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DISCUSSION PAPER SERIES

IZA DP No. 16884

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ABSTRACT

Immigrant Key Workers: Their Contribution to Europe's COVID-19 Response*

This paper contributes to the literature on the Covid-19 effects on workers and labor markets by focusing on the experience of migrant key workers in EU countries. Our analysis, based on survey data on more than 3 million workers, explores three main aspects. First, we document the over-representation of migrant workers in key occupations, particularly in low-qualified roles. Second, we examine the selection into key occupations. According to our estimates, women are more likely to be key workers, the relationship with education is V-shaped, and EU and Extra EU migrants are, respectively, 12 and 15 percent more likely to be key workers than comparable natives. Finally, we estimate the impact of Covid-19 on the labor market, showing that migrant key workers had to extend their working hours during the pandemic and, nevertheless, faced a 2-3 times higher probability of being laid off relative to natives. Our findings imply that migrant workers played a crucial role in the response to the pandemic, but endured a harsher fate than native workers.

JEL Classification: F22, J61, K37
Keywords: migrant workers, COVID-19, essential occupations

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* This articles supersedes an earlier version ("Immigrant Key Workers: Their Contribution to Europe's COVID-19 Response" published in 2020 as European Commission Note JRC120537 and IZA Policy Paper 155), integrating and extending the original analysis in several directions. All data and computer programs are available on request.

1 — Introduction

The notion that the global spread of the Covid-19 virus occurred primarily through direct contact between individuals traveling across countries prompted some commentators and politicians to blame international migrants for the propagation of the pandemic (Trilling, 2020; De Loera-Brust, 2020). Despite evidence demonstrating that international movements for business and tourism far exceed migratory movements in scale and frequency, migrants continued to be a focal point in political debates. This phenomenon led to speculation among international institutions (Guadagno, 2020) and academic researchers (O'Brien and Eger, 2021) that hostility toward migrants, scapegoating, and stigmatization might increase significantly as a consequence of the pandemic. A potentially countervailing force against this negative narrative emerged from the growing awareness among the general public that migrant workers played a crucial role in responding to the pandemic crisis, especially as they were concentrated in many essential occupations (Anderson et al., 2021; Koinova et al., 2023). While some studies observed an increase in hostility towards foreigners during the pandemic (Bartos et al., 2021; Freitag and Hofstetter, 2022; Rodríguez Chatruc and Rozo, 2022; Dipoppa et al., 2023), evidence for the post-pandemic period suggests no systematic change in attitudes toward immigrants and a clear reduction in the salience of concerns about migration compared to other areas of public policy (Dennison et al., 2023; Heizmann and Huth-Stöckle, 2023). Although migrants may benefit from stepping out of the central stage of an often hostile policy debate, there is a risk of overlooking - or quickly forgetting - the critical role foreign-born workers played during the pandemic and the difficulties they endured.

A substantial body of literature has documented how Covid-19 exacerbated existing inequalities, disproportionately affecting the most vulnerable segments of the workforce, including low-income workers, low-educated individuals, women, and

ethnic minorities.[1] However, considerably less attention has been paid to analyzing and documenting the experiences of international migrant workers during the Covid-19 crisis. In the U.S. context, Gelatt (2020) provides early estimates of the presence of foreign-born workers in essential occupations, while Blau et al. (2021) and Allen et al. (2023) highlight the over-representation of migrants relative to natives in these types of jobs. Borjas and Cassidy (2023) assess the impact of the pandemic, revealing a disproportionate disemployment effect on immigrants, particularly undocumented migrants, relative to native workers. Similarly scattered and incomplete is the evidence for European countries. In previous work, we estimate the presence of immigrants among essential workers across occupations and countries in the European Union (EU) (Fasani and Mazza, 2020), and study how job characteristics affected the employment risk of migrants and natives during the Covid-19 pandemic (Fasani and Mazza, 2023). Furthermore, Basso et al. (2022) and Bossavie et al. (2022) show that foreign-born workers are disproportionately concentrated in occupations that expose them to a higher risk of contagion than natives.[2]

This paper contributes to the literature on the effects of the Covid-19 pandemic on workers and labor markets, by deepening our understanding of the experience of key workers during the pandemic crisis and highlighting migrant-native gaps in both the selection into key occupations and in the effects of the economic downturn in Europe. More specifically, we explore individual survey data on more than 3 million workers in 12 EU countries and contribute novel evidence on three important aspects. First, we document the presence of immigrants in key occupations during the pandemic. Second, we study the selection into essential occupations, focusing

1. See, among others: Adams-Prassl, Boneva, Golin, and Rauh (2020); Couch, Fairlie, and Xu (2020); Albanesi and Kim (2021); Farré, Fawaz, González, and Graves (2022); Cortes and Forsythe (2023). Stantcheva (2022) provides an excellent review of this evidence.

