to Belhocine and Jirasavetakul (2020), improvements in the scoreboard are also accompanied by an increase in the share of public investment to GDP. They estimate that a one-point increase in the scoreboard would trigger an increase in public investment between 0.04 and 0.07%. For the baseline scenario, we thus use their lowest estimated value (0.04), simulating an increase in the share of public investment equal to 0.08%. An equivalent reduction of current public expenditures accompanies the latter to obtain a neutral effect on the public deficit. In the best-case scenario, we use the upper-bound elasticity value (0.07), leading to an increase in public investments of 0.14%.[19] In the low-impact scenario, we halve the elasticity used in the baseline scenario, producing a change in public investments equal to 0.04%.

The actions related to the procurement system (?) are assumed to start affecting the economy in the second quarter of 2022 and in the first quarter of 2023, while measures related to competition should be adopted at the beginning of 2023 and completed by 2026. We set the end date accordingly.

Our mapping is summarised in Table 3. We consider the simulation strategies of both lines of action as bottom-up. The M&Ts, in fact, provide enough information to quantify the impact of the structural measures on the two synthetic indicators (PMR and SMS).

---

[19] Or equivalently, keeping constant the elasticity (0.04), in the high-impact scenario, the SMS would increase by 3.5 points and in the low-impact scenario by 1 point, as reported in Table 3.

Table 3 - Competition and procurement system mapping.

Line of action	Indicator	Indicator Variation			Timing		Model Variable	Map
		Low	Baseline	High	Start	End		
Competition	PMR Transport	-4%	-8%	-8%	2023:Q1	2027:Q4	Markup	BU
Simplification	Single-Market-Scoreboard	+1	+2	+3.5	2022:Q2	2027:Q1	Public Investment/ Consumption	BU

Notes: Bottom-Up (BU), Benchmarking (B), and Judgemental (J).

3.4 Education and research

The reform aims to improve the entire educational system, from nursery schools to universities and research. The relevant measures for the simulations can be summarised in three lines of action: (i) reduction of school dropout, (ii) improvements in the composition of human capital, and (iii) improvements in the quality of education.

The main target associated with the first line of action is a reduction in the school dropout rate from 13.5 to 10.2% between 2019 and 2024, equivalent to a decrease of early leaving individuals from 538,300 to 386,000 (Eurostat data).[20] The observed dropout has a decreasing trend because of previous measures; therefore, we implement the effects of the reform target by accounting for its observed dynamics. Without the introduction of the reform, the target (10.2%) would be reached in 2027. In implementing the reform, we assume that the fall in dropout rates will speed up, reaching the target by 2024. After 2027, the dropout rate will stabilise at 10.2%.[21] The reform actions imply, on average, 27,000 fewer early leavers per year up to 2027. The latter is mapped into the model assuming that those who do not drop out will obtain a high-school or tertiary-level education. Our assumption implies a reduction in the low-skilled share of the labour force and an equivalent increase in the share of the medium-skilled.

The second line of action foresees several measures enhancing human capital composition. First, it envisions investments in the tertiary vocational education system to enrol 11,000 additional individuals. Second, it foresees 80,000 additional college scholarships. Both measures imply a gradual shift from high school to tertiary graduates,

---

[20] Dropout rate is the share of early leavers from education and training. Early leavers are individuals aged 18-24 with, at most, a lower secondary level of educational attainment (ISCED 0-2) not engaged in further education and training in the four weeks preceding the survey.

[21] Detail of our assumptions are provided in the working paper version of this article (D'Andrea *et al*., 2023).

which can be mapped into the model by increasing the average efficiency of the medium-skilled category. Third, 23,144 PhD grants will be awarded; those are translated into the model as a shift from the medium-skilled group to the high-skilled group. Overall, this line of action entails a reduction of 91,000 individuals in the low-skilled category and an increase of 67,856 and 23,144 individuals in the medium and high-skilled groups, respectively.

The third line of action includes measures designed to improve the quality of the education system, such as improving school facilities, the quality of training, and continuing education programs for teachers and school deans. The mapping into the model is based on Égert *et al.* (2022), who estimate the elasticity of total factor productivity to the PISA test scores as a proxy for the quality of education. Adopting a benchmarking approach, we assume that the planned measures will raise the score of the Italian PISA test to match the average of the three best European performances (from 487 to 519 points). Using the elasticities estimated by Égert *et al.* (2022), i.e., 0.8, we compute a 5.3% increase in TFP.[22]

To test the sensitivity of our results, we explored two alternative scenarios. In the high-impact scenario, we assume that the PISA score aligns with the best European performer (Estonia, 523 points), leading to an increase in TFP of 5.9% instead of 5.3%. In the low-impact scenario, the number of individuals obtaining the various qualifications considered in the first and second components is halved. Moreover, the domestic PISA score aligns with the EU average (497 points). The reform-induced change in aggregate productivity would then be equal to 1.6%.

