RECOVERY WATCH

POLICY STUDY
January 2023

PROMOTING A JUST DIGITAL TRANSITION FOR WORKERS

HOW DO THE NRRPS FARE?

Manos Matsaganis, Georgios Manalis, Avilia Zavarella

FEPS FOUNDATION FOR EUROPEAN PROGRESSIVE STUDIES

FRIEDRICH EBERT STIFTUNG

IEV

ΕΛΙΑΜΕΠ ELIAMEP
ΕΛΛΗΝΙΚΟ ΙΔΡΥΜΑ ΕΥΡΩΠΑΪΚΗΣ & ΕΞΩΤΕΡΙΚΗΣ ΠΟΛΙΤΙΚΗΣ
HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY

Policy Study published in January 2023 by

THE FOUNDATION FOR EUROPEAN PROGRESSIVE STUDIES (FEPS)
European Political Foundation - No 4 BE 896.230.213
Avenue des Arts 46 1000 Brussels (Belgium)
www.feps-europe.eu
@FEPS_Europe

FRIEDRICH EBERT STIFTUNG
EU-Office Brussels- Rue du Taciturne 1000 Brussels (Belgium)
www.brussels.fes.de
@FES_Brussels

INSTITUT EMILE VANDERVELDE (IEV)
Boulevard de l'Empereur 13 1000 Brussels (Belgium)
www.iev.be

This Policy Study was produced with the financial support of the European Parliament.
It does not represent the views of the European Parliament.

This paper only represents the opinion of its authors and not necessarily the views of FEPS.
Copyright © 2022 by Foundation for European Progressive Studies.

Knowledge Partners for this Policy Study:

ELIAMEP
(HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY)
Leof. Vasilissis Sofias 49, Athina 106 76, Greece
www.eliamep.gr
@eliamepgr

ISBN: 9782930769967
Editing: Helen Johnston
Layout and editing: Triptyque
Cover photo: Shutterstock.com


RECOVERY
WATCH

KNOWLEDGE PARTNERS

RECOVERY WATCH

WHAT IS THIS PROJECT ABOUT?

The National Recovery and Resilience Plans represent the new framework in which European member states identify their development strategies and allocate European and national resources – with the objective of relaunching socio-economic conditions following the coronavirus pandemic.

This process, initiated as part of the European response to the global health crisis, follows the construction of NextGenerationEU. It combines national and European efforts to relaunch and reshape the economy, steering the digital and climate transitions.

For European progressives, it is worth assessing the potential of these national plans for curbing inequalities and delivering wellbeing for all, as well as investigating how to create a European economic governance that supports social, regional, digital and climate justice.

The Foundation for European Progressive Studies (FEPS), the Friedrich Ebert Stiftung (FES) and the Institut Emile Vandervelde (IEV), in partnership with first-rate knowledge organisations, have built a structured network of experts to monitor the implementation of National Recovery and Resilience Plans and assess their impact on key social outcomes. Fact- and data-based evidence will sharpen the implementation of national plans and instruct progressive policymaking from the local to the European level.

The Recovery Watch will deliver over 15 policy studies dedicated to cross-country analysis of the National Recovery and Resilience Plans and NextGenerationEU. Monitoring the distributive effects of EU spending via NextGenerationEU, and the strategies and policies composing the national plans, the project will focus on four areas: climate action, digital investment, welfare measures and EU governance.

LIST OF FIGURES AND TABLES

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Recovery and Resilience Facility (RRF) was created to "mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions". This policy study poses the question of the Facility's contribution to achieving one of these goals: preparing member states for the digital transformation, by maximising its benefits, minimizing its costs, and distributing both benefits and costs equitably.

We focus on six member states: Germany, Greece, France, Italy, Portugal, and Slovakia. The policy study first describes **how advanced the six countries were in terms of the digital transition before the first RRF funds were disbursed**. We find that the six countries started from a widely different baseline, while their performance was not consistent across policy areas including e-government, high-tech employment, connectivity, jobs at risk of automation, digital skills, and job quality.

Subsequently, we offer an analysis of the digital components of the six NRRPs. **National governments tend to emphasise investing in the digitalisation of public administration, education, and health and social services.** This is to be welcomed, though it does raise the question of preparing public sector workers for the new (presumably more digitalised) tasks they will be called upon to perform. Moreover, **there is no evidence whatsoever that the NRRPs prioritise upskilling of workers at high risk of automation**.

Also, our prior assumption that National Recovery and Resilience Plans (NRRPs) were shaped by an awareness on the part of national governments of the strengths and weaknesses in each member state's preparedness for the digital transition was not always supported by the evidence. Often, the plans seem to build on national strengths (path dependency). This means that **rather than bridging gaps in performance between member states (the RRF's avowed objective), the RRF could widen them further**.

In the concluding section, we reflect on the challenges ahead. How are NRRPs expected to contribute to equitable growth? Can the plans' likely employment effects be gauged at this early stage? What are the main issues policy makers will need to address in the six countries? We find job creation estimates inconsistent, and in some cases highly optimistic. Darkening economic prospects make it unlikely that they will materialise. What is more, job destruction as a result of the acceleration of the digital transformation is neglected. Besides, the quality of the jobs created remains an open question. Conditions vary widely across member states, while recent developments did not always align with national weaknesses. More generally, in some member states, in the absence of a shared commitment to a 'high path to growth', of which investing in high-value added high-wage jobs is a key ingredient, advances in employment conditions are vulnerable to government change.

Because of high uncertainty, and lack of key information, we can only shed limited light on some big questions (will the RRF make European economies more dynamic?), while we remain in the dark about others (what will be the effects of RRF on income inequality?). Therefore, more research is needed to address two issues that go beyond the scope of the current Policy Study. The first is skills. To ensure that workers are qualified for the new jobs in the digital economy, a wide set of skills will be needed. What investments are put in place for upskilling of current workers so they can move to better jobs? What reforms are planned in education and training systems to ensure that future workers possess the skills that are needed to thrive in the digital economy? In another Appendix, we cite examples of actions included in NRRPs, though more careful monitoring is needed as implementation evolves. The second issue is social protection. Clearly, not all displaced workers can be realistically expected to reskill and move to new jobs. Are national welfare states equipped for the challenge? Do NRRPs contain investments and reforms geared to making social protection systems more responsive, more resilient, and more effective? These are urgent questions, which we leave to future research, and other Policy Studies of the Recovery Watch series.

1. INTRODUCTION

The declared aim of the Recovery and Resilience Facility (RRF) was to "mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions". This policy study poses the question of the Facility's contribution to achieving one of these goals: preparing member states for the digital transformation, by maximising its benefits, minimising its costs, and distributing both benefits and costs equitably. Special attention is paid to employment effects, namely the number and nature of the jobs created (net of jobs destroyed) as a result of the investments and reforms funded by the RRF.

Whilst the effects of the digital transition on jobs are rightly a key concern for Europe, earlier forecasts of "the end of work" – that is, a future in which most production is carried out by robots, while most workers are resigned to idleness and despondency – seem overblown. As explained in a recent authoritative MIT report on the future of work:

> No compelling historical or contemporary evidence suggests that technological advances are driving us toward a jobless future. On the contrary, we anticipate that in the next two decades, industrialised countries will have more job openings than workers to fill them, and that robotics and automation will play an increasingly crucial role in closing these gaps. Nevertheless, the impact of robotics and automation on workers will not be benign. These technologies, in concert with economic incentives, policy choices, and institutional forces, will alter the set of jobs available and the skills they demand.[1]

Indeed, most experts now think that technology is likely to continue to create more jobs than it destroys. The trouble is, the jobs created are likely to be very different from the jobs destroyed by digitalisation – in terms of location, industry, age of workers concerned, skills required, and therefore, eventually, wages paid.

If this is true, it follows that the task facing European policymakers is not so much how to avert mass unemployment induced by technological change, as how to arrest the trend towards job polarisation, precarious work, and rising inequality. This digital transition predates this trend, but could accelerate it, unless of course, policy measures are put in place to contrast it and reverse it.

> "The policy challenge for the EU and national governments is twofold: (1) to help create more and better jobs in the digital economy; and (2) to give displaced workers a second chance in terms of reskilling, mobility and social protection."

In a nutshell, the policy challenge for the EU and national governments is twofold: (1) to help create more and better jobs in the digital economy; and (2) to give displaced workers a second chance in terms of reskilling, mobility and social protection.[2]

Clearly, at the time of writing (autumn 2022), it is far too early to assess properly the effects of the National Recovery and Resilience Plans (NRRPs) on the economy and society. The RRF is scheduled to run until December 2026, while its full effects on the economy and labour market of member states can be safely expected to take longer to unfold. Nonetheless, clarifying the nature of the task, namely, how best to assess the employment effects of digital investments funded under the RRF, is of crucial importance at the outset.

The first issue concerns *creative destruction*. From the Industrial Revolution onwards, economic history is characterised by successive waves of technological change creating as well as destroying jobs. The current wave of such change, the transition to a digital economy, is likely to be more disruptive in this sense than previous ones. Accelerating the digital transition via RRF-funded projects is aimed at creating more (and hopefully better) jobs than would otherwise have been the case, but it is also possible that the acceleration might destroy more jobs than would otherwise have been the case. Therefore, proper assessment of employment effects must address the balance of job creation vs job destruction.

1. INTRODUCTION

The second issue concerns what might be termed *net marginal effects*. To be judged successful, RRF-funded digital investments must be shown to have created more and better jobs than they have destroyed (*net effect*), relative to a counterfactual in which the RRF had not existed (*marginal effect*).

The third issue concerns *job quality* as well as quantity. To be judged successful, RRF-funded digital investments must create jobs that are better than the jobs destroyed (over and above what would have happened anyway) in terms of pay, conditions, employment rights, job satisfaction – and so on.

The information provided in the NRRPs falls short of what is required for a proper evaluation. This, as pointed out above, is partly because it is too soon to tell. However, it is also partly because, as discussed later on in this policy study, insufficient attention is being paid to certain issues such as job destruction, the quality of new jobs, reskilling for the workers who will occupy the new jobs, social protection for the displaced workers who cannot realistically reskill, and so on.

It follows that in speculating about the employment effects of RRF-funded digital investments and related reforms, inevitably more questions are posed than can be answered. Ideally, one would like to know the effects of RRF-funded digital investments on employment and earnings, and their distribution, including by gender. In practice, the ambition of this policy study is more modest.

More specifically, NRRPs are parsed in search of clues. **Do they respond adequately to the digital needs and challenges that member states face? Do they contain estimates of how many jobs they hope to create? Are these projections reasonably realistic?** This policy study is also interested in the types of jobs likely to be created, in terms of skills and wages. Employment effects will be partly shaped by the investment projects selected for funding, and partly by the institutional environment in which these projects will operate. This is why the regulation of labour markets in the digital economy, including platform work, is so important. A further set of questions therefore arise. **Do reforms and investments in NRRPs ensure that adequate employment rights and social protection will be available for platform and other workers?** Given the paucity of information making it almost impossible to link RRF-funded digital investments to effects in the platform economy, this is left for further research.

"

Insufficient attention is being paid to certain issues such as job destruction, the quality of new jobs, reskilling for the workers who will occupy the new jobs, social protection for the displaced workers who cannot realistically reskill.

"

This policy study focuses on six member states: Germany, Greece, France, Italy, Portugal and Slovakia. This selection includes countries greatly affected by the euro crisis and Covid-19, as well as industrial economies with advanced vocational education and training (VET) policies, or (and) where a greater share of jobs is at high risk of automation.[3] As regards geographical balance, while this sample is biased in favour of the EU's southern periphery, northern and eastern member states are also represented.

The structure of this policy study is as follows. Section 2 briefly discusses where the six countries were before the first RRF funds were disbursed, in terms of the complexity and technological advancement of the national economy, digital infrastructure (broadband connection), online access to public authorities (e-government), digital skills, ICT tasks at work, training for digital skills, and job quality. The purpose here is to give a sense of the different challenges faced by each of the six member states.

Section 3 analyses the digital components of the six NRRPs. First, information is extracted from the Bruegel dataset,[4] a detailed analysis of the actions listed in the NRRPs of all 27 member states, recently made public. Then, turning to the NRRPs, more detail is retrieved on the digital actions identified, with special emphasis on those that account for a greater share of RRF resources. Lastly, reference is made to the Commission's assessment of NRRPs in the relevant Staff Working Documents.

Section 4 offers a tentative assessment of the challenges ahead. How are NRRPs expected to contribute to equitable growth? Can the Plans' likely employment effects be gauged at this early stage? What are the main issues policymakers will need to address in the six countries?

2. THE BASELINE

National economies in the EU are different not just in the obvious sense that some member states are richer than others, but also in how they combine capital, labour and technology in producing their distinct mix of goods and services. In view of that, before assessing the contribution of the RRF in helping member states accelerate the digital transition and cope with its unintended effects, acknowledgement is needed that their starting point is different. In the early 2020s, before the RRF came into effect, the digital transition had already commenced, and had progressed further in some national economies than in others. As a result of that, the various countries faced different challenges. Therefore, the aim of Section 2 is to describe the degree of preparedness for the digital transformation (or lack thereof) of the six member states selected in this policy study.

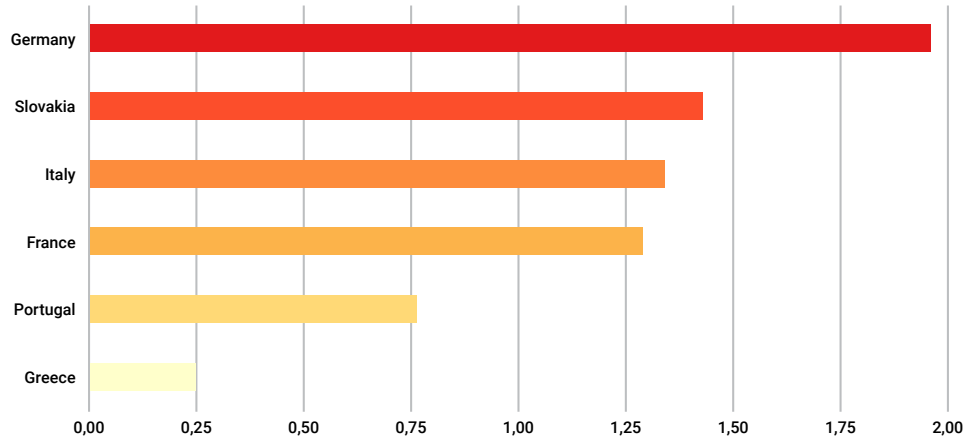
2.1. ECONOMIC COMPLEXITY

First, the question of how technologically advanced the six member states actually were when the RRF came into effect. Figure 1 draws on the Economic Complexity Index, developed by the Growth Lab of Harvard University's Kennedy School. The index takes into consideration "the number and complexity of the products [national economies] successfully export". More specifically: "The economic complexity of a country is calculated based on the *diversity* of exports a country produces and their *ubiquity*, or the number of the countries able to produce them (and those countries' complexity)."