2. In low- and middle-income countries, a higher exposure to health hazard and to detrimental negative effects of the pandemic has been documented for both economic migrants (Diana Suhardiman and Taylor, 2021; Grace Carswell and Subramanyam, 2022; Barker et al., 2023) and internally displaced individuals (Di Maio et al., 2023). Some studies have also analyzed the pandemic impact on migration decisions in source countries (see, among others, Bah et al. (2022)).

on migrant-native differences in the individual characteristics that predict employment in this type of occupations. Finally, we estimate the impact of the pandemic on hours worked and job separation probability of native and migrant workers, highlighting differences between key and non-key workers.

The article has the following structure. We present our data and discuss our definition of key workers in Section 2. In Section 3, we describe the share of key workers in EU member states at the onset of the Covid-19 pandemic and the relative representation of migrants and natives in these occupations. In Section 4, we examine the process of selection into key occupations, focusing on the different patterns for native and migrant workers. We study the impact of the Covid-19 recession on labor market outcomes of migrants compared to natives in Section 5, empirically assessing differences between workers employed in key and non-key occupations. Lastly, we summarize our findings and provide some concluding remarks in Section 6.

2 — Data and Definitions

2.1. The EU Labour Force Survey

We use individual-level data from three waves of the EU Labour Force Survey (EU-LFS) collected in 2018, 2019, and 2020. The EU-LFS is a large household survey that combines and harmonizes micro-data from the Labour Force Surveys collected by the national statistical institutes of each EU Member State. The EU-LFS contains standard demographic variables, information on migration status, and detailed information on respondents' labor market outcomes.

In our analysis, we distinguish two groups of migrant workers according to their country of birth: EU mobile and Extra EU migrants, identified as workers born in an EU Member State other than the one where they currently work and reside, and workers born outside of the European Union, respectively. Further, we define as native anyone who was born in the current country of residence. Since the definition

of key workers is based on the occupation held by each worker (as we explain in the next section), we restrict the sample to workers aged 15-64 years who are in employment. Our sample includes the following twelve EU Member States: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal, Spain, and Sweden. These countries are all part of the EU14 group, the set of countries that were members of the EU before the 2004 EU Enlargement.[3]

In the first part of the paper, when we quantify the number of workers employed in key occupations (Section 3) and study patterns of self-selections in these jobs (Section 4), we use the EU-LFS wave collected in 2019, just before the outbreak of the Covid-19 pandemic. This sample includes 1,101,484 individuals, of which 955,071 (86.7%) are natives, 49,118 (4.4%) EU-mobile workers, and the remaining 97,295 (8.8%) are Extra EU migrants. Appendix Table A.1 reports some descriptive statistics for each of the three origin groups. EU migrants have a higher share of women (51%) compared to natives (47%) and Extra EU migrants(45%). EU migrants tend to be slightly more educated than natives, who in turn are more educated than Extra EU workers: the share of workers with higher education is 29% among EU mobile, 28% among natives and 23% among Extra EU workers. Extra EU migrants are on average 1 year younger than both natives and EU migrants.

In the second part of the paper, we study the number of hours worked and the probability of job loss of migrants relative to natives during the Covid-19 recession of 2020 and contrast their relative performance with that of two pre-pandemic years (section 5). For this analysis, we use the three EU-LFS waves from 2018 to 2020. In our empirical application, we restrict the sample to workers who were in employment at the beginning of each of the three years and for which we can establish

3. From the EU14 countries, we leave out Ireland, due to data limitations (discussed below), and Luxembourg, due to its exceptionally small resident population (640 thousand residents in 2021) and unusually large migrant share (almost 50% in 2021). The UK joined the EU in 1973 and left it on the 30th of January, 2020, being then excluded from the EU-LFS data collection. In Fasani and Mazza (2020), we consider all 27 EU countries and exclude the UK.

whether the occupation held was essential or not.[4] After applying these selection rules, our main sample includes 3,013,724 individuals, of which 2,622,155 (87%) are natives, 130,782 (4.3%) EU migrants, and the remaining 260,787 (8.6%) are Extra EU migrants, as shown in Appendix Table A.2.[5]

