Labor Market and Digitalization in Portugal

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2023
JUL

SELECTED ISSUES PAPER

SIP/2023/047

IMF Selected Issues Paper
European Department

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Authorized for distribution by Rupa Duttagupta
July 2023

ABSTRACT: This paper analyzes Portugal's labor market and digitalization trends during COVID-19. Portugal had a milder impact on its labor market than previous recessions, with smaller employment declines and less unemployment. However, labor force participation sharply dropped, especially among low-skilled and young workers. Contact-intensive and non-digital jobs and young and low-skilled workers were disproportionately affected. Conversely, digital employment in Portugal grew while non-digital employment decreased. Regression analysis for Europe and the US suggests a temporary rise in digital employment during the pandemic. Policy emphasis on digitalization investments and skills development is crucial for a resilient labor market in Portugal, considering future shocks.

JEL Classification Numbers:	E24, J08, J22, J23, J24, J63
Keywords:	Digitalization; Labor Market; Employment; Vacancies; COVID-19
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Labor Market and Digitalization in Portugal

INTERNATIONAL MONETARY FUND

PORTUGAL

SELECTED ISSUES

June 1, 2023

Approved By	Prepared By Ippei Shibata
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LABOR MARKET AND DIGITALIZATION IN PORTUGAL[1]

1.   The Portuguese labor market was hit during Covid-19, but to a lesser degree than previous recessions. As shown in the Figure 1 top row panels, aggregate employment rate (unemployment rate) declined (increased) less during the Covid-19 recession than in previous recessions. This pattern is broadly in line with the median euro area (EA) country and smaller than the US, in large part due to job retention scheme extensively deployed in most European countries (Ando et al, 2022, Duval et al, 2022, Pizzinelli and Shibata 2023, and Shibata 2021). The labor force participation rate, however, dropped more sharply during Covid-19 than in the previous two recessions, in part reflecting the unique nature of health-related shocks, largely driven by low-skilled and young workers[2] (Figure 1, bottom row panels).

Figure 1. Aggregate Labor Market Dynamics

Employment-to-Population Ratio
(Percent)

Sources: Euro Stat and IMF Staff Calculations.

Unemployment Rate
(Percent)

Sources: Euro Stat and IMF Staff Calculations.

Labor Force Participation Ratio
(Percent)

Sources: Euro Stat and IMF Staff Calculations.

Contributions to Overall Participation Rate Change
(Percent point change from 2019Q4)

Sources: Eurostat and IMF staff calculations.

[1] Prepared by Ippei Shibata.

[2] Some of the decline in labor force participation could reflect statistical (measurement error) issues. Specifically, during Covid-19, individuals who should be classified as unemployed may have been reclassified as inactive (out of the labor force). Young is defined as those with age between 15-29 years old. Low-skilled workers are workers with below tertiary education.

2.   The aggregate dynamics mask important distributional impacts of the Covid-19 recession on the labor market. Young, and low-skilled employment in contact-intensive and non-digital jobs experienced a sharper decline compared to counterpart groups (Figure 2).[3] The

adjoining figure plots the change in the employment share of different worker/job groups between 2020Q1 and 2020Q2 at the onset of the Covid-19 pandemic. The share of young workers (15-29 years old) employment in total employment (among 15-64 years old) experienced a decline of around 1.1 percentage points. Low-skilled workers (below tertiary education) employment also experienced a drop in their share in total employment of around 1.6 percentage points. Moreover, contact-intensive employment (in sectors requiring workers to interact with customers in the

Figure 2. Employment Impact During Covid-19 by Worker and Job Types
(Percentage point change, share of employment)

Sources: Eurostat and IMF staff calculations.

production process, such as in hotels and restaurants) was greatly affected, experiencing a decline of around 1 percentage point in its share of total employment.[4] Conversely, Portugal did not experience any significant differences in changes to male versus female employment levels, unlike some other advanced economies that saw female employment levels being disproportionately hit (Bluedorn et al, 2023).
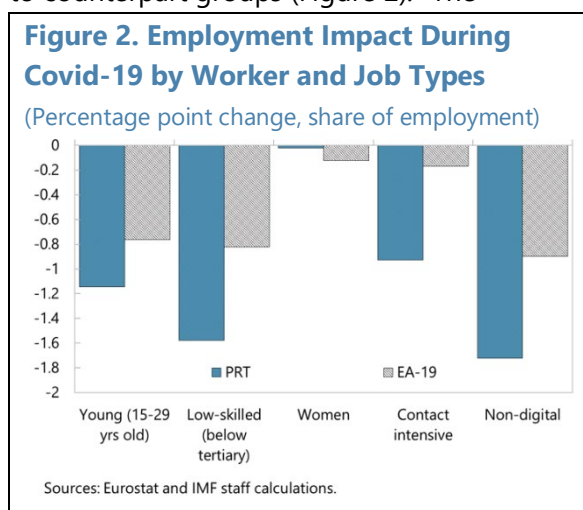
3.   Among the heterogenous labor market impacts in Portugal, non-digital employment, in particular, experienced the sharpest drop in its share of total employment in Portugal, with around 1.7 percentage points decline in its share of total employment. To investigate further, we follow Muro et al. (2017) to better understand the effect of Covid-19 on digital versus non-digital employment using O*NET.[5] Specifically, we calculate distal scores—the weighted averages of scores on (i) knowledge and (ii) work activity related to computers—for each occupation and classify occupations above the median score as digital.[6] Based on this method, ISCO08 occupations defined as digital are (i) managers, (ii) professionals, (iii) technicians and associate professionals, and (iv) clerical support workers, while those that are non-digital are (i) service and sales workers, (ii) skilled