The latest figures available, for 2020, show that Germany was the most complex economy of the six considered here (and of all EU member states, ranking third in the world after Japan and Switzerland). Next came Slovakia, Italy and France, clustering close to each other. Portugal followed at some distance. Greece brought up the rear, ranking 50th among 133 countries, lower than all other EU member states.

Note that even though both goods and services are included in the Index, services are analysed in less detail[5] and are assigned a lower complexity weight.[6] This has certainly affected France's ranking, whose exports include a larger component of higher-complexity business services (e.g. ICT or insurance & finance) than either Slovakia or the tourism powerhouses of Southern Europe.[7]

Figure 1. Economic Complexity Index (2020).



Note: Countries' ECI score (and ranking) is "based on how diversified and complex their export basket is". (For more information, see the Glossary, Atlas of Economic Complexity website.)
Source: Atlas of Economic Complexity produced by Harvard's Growth Lab.

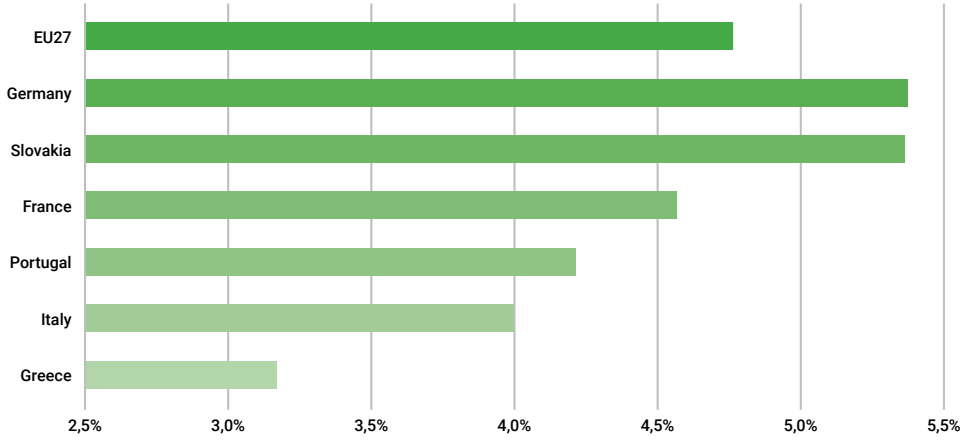
Other indicators shed light on different aspects of technological progress at the baseline in the six countries, largely painting a similar picture, while offering extra nuance. In 2021, the employment share of technology and knowledge-intensive sectors was 5.4% in both Germany and Slovakia, that is, above the EU average of 4.8%. (Other EU member states did better: in Ireland, the share of high-tech employment was just over 10%; in Slovenia, Estonia, Hungary, Finland, Sweden and Malta, it was between 6% and 7%.) The remaining four countries were below average: France (4.6%), Portugal (4.2%), Italy (4.0%), while Greece registered the lowest share of high-tech employment in the EU (3.2%). This is shown in Figure 2 below.

Turning to the share of enterprises (outside finance) with high or very high digital intensity index in 2021, Germany (25%) scored best, followed by Portugal (21%) and Italy (20%). France came last (14%), after Slovakia and Greece (both 17%). This is interesting, but comparisons of firms suffer from possible composition effects, at least to some extent. In order to compare like with like, the focus is placed on large enterprises (defined as those with 250 or more employees). Figure 3 shows that at the top of the league table, Germany is now joined by Italy, where firm size is notoriously lower: in both countries, the share of large enterprises with high or very high digital intensity index in 2021 was 62%, just above the EU average of 60%. Portugal (59%) and France (55%) came close. Slovakia and Greece (both at 40%) trailed.

A different way to gauge how far digitalisation has progressed in a certain country is to look at the share of enterprises (again, outside finance) using at least one of the artificial intelligence technologies (such as machine learning, text mining, speech recognition, natural language generation, image recognition and processing). As shown in Figure 4, the share of large firms using AI (artificial intelligence) technologies in 2021 was the same in Germany as in France and Portugal (31%). In Italy it was 24%, that is, below the EU average of 28%. In Slovakia, 19% of large firms used AI. In Greece, only 10% did.

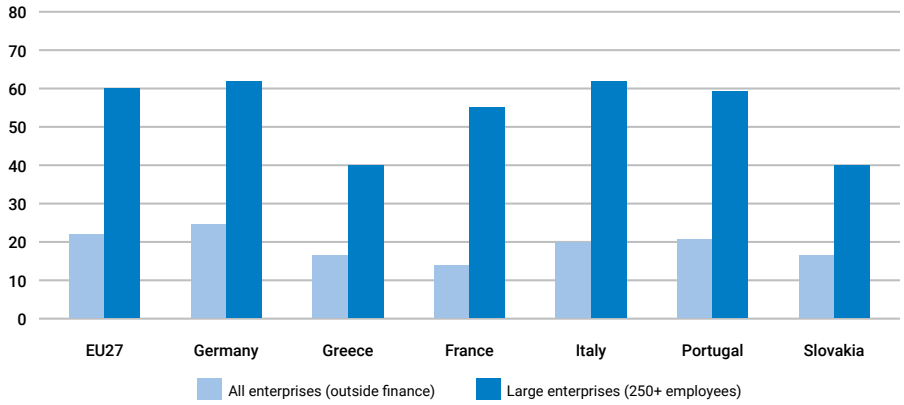
Figures 2, 3 and 4, on high-tech employment, the digital intensity of firms, and use of artificial intelligence technologies respectively, report economy-wide aggregates which typically conceal significant variation by economic sector. However, what stands out is the large gap between large, medium-sized and small firms concerning the use of digital technologies in all member states.

Figure 2. Share of high-tech employment (2021).



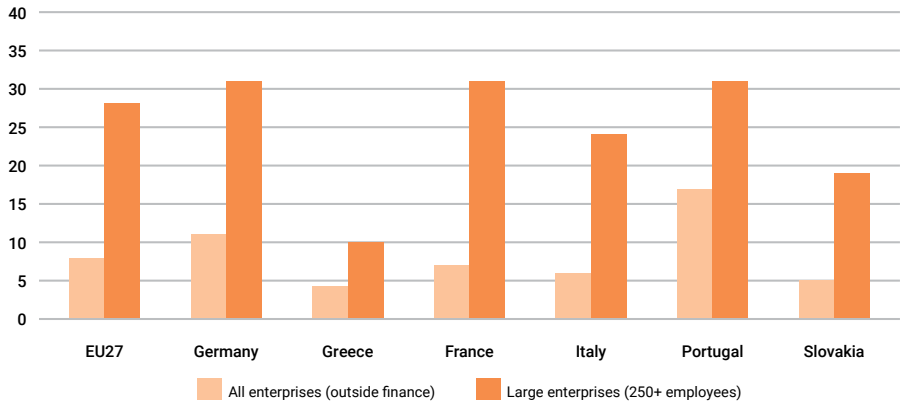
Note: People employed in high-tech industry and knowledge-intensive services as a share of all employment. (For more information, see "High-tech industry and knowledge-intensive services", Eurostat website.)
Source: Eurostat (htec_emp_nisced2).

Figure 3. Enterprises with high or very high digital intensity (2021).



Note: The Digital Intensity Index (DII) is a composite indicator, derived from Eurostat's "Survey on ICT usage and e-commerce in enterprises". The index selects 12 digital technologies, then counts how many of them the enterprises use. "High" is defined as between 7 and 9, "very high" as 10 to 12. (For more information, see "How digitalised are EU's enterprises?", Eurostat website, 29 October 2021.)
Source: Eurostat (isoc_e_dii).

Figure 4. Enterprises using artificial intelligence (2021).



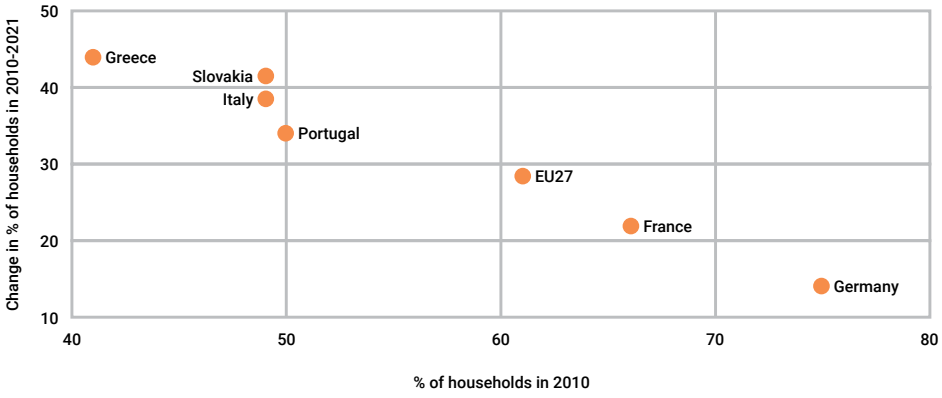
Note: Share of enterprises (outside finance) using at least one of the following technologies: text mining, speech recognition, natural language generation, image recognition and image processing, machine learning, AI-based software robotic process automation, and technologies enabling machines to physically move by observing their surroundings and taking autonomous decisions. (For more information, see "Use of artificial intelligence in enterprises", Eurostat website.)
Source: Eurostat (isoc_eb_ai).

2.2. CONNECTIVITY

Shifting attention to the question of connectivity, proxied by the share of households having access to a broadband connection, at aggregate level this indicator is no longer very informative: in 2021, the six member states ranged from 84% (Portugal) to 90% (Slovakia). Looking at earlier figures reveals that a considerable amount of catch-up has taken place in a relatively short period: in Greece, the share of households with access to a broadband connection has more than doubled, from 41% in 2010 to 85% in 2021; in contrast, in Germany, where the relevant share was already 75% in 2010, progress has been more modest (to 89% in 2021). This is shown in Figure 5.

If the fact that the share of households with access to a broadband connection is high (and quite similar) throughout the EU may appear reassuring, further analysis suggests the digital divide is significant and unevenly distributed between member states. As shown in Figure 6, in Germany households living in rural areas were only slightly less likely to have access to a broadband connection relative to those living in cities (88% vs 90% respectively in 2021). In contrast, in Portugal and Greece, the urban–rural gap was significant: in both countries, access to a broadband connection was available to 75% of households living in rural areas, compared to 89% of those living in cities. (Only in Bulgaria was that gap greater: 91% in cities vs 72% in rural areas.)

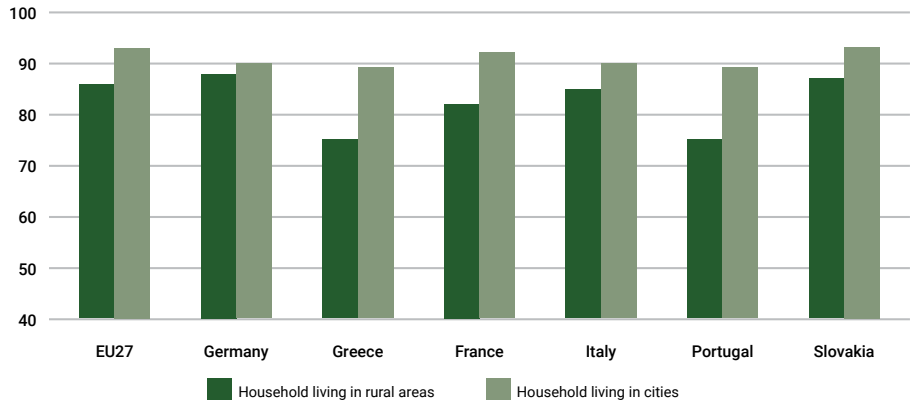
Figure 5. Broadband connection (progress since 2010).



Note: Horizontal axis – share of households with access to a broadband connection in 2010. Vertical axis – increase in share of households with access to a broadband connection in 2021 relative to 2010. (For more information, see "ICT usage in households and by individuals", Eurostat website.)
Source: Eurostat (isoc_ci_it_h).

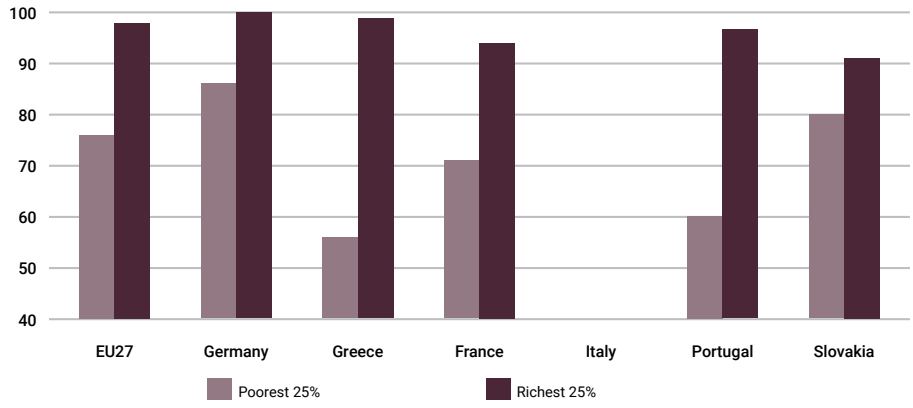
The digital divide was worryingly large in terms of income. Figure 7 shows that in Greece, almost all (99%) households in the top quartile (that is, the richest 25%) had broadband access in 2020. By comparison, the equivalent share of those in the bottom quartile (the poorest 25%) was only 56%. In Portugal, the difference between rich and poor in terms of access to a broadband connection was only slightly smaller (97% vs 60%). By contrast, in Slovakia (91% vs 80% for rich and poor respectively), and in Germany (100% vs 86%), the gap was narrower – though still significant. France fell somewhere in between: 94% in the top quartile vs 71% in the bottom quartile (data for 2019). In Italy, the latest available data (from 2013) suggest a similar pattern as in other countries.