2.2. Identifying Key Workers in Europe

The definition of key (or essential) workers is not univocal: it depends on the policy context under study and may adapt over time. See Blau et al. (2021) for a discussion of the measurement issues entailed by identifying essential workers in the context of the U.S.. We developed the definition adopted in this paper to produce official estimates of the key workers' population in Europe for the European Commission (Fasani and Mazza, 2020). We follow the Communication of the European Commission on Guidelines concerning the exercise of the free movement of workers during the COVID-19 outbreak[6] supplemented with the Dutch definition of key workers.[7] We identify key workers based on ISCO-08 occupations at three digits, which is the most detailed classification available in the EU-LFS.[8] A full list of our definition of key occupations is provided in the Appendix Table A.3.

4. The EU-LFS is particularly well suited for our objective as it reports, in case of job separation, both the occupation held and the sector of employment for the previous job. It also records when the employment contract was terminated and the reason for this event (e.g. dismissal, resignation, expiration of contract). This information allows us to reconstruct the job history for both currently employed and currently non-employed workers and to determine when the termination occurred and whether the occupation held at the start of the year was an essential one. We remove Ireland from our sample as information on the previous job held is missing for Irish workers.

5. The 2018 and 2019 waves of the EU-LFS are larger than the 2020 wave because the latter was fielded largely during the pandemic and its collection was affected by the social distancing measures in place at the time.

6. See: https://ec.europa.eu/social/main.jsp?langId=en&catId=89&furtherNews=yes&newsId=9630

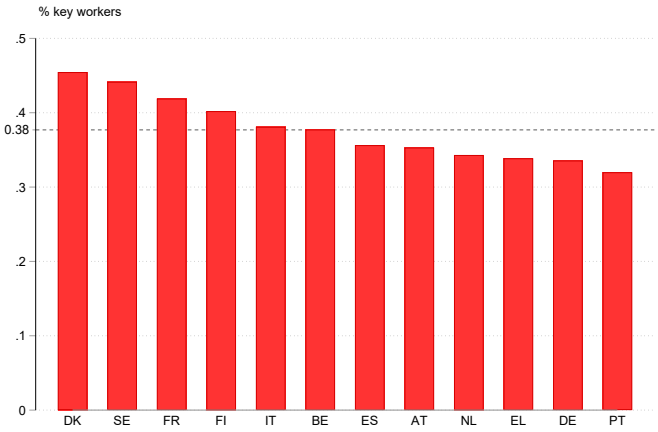
7. See: https://www.government.nl/topics/coronavirus-covid-19

8. Note that both the EU Commission's and the National's definitions often refer to a finer ESCO four digits classification. ESCO is the European implementation of ISCO and therefore the two classifications can be easily mapped into each other. Therefore, our definition is necessarily more generous than the original one. However, there are no obvious reasons to expect this discrepancy to affect the comparisons between natives, EU migrants, and Extra EU migrants that we discuss in the next section.

3 — Key Workers in Europe

According to our definition and estimates, approximately 38% of the workers in EU14 countries were employed in key occupations at the onset of the Covid-19 crisis in the early months of 2020. Figure 1 illustrates that this share varies from 45% in Denmark to 32% in Portugal. These estimates for Europe can be contrasted with those produced for the U.S., which range from 30-40% of the workforce (Tomer and Kane, 2020), to 50% (Kearney and Pardue, 2020; Allen et al., 2023), or even 70% (Selden and Berdahl, 2021; Blau et al., 2021), depending on the definition and methodology adopted.

Figure 1 — Share of Key Workers, by Host Country

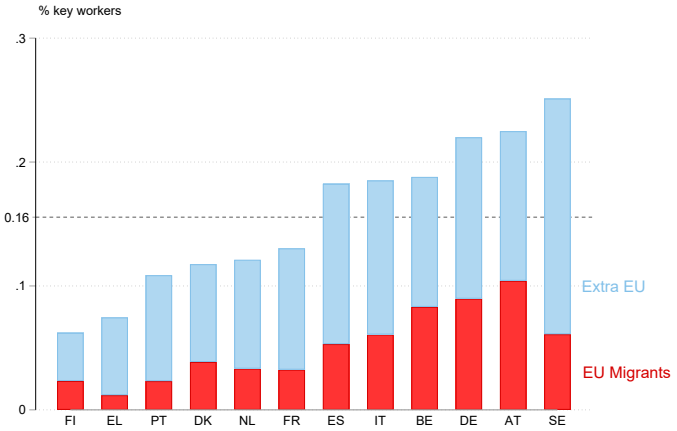


Note: The bars report the percentage of key workers over the employed population for each country in our sample. The red dotted line indicates the cross-country average of workers defined as key workers (38%). Sample: EU-LFS data for the year 2019.