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[3] Industries that are defined to be contact-intensive are (i) Construction, (ii) Trade, (iii) Transport, (iv) Accommodation and Food, (v) Education, (vi) Health, (vii) Arts (viii) Other Services Digital occupations are defined in more detail in the following paragraph.

[4] Note that there is an overlap between young and low-skilled workers and contact-intensive employment, in particular for tourism related activities. Also, some sectors did not see a decline in employment (for example, health).

[5] O*NET is online database developed by the United States Department of Labor and contains comprehensive information on required skills and job duties on hundreds of occupations. See https://www.dol.gov/agencies/eta/onet for more details.

[6] Specifically, we calculate the weighted average of knowledge and work activity related to computers. See Soh et al (2022) for detail. The 50th percentile level is 53. These measures were mapped to ISCO08 codes to obtain digital scores for 9 categories of ISCO08 one-digit occupation codes.

agricultural, forestry and fishery workers, (iii) craft and related trade workers, (iv) plant and machine operators and assemblers, and (v) elementary occupations.[7]
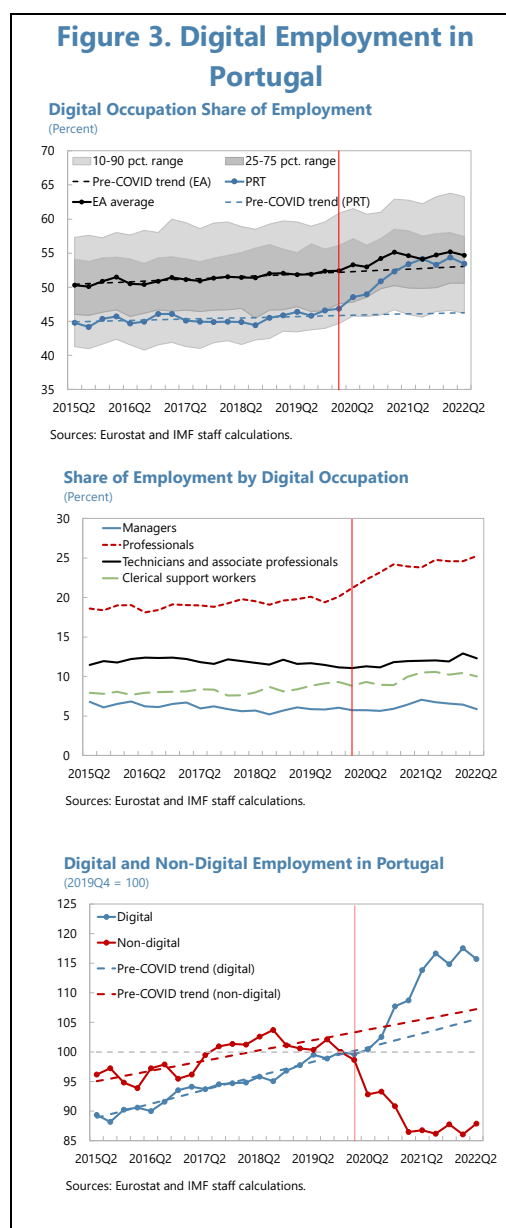
4.   On the basis of this measure of digital employment, we find that the share of jobs in digital occupations experienced a sharper increase in Portugal during Covid-19 compared to the rest of EA, and at the cost of a falling share of non-digital jobs. Figure 3, top panel plots the evolution of employment share of digital occupation for Portugal and EA countries. While the EA experienced a *small* increase in digital employment share during the Covid-19, Portugal experienced a much *sharper* increase in digital employment than in the Euro Area, driven by an increase in the share of the "professional" occupation (Figure 3, middle panel). Looking at levels for Portugal, digital employment actually increased during Covid-19, while non-digital employment declined (Figure 3, bottom panel).