Figure 6. Broadband connection (2021) (urban vs rural).



Note: See note to Figure 5. Urban areas are defined as NUTS level 3 regions where at least 80 % of the population live in urban clusters. Rural areas are defined as NUTS level 3 regions where at least 50 % of the population live in rural grid cells. (For more information, see "Classes for the typology and their conditions", Eurostat website.)
Source: Eurostat (isoc_ci_it_h).

Figure 7. Broadband connection (2020) (rich vs poor).



Note: See note to Figure 5. Rich (poor) households are defined as those in the highest (lowest) quartile of the distribution of net monthly income. Data for France refer to 2019.
Source: Eurostat (isoc_ci_it_h).

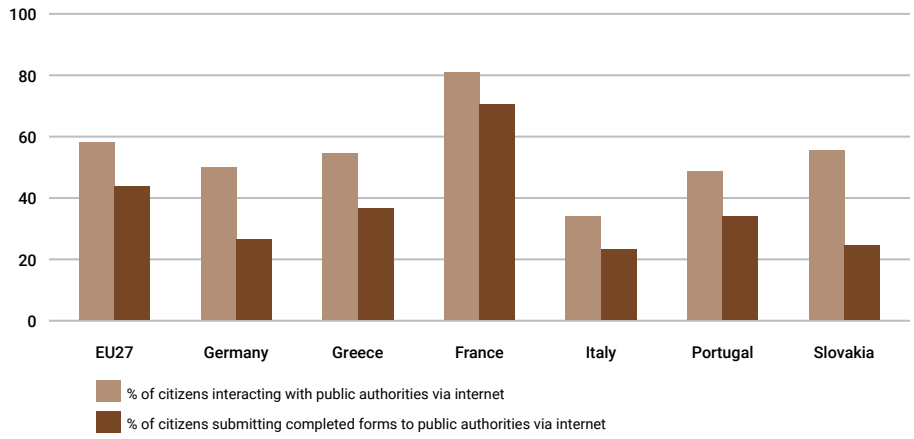
2.3. E-GOVERNMENT

Turning next to the question of progress towards making it possible for citizens to interact with public administration online. Results from the "EU survey on the use of information and communication technologies (ICT) in households and by individuals" revealed that there was wide variation within the EU in the share of those reporting they had used ICT to exchange information and services with governments and public administrations (e-government) over the last 12 months.

In Denmark, Sweden and Ireland, over 90% of survey respondents in 2021 said they had interacted with public authorities via websites. At the other extreme, in Romania only 15% did, in Bulgaria 27%. Among the member states considered here, contacting public offices online appeared to be common in France (81%), but less so in the other five countries, where the relevant share was below the EU average (58%). Greece and Slovakia (55-56%) did better than Portugal and Germany (49-50%). Italy did worst (34%). This is shown in Figure 8.

The nature of the interaction can be gauged by responses to other questions in the survey. For instance, results on the share of citizens submitting completed forms to public authorities via internet confirmed the same picture. France stood out (71%). Greece (37%) and Portugal (34%) followed at a considerable distance, well below the EU average (44%). Germany (27%), Slovakia (25%) and Italy (23%) were clustered towards the bottom of the European league table.

Figure 8. E-government (2021).



Note: "E- government" is defined as the use of ICT by individuals to exchange information and services with governments and public administrations. (For more information, see "ICT usage in households and by individuals", Eurostat website.)
Source: Eurostat (isoc_ciegi_ac).

2.4. IMPACT OF TECHNOLOGY ON JOBS

What is the share of jobs threatened by automation? Early estimates put the share of workers in jobs facing a high risk of automation (defined as likely to be performed by computers and algorithms with a probability of over 70% within the next 10 to 20 years) in the United States as high as 47%.[8]

Later empirical studies re-estimated the risk of automation for jobs, significantly revising downwards earlier estimates. Arntz, Gregory and Zierahn applied a similar methodology to that of Frey and Osborne, except that instead of the occupation-based approach used by Frey and Osborne, they adopted the task-based approach developed by Autor, Levy and Murnane.[9] The latter's key insight was that what machines actually displace is not occupations, but tasks. Since most occupations contain tasks that cannot be easily automated, and since tasks differ across countries and within occupations, Arntz and her colleagues assumed that occupations may well be less prone to automation than previously thought. They tested their assumption on data from the PIAAC (Programme for the International Assessment of Adult Competencies) survey, which reports on the task structure of jobs across OECD countries. They found that the share of jobs at risk of automation in the US was significantly lower than estimated by Frey and Osborne (9% vs 47%), and varied inversely with education level and income.[10]

"What machines actually displace is not occupations, but tasks. Since most occupations contain tasks that cannot be easily automated, and since tasks differ across countries and within occupations, Arntz and her colleagues assumed that occupations may well be less prone to automation than previously thought."

Another OECD study, by Nedelkoska and Quintini,[11] built on the approach of Arntz and her colleagues, used similar data, but estimated the risk of automation for a broader set of workers in more countries (28, of which ten were not part of the EU). That risk was found to be greatest for workers on lower earnings, and declined with age.[12]

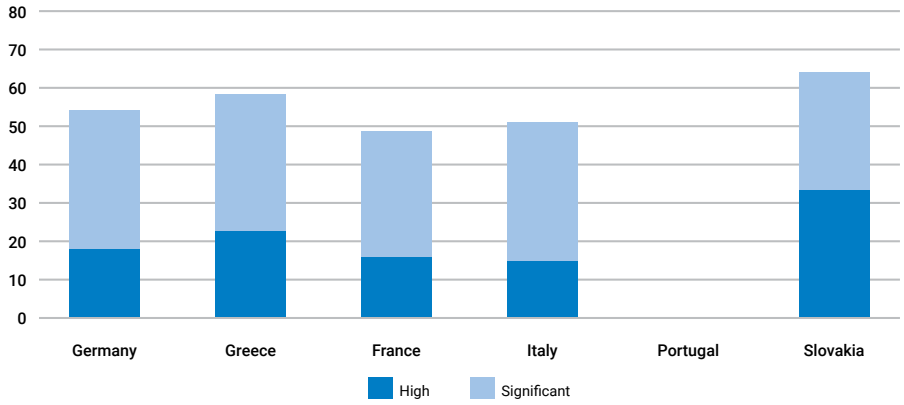
The study's findings for five of the six countries in the sample (no data for Portugal) are presented in Figure 9. Slovakia featured the greatest share of jobs at risk of automation among all 28 countries in the study: 34% of jobs were found to be at "high risk of automation", while another 31% were "at significant risk of change". In the other four countries in the sample, the share of jobs at high risk was estimated to range from 15-16% in Italy and France, to 18% in Germany, and to 23% in Greece. As for the share of jobs at significant risk, it was 33% in France, and around 35-26% in the other three countries.

Moving beyond projections for the future, some evidence already exists on the effects of technology on jobs, as perceived by workers themselves. Data for 2018 suggest that nearly a quarter of employees and self-employed workers in the EU who had used the internet in the previous year felt they had the skills to cope with more demanding ICT duties at work (i.e. were overqualified). In Germany, the relevant share was over a third. At the other extreme, only 15% of workers in Greece thought they had greater ICT skills than required by their job.

On the other hand, 12% of all employees and self-employed workers in the EU who had used the internet in the previous year reported in 2018 that to cope well with ICT duties at work they needed further training. Among the member states examined here, that share was lowest in Germany (9%) and, especially, Slovakia (4%), and highest in France and Italy (both 17%).

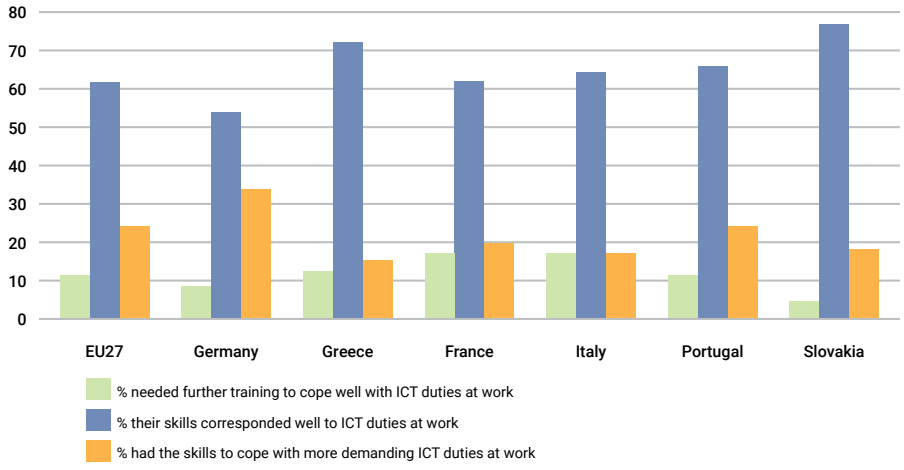
The residual category, the share of those who thought their skills corresponded well to ICT duties at work, was the largest: it comprised 62% of all employees and self-employed workers in the EU who had used the internet in the previous year, ranging from 55% in Germany to 77% in Slovakia. This is shown in Figure 10 below.

Figure 9. Share of jobs at risk of automation (%).



Note: Jobs are at high risk of automation if the likelihood of the job being automated is at least 70%. Jobs at risk of significant change are those with the likelihood of the job being automated estimated at between 50 and 70%. The data for DE, IT, FR and SK are from 2012, the data for EL are from 2015.
Source: OECD calculations based on the Survey of Adult Skills (PIAAC), and Nedelkoska and Quintini "Automation, skills use and training".

Figure 10. Performing ICT duties at work (2018).



Note: The numerator is based on respondents' choice of one of three answers to question Q7 ("Which of the following statements best describes your skills relating to the use of computers, software or applications at work?") of the 2018 Community survey on ICT usage in households and by individuals. (See ICT-HH 2018 model questionnaire). The denominator is individuals who, at work, use any type of computers, portable devices or computerised equipment or machinery. (See "ICT usage in households and by individuals".)
Source: Eurostat (isoc_iw_imp).

2.5 SKILLS AND TRAINING

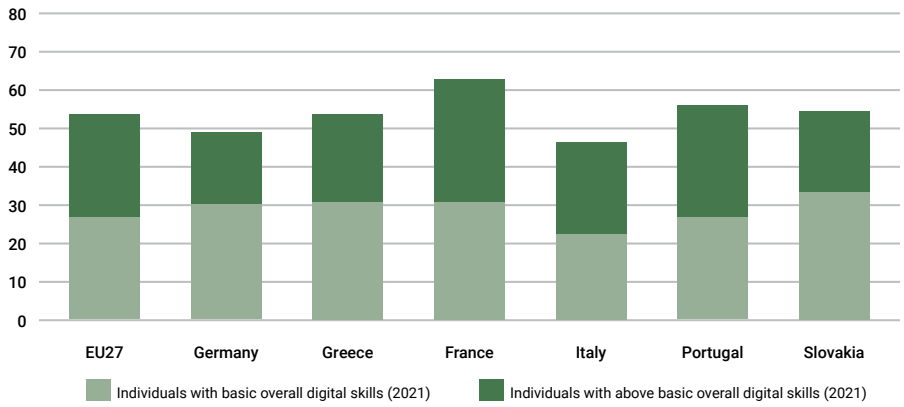
What is the level of digital skills in Europe? Figure 11 shows that, among the six member states examined here, the share of individuals (aged 16-74) with at least basic overall digital skills in 2021 was highest in France (62%). Not very far behind, Portugal and Slovakia (both 55%) were also above the EU average (54%). The other three countries followed. Greece (52%) outperformed Germany (49%), while Italy (46%) did less well than all other member states except Poland, Bulgaria, and Romania.

Exploring the data in more depth (not shown here) revealed interesting patterns. To start with, performance varied by component, which by itself is hardly surprising. Moreover, the six countries' ranking by component was not always consistent with their overall ranking. In particular, the share of individuals with basic or above basic digital skills in Germany was higher than it was in Greece in all five components (as regards problem solving, communication and collaboration, and safety skills – by a wide margin). Nevertheless, as pointed out earlier, the opposite was true when one looked at the share of individuals with basic or above basic *overall* digital skills: Greece did better than Germany. This seemingly paradoxical finding can be explained by the fact that in Germany more people had good digital skills in some but not all components, whereas the distribution of digital skills in the population was somewhat polarised in Greece, with more people having good digital skills in all components, but fewer in some but not all components.

Further analysis (not shown here) confirmed that, as might have been expected, digital skills tended to decline with age: in the EU as a whole, 73% of respondents aged 20-24 had at least basic overall digital skills in 2021, compared to only 25% of those aged 65-74. At younger ages, Greece and Portugal performed exceptionally well; in contrast, Germany and Italy scored well below the EU average.

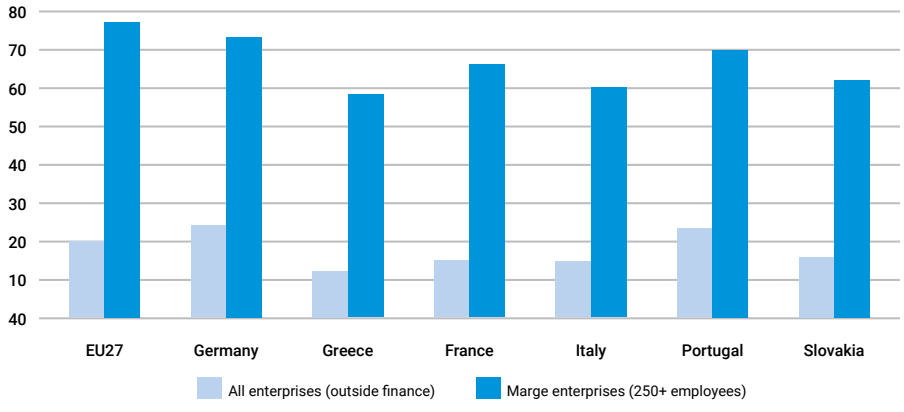
Lastly, the provision of training by employers varied significantly among countries, and generally rose linearly with firm size. Focusing on large enterprises (with 250 or more employees) outside finance shows that as many as 73% of these enterprises in Germany, and 70% in Portugal, provided workers with training to develop and upgrade ICT skills in 2020. In France, that share was 66%, just below the EU average (68%). In Slovakia it was 62%; in Italy 60%; and in Greece 58%. This is shown in Figure 12.