Measures to reduce school dropouts have started in 2021. Additional high-school diplomas have thus be obtained starting in 2022. The effect is assumed to last up to the end of 2027. The timing of the actions related to human capital composition is based on i) the official starting period of each measure as reported in the M&Ts and ii) the required years to obtain each degree. The measures aiming at improving the quality of education are considered to impact the stock of human capital in fifty years. A long period is required for the new graduates to gradually substitute the current labour force.[23]

Our mapping is summarised in Table 4.

---

[22] The elasticity used is the product between the elasticity of the stock of human capital index to the increase in PISA scores (0.278) and the one between human capital and the TFP (2.84). See Égert *et al.* (2022: Table 8).

[23] As also observed by Égert et al. (2022).

Table 4 – Education and research mapping.

Line of action	Indicator	Indicator Variation			Timing		Model Variable	Map
		Low	Baseline	High	Start	End		
School dropout	Annual dropout	-13,000	-27,000	-27,000	2022:Q1	2027:Q4	Share of low-skilled	BU
Human capital composition	Tertiary graduates	+33,928	+67,856	+67,856	2024:Q1	2029:Q4	Share of medium-skilled	BU
	Researchers	+11,572	+23,144	+23,144	2025:Q1	2028:Q4	Share of high-skilled	BU
Quality of education	PISA scores	+2.1%	+6.6%	+7.4%	2022:Q1	2070:Q1	TFP	B

Notes: Bottom-Up (BU), Benchmarking (B), and Judgemental (J).

4.5 Labour market and training

In 2019 Italy's activity rate was 65.7% against an EU average of 73.4%. The gap was even wider for women and young people participation rates. The reform aims at increasing participation in the labour market through three lines of action: (i) the upskilling and reskilling of inactive and unemployed individuals; (ii) encouraging greater female participation; (iii) improving the demand and supply matching efficiency.

Concerning the first line of action, the RRP introduces the so-called Employability Guarantee of Workers (*Garanzia di occupabilità dei lavoratori*, GOL), a program aimed at skilling, upskilling, and reskilling at least 2.6M inactive and unemployed individuals by the end of 2026. According to the RRP, over the 2022-2026 period, 3M inactive and unemployed individuals will be involved in the GOL program.[24] Based on a conservative hypothesis, we assume that 500,000 individuals will join the labour force, that is, a 3.3% increase in the labour force, which is mapped into the model by reducing the inactivity rates.[25]

The second line of action refers to female participation. It can be summarized in two measures: a) support for female entrepreneurship; b) support for female participation through early childhood education and care services. Female entrepreneurship is encouraged through venture capital operations and technical-management support. Moreover, M&T foresees that at least 1,000 companies will obtain gender equality certification. Other

---

[24] Among these, 75% (about 2M) should be women, long-term unemployed, disabled, under 30, or over 55 workers. The GOL also envisages that 800,000 people will be involved in vocational training programs. The number of eligible individuals to the GOL equals 11.2M.

[25] Calibrations are based on Eurostat data on the actual composition of the labour force.

RRP interventions also aim to boost female participation rates (MEF, 2021, for details). Without an explicit target, we assume these interventions will close one-tenth of the gap between the observed Italian female activity rate and the average of the best three European performers. The gap closure corresponds to about 220,000 additional women in the labour force, which translates into a proportionate reduction in the share of inactive individuals. The RRP's goal to boost female participation includes creating 264,500 new early childhood education and care slots for children aged 0-6. Based on Thévenon (2013) and considering the Italian fertility rate, 213,000 women could benefit from these facilities. Focusing on those currently inactive but willing to work, which is 12.1% of the female population according to ISTAT, we projected that approximately 25,750 additional women could enter the labour force.[26]

The third line of action is expected to improve the matching between the demand and supply of labour through training programs for the inactive and the unemployed (second line of intervention). To map the improvement of the search and matching in the labour market, we assume a 10% increase in the marginal cost of searching for a job, a value that we deem conservative.[27]

To sum up, our mapping implies that: (i) 0.5 million individuals involved in the GOL program would enter the labour force; (ii) the gap in the female activity rate with the top 3 European performers is closed by 1/10; (iii) 25,750 additional mothers could enter the labour force, taking advantage of childcare services; (iv) the marginal cost of searching for a job increase by 10%. Alternative high and low scenarios are built by doubling and halving the previous shocks, except for the measures related to childcare services, which are halved in the low and kept constant in the high scenario, given that we consider the increase of 25,750 women in the labour force already as an upper bound.