In our estimates, migrant workers accounted on average for 16% of essential workers in the EU-14 area at the onset of the pandemic. Since migrant workers comprised 13% of the workforce at the time, they were overrepresented in key occupations relative to natives. Estimates for the U.S. are fairly similar, suggesting that foreign-born workers accounted for 19% of the U.S. workers in frontline essential industries in 2020, while making up approximately 17% of the employed workforce

(Gelatt, 2020). Figure 2 illustrates a significant variation in the share of migrant key workers across host countries, ranging from as low as 5% in Finland to exceeding 20% in Germany (22%), Austria (22%) and Sweden (25%). This heterogeneity is driven by differences between countries in both the size of migrant populations and their relative concentration in key occupations. For each country in the sample, Figure 2 further distinguishes between EU migrants (red bars) and Extra EU migrants (blue bars), revealing that the latter group tends to represent a larger share of key workers.

Figure 2 — Share of Immigrants among Key Workers, by Host Country

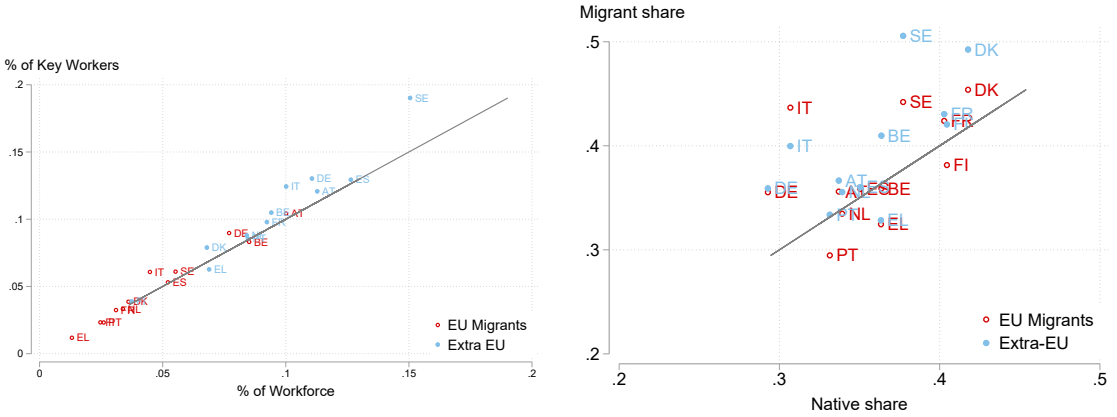


Note: The bars report the percentage of immigrants over total key workers for each Member state, distinguishing between EU migrants (red bars) and Extra EU migrants (blue bars). The black dotted line represents the average share of immigrant key workers across the EU countries in our sample (16%). Sample: EU-LFS data for the year 2019.

We further assess the degree of concentration of migrant workers in essential occupations in Figure 3. In panel (a), we plot the share of migrants among key workers (vertical axis) against their share in the workforce (horizontal axis) in each host country in the sample. As far as EU migrants are concerned (identified by red empty dots), the dots are scattered around the 45-degree line, implying that their presence in key occupations closely mirrors their share of the general workforce. For Extra EU migrants, most of the points lie just above the 45-degree line, suggesting a slight

over-representation among key workers relative to their share in the workforce. In Panel (b) of Figure 3, we directly compare the concentration of migrants and natives in essential jobs by contrasting the share of migrants employed in key occupations (vertical axis) with the corresponding share for natives (horizontal axis). This scatter plot shows that migrants, and extra EU migrants in particular, are considerably more concentrated in essential occupations than natives, with most points placed well above the 45-degree line. Similar evidence of a higher concentration in essential occupations for migrants than for natives is reported by Allen et al. (2023) for the U.S.. They estimate that 48% of native workers were employed in essential occupations during the pandemic, and this share increases to 56% among immigrants (being as high as 70% among undocumented immigrants).