Figure 11. Digital skills (2021).



Note: The new Digital Skills Indicator, developed in cooperation with data users in the European Commission (DG CNECT) and the Joint Research Centre (JRC), is a composite indicator based on selected activities related to internet or software use that individuals perform in five specific areas: information and data literacy; communication and collaboration; digital content creation; safety; and problem solving. Individuals with above basic overall digital skills have all five component indicators at above basic level. Individuals with basic overall digital skills have all five component indicators at basic or above basic level, but not all above basic. (For more information, see "Individuals' level of digital skills", Eurostat website.)
Source: Eurostat (isoc_sk_dskl_i21).

Figure 12. Enterprises providing training for ICT skills (2020).



Note: Share of enterprises providing training to their personnel to develop their ICT skills. All enterprises: 10 or more employees and self-employed persons. Large enterprises: 250 or more employees. Financial sector excluded.
Source: Eurostat (isoc_ske_ittn2).

2.6 JOB QUALITY

The next section discusses estimates of job creation as a result of the RRF. But job quality is also of crucial importance. What do we know of the quality of existing jobs in the six countries examined here?

Job quality is not easy to pin down, although there is consensus that the dimensions of job content, interpersonal relationships, physical working conditions and contractual employment conditions are all relevant.[13] Here we report the latest findings of the Eurofound's Job Quality Index, which "summarises the quality of the working environment as the difference between the number of job resources (which affect workers positively) and the number of job demands (which affect workers negatively). The indicator is calculated at the level of the individual worker by comparing the number of demands and resources in their job. A job is described as 'strained' when the number of demands exceeds the number of resources and 'resourced' when the number of resources exceeds the number of demands".[14]

Results from the latest wave of the European Working Conditions Surveys (EWCS), conducted over the telephone in 2021, were published in December 2022. Figure 13 shows the share of workers in the six countries (and in the EU as a whole) who in 2021 responded they working conditions were on the one hand "extremely strained" or "highly strained", and on the other hand "highly resourced".

In the EU as a whole, the share of workers who reported high job quality (defined as "highly resourced") was nearly twice as great as the share of those who reported low job quality (defined as "extremely strained" or "highly strained"), the relevant shares being 21% and 11% respectively.

However, cross-country variation was rather significant. In Germany, 27% of respondents enjoyed high job quality, while only 8% said their job quality was low. In Portugal, too, many more workers were in "highly resourced" jobs (23%) than in "extremely strained" or "highly strained" ones (9%). The opposite was true in Slovakia and France, where more respondents reported low job quality (both 16%) than did high job quality (11% and 13% respectively). In Greece and Italy, the share of "highly resourced" jobs (both 15%) only slightly exceeded that of "extremely strained" or "highly strained" jobs (14% and 13% respectively).

Turning from subjective valuations to the objective reality of non-standard work in the EU, which correlates imperfectly with job quality, in 2019 the share of workers who are either self-employed, part time or temporary varied significantly among the six countries considered here.

Specifically, taking each category separately, the share of self-employment in Greece was twice as large as in the EU as a whole (28% vs 13% respectively), with Italy a rather distant second (21%). Germany featured a much larger share of part-time work (28%) than in Italy or France (19% and 17% respectively), with single-digit figures in the remaining three countries. In terms of temporary contracts, Portugal had a higher share (18%) than the other five countries, while the EU average was 13%.

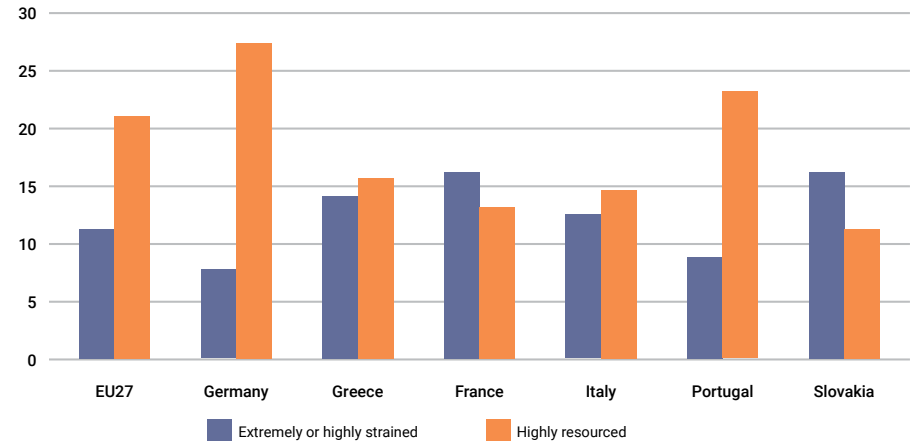
Furthermore, adding up the share of all three categories might be slightly misleading if a large number of workers were both part time and temporary, or both part time and self-employed. Assuming that this is unlikely, Slovakia stood out with a total share of non-standard work of only 25%. The relevant share ranged from 40% (Portugal) to 53% (Italy), with France, Greece and Germany clustered closer to the EU average of 45%. This is shown in Figure 14.

"

In the EU as a whole, the share of workers who reported high job quality (defined as "highly resourced") was nearly twice as great as the share of those who reported low job quality (defined as "extremely strained" or "highly strained"), the relevant shares being 21% and 11% respectively.

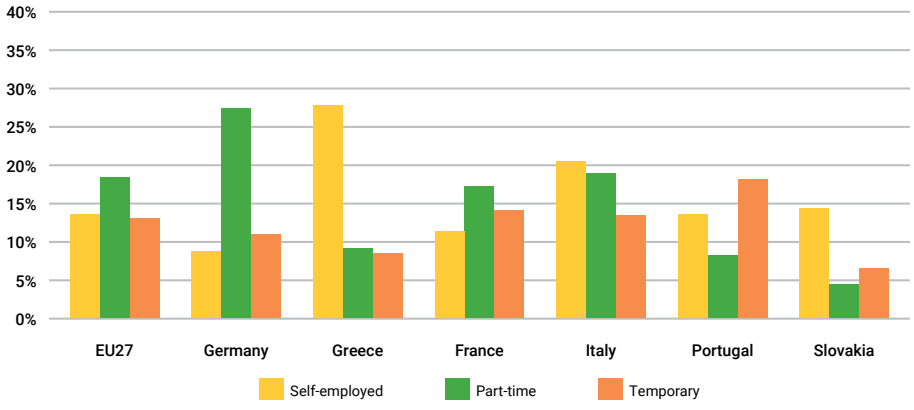
"

Figure 13. Job Quality Index (2021).



Note: Share of respondents reporting that working conditions in their job were "extremely strained" or "highly strained" vs "highly resourced".
Source: Eurofound (2022) and EWCTS 2021.

Figure 14. Share of non-standard workers (2019).



Note: Share of self-employed, part-time and temporary workers aged 15-64.
Source: Eurostat (lfsa_esgan, lfsa_epgaed, lfsa_etgaed, lfsi_emp_a).

2.7 SUMMING UP

The above overview shows that the six member states faced different challenges in their quest for preparing for the digital transformation (which, as discussed earlier, involves maximising the benefits of, minimising its costs and distributing both benefits and costs equitably).

- The **German** economy remained of course Europe's most advanced, its vocational education and training system much envied by the rest of the world, with a high share of quality jobs, but the country lagged in terms of e-government and (more surprisingly) digital skills.

- **Greece**'s predicament seemed the exact opposite: it scored poorly on economic complexity, and firms providing training, but had made great strides in terms of connectivity, e-government and digital skills.

- **France** did exceptionally well in terms of e-government and digital skills, but trailed both Italy and Portugal with respect to the digital intensity of private firms.

- **Italy**'s larger firms were as "digitally intense" as Germany's, even though fewer used AI technologies; nevertheless, the share of small and medium enterprises (which are characterised by lower digital intensity in all countries) is significantly greater in Italy than in Germany.[15] In addition, in terms of e-government and digital skills Italy lagged behind the other five countries in the sample, while the share of its large firms providing ICT training to their workers was lower than most.

- **Portugal** punched above its weight as regards digital skills and employer-provided training, but underperformed in terms of e-government, and (with Greece) scored lowest on connectivity, especially for poorer households and rural areas.

- As for **Slovakia**, it famously featured a highly industrialised economy and a well-trained workforce. On the other hand, if recent estimates[16] prove reliable, the country had the greatest share of jobs at risk of automation in the OECD.

Enter RRF. How did the NRRPs respond to the different challenges faced by each of the six countries considered here? This is the subject of the next section.

3. THE RRF AND THE DIGITAL TRANSITION

The Recovery and Resilience Facility is the centre-piece of NextGenerationEU (NextGenEU), the €806.9 billion temporary package launched by the EU in 2020 to support member states as they recovered from the pandemic, corresponding to approximately 5% of the annual GDP of the 27 national economies combined. NextGenEU, coupled with the new long-term budget (2021-2027), amounts to the largest of stimulus packages ever financed by the Union, equal to over €2 trillion. The RRF contributes €723.8 billion to NextGenEU, of which €385.8 billion in loans and €338 billion in grants. It aims to support reforms and investments over a six-year period (2021-2026). Reforms and investments are detailed by member states in their NRRPs, which must then be approved by the European Commission.

RRF allocations to member states were determined according to a formula having two parts. The first part, amounting to 70% of all RRF grants (€234.5 billion), was allocated on the basis of historical data (population in 2019, GDP per capita in 2019 and unemployment in 2015-2019). The second part, amounting to 30% of all RRF grants (€103.5 billion), was decided taking into account both the pre-Covid baseline (population in 2019 and GDP per capita in 2019) and developments during the pandemic (GDP growth in 2019-2021). Only those member states where GDP growth was negative received a share of this second part (30% of all RRF grants).

3.1. THE RRF AND THE NATIONAL ECONOMIES

The combined effect of the formula, and economic conditions in each country, implied that national allocations differed widely, both in absolute terms and relative to GDP. Italy, a large country badly hit by the pandemic, following a long-term period of relative decline, received the largest share (€68.9 billion, or 20.4% of all RRF grants available), more than France and Germany together (€39.4 and €25.6 billion).

Nevertheless, smaller countries' RRF allocation was worth more if compared to GDP. In relative terms, the greatest beneficiary was actually Greece: RRF grants, though "only" €17.7 billion in 2021-2026, corresponded to 1.61% of GDP (on an annualised basis, that is divided by six, taking as a point of reference the 2019 GDP). Slovakia's and Portugal's allocations of RRF grants were worth 1.12% and 1.08% of GDP respectively; Italy's 0.64%. In France (0.27%) and Germany (0.12%), RRF grants amounted to less than the EU average of 0.40% of GDP on an annualised basis. This is shown in Figure 15.

Obviously, this is all merely in accounting terms; if (as is reasonable to expect) the "Keynesian multiplier" turns out to be greater than one, meaning that RRF grants create new wealth and hence generate more income than as simple cash transfers, the effect on GDP will be greater than implied here. Bringing in RRF loans will add to that effect. The better RRF funds are spent, the higher the multiplier, and the greater the benefit for the national economy. (The estimated contribution of RRF on GDP growth is discussed in a later section.)

The varying significance of the Recovery and Resilience Facility to member states stands out more clearly still if RRF grants are compared to public investment, which they were designed to boost. As shown in Figure 16, in Greece and Portugal the RRF is scheduled to cause public investment to increase by as much as 64% and 59% respectively on an annual basis in 2021-2026. Public investment will also rise considerably – though less spectacularly – in Slovakia (+31%) and Italy (+28%). But even in France (+7%) and Germany (+5%), the public investment rise implied by the RRF is non-negligible.

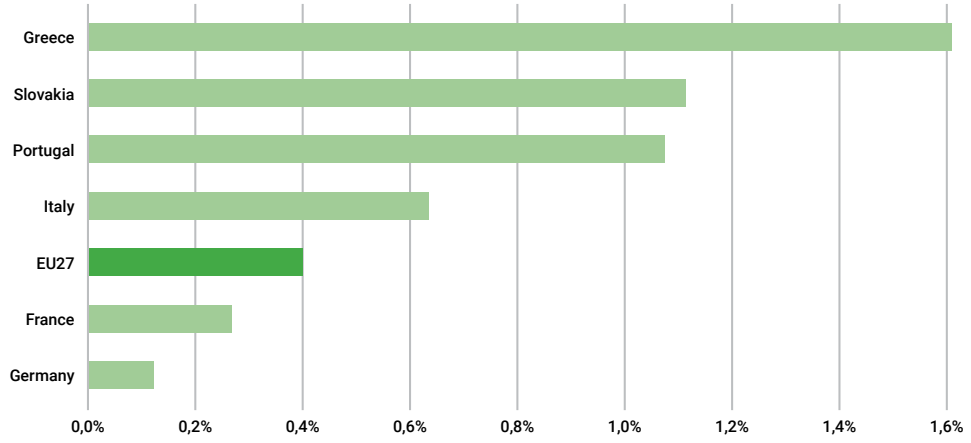
One question mark hanging over RRF concerns its added value relative to what national governments were planning to do anyway. If national governments substitute EU resources into national ones, or divert projects to RRF from other EU programmes, the net effect of RRF will be bound to be less than would have been had EU-funded projects been additional. This is after all why 'additionality' is a legal requirement of EU funding. Nevertheless, as recently pointed out by Corti, Gros et al. (2022), 'additionality' in the Austrian, Belgian, and German NRRPs was significantly less than full: "RRF funds were at least partly used to finance existing investment projects" while "due to time constraints with respect to the planning and executing periods, Member States, to a large extent, included existing projects in their NRRPs that had already reached a more advanced stage".