Regarding the timing of each line of action, the GOL program is expected to impact the economy and increase the labour force levels starting in the third quarter of 2022. The latter considers that, according to the M&Ts, the GOL program should affect the first group of inactive individuals by that date. Regarding female labour participation,

---

[26] Dividing the additional positions in early childhood education and care services (264,500) for the fertility rate (1.24), we estimate that 213,000 women can take advantage of additional facilities. As currently inactive but willing-to-work women are 12.1%, 25,750 follows.

[27] We approximate search and matching effects in QUEST using the job search costs. The results from this approach align with those obtained using a DSGE model with fully-fledged search-matching labour market dynamics.

new places in kindergartens should be ready by the beginning of 2024, while the reduction in the gap vis-à-vis the best EU performers and the improvements in the labour market search and matching are assumed to take ten years.

Our mapping is summarised in Table 5.

Table 5 - Labour market policies and training mapping.

Line of action	Indicator	Indicator Variation			Timing		Model Variable	Map
		Low	Baseline	High	Start	End		
GOL program	Inactive people	-0.25M	-0.5M	-1M	2022:Q3	2026:Q4	Non-part. rate	BU
Female participation	Three best EU performer gap	-5%	-10%	-20%	2023:Q1	2032:Q4	Non-part. rate	B
	Active female	12,870	25,750	25,750	2024:Q1	2026:Q1	Non-part. rate	BU
Search and Matching	Matching efficiency	+5%	+10%	+20%	2022:Q2	2031:Q4	Cost of search	J

Notes: Bottom-Up (BU), Benchmarking (B), and Judgemental (J).

4. Simulation results

Structural reforms have a significant impact on GDP both in the medium and long term. Our assessment is reported in Figure 1, which presents the transition dynamics of the reforms for selected macroeconomic variables (GDP and its main components, as well as the GDP deflator). The outcomes are percentage deviations from a no-reform (steady-state) scenario. The figure presents a reform-decomposition analysis, i.e., we provide information about the relative contribution of each reform to the change observed in the macroeconomic variables considered.

At the end of the Plan, in 2026, GDP would already be 3.4% higher than in the no-reform scenario. In the long run (2050), GDP would be around 10% higher compared to the no-reform scenario. According to our decomposition, the reform with the highest impact in terms of additional GDP is the labour market reform. A significant impact on GDP also stems from Education and PA reforms, followed by Justice and Competition and public procurement reform.

These results are not surprising, given that the policy measures associated with the labour market mainly deal with one of the main structural weaknesses of the Italian economy, namely the low participation rates, which compresses potential output. Instead, the low impact associated with the competition measures depends on the past positive performance, i.e., past-

implemented reforms have successfully reduced the room for further significant improvements in this intervention area. Finally, it is worth mentioning that the evaluation of the other measures has been remarkably conservative.[28]