5.   We next investigate the causal impact of Covid-19 on the digital employment, using a regression approach for 29 European countries and the US economy. Following Soh et al. (2022), the following regression specification for the 29 European countries was implemented.[8]

$$Y_{m,q,t} - Y_{m,q,2019} = \alpha_0 + \alpha_1\left[COVIDshock_m \times I_{q,t}\right] + \alpha_2 COVIDshock_m + \alpha_2 I_m + \beta\ controls_{m,q,t} + \epsilon_{m,q,t} - (1)$$
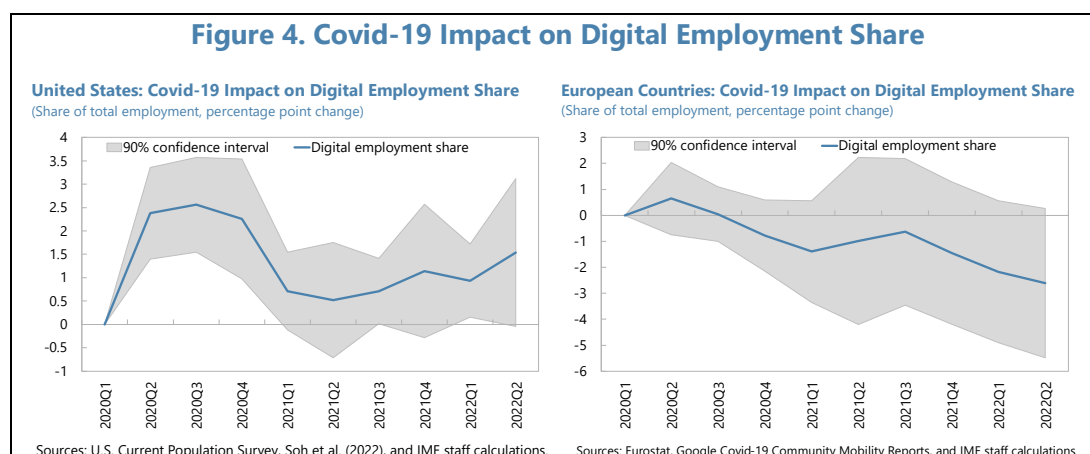
In this specification, *Y* refers to the share of digital employment, *m* refers to region (either country in case of Europe or state in case of U.S.), *q* refers to quarter, and *t* to year. $Y_{m,q,t} - Y_{m,q,2019}$ is the change in the share of digital employment in region *m* at quarter *q*, year *t*

Figure 3. Digital Employment in Portugal

Digital Occupation Share of Employment
(Percent)

Sources: Eurostat and IMF staff calculations.

Share of Employment by Digital Occupation
(Percent)

Sources: Eurostat and IMF staff calculations.

Digital and Non-Digital Employment in Portugal
(2019Q4 = 100)

Sources: Eurostat and IMF staff calculations.

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[7] Digital skills go beyond teleworkability of occupations to capture the underlying skills required to perform a job, instead of characterizing only on the basis of the job arrangement. While digital and teleworkable occupations are related, the mapping between the two is not one-to-one. See Soh et al (2022) and Florence et al (2023) for more detailed information on how digital occupations are defined and how digital occupations are related to teleworkable occupations.

[8] We include the following 29 European countries beyond Euro Area to maximize the sample size (cross-country dimensions): Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.

relative to the same quarter q in 2019. 2019 was chosen as the pre-Covid-19 base year. Taking the difference of the same quarter relative to 2019 addresses the potential seasonality in data. $I_{q,t}$ is dummy variable for the quarter q and year t which includes each post-recession period from 2020Q2 to 2022Q2. The variable $COVIDshock_m$ uses the largest drop in the average of Google mobility indicators in (i) retail and recreation areas and (ii) transit locations in 2020 relative to January 2020 for each country, while $COVIDshock_m$ uses a Bartik shock for the U.S. (see Soh et al. (2022) for details).[9] The variable $controls_{m,q,t}$ includes pre-Covid level of digital employment share to account for the pre-Covid-19 heterogeneity in inclinations to increase digital employment for the regression for European countries.[10]

Figure 4. Covid-19 Impact on Digital Employment Share

Sources: U.S. Current Population Survey, Soh et al. (2022), and IMF staff calculations.
Sources: Eurostat, Google Covid-19 Community Mobility Reports, and IMF staff calculations

6.   **The results indicate a significant and temporary increase in digital employment for the U.S. during the pandemic.** Figure 4 plot coefficients α_1's in equation (1), which capture the impact of a unit increase in the Covid-shock on cumulative percentage point change in digital employment.[11] The U.S. results show a significant but temporary increase in the US economy digital employment (Figure 4, left panel). Further analysis in Soh et al. (2022) show that while both digital and non-digital employment declined in absolute levels in the United States, digital employment declined less, and the increase in digital employment share was driven by digital and cognitive occupations rather than digitalization of manual or routine jobs.