“

In Greece and Portugal the RRF is scheduled to cause public investment to increase by as much as 64% and 59% respectively on an annual basis in 2021-2026. Public investment will also rise considerably – though less spectacularly – in Slovakia (+31%) and Italy (+28%). But even in France (+7%) and Germany (+5%), the public investment rise implied by the RRF is non-negligible.

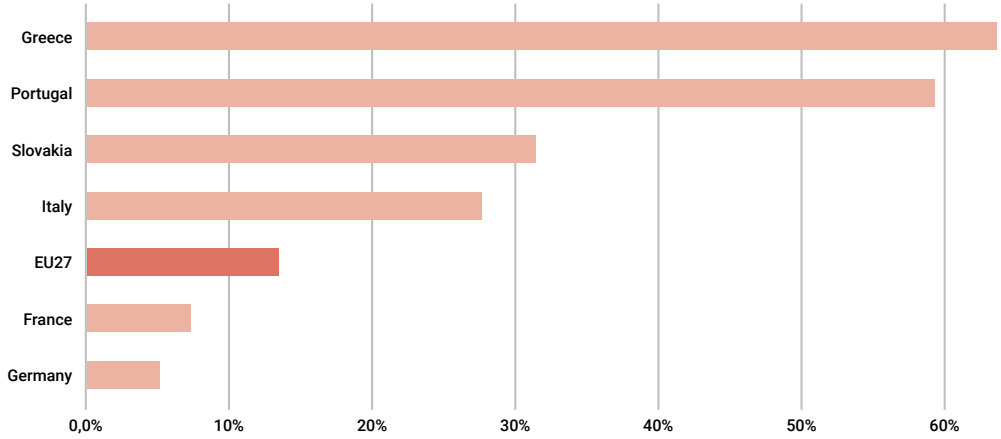
”

Figure 15. RRF grants as percentage of GDP.



Note: Numerator – national allocation in terms of RRF grants in 2021-2026 divided by six (annualised); denominator – GDP in 2019.
Source: Eurostat (nama_10_gdp).

Figure 16. RRF grants as percentage of public investment.



Note: Numerator – : National allocation in terms of RRF grants in 2021-2026 divided by six (annualized). Denominator: Gross fixed capital formation by general government in 2019.
Source: Eurostat (gov_10a_exp).

3.2. WHAT COUNTS AS DIGITAL?

RRF rules require member states to earmark at least 20% of their total allocation to digital investments (and at least 37% to green ones). Nevertheless, the identification of the relevant actions included in the NRRPs is less straightforward than it may appear at first sight.

Take for instance the painstaking analysis of all actions listed in the NRRPs of all 27 member states, recently updated by Bruegel (Darvas et al. 2022). The authors used three different classifications. The first considers the six *pillars*, as defined in the RRF Regulation:

- Green transition
- Digital transformation
- Smart, sustainable and inclusive growth including economic cohesion, jobs, productivity, competitiveness, research, development and innovation and a well-functioning internal market with strong small and medium enterprises
- Social and territorial cohesion
- Health and economic, social and institutional resilience, also to increase preparedness and response capacity to crises
- Policies for the next generation, children and youth such as education and skills.

To account for programmes relevant to more than one pillar, the authors also created joint categories (e.g. 'green and digital").

The second classification follows the seven *flagship areas* for investment and reforms, as defined by the European Commission:

- power up (clean technologies and renewables)
- renovate (energy efficiency of buildings)
- recharge and refuel (sustainable transport and charging stations)
- connect (rollout of rapid broadband services)
- modernise (digitalisation of public administration)
- scale-up (data cloud capacities and sustainable processors)
- reskill and upskill (education and training to support digital skills).

As the Bruegel team pointed out, this second classification has fewer overlaps, but leaves out several actions that they classified separately (for example, as "other digital").

Lastly, in a bid to overcome the shortcomings of the previous two classifications, Darvas et al. produced a third classification of their own.[17] Within each NRRP, all spending items are classified under three main categories (green transition; digital transformation; social, economic, and institutional development), further divided into several sub-categories. In the case of *digital transformation*, the sub-categories are as follows:

- connectivity
- digital-related investment in research and development
- digital skills and digital inclusion
- digital public sector
- digitalisation of businesses
- investment in digital capacities and deployment of advanced technologies (includes cybersecurity)
- greening the digital sector (energy efficiency of data centres and networks).

In the case of actions stranding more than one sub-category, a secondary heading was also assigned. As a result, three joint categories were also added (that is, "green transition and digital transformation", "green transition and social, economic, and institutional development", and "digital transformation and social, economic, and institutional development").

The size of the digital component, broadly defined, of NRRPs in the six member states of the sample, according to the three alternative definitions discussed above, is presented in Table 1.

Certain differences in the size of the digital component between classifications become immediately clear. In France, digital actions by flagship area are twice as costly as by pillar or according to the method proposed by Bruegel. In Slovakia, the discrepancy is by a factor of four (by flagship area) to one (per Bruegel method). In the other four countries there is less variation. In the EU as a whole, the size of the digital component ranges from 25% (by pillar, and per Bruegel) to 40% (by flagship area) of the total RRF allocation.

> “RRF rules require member states to earmark at least 20% of their total allocation to digital investments (and at least 37% to green ones).”

TABLE 1. The digital component of NRRPs.

	BY PILLAR		BY FLAGSHIP AREA		AS PER NEW BRUEGEL METHOD	
	€ billion	% total RRF	€ billion	% total RRF	€ billion	% total RRF
GERMANY	14.7	52%	14.2	55%	14.7	53%
GREECE	5.5	30%	6.0	48%	4.0	23%
FRANCE	5.9	14%	12.8	39%	6.2	15%
ITALY	53.7	29%	47.8	35%	44.6	24%
PORTUGAL	2.6	16%	4.2	45%	2.7	17%
SLOVAKIA	1.2	18%	2.8	55%	0.7	11%
EU27	121.9	25%	156.8	41%	122.6	25%

Note: RRF allocations include both grants and loans. "By pillar" includes "digital transformation" and joint categories (e.g. "green and digital"). "By flagship area" includes "connect", "modernise", "scale-up", and "reskill and upskill", as well as "other digital". "New Bruegel" includes actions with a secondary "digital" heading (e.g. "digital transformation and social, economic, and institutional development"). Total RRF allocation excludes "uncategorised".
Source: Darvas et al. (2022).

3.3. ANALYSING THE DIGITAL COMPONENT BY POLICY AREA

What are the main priorities of NRRPs as regards their digital component? In order to cut through the maze, the Bruegel dataset is drawn on to group 168 actions in the six member states under four policy areas:

- digital infrastructure (connectivity, or investment in digital capacities and deployment of advanced technologies, including cybersecurity)
- public sector (digital public sector, or justice and combatting corruption)
- private sector (SMEs, or digitalisation of businesses)
- skills, jobs, and cohesion (digital skills and digital inclusion, or education and non-digital skills).

It seems evident that public-sector actions account for the lion's share of RRF-funded digital investments. Infrastructure accounts for about a quarter of all digital actions in Italy and Germany. Upskilling and reskilling, job creation, and cohesion (territorial and social) absorb 30% of the digital component in Greece. Private-sector actions take up about a quarter of all funds allocated here as digital investments in Portugal, and even more in Italy (where the largest projects concern supporting the digital transformation of firms).

The limits of the exercise should already be clear. The four policy areas of Table 2 are not mutually exclusive; good projects are bound to address more than one simultaneously. One example is particularly instructive: Italy's largest single RRF action, "Transition 4.0", worth €14 billion, is (correctly) classified as private-sector investment on the grounds that is aimed to prepare Italian firms for the digital transition. Nevertheless, at the same time, "Transition 4.0" includes actions explicitly aimed to improve skills: of the three tax credits it will make available to firms, one concerns spending on training activities in digitalisation and related skills development, while the other involves spending on research, development and innovation. (The third relates to spending on investing in capital goods.)

Appendix 1 describes the two or three most important actions under each policy area in the six member states, drawing on the NRRPs.

TABLE 2. Total cost of digital investments (in € billion) by policy area.

	INFRASTRUCTURE	PUBLIC SECTOR	PRIVATE SECTOR	SKILLS, JOBS, COHESION	ALL DIGITAL
GERMANY	3.5	7.3	1.9	1.5	14.7
GREECE	0.7	2.0	0.6	1.4	5.5
FRANCE	0.2	3.0	0.4	0.4	5.9
ITALY	9.0	10.1	16.3	4.3	53.7
PORTUGAL	0.1	1.1	0.6	0.6	2.6
SLOVAKIA	0.1	0.8	0.0	0.1	1.2

Note: The digital actions analysed here were grouped under the four headings using variable "Bruegel Level 2, 1st" (column L in the Bruegel dataset).
Source: Own analysis of data in Darvas et al. (2022).

3.4. ANALYSING THE DIGITAL COMPONENT BY SECTOR

How are RRF-funded digital projects distributed by sector of economic activity? Taking as a starting point the Bruegel dataset,[18] it is often possible to classify such projects by NACE code. Often but not always: more than a quarter of all spending on RRF-funded digital projects in Italy was "unclassified". Furthermore, to avoid double-counting, the Bruegel classification necessarily opts for one NACE code when more are relevant: many projects classified as information and communication are in fact located in the public sector. Bearing these caveats in mind, the results of this exercise are shown in Table 3.

The sectoral composition of RRF-funded digital projects varied widely. In Italy digital projects will be spread quite evenly across sectors: 50% of all relevant spending will be in social services, public administration, and information and communication. At the other extreme, 93% of all digital projects (by spending) in France, and 62% in Greece, will be concentrated in one NACE code: information and communication – although as mentioned above, many projects involve the digital upgrading of public administration. In Slovakia, 95% of spending on digital projects will be in two NACE codes: information and communication, and public administration. In Germany, 55% of all digital spending will be in public administration and social services. In Portugal, two sectors, education and professional, scientific and technical activities, will each account for a quarter of all digital spending, with public administration accounting for just over a third. The share of education (23%) will also be significant in Greece.

TABLE 3. RRF-funded digital projects by NACE code (% of all digital spending).

	J	P	H	O	Q	M	Other	Unclassified
GERMANY	19%	9%	16%	29%	26%	0%	0%	0%
GREECE	62%	23%	0%	1%	9%	0%	3%	1%
FRANCE	93%	7%	0%	0%	0%	0%	0%	0%
ITALY	14%	5%	1%	17%	19%	5%	12%	26%
PORTUGAL	4%	25%	0%	34%	13%	25%	0%	0%
SLOVAKIA	42%	0%	0%	53%	4%	1%	0%	1%

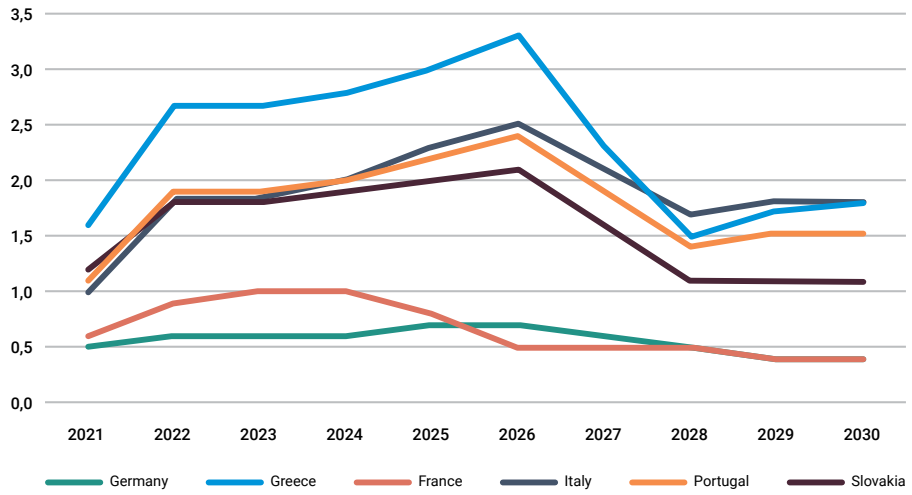
Note: NACE codes should be interpreted as follows – J: Information and communication; P: Education; H: Transportation and storage; O: Public administration and defence, compulsory social security; Q: Human health and social work activities; M: Professional, scientific and technical activities.
Source: Own analysis of data in Darvas et al. (2022).

3.5. EFFECTS ON GROWTH

For the reasons discussed in the introduction, making a statement about the effects of the digital component of RRF-funded investments on national economies would be unwise. On the one hand, it is far too early: these investments will unfold over a six-year period, and their effects will be felt over many more years. On the other hand, after these effects have worn off, a counterfactual will have to be established so as to attribute the changes observed to the RRF itself rather than to unrelated developments taking place over the same period, which will be difficult and controversial. For the time being, all that can be done is to review forecasts based on models that take into account all RRF-funded investments, not just the digital component.

One such model, the Quarterly European Simulation Tool (QUEST), has been used by the European Commission consistently for all member states in order to estimate the gains from RRF-funded investments in terms of increases to GDP growth relative to a counterfactual of no RRF. The model's central estimates ("baseline scenario") are shown in Figure 17.

Figure 17. RRF-induced boost to GDP growth.



Note: QUEST estimates of additions to GDP growth due to RRF-funded investments under the baseline scenario.
Source: European Commission Staff Working Documents.

"

Effects on GDP growth are forecast to be cumulative, gathering speed as RRF funds are disbursed, peaking in 2026, and falling off after the programme is terminated, but having put growth in member states permanently at a higher trajectory compared to the counterfactual of no RRF.

"

It can be seen that effects on GDP growth are forecast to be cumulative, gathering speed as RRF funds are disbursed, peaking in 2026 (last year of RRF), and falling off after the programme is terminated, but having put growth in member states permanently at a higher trajectory compared to the counterfactual of no RRF. The boost to GDP growth is expected to be greatest in Greece: between 2.7 and 3.3 percentage points higher in 2022-2026 than would have been the case otherwise. In the case of Italy and Portugal, GDP growth in 2026 will be 2.4-2.5 points higher than would have been in the absence of the RRF. In Slovakia, it will be 2.1 percentage points higher. In France, the effect will peak earlier (+1.0 percentage point in 2023-2024). Even in Germany, where the RRF is smaller relative to the size of the economy and public investment, it is forecast to add a welcome 0.7% to GDP growth by 2026.