Figure 1: Macroeconomic impact of the structural reforms – Baseline scenario.
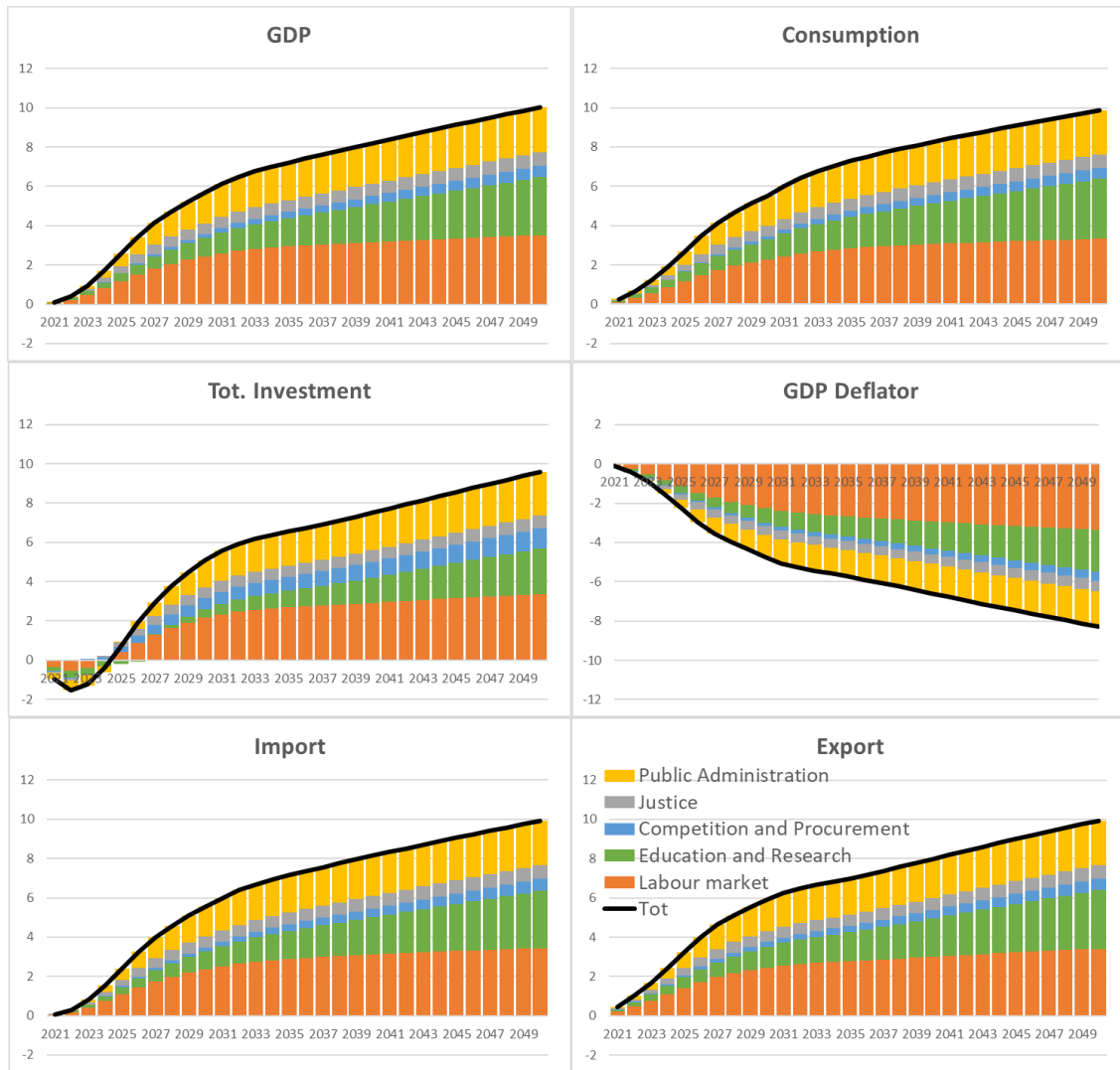
Notes: The figure shows the impact of structural reforms on selected macroeconomic variables in percentage deviations from a no-policy scenario. GDP and its components are expressed in real terms. The figure disentangles the effects of the different reforms.

The impact on aggregate investment and consumption is proportional to what we

---

[28] In the Justice and PA areas, we considered only the direct effect on productivity rather than the potential effects that these reforms could have on private investment, domestically and abroad. Our assessment of the public procurement reform has been remarkably conservative, as we assumed that the RRP would only slightly improve (by 2 points) the single-market scoreboard indicator.

observe for GDP. The figure shows an initial crowding-out of private investment, which is standard in this class of models and motivated by the fact that firms anticipate that TFP will increase over time, thus making future investments more productive than present ones (see, e.g., Ciapanna *et al.*, 2023). The impact on prices is negative as most reforms are assumed to affect TFP positively. This standard supply-side shock triggers production increases accompanied by a generalised price reduction. Furthermore, price dynamics can be easily inferred from the dynamics of the GDP deflator, which mirrors GDP dynamics. Regarding external trade, productivity-enhancing reforms positively and similarly affect imports and exports.

Figure 2 details the impact of the reforms on selected labour market variables (average real wage and aggregate employment). Again, the figure outcomes are expressed as percentage deviations from a no-reform scenario.

Apart from the labour market reform, all structural measures increase labour productivity and real wages. The expected negative impact of the Labour market reform on wages stems from the increase in labour supply, reducing workers' market power and triggering a reduction in their wage markups. However, the same reform has a robust positive effect on employment due to increased participation in the labour market. The negligible effects of the other reforms on employment are not surprising, given that all the reforms, apart from the labour market one, mainly improve productivity, thus allowing higher output without necessarily increasing the number of workers.