Figure 3 — Migrant Key Workers, by Host Country and Origin Group



(a) Share of Migrant Key Workers vs. Share of Migrant Workers

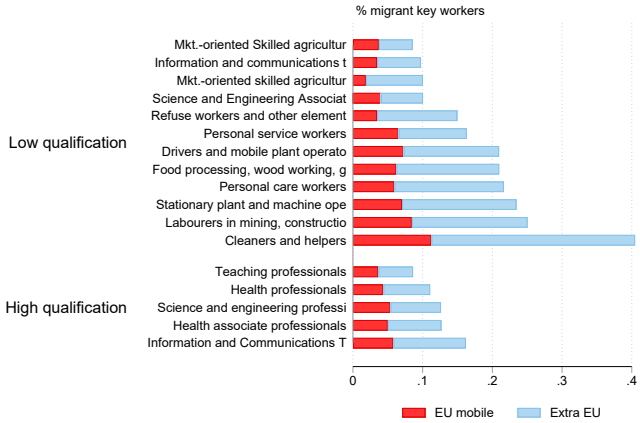
(b) Share of Key Workers: Migrants and Natives

Note: Panel 3a reports the share of migrants among key workers (vertical axis) and the share of migrant workers in the workforce (horizontal axis) for each country in the sample. Panel 3b reports the share of migrants employed in key occupations (vertical axis) and the corresponding share for natives (horizontal axis) for each country in the sample. In both panels, EU migrants are identified by empty red dots and Extra EU migrants by full blue dots. The 45-degree line is depicted with a continuous black line. Sample: EU-LFS data for the year 2019.

Finally, Figure 4 illustrates the presence of migrant workers, distinguishing between EU and Extra EU migrants, in each key occupation. We categorize occupa-

tions into high- and low-qualification ones, based on the median level of education of the workers employed in each occupation. The graph highlights how some key occupations are highly dependent on migrant workers. If foreign-born workers account for 16% of key workers in our sample (see Figure 2), we observe shares that are substantially higher in many key occupations. Notably, all key occupations in which migrants are overrepresented are low-qualified ones. For example, migrants account for more than 40% of cleaners and helpers, approximately a quarter of laborers in the mining and construction sectors, stationary plant and machine operators, and more than one in five workers in drivers and mobile plant operators, food processing, and personal care. Appendix Figure A.1 reports the gender composition of the migrant labor force within key occupations: women make up the majority of cleaners and helpers, personal care workers, and teachers, while laborers in mining and construction, drivers and mobile plant operators, or ICT professionals are mostly men.

Figure 4 — Share of Immigrants among Key Workers, by Key Occupation and Origin Group



Note: The bars report the percentage of immigrants over total key workers for each ISCO 2-digit occupation. We define "high qualification" occupations as all occupations whose workforce median educational level is above ISCED level 3, while "low qualification" occupations are those whose workforce median level of education is equal to or below that level. Sample: EU-LFS data for the year 2019.

4 — Selection into Key Occupations

After documenting the presence of migrants among key workers across EU countries at the onset of the Covid-19 pandemic, this section delves into patterns of sorting into key occupations. In particular, we address the following two empirical questions: (i) Which individual characteristics predict workers' probability of being employed in a key occupation? (ii) Do migrants exhibit a higher likelihood of being employed as a key worker compared to natives with similar characteristics?

4.1. Empirical Strategy

We answer these empirical questions by estimating the following regression equation:

$$Pr(KW_i = 1) = \alpha_i + \beta X_i + \gamma EU_i + \theta ExtraEU_i + \psi_c + \epsilon_i \quad (1)$$

where: KW_i is an indicator variable for being a key worker; X_i is a vector of individual controls (gender, age, and education); the dummies EU_i and $ExtraEU_i$ identify EU and Extra EU migrant workers, respectively; ψ_c are country of residence fixed effects; ϵ_i is an idiosyncratic shock. We control for age by including a full set of dummies for 5-year age intervals and condition on dummies for three levels of education (low, intermediate, and high). We estimate equation (1) with a Linear Probability Model (OLS) and use robust standard errors in all regressions (to account for heteroskedasticity in the error term when the outcome is binary). After estimating the baseline specification displayed in equation (1), we introduce interaction terms of migrant status (EU and Extra EU) with gender and education variables to explore differential sorting between migrants and natives along these observable dimensions.

Table 1 — Probability of Being a Key Worker by Personal Characteristic

	(1)	(2)	(3)
EU mobile	0.047***	0.043***	0.015
	(0.006)	(0.006)	(0.013)
Extra EU	0.052***	0.052***	0.027***
	(0.004)	(0.004)	(0.007)
Woman		0.041***	0.027***
		(0.002)	(0.002)
Woman × EU mobile			0