National estimates tend to be more generous. The French NRRP claimed that "taken in its entirety, the Recovery Plan would boost activity by 4 pts of GDP over the period 2020-2025" (p. 730), which seems improbable (unless, of course, its authors added up annual gains over more years). The Slovak government's Stability Programme 2022-2025 estimated that "The Recovery and Resilience Plan funds will increase Slovakia's GDP by 2.7% by 2026" (p. 11) (QUEST put the gain to 2.1 percentage points). The Greek NRRP's forecast for growth in 2023 (+4.1% relative to the year before) was significantly higher than either the European Commission's (+3.1%) or the IMF's (+2.6%).

One possible explanation for the discrepancies between growth estimates produced by the European Commission vs those of national governments is that the latter include the forecast effect of policy reforms, which are explicitly ignored in the Commission's QUEST model.[19] The issue was addressed in a previous study,[20] where Commission experts attempted to quantify the effects of structural reforms. To the extent that the gap in growth forecasts is due to the effect of structural reforms, it seems wiser to exclude it, both because of the high degree of uncertainty surrounding the successful implementation and contribution to growth of the policy changes concerned, as well as of the time span (likely to be longer than the timeframe of RRF itself) between sowing the seeds and harvesting the fruits of any given policy change.

Needless to add, Russia's invasion of Ukraine, and the ensuing energy crisis, have introduced a big extra dose of uncertainty, making economic forecasts (such as those listed above) even less reliable than they usually are at normal times.

The return of inflation is another complication. Several aspects need to be considered here. On the one hand, the hike in interest rates (the central banks' response to rising prices) is almost explicitly aimed to slow down the economy, making last year's growth forecasts seem overly optimistic. On the other hand, even though interest rates have not risen as fast as prices, at least for the time being, which implies that real interest rates (net of inflation) remain low, or even negative, leaving investment projects as attractive as before, the uncertainty introduced by inflation (over and above its effect on real interest rates) is almost certain to have a cooling effect on investment. Both considerations are bound to lower the trajectory of future growth relative to the one traced earlier.

3.6. EFFECTS ON JOBS

The European Commission's QUEST model has also been deployed to produce estimates of the jobs to be created. These are shown in Table 4. The gains forecast are quite significant. In relative terms, they will be greatest in Greece (+1.0% of the working-age population), followed by Portugal (+0.8%), Italy (+0.7%) and Slovakia (+0.6%). In absolute terms, the model puts at 240,000 the number of jobs to be created in Italy. But even in France (157,000) and Germany (135,000), job creation will be non-negligible.

Again, national estimates of job creation as a result of RRF tend to be more plentiful. The Greek government put the number of jobs created by the end of 2026 to between 180,000 and 200,000, that is, three times as much as forecast by the Commission. The French plan promised 240,000 jobs will be created (instead of 157,000 as forecast by the Commission). The Italian NRRP estimated that the RRF will raise employment by 4% in 2024-2025, which even if it is taken to imply an increase by 4% of the number employed, rather than an increase to the employment rate by four percentage points, still amounts to nearly 900,000 jobs created (instead of the 240,000 forecast by the Commission). Portugal's Plan forecast the employment rate to be 1.4 percentage points higher in 2026 as a result of the RRF (compared to 0.8). In contrast, the Slovak government's estimate of an increase in employment by 0.8% in 2026 (p. 11) is in line with an increase to the employment rate by 0.6 percentage points. As for the German NRRP, it contains no forecasts of jobs created (nor, for that matter, of gains in GDP growth).

TABLE 4. Employment effects of RRF.

	NO. OF NEW JOBS CREATED		ADDITIONS TO THE EMPLOYMENT RATE	
	QUEST	NRRP	QUEST	NRRP
GERMANY	135,000		0.3	
GREECE	62,000	180,000 to 200,000	1.0	2.9 to 3.2
FRANCE	157,000	240,000	0.4	0.7
ITALY	240,000	900,000	0.7	2.6
PORTUGAL	50,000	85,000	0.8	1.4
SLOVAKIA	20,000	21,000	0.6	0.6

Note: QUEST estimates of number of jobs created due to RRF-funded investments under the baseline scenario.
These figures are expressed as percentage point additions to the 2019 employment rate (relative to population aged 20-64).
Source: European Commission Staff Working Documents; NRRPs; Eurostat (lfsi_emp_a).

"Given its focus on the green and digital transitions, which are both thought to be disruptive, it seems safe to assume that RRF-funded investments, by accelerating those transitions, will render more jobs redundant than would otherwise have been the case."

In addition to the point raised above about the effect of structural reforms, and the extra uncertainty created by the war in Ukraine, high energy prices, and inflation, a more fundamental issue concerns the question of jobs *lost*. In a market economy, some jobs are created while other jobs are destroyed in a perpetual process, whose net effect determines whether employment goes up or down. At times of rapid technological change, "creative destruction" accelerates. Given its focus on the green and digital transitions, which are both thought to be disruptive, it seems safe to assume that RRF-funded investments, by accelerating those transitions, will render more jobs redundant than would otherwise have been the case. This may be inevitable, even desirable (provided of course that losers are compensated for their losses). Nevertheless, most NRRPs are pretty silent on job destruction, nor does the Commission's QUEST model take into account job destruction.

There are exceptions. The Bank of Greece's model (the source of the optimistic estimate that 180,000 to 200,000 jobs will be created by 2026) forecast that the digitalisation of public administration will raise GDP and "productive labour services", but will reduce employment in the private sector by more than 1% in 2023-2026. One might add that, even in Greece, a country that produces no motor vehicles, the shift away from internal combustion engines towards electric cars is bound to reduce employment in the maintenance and repair of motor vehicles sector (over 30,000 jobs currently). Needless to say, the changes are likely to be far more dramatic in countries with a robust motor vehicle manufacture (accounting for an estimated 2.6 million jobs in the EU as a whole).

Another aspect concerns the quality of the jobs created. In those parts of the EU where public investment has been low (for instance, in Greece or Portugal), and even vital public services are funded with European rather than national resources (for example, in southern Italy, as in the case of childcare[21]), the jobs created in the context of EU-funded investment projects tend to be fixed-term rather than permanent, and may be discontinued as soon as funding dries up. Only hints to that effect can be found in some of the NRRPs, which seem to have given preciously little thought to the question of job quality.

While the above concern job creation as a result of RRF-funded projects under all policy areas ("pillars"), some NRRPs provide limited information on the projected employment effects of RRF-funded *digital* projects. For instance, the French NRRP forecasts the creation of 75,000 new jobs in cybersecurity, 16,000 jobs (by 2030) in quantum technologies, and 4,000 digital advisers (to promote digital inclusion). The Italian NRRP hypothesises the creation of 700 private-sector jobs in high-tech occupations, and of an undefined number of public-sector jobs (mostly fixed term) in task forces specifically created to assist the implementation of the NRRP itself, as well as in the justice system, and in cybersecurity. The Greek NRRP claims that 50,000 to 70,000 jobs will be created as a result of investing in connectivity. The Slovak NRRP estimates that a small number of government jobs will be created on regulatory reform, and on strengthening the justice system. No estimates are available in the German and the Portuguese NRRPs.

A more specific issue concerns jobs in the platform economy. The question of how platform work is (or ought to be) regulated, and the related question of how to ensure that platform workers have access to employment and social rights, are both novel and complex. The link with RRF is unclear: NRRPs are silent about how many of the jobs created will be platform jobs, while more generally the direction of change is not unequivocal and is at least partly influenced by policy. As a result, platform work may or may not become more common due to the acceleration of the digital transition brought about by RRF. Nonetheless, how governments deal with platform work(ers) is often symptomatic of their approach to new forms of work more generally, and therefore indicative of future challenges ahead.

4. CONCLUSIONS AND RECOMMENDATIONS

This policy study has attempted to tackle the task of assessing the employment effects of RRF-funded digital investments in a context of high uncertainty, and under conditions of paucity of key information. As a result, it was possible only to shed limited light on some big questions (will the RRF make European economies more dynamic?), while we remain in the dark about others (what will be the effects of RRF on income inequality?).

The first point to make is that the six countries started from a widely different baseline in terms of digitalisation. What is more, their degree of 'digital' preparedness differs significantly between policy areas. Sometimes, the findings are counterintuitive: Germany is obviously Europe's more advanced economy, but in terms of, for example, e-government it is clearly outperformed by Greece.

Even more unexpectedly, there is mixed evidence that an awareness of strengths and weaknesses in the degree of each member state's preparedness for the digital transition on the part of national governments shaped NRRPs. In certain aspects, national priorities seem to be closely aligned to national weaknesses.

- For instance, **Germany's NRRP prioritises the digitalisation of the public sector**, which seems wise in view of the flaws of the country's digital infrastructure brought to light during the Covid-19 pandemic. Similarly, **Portugal's NRRP emphasises investing in the government's IT network**, which seems appropriate given the country's disappointing performance in e-government. Public sector initiatives to provide "better services for citizens and businesses" also make up a large share of all digital investments in Slovakia's Plan, which makes sense as Slovakia also scores low in the share of citizens submitting completed forms to public authorities via internet.

- **Greece's Plan focuses on the digitalisation of small and medium enterprises**, as the weight of such firms in the national economy is greater, and their digital intensity lower, than is the case in the rest of the EU. **France's NRRP also aims to support the digitalisation of private firms**, where the country scores surprisingly low.

- **Italy's Plan stresses the upgrading digital and other skills**, where the country's current performance leaves much to be desired.

Nevertheless, in other respects, NRRPs seem to build on national strengths, focusing on what each country already does well at. This is hardly surprising (and partly attributable to path dependency), but still a cause for concern: rather than bridging the gaps in performance between member states (the RRF's avowed objective), the RRF could widen them further.

- For instance, **Germany's Plan appears not to be particularly concerned with digital skills**, even though the country's performance is worse than might have been expected (given that Germany is renowned for its vocational education and training dual system).

- Additionally, **the digital divide between high- and low-income groups** (in terms of the share of households with broadband connection) **is largest in Greece, closely followed by Portugal**. However, the NRRPs of these two countries make no mention of targeted actions to address the issue. Similarly, Portugal's connectivity divide between urban and rural areas, as large as Greece's, is greater than in the other four member states reviewed here, and yet the **Portuguese Plan includes no actions to improve the digital infrastructure specifically targeted to rural areas**.

- Finally, **Slovakia's workers are more likely to be in jobs at high risk of automation than any other country in the OECD**, and yet the private sector projects of its NRRP privilege general-purpose policy objectives, such as the digitalisation of insolvency proceedings, or reducing the regulatory burden on business. Conversely, **France is performing excellency in terms of e-government**, in spite (or because?) of which the French NRRP prioritises digital investments in the public sector ahead of other policy goals.

Furthermore, national governments emphasise investing in the digitalisation of public administration, education, and health and social services. This is to be welcomed, though it does raise the question of preparing public sector workers for the new (presumably more digitalised) tasks they will be called upon to perform. Moreover, there is no evidence that the NRRPs prioritise upskilling of workers at high risk of automation. On the contrary, the language of National Plans strongly suggests that the main beneficiaries of investments in education and training could well turn out to be students, pensioners, public administration workers, and other high-skilled employees in jobs at low risk of automation.

Job creation estimates seem inconsistent, and in some cases highly optimistic. Darkening economic prospects make it unlikely that even the less optimistic forecasts might come true. Job destruction as a result of the acceleration of the digital transformation (presumably an explicit goal of RRF) is neglected.

The quality of the jobs created remains an open question. Baseline conditions vary widely across member states, while recent developments do not always align with national weaknesses. For instance, in Greece non-standard work is pervasive, and job quality low, yet recent labour-market reform does not seem to be concerned with improving precarious conditions. Elsewhere, in the absence of a shared commitment to a "high path to growth", a key ingredient of which is investing in high-value-added and high-wage jobs, advances in employment conditions may prove vulnerable to government change. Early signs indicate that this might be the case in Italy.

More research is needed to address two issues that go beyond the scope of this policy study. The first concerns skills. To ensure that workers are qualified for the new jobs in the digital economy, a wide set of skills will be needed: digital and non-digital, cognitive and non-cognitive.[22] It is therefore essential to examine the skills strategy embedded in NRRPs. What investments are put in place for upskilling of current workers so they can move to a better job? What reforms are planned in education and training systems to ensure that future workers possess the skills that are needed to thrive in the digital economy? This policy study cites examples of actions included in NRRPs (in Appendix 1), without going much further.

The second issue concerns social protection. Not every worker affected by the digital transformation can be realistically expected to acquire new skills. Therefore, the final concern is the social-protection arrangements in place for displaced workers who are unable to reskill and move to new jobs. Are national welfare states equipped for the challenge? Do NRRPs contain investments and reforms geared to making social-protection systems more responsive, more resilient and more effective? These are urgent questions, left to future research, including other policy studies in the Recovery Watch series.

AGAINST THIS BACKGROUND, WE ADVANCE THREE RECOMMENDATIONS.

First, the entire purpose of a considerable share of NRRP resources is to accelerate the digital transition by preparing firms and workers to deal with the implications and to cope with unintended consequences. In view of this, it is only natural that new jobs will be created as other jobs will be destroyed. The real test of the added value of the RRF is the extent to which the new jobs are more numerous, of better quality, and better pay, than the jobs destroyed, relative to a no-RRF counterfactual. The complexity of this test suggests that monitoring employment effects requires far more and far better data than are currently available (or indeed collected). Therefore, our first policy recommendation is that employment effects should be systematically assessed, and the relevant evidence (on jobs created and destroyed, and their duration, quality, and pay) methodically collected.

Second, the evidence that NRRPs were primarily driven by a wish on the part of national governments to address weaknesses in the extent of each member state's preparedness for the digital transition is mixed. Though in some respects national priorities seem closely aligned to national weaknesses, in other respects NRRPs seem to build on national strengths, focusing on what each country already does well at. This should be a cause for concern: rather than bridging the gaps in performance between member states, the RRF could widen them further. In view of this, our second policy recommendation is that national performance should be closely monitored, and NRRP implementation corrected, when necessary.