Should we thus interpret our result by saying that structural reforms, different from labour market ones, have no positive effects on employment? The answer is no. Structural reforms lay the foundation for a more productive economic environment, while employment should be sustained by additional investments enabled and encouraged by structural reforms. This indirect (mostly demand-side) effect should be considered in our exercise. Additionally, the success of the reforms is a condition for the effective implementation of the significant investments foreseen in the RRP, which are expected to raise employment in the medium and long run (see, e.g., Di Bartolomeo and D'Imperio, 2022).

Figure 2: Impact of the structural reforms on the labour market.
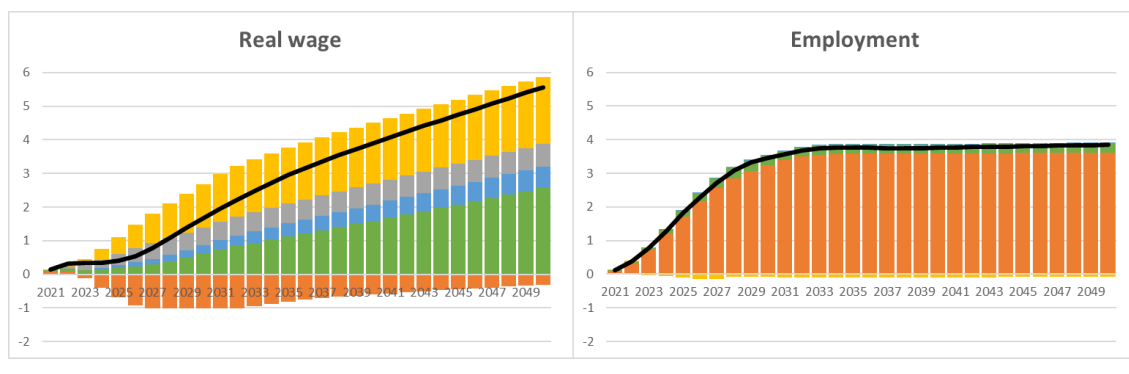
Notes: The figure shows the impact of structural reforms on selected labour market variables in percentage deviations from a no-policy baseline scenario. For the legend, see Figure 1.

As previously mentioned, the baseline assessment is subject to significant margins of uncertainty that might arise from risks related to the implementation timing and the reforms' efficiency. An additional degree of uncertainty stems from our modelling choices and the econometric studies employed to calibrate the simulations (e.g., choosing transmission channels for reforms and quantifying their impact on the model parameters). Accordingly, in the previous sections, we have detailed our assumptions and described high and low scenarios to build uncertainty intervals around the baseline setup.

We observe a significant degree of uncertainty on the impact of the reform. The margin grows with the time horizon considered as the impacts of structural reforms have permanent effects that (when present) tend to consolidate over time. According to the scenario considered (low-high), the long-term impact on GDP would range from 4.5% to 16.3%. The result is unsurprising since the uncertainty interval is based on alternative scenarios. The low-impact scenario represents a situation in which the planned goals still need to be fully achieved. In contrast, the high-impact scenario should be regarded as the most favourable outcome in which all reforms are implemented to their maximum potential.[29]

5. The social impact of the reform package

The reform package can soundly contribute to the long- and medium-run growth, tackling some structural weaknesses of the Italian economy. However, heterogeneous dynamics across income earners and categories could also be observed, as the benefits of the reforms would not necessarily be equally distributed. This section explores this issue by investigating the

---

[29] Additional details are provided in the working paper version of this article (D'Andrea *et al.,* 2023).

impact of the reforms on the different income categories. We investigate the model-based functional income distribution in line with Roeger *et al.* (2021), who focused on labour market reforms. We analyse the impact of the reforms on wages, capital and profits, financial wealth, unemployment benefits, and transfers, which constitute the Net Disposable Income (NDI) in the model.[30]

Figure 3 reports the impact of each structural reform on income categories. It reports the impact in absolute terms (left column) and the changes in the relative shares of the total NDI (right column). Results are shown at 10, 20, and 30 years after the beginning of the RRP.

In absolute terms, the reforms can simultaneously increase income from wages, capital, and profits. These improvements can be ascribed to the increase in GDP previously observed and a reduction in the revenues stemming from financial wealth. However, an exception is represented by the simulated impact of the competition and public procurement reform. As expected, it reduces the income from capital and profits triggered by higher competition across firms.

Across the different reforms, income stemming from bond markets tends to be initially positive, while it turns negative during the last part of the simulation. This dynamic mainly depends on the government bond accumulation from which the financial income stems. In the following, we provide an intuition for the result.