7.   **The results for European countries, which suggests that the increase in the share of digital employment is small and not statistically significant, are subject to some caution (Figure 4, right panel).** First, the sample size is only 29 countries at the aggregate level, while the
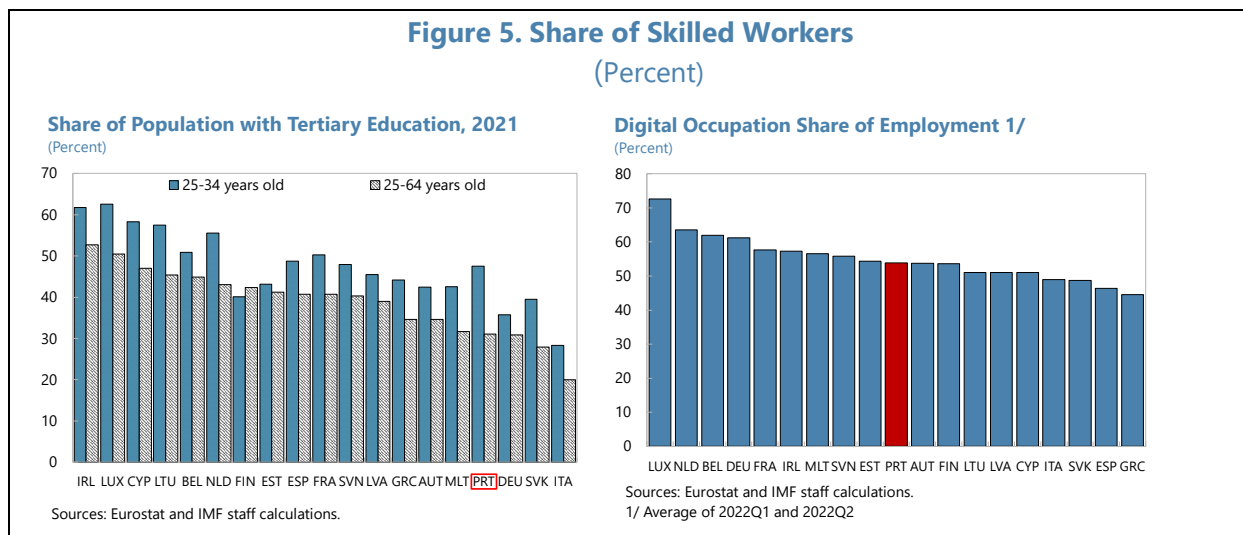
[9] Note google mobility shock deliver similar results for the U.S. in similar estimates.

[10] For the U.S. analysis, the vector $controls_{m,q,t}$ includes pre-Covid-19 levels of digital employment share to and (i) demographic controls such as share of population with bachelor's degree, share of population with age between 25-44 years old, race compositions, migration in-flows, (ii) GDP per capita in reach region, (iii) quit rates for Job Openings and Labor Turnover Survey (JOLTs) for the U.S. to address historically higher quite rates in some regions for robustness checks.

[11] For European countries, the measures calculate the impact from an one percent change in the google mobility shock. For the U.S., we normalize the variable $COVIDshock_m$, with the difference between the 10th and 90th percentiles of the Bartik shock's distribution across states. The interpretation is the differences in digital employment share between the hard-hit region (90th) and the less-hit region (10th).

U.S. analysis is done at state level. Second, most European countries deployed job retention schemes to mitigate the impact of Covid-19 shocks in the labor market, which most likely disproportionally saved jobs in more affected occupations and sectors including non-digital jobs. Therefore, the U.S. results could be capturing a cleaner Covid-19 impact on the change in the digital employment share (and shielding of digital employment) in the absence of policy measures to preserve employment. Indeed, stylized facts for Portugal suggests a sharp persistent rise in digital employment share in Portugal.

8.   **Our analysis points to an important role for policies to invest in digitalization and digital skills for a more resilient labor market in Portugal.** Covid-19 did not impact the Portuguese labor market more adversely relative to previous recessions. The aggregate figures, however, mask distributional impacts of the pandemic. This analysis shows that young, and low-skilled workers in contact-intensive and non-digital jobs were more affected than their counterparts. Moreover, digital employment share experienced an increase in Portugal. While the share was already increasing over the past decade, the rise became steeper at the onset of Covid-19. Our regression analysis provides suggestive evidence that digital employment was shielded during the Covid-19. These findings reinforce the relevance of policies to invest in digital skills and higher education in Portugal to build a more resilient labor market for future shocks (Figure 5).

Figure 5. Share of Skilled Workers
(Percent)

Share of Population with Tertiary Education, 2021
(Percent)

Sources: Eurostat and IMF staff calculations.

Digital Occupation Share of Employment 1/
(Percent)

Sources: Eurostat and IMF staff calculations.
1/ Average of 2022Q1 and 2022Q2

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