Third, success in the digital economy for citizens, firms, and national economies will largely hinge on skills: equipping future workers and entrepreneurs with the skills (digital and non-digital, cognitive and non-cognitive) that they need in order to thrive. Clearly, the return on investments in skills and in systems of skill formation, only becomes apparent with some time lag. Nevertheless, that makes the need to monitor training outcomes more (not less) urgent. Keeping time consistency issues in mind, our third policy recommendation is that data on training outcomes should be methodically collected, and RRF-supported investments evaluated ex post in the light of tangible improvements in skills upgrade.

APPENDIX 1: KEY NRRP ACTIONS UNDER THE DIGITAL TRANSFORMATION COMPONENT BY POLICY AREA

GERMANY	
DIGITAL INFRASTRUCTURE	• **Microelectronics and communication technologies:** Investment in components such as processors and microchips as well as components for control and data processing, sending and receiving components for fixed data transmission (expansion of fibre-optic broadband) or wireless data transmission (mobile phone reception), and components for self-diagnosis, defence against attacks or AI and HPC (high-performance computing) hardware. • **Next-generation cloud infrastructure and services:** create the basis for a sovereign, highly scalable edge cloud infrastructure in Europe. This will require extensive R&D activities, including the development and definition of open-source technologies.
PUBLIC SECTOR	• **Future programme for hospitals:** Aims to fund the necessary investments in modern emergency capacity and better digital infrastructure. • **Administrative digitalisation:** User-friendly and legally sound digitalisation of 575 administrative services. • **Digital and technical strengthening of the public health service.**
PRIVATE SECTOR	• **Vehicle manufacturer/supplier industry investment programme:** Addressing digitisation in vehicles and their production ¬¬– including the digitisation in the rail sector.
SKILLS, JOBS, COHESION	• **Online education platform:** A space for all areas of education in which data is protected and quality is assured. • **Teacher equipment:** Investment in the digital transition, particularly education and digital skills; conditions for higher growth. • **Educational competence centres:** An initiative to strengthen digital teaching and learning, among others interlinking activities from universities, non-university research institutes and institutions for in-service teacher and training is planned. • **Digital pension system:** Intends to enable citizens to obtain information about their individual pension provision from all three pillars (statutory, company and private pensions) and identify any actions they need to take.

GREECE	
DIGITAL INFRASTRUCTURE	• **Small satellites:** Development of a constellation of small satellites that will support telecommunications services, as well as earth-observation applications in the fields of mapping, shipping, precision agriculture, spatial planning and others. • **5G corridors:** Development of 5G network infrastructure along the major Greek highways that are part of the Trans-European Transport Network in order to serve the needs for connected and autonomous mobility. • **Submarine fibre cables:** Deployment of modern submarine fibre cables that will connect mainland Greece with its islands and Cyprus. It will remove a major obstacle in the availability of high-speed broadband services to end-users, both through fixed and mobile networks, and enhance the capacity and resilience of the backhaul infrastructure in support of 5G.
PUBLIC SECTOR	• **Digitisation of archives and related services:** Digitisation of key archives in various sectors (justice, health, education, immigration and asylum, environment and energy, and digital governance) and integration in the relevant IT systems. • **Digital transformation of education:** The proposal features the digital transformation of education in terms of content, infrastructure and services, embedded within a comprehensive reform strategy to update curricula, rationalise services and monitor educational outcomes. • **Digital transformation of tax and customs administration:** This investment consolidates 14 digital infrastructure sub-projects necessary to implement the reform package of this component and support their objectives (reducing the VAT and personal income tax gaps, and lost revenue from smuggling, enhancing the operating efficiency of the IAPR [Independent Authority for Public Revenue] and reducing the administrative burden for tax payers).
PRIVATE SECTOR	• **Digital transformation of small and medium enterprises (SMEs):** This investment will support SMEs in obtaining (a) digital services (digital sales, payments, AI, cybersecurity, etc.), (b) industrial data platforms and data space, (c) new technology cash registers and point-of-sale (POS) terminals. • **New industrial parks:** Establishment of new, next-generation industrial parks consistent with the requirements of Industry 4.0 – i.e. 5G and ultra-high bandwidth network infrastructure – as well as renewable energy sources, smart energy management and energy-saving interventions, and circular economy infrastructure.
SKILLS, JOBS, COHESION	• **A new strategy for lifelong skilling – modernising and upgrading Greece's upskilling and reskilling system:** puts in place a new governance providing an incentives-compatible framework of training provision in Greece. In full alignment with the proposals of the Pissarides Committee interim report, the reform envisages an outcomes-based skilling–reskilling system, providing the right incentives for trainees and training providers, as well as an error-proof certification framework. • **Upgrading vocational education and training – supply of laboratory equipment for laboratory centres for IEK, EPAL, post-secondary year-apprenticeship class and vocational training schools:** The investment aims at the renewal and complete modernisation of VET infrastructure throughout Greece with the supply of laboratory equipment for laboratory centres for IEK, EPAL, post-secondary year-apprenticeship class and vocational training schools. This investment further strengthens the overall objectives described in the reform on Upgrading VET. • **Upgrade vocational education and training for young people:** Aims at increasing the quality and market relevance of the VET system. More specifically, it pursues the transformation of VET into an appealing educational pathway, delivering qualifications that are relevant to labour-market demand, boosting productivity and reducing unemployment, especially among young people.

APPENDIX 1: KEY NRRP ACTIONS UNDER THE DIGITAL TRANSFORMATION COMPONENT BY POLICY AREA

FRANCE	
DIGITAL INFRASTRUCTURE	• **Digital infrastructure:** The measure shall encourage the acceleration of the deployment of Next Generation Access (NGA) networks, in particular in optic fibre, with speeds above 100 Mbps and generally exceeding 1 Gbps. The projects shall take place in the so-called "public initiative networks", zones for which the private investment is difficult to attract, and part of the funds shall also be dedicated to premises with complex technical connections, in all of the country. The government's overarching goal is to provide full NGA access by 2025, in line with the Gigabit society objectives.
PUBLIC SECTOR	• **Health information systems:** Accelerate the development of digital tools in the health sector. Four sub-measures: (1) accelerate the deployment of state information systems; (2) upgrading of the existing software already used in the public and private sector to make them compatible with the interoperability and security requirements imposed by the state; (3) support and incentivise healthcare professionals in the digital transition; and (4) digital catch-up of social medicine. • **Digitalisation of public sector:** Identify digital innovative approaches allowing for an improvement of the efficiency of the public action and the quality of the working environment of public officials, including for e-mobility. To this end, a "public agent digital backpack" fund for projects will modernise the workstations of state officials and an "innovation and digital transformation" fund will support high-impact digital initiatives within the state and local authorities, while supporting the digital sector.
PRIVATE SECTOR	• **Digitalisation of small enterprises:** Includes two sub-measures: (1) continuation of the existing "France Num" initiative and support companies in their digital transformation to develop their business digitally; (2) support investments in industrial SMEs and mid-caps through upscaling and supporting their medium-/long-term digitisation strategy with the adoption of new technologies.
SKILLS, JOBS, COHESION	• **Digital inclusion:** The action builds on an existing initiative to support digital inclusion and it will train additional 4,000 digital advisers, who will be hosted by local authorities and private actors from associations or from the social and solidarity economy (such as town halls, libraries, retirement homes, nursing homes, social action centres and local associations). These digital advisers will organise workshops and offer training sessions to enable everyone to gradually take ownership of everyday digital tasks, such as to protect their personal data, master social networks, check sources of information, make a CV, sell an item, buy online, work remotely or schedule a doctor appointment. • **Remote learning:** Strengthen the provision of distance learning (FOAD) for jobseekers by doubling the number of places offered in 2021 (30,000 compared to 15,000 in 2020). • **Funds for individual digital skills development:** To foster the acquisition of digital skills across the workforce, access to training specifically focusing on digital skills or digital careers will be reinforced, by enabling individuals to sign up to such training through their individual learning accounts, which shall be topped up with a €1,000 credit.

ITALY	
DIGITAL INFRASTRUCTURE	• **High-speed networks:** Ensure 1 Gbps connectivity for around 8.5 million households, businesses and institutions in peripheral areas by 2026 and 5G coverage throughout the territory; to achieve this, authorisation processes will be simplified and new infrastructure will be built. • Satellite technologies and space economy: Develop satellite connections in view of the digital and green transition and to contribute to the development of the space sector. • High-tech investments: Support investments in civil works, plants and advanced equipment enabling volume production of innovative materials and components in the field of microelectronics.
PUBLIC SECTOR	• **Digital services and digital citizenship:** Improving the digital services offered to citizens, including enhancing existing and creating new services. • **Strengthening the technological infrastructure and tools for data collection, processing, analysis and simulation:** Strengthening the electronic health record (FSE) to ensure its dissemination throughout the country and reinforcing the New Health Information System (NSIS), the infrastructure and tools with which the Ministry monitors the Essential Levels of Care (LEA) and plans health services. Through the work of general practitioners, data collection will be standardised and medical records will be continuously updated. In addition, a central archive will be created and financial support will be provided to the regions that adopt the FSE platform. • **Enabling and facilitating migration to the cloud:** Implement a support and incentive programme to migrate local-government systems, data and applications to qualified cloud services. • **Digital infrastructure:** Ensure that PA systems, datasets and applications are hosted in highly reliable data centres with high-quality standards for security, performance, scalability, European interoperability and energy efficiency. The measure envisages the creation of a state-of-the-art cloud infrastructure in the country called the National Strategic Hub.
PRIVATE SECTOR	• **Transition 4.0:** Support the digital transformation of companies by incentivising private investment in goods and activities in support of digitisation through the recognition of tax credits. In detail, the measure consists of the recognition of three types of tax credits to companies that invest in: (a) capital goods; (b) research, development and innovation; and (c) training activities in digitisation and related skills development.
SKILLS, JOBS, COHESION	• **School 4.0 – innovative schools, new classrooms and laboratories:** Accelerate the digital transition of Italian schools by making their facilities more technologically advanced, flexible and suitable for the digitisation of teaching. • Integrated digital teaching and training on digital transition of school personnel: Developing teachers' digital teaching skills through continuous training to accelerate the digital transition and the adoption of a single integrated teaching model for all schools. The intervention foresees: the implementation of a system for the continuous training of teachers and school staff for the digital transition; the adoption of a national reference framework for integrated digital education to promote the adoption of digital-skills curricula in all schools.

APPENDIX 1: KEY NRRP ACTIONS UNDER THE DIGITAL TRANSFORMATION COMPONENT BY POLICY AREA

PORTUGAL	
DIGITAL INFRASTRUCTURE	• **Efficient, secure and shared critical digital infrastructures:** Intervene in the government's IT network, making it more resilient and more digital; renew the architecture of information systems and processes associated with border management and control, police and judicial cooperation and asylum, allowing for a reduction in the bureaucratic burden of SEF services; eliminate redundancies in the bureaucratic technical processes of the security forces and services (FSS), with a view to creating common systems in volatile contexts that allow police elements to be made available for operational functions, promoting the reduction of operating costs through the use of solutions and common-use capabilities, the reduction of administrative effort promoted by standardisation and the integration and automation of processes. • **Strengthening the overall cybersecurity framework:** Strengthen training in cybersecurity and information security; increase security in information lifecycle management; implement the national cybersecurity framework; create the physical and technological conditions for the implementation and operationalisation of the new cybersecurity and information security coordination model.
PUBLIC SECTOR	• **Digital transition in health:** A dedicated programme to promote digital transition in health, implemented through the improvement and strengthening of the information systems of the national health service. • **Social security digital transition:** Reorganisation of the design of the social security system; development and implementation of a new relationship model; reformulating and adapting the work station; implementing infrastructure and support solutions for social security systems; re-engineering of processes and qualification of professionals.
PRIVATE SECTOR	• **Digital transition of companies:** Contributes to the transformation of the business model of Portuguese SMEs and to their digitisation, aiming at greater competitiveness and resilience. It integrates the promotion of business digitalisation through the acceleration and automation of decision-making and execution-based AI, the redesign of the value and supply chains, optimising speed and resilience and the use of cross-sectoral data spaces supported in innovative secure and energy-efficient European cloud and edge computer infrastructures, enabling companies to reposition their businesses in a digitally advanced ecosystem. • **Digital training of companies:** Provides for the creation of two interconnected training programmes, with innovative approaches and aimed at filling gaps in the digital skills of workers (employees and entrepreneurs) and companies: (1) Academia Portugal Digital – platform and programme for the development of digital skills on a large scale; (2) Employment + Digital 2025 – training programme in digital technologies that aims to respond to the challenges and opportunities of various business sectors, namely industry, commerce, services, tourism, agriculture, maritime economy, and construction.
SKILLS, JOBS, COHESION	• **Public administration training:** development of organisational capacity in all public bodies and entities, including ensuring that the public administration has trained human resources, in terms of management and technologies, to effectively take advantage of the ongoing transformations, particularly in the digital field, with a view to providing a better public service. • **Digital transition in education:** Removing obstacles to quality internet access in the school environment; removing limitations to the integrated use of technological and digital equipment and eliminating the lack of specialised equipment to develop digital skills and encourage the pursuit of STEM (science, technology, engineering and maths) careers, promoting equal participation of girls and boys; overcoming the insufficient use of digital educational resources in the teaching and learning process and in the evaluation processes; overcoming the dispersion and inefficiency of the education system's management and information systems.

SLOVAKIA	
DIGITAL INFRASTRUCTURE	• **Investments in prevention and speed of solving security incidents:** Developing an early-response system in cybersecurity of the public administration. It follows up on projects under the Operational Program Integrated Infrastructure.
PUBLIC SECTOR	• **Better services for citizens and businesses:** In direct link to Reform 1 under the same NRRP component, this investment will consist of deploying integrated e-government solutions to 16 priority life situations. The solutions will be developed using a common platform of IT tools necessary to build and deliver understandable and user-friendly digital services covering the integrity of the life-situation procedure. • **Digital transformation of public administration service provision:** Shorten the duration of completion of public services by optimising and automating administrative processes. The investment will transform 42 public administration sections by launching a fully functional digitalised version.
PRIVATE SECTOR	• **Digitalisation of insolvency proceedings:** The investment shall fully digitalise insolvency procedures in order to shorten them and reduce the cost for entrepreneurs. This shall comprise digitalising liquidation, bankruptcy, restructuring and debt discharge, including pre-insolvency proceedings. Various actors shall be connected to it, such as courts, creditors, and the public. • **Reducing the regulatory burden on business:** Reduce the administrative burden on businesses by introducing the following tools: the ex-ante evaluation of planned transposition legislation to prevent unjustified gold-plating; the ex-post evaluation of the effectiveness and justification of already introduced regulation; the 1-in-2-out rule that ensures new legislation does not increase administrative cost for businesses; and packages of individual measures based on stakeholder consultations that are suited to simplify administrative requirements to businesses.
SKILLS, JOBS, COHESION	• **Improving the digital skills of seniors - tablets for pensioners:** Support the development of digital skills of seniors and disadvantaged individuals.