The simulated reforms increase GDP and government revenues, thus reducing the bonds supplied by the government in each period. The slowdown in the acquisition of public bonds has a positive effect on the year-by-year financial income of bond buyers. The latter can be better understood by noticing that the yearly financial income depends positively on the interest received on debt securities acquired in the past and negatively on the number of bonds purchased during the same year. Consequently, a decreasing debt stock triggers an increase in bond income in the first years of our analysis (up to 2030). The negative deviations of bond income observed during the following ten years (up to 2040) can be explained by recalling the model's assumptions on the fiscal rule.[31] It triggers an increase in the debt stock after ten years to stabilise the GDP-to-debt ratio, adversely affecting bond income. In the long run (up to 2050), bond income, in absolute terms, tends to return to its initial steady-state level.

In relative terms, the wage and the capital/profit shares tend to increase across the

---

[30] The model-based NDI is net income from labour, capital, profits, financial wealth, and government transfers.

[31] A detailed description of the fiscal rule adopted is provided in the working paper version of this article (D'Andrea *et al.*, 2023).

different reforms at the expense of financial wealth, government benefits, and transfers, with two noticeable exceptions. First, in line with what was previously observed, the reform of competition and procurement induces a reduction in the share of income obtained through capital and profits. Second, the PA reform is associated with an increase in the capital/profit share (also) at the expense of the wage share. The observed dynamics are not due to a decrease in wages—which improve in absolute terms—but to the higher growth of capital and profits to wages in absolute terms, as shown on the left side of Figure 3.

The latter results can be explained by looking at the public sector reform simulation channels: i) the increase of total factor productivity, ii) the reduction in the bureaucratic costs faced by firms, and iii) the labour force upskilling. The first tends to positively impact labour and capital income via increased factor productivity. The second one positively affects profits but negatively impacts wage income because of the reduced employment devoted to overhead labour. Finally, the third channel has a weak positive effect on wage income. The combined effects of the analysed shocks favour a more substantial increase in the income from capital and profits to wages, reducing the latter's share.

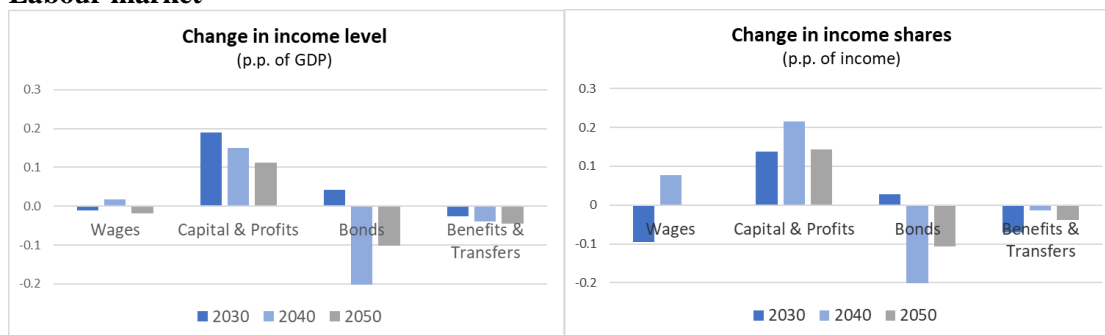**Figure 3: The impact of the structural reforms on the functional distribution of income.**

Public Administration

Justice

Competition and public procurement
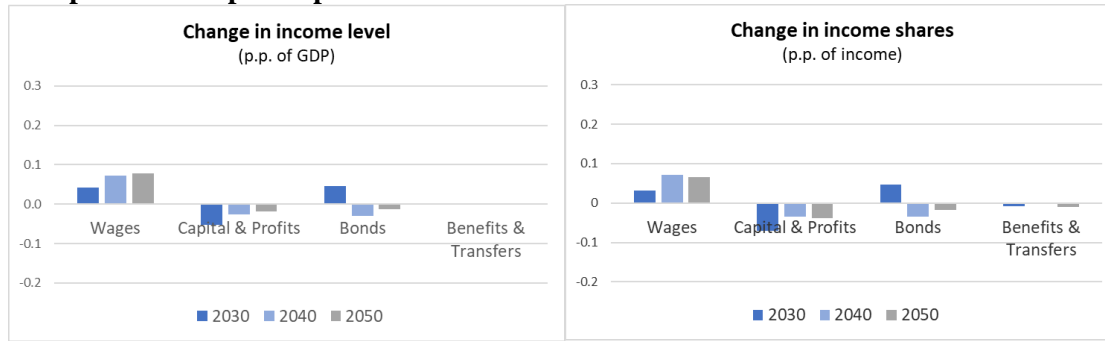
Education

Labour market

Notes: The figure shows the impact of each structural reform on income categories. It reports the impact in absolute terms (left column) and the changes in the relative shares of the total NDI (right column). Results are reported at 10, 20, and 30 years after the beginning of the RRP.

7. Conclusions

This paper assesses the impact of the structural reform package of the Italian RRP. We document a significant impact on GDP in the medium and longer term. The full efficacy of the reform package emerges in the long run. In 2050, GDP would be 10% higher than in the alternative scenario where no reform is implemented. However, sizeable effects would be observed from 2026, the end of the Plan, when observed GDP would rise by 3.4%. The labour market and education measures primarily drive the impact of the reforms on GDP and

employment. We also looked at the distributional effects of the reform program. We find that a significant labour and capital income increase accompanies the aggregate positive effect on output. The latter partially occurs at the expense of bond market income.

Our assessment of the reforms' impact shows a large margin of uncertainty. The latter refers not only to the assessment *per se* but also to the uncertainty about the efficient implementation of the Plan. In other words, our assessment also highlights the potential risks (and the opportunity social costs) associated with poor management in implementing reforms that cannot achieve the expected objectives. Furthermore, inflationary dynamics could also reduce the total macroeconomic effects of the reforms. When the Plan was designed, the average expected inflation was below 2%. Since it is defined in nominal terms, without additional funding, this would imply lower investments in real terms, which could preclude the full effectiveness of the reforms considered.[32] To offset the effects of the unanticipated inflation, the Italian Government has allocated substantial additional resources.

Finally, it is worth mentioning that the long-run outcomes of the reform only depend on the policy measure designed and implemented. However, in our forward-looking context, the short-run (transition) dynamics also depend on agents' expectations. We assumed the contents and timing of the reforms were announced and thus fully anticipated by the agents. Different short-run dynamics would emerge if agents misperceived the reforms' contents or timing.[33] We did not consider this aspect, leaving this issue to future research.

References

Alcidi, C., P. D'Imperio, and G. Thirion (2023), "Risk-sharing and consumption-smoothing patterns in the US and the Euro Area: A comprehensive comparison," *Structural Change and Economic Dynamics*, 64, 58-69.

Anderson, D., B., Hunt, and S., Snudden (2014), "Fiscal consolidation in the euro area: How much pain can structural reforms ease?" *Journal of Policy Modeling*, 36(5), 785-799.

Annicchiarico, B., F. Di Dio, and F. Felici (2013), "Structural reforms and the potential effects on the Italian economy," *Journal of Policy Modeling*, 35(1): 88-109.

Annicchiarico, B., F. Di Dio, and F. Felici (2015), "Fiscal devaluation scenarios: A quantitative assessment for the Italian economy," *Open Economies Review*, 26: 731-785.

Bańkowski, K., M. Ferdinandusse, S. Hauptmeier, P. Jacquinot, and V. Valenta (2021), "The

---

[32] For a discussion on the point, see Pfeiffer *et al*. (2023).

[33] Long-run outcomes are independent of private sector expectations. Instead, generally, the less agents can anticipate the effects of reforms, the more forward their macroeconomic effects will be.

macroeconomic impact of the Next Generation EU instrument on the euro area," Occasional Paper Series No. 255, European Central Bank, Frankfurt, Germany.

Belhocine, N., and L. B. F. Jirasavetakul (2020), "Lessons from two public sector reforms in Italy," IMF Working Paper No. 20/40.

Campos, N., P. De Grauwe, and Y. Ji (2020), *Economic Growth and Structural Reforms in Europe*, Cambridge University Press.

Canton E. and A. Thum-Thysen (2015), "Estimation of service sector markups determined by structural reform indicators," European Economy, Economic Papers No. 547, ECFIN.

Christiano, L. J., M. S. Eichenbaum, and M. Trabandt (2018), "On DSGE models," *Journal of Economic Perspectives*, 32(3): 113-140.

Ciapanna, E., S. Mocetti, and A. Notarpietro (2023), "The macroeconomic effects of structural reforms: An empirical and model-based approach," *Economic Policy*, 114(38): 243-285,

Corti, F. and J. Núñez Ferrer (2021), "Assessing reforms in the National Recovery and Resilience Plans. Italy," Recovery and Resilience Reflection Papers, CEPS, Brussels.

D'Andrea, S., D'Andrea, S., Di Bartolomeo, G., D'Imperio, P., Infantino, G., & Meacci, M. (2023), "Structural reforms in the Italian National Recovery and Resilience Plan: a macroeconomic assessment of their potential effects", Italian Ministry of Economy and Finance, Department of the Treasury, WP no. 2, 2023.

D'Auria, F., A. Pagano, M. Ratto, and J. Varga (2009), "A comparison of structural reform scenarios across the EU member states," Economic Papers, No. 392.

Di Bartolomeo, G. and P. D'Imperio (2022), "A macroeconomic assessment of the Italian National Recovery and Resilience Plan," Ministry of Economy and Finance, Department of the Treasury, Working Paper No 2/2022.

Di Bartolomeo, G., P. D'Imperio, and F. Felici (2022), "The fiscal response to the Italian COVID-19 crisis: A counterfactual analysis," *Journal of Macroeconomics*, 73, 2022.

Djankov, S., R. L. Porta, F. Lopez-De-Silanes, and A. Shleifer (2002), "The regulation of entry," *Quarterly Journal of Economics*, 117(1): 1-37.

Égert, B., C. de la Maisonneuve, and D. Turner (2022), "A new macroeconomic measure of human capital exploiting PISA and PIAAC: Linking education policies to productivity," OECD Economics Department Working Papers No. 1709.

European Commission (2014), "Market reforms at work in Italy, Spain, Portugal and Greece," European Economy, Institutional Papers No. 5.

European Commission (2016), "The economic impact of selected structural reform measures in Italy, France, Spain and Portugal," European Economy, Institutional Papers No. 23.

European Commission (2021), "Revised annexe to the Council implementing decision on the approval of the assessment of the recovery and resilience Plan for Italy," 8 July 2021.

Falavigna, G., and R., Ippoliti (2021), "Reform policy to increase the judicial efficiency in Italy: The opportunity offered by EU post-Covid funds," *Journal of Policy Modeling*, 43(5), 923-943.

Freier, M., C. Grynberg, M. O'Connell, M. Rodríguez-Vives, and N. Zorell (2022), "Next Generation EU: a euro area perspective," *ECB Economic Bulletin*, Issue 1/2022.

Giordano, R., S. Lanau, P. Tommasino, and P. Topalova (2020), "Does public sector inefficiency constrain firm productivity? Evidence from Italian provinces," *International Tax and Public Finance*, 27(4): 1019-1049.

Heichlinger, A., N. Thijs, G. Hammerschmid, and K. Attström (2018), "Public administration reform in Europe: Conclusions, lessons learned and recommendations for future EU

policy," European Commission, July 2018.

OECD (2022), *Assessment of the Links between the National Recovery and Resilience Plans and the OECD Product Market Regulation Indicators*, Commissioned by the European Commission's DG for Economic and Financial Affairs, OECD Publishing, Paris.

Pfeiffer, P., J. Varga, and J. in 't Veld (2022), "Quantifying spillovers of Next Generation EU investment," *Macroeconomic Dynamics*, 1-23.

Pfeiffer, P., J. Varga, and J. in 't Veld (2023), "QUEST simulations of Next Generation EU: An update," paper presented at the QUEST User Workshop 2023, European Commission, DG ECFIN.

Pfeiffer, P., W. Roeger, and J. in 't Veld (2020), "The COVID19-pandemic in the EU: Macroeconomic transmission and economic policy response," European Economy, Discussion Paper No. 127.

Rios, V., and L., Gianmoena (2020), "The link between quality of government and regional resilience in Europe," *Journal of Policy Modeling*, 42(5), 1064-1084.

Roeger, W., J. Varga, and J. in 't Veld (2008), "Structural reforms in the EU: A simulation-based analysis using the QUEST model with endogenous growth," European Economy Economic Paper, n. 351, European Commission, Brussels.

Roeger, W., J. Varga, J. in 't Veld, and L. Vogel (2021), "The distributional impact of labour market reforms: A model-based assessment," *European Economic Review*, 13I.

Thévenon, O. (2013), "Drivers of Female Labour Force Participation in the OECD," *OECD Social, Employment and Migration Working Papers*, No. 145, OECD Publishing, Paris.

Vitale, C., R. Bitetti, I. Wanner, E. Danitz, and C. Moiso (2020), "The 2018 edition of the OECD PMR indicators and database: Methodological improvements and policy insights," OECD Working Paper No. 1604, OECD Publishing, Paris.