BIBLIOGRAPHY

Arntz M., T. Gregory and U. Zierahn (2016) "The risk of automation for jobs in OECD countries: A comparative analysis". OECD Social, Employment and Migration working paper 189. Paris: Organisation for Economic Co-operation and Development.

Autor D.H., F. Levy and R.J. Murnane (2003) The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118 (4) 1279.

Autor D.H., D. Mindell and E. Reynolds (2020) The work of the future: Building better jobs in an age of intelligent machines. MIT Task Force on the Work of the Future, Cambridge MA: Massachusetts Institute of Technology.

Corti F., D. Gros, A. Liscai et al. (2022) "The European added value of the Recovery and Resilience Facility: An assessment of the Austrian, Belgian and German plans". Study requested by the Committee on Economic and Monetary Affairs. Brussels: European Parliament.

Corti F., P. Luongo, C. Morabito and T. Ruiz (2022) "The role of the Recovery and Resilience Facility in strengthening childcare policies". Recovery Watch policy study. Brussels: Foundation for European Progressive Studies.

Darvas Z., M. Domínguez-Jiménez, A. Devins et al. (2022) "European Union countries' recovery and resilience plans". Dataset. Brussels: Bruegel.

Eurofound (2022) Working conditions in the time of COVID-19: Implications for the future. European Working Conditions Telephone Survey 2021 series. Luxembourg: Publications Office of the European Union.

Frey C.B. and M.A. Osborne (2013) "The future of employment: How susceptible are jobs to computerisation?" Working paper. Oxford Martin School, University of Oxford.

Frey C.B. and M.A. Osborne (2017) "The future of employment: How susceptible are jobs to computerisation?" *Technological Forecasting and Social Change*, 114: 254-280.

Matsaganis M. (2020) "Technological change, the future of work, and public policy". Lps working paper 01/2020. Social Policy Laboratory, Polytechnic University of Milan.

Morandini M.C., A. Thum-Thysen and A. Vanderplas (2020) "Facing the digital transformation: Are digital skills enough?" European Economy Economic Brief 54. Luxembourg: Publications Office of the European Union

Nedelkoska L. and G. Quintini (2018) "Automation, skills use and training". OECD Social, Employment and Migration working paper 202. Paris: Organisation for Economic Co-operation and Development.

Nurski L. and M. Hoffman (2022) "Beating burnout: Identifying bad jobs and improving job quality". Policy Contribution 07/2022. Brussels: Bruegel.

Roeger W., J. Varga and J. in't Veld (2022) "The QUEST III R&D model", in U. Akcigit, C. Benedetti Fasil, G. Impullitti et al. (eds), *Macroeconomic Modelling of R&D and Innovation Policies* (Cham: Palgrave Macmillan).

Varga J. and J. in't Veld (2014) "The potential growth impact of structural reforms in the EU: A benchmarking exercise". European economy economic papers 541. Directorate General Economic and Financial Affairs (DG ECFIN). Brussels: European Commission.

ACKNOWLEDGEMENTS

An earlier version of this policy study was presented at a workshop in Brussels (30 September 2022). We thank Francesco Corti, Laura Nurski, David Rinaldi, Sotiria Theodoropoulou, and all other workshop participants for their comments and suggestions. We are especially grateful to Matej Bobovník, Jérôme Creel, Tiago Santos Pereira and Inga Sabanova for contributing written feedback. We also thank Jonas Vargas for clarifying the assumptions built into the QUEST model. Helen Johnston's editing went further than correcting our language and style, for which we are much obliged. Above all, we are indebted to Justin Nogarede for his close guidance at all stages of the production process. It goes without saying that responsibility for the views expressed here, and for any errors still present, remains ours alone.

END NOTES

1 Autor et al. (2020), p. 4.

2 Matsaganis (2020).

3 Nedelkoska and Quintini (2018).

4 Darvas et al. (2022).

5 The Growth Lab's Product Complexity Index listed 1,243 items in the case of goods, but only 4 items in the case of services. See Harvard Growth Lab's Country & Product Complexity Rankings.

6 For instance, the 2020 Product Complexity Index gave a value of 0.91 to "Motor cars and other motor vehicles principally designed for the transport of persons" (code 8703), 1.63 to "Self-propelled railway or tramway coaches, vans and trucks" (code 8603), and 2.07 to "Machines and mechanical appliances having individual functions" (code 8479). By comparison, the value assigned to "Information and communications technology" was 0.06, to "Insurance and financial services" -0.28, to "Transport services" -0.59, and to "Travel and tourism services" -0.76. See Harvard Growth Lab's Country & Product Complexity Rankings.

7 Namely, (relatively) higher-complexity ICT services made up 20.6% of France's export basket in 2020, compared to 5.8% of Slovakia's, and 8.1% of Italy's. On the contrary, lower-complexity transport and travel and tourism services jointly accounted for 34.9% of Greece's export basket, and 16.9% of Portugal's, compared to only 10.4% of France's. See Harvard Growth Lab's Country Profiles.

8 Frey and Osborne (2013) and (2017).

9 Arntz et al. (2016); Autor et al. (2003).

10 Arntz et al. (2016), p. 34.

11 Nedelkoska and Quintini (2018).

12 Ibid, pp. 46-57.

13 Nurski and Hoffman (2022).

14 Eurofound (2022), p. 49.

15 Indeed, the share of small firms with 'very low' digital intensity is actually greater in Germany (45%) than it is in Italy (42%), while the share of medium-sized firms with 'very low' digital intensity is equal (23%) in the two countries. On the other hand, Germany outperforms Italy in both size classes in terms of the share of firms of 'low' digital intensity [Eurostat online data code: isoc_e_dii]. Nevertheless, Germany's advantage over Italy in firms' digital intensity is due to composition effect: in Italy, firms with fewer than 250 employees accounted in 2020 for 76% of total employment and for 64% of all value added, while the equivalent shares in Germany were 57% and 47% respectively [Eurostat data online data code: sbs_sc_sca_r2].

16 Nedelkoska and Quintini (2018).

17 Darvas et al. (2022).

18 Ibid.

19 Roeger et al. (2022).

20 Varga and in't Veld (2014).

21 Corti, Luongo et al. (2022).

22 Morandini et al. (2020).

ABOUT THE AUTHORS

Manos Matsaganis is Professor of Public Finance at Polytechnic University of Milan (since 2016), and Head of the Greek & European Economy Observatory at the Hellenic Foundation for European & Foreign Policy ELIAMEP in Athens (since 2021).He studied at the Athens University of Economics and Business (1986), the University of York (MSc 1988), and the University of Bristol (PhD 1992). He has worked at the London School of Economics (1990-1993), the Greek Prime Minister's Office (1997-2001), the University of Crete (1996-1999 and 2001-2004), and the Athens University of Economics and Business (2004-2016), where he founded and directed the Policy Analysis Research Unit. He has worked for international organizations such as the European Commission, the OECD, UNICEF, and the World Bank. He was a member of the Expert Group on Social Investment for Growth and Cohesion created by European Commissioner László Andor (2012-2013). He has been Fulbright Scholar at Harvard University (2014) and University of California, Berkeley (2015), Visiting Scholar at Boston University (2017, 2018), and Visiting Professor at University of Vienna (2019). His Oxford University Press book (with Anton Hemerijck) on the transformations of the European welfare state following the Eurozone and the pandemic crises is due in 2023.

Georgios Manalis is a research economist, currently working as an Early Career Researcher (Post-Doc) at the School of Economics in the University of Edinburgh. Georgios held the A.G. Leventis Chair (Research Fellowship) at the Hellenic Foundation for European and Foreign Policy (ELIAMEP) for the year 2021/22. Prior to that, he has worked as a Special Research Scientist at the Department of Economics in the University of Cyprus (2020/21), and as an economic analyst in the research department of the National Bank of Greece (internship position). Georgios holds a PhD in Economics from the European University Institute (Florence, Italy), a MSc in Political Science and Political Economy from the London School of Economics (London, UK), and a Ptychion and a MSc in Economic Science from the Athens University of Economics and Business (Athens, Greece). His research interests include macroeconomics and development, economic growth and international economics. His work has been presented in multiple academic conferences (e.g., SIOE-2022, AMES-2022, EEA-2022, CEPR-STEG-2021, GLAD conference-2021, EERN Conference-2020), as well as received research awards (7th Giorgio Rota Best Paper Award – 2019, Best paper at Warsaw International Economic Meeting 2019, Shortlisted for LAGV Prize (ASSET 2019)).

Avilia Zavarella is an early career European and international affairs professional and interdisciplinary researcher, with a passion for promoting development, security and positive social change. She holds a BA in European Politics (King's College London) and an MSc in International Social and Public Policy for Development (LSE), and she is currently pursuing an Erasmus Mundus MA in Global Studies. She has 2+ years' experience working in policy research and analysis for public and third sector organisations across Europe, her research having so-far resulted in 11 published collaborative reports spanning a range of policy areas – from EU development cooperation to the EU Green Transition. Her most recent professional research focus has been on analysing the socio-economic impact of digital transition provisions of EU National Recovery Plans, while her MA academic research has focused on evaluating the impact of Chinese public diplomacy operations on public opinion in Sub-Saharan Africa.

FEPS
FOUNDATION FOR EUROPEAN
PROGRESSIVE STUDIES

THE FOUNDATION FOR EUROPEAN PROGRESSIVE STUDIES (FEPS)

The Foundation for European Progressive Studies (FEPS) is the think tank of the progressive political family at EU level. Our mission is to develop innovative research, policy advice, training and debates to inspire and inform progressive politics and policies across Europe. FEPS operate as hub for think- ing to facilitate the emergence of progressive answers to the challenges that Europe faces today. FEPS works in close part- nership with its members and partners, forging connections and boosting coherence among stakeholders from the world of politics, academia and civil society at local, regional, nation- al, European and global levels.

FRIEDRICH EBERT STIFTUNG

FRIEDRICH EBERT STIFTUNG

The EU Office of the Friedrich-Ebert-Stiftung (FES) participates in the European integration process, backs and accompanies the interests of the Federal Republic of Germany in Europe. As an agency of dialogue, education and consultancy, the Frie- drich-Ebert-Stiftung fulfils its special role as a 'political network organisation' for and with the various European institutions.

IEV

INSTITUT EMILE VANDERVELDE (IEV)

The Emile Vandervelde Institute is the researche centre of the Belgian Parti Socialiste and devotes itself to research concern- ing all questions of an economic, social, financial, administra- tive, political, ethical and legal nature facing the party and its organizations. The IEV carries out analytical notes and studies on social issues and topical issues for the general public, as- sociations and PS activists. The activities of the institute shall offer prospective and analyses accessible to all, thus contrib- uting to the awareness, critical knowledge and engagement of citizens and activists in the social, economic, cultural and environmental debates.

ΕΛΙΑΜΕΠ
ELIAMEP
ΕΛΛΗΝΙΚΟ ΙΔΡΥΜΑ ΕΥΡΩΠΑΪΚΗΣ & ΕΞΩΤΕΡΙΚΗΣ ΠΟΛΙΤΙΚΗΣ
HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY

ELIAMEP

(HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY)

The Hellenic Foundation for European and Foreign Policy (ELIAMEP) is an independent, non-governmental, non-profit think tank, established in Athens (Greece) in 1988. Its mission is to conduct policy-oriented research and provide policy makers, academia and the public at large with authoritative information, analysis, and policy recommendations, for the development of evidence-based responses to major European and foreign policy challenges. ELIAMEP is committed to excellence, open dialogue and policy deliberation, research, training and any other undertaking that falls within its spheres of interest. ELIAMEP promotes pluralist democratic values; a rational level-headed public debate on the major regional, European and global challenges; the resolution of disputes through dialogue; Greece's European and Euro-Atlantic commitment.


RECOVERY
WATCH

RECOVERY WATCH

The Recovery and Resilience Facility was created to "mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions". This policy study poses the question of the Facility's contribution to achieving one of these goals: preparing member states for the digital transformation, by maximising its benefits, minimizing its costs, and distributing both benefits and costs equitably.

The policy study first describes how advanced the six countries, Germany, Greece, France, Italy, Portugal, and Slovakia, were in terms of the digital transition before the first RRF funds were disbursed. We find that the six countries started from a widely different baseline, while their performance was inconsistent across policy areas including e-government, high-tech employment, connectivity, jobs at risk of automation, digital skills, and job quality.

Subsequently, we offer an analysis of the digital components of the six NRRPs. National governments tend to emphasise investing in the digitalisation of public administration, education, and health and social services. This is to be welcomed, though it does raise the question of preparing public sector workers for the new tasks they will be called upon to perform. Moreover, there is no evidence whatsoever that the NRRPs prioritise upskilling of workers at high risk of automation. Furthermore, our prior assumption that NRRPs were shaped by an awareness on the part of national governments of the strengths and weaknesses in each member state's preparedness for the digital transition was not always supported by the evidence. Often, the plans seem to build on national strengths. This means that rather than bridging gaps in performance between member states, the RRF's avowed objective, the RRF could widen them further.

POLICY STUDY PUBLISHED IN JANUARY 2023 BY

FEPS FOUNDATION FOR EUROPEAN PROGRESSIVE STUDIES

FRIEDRICH EBERT STIFTUNG

IEV

Knowledge partners

ΕΛΙΑΜΕΠ ELIAMEP
ΕΛΛΗΝΙΚΟ ΙΔΡΥΜΑ ΕΥΡΩΠΑΪΚΗΣ & ΕΞΩΤΕΡΙΚΗΣ ΠΟΛΙΤΙΚΗΣ
HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY

ISBN : 9782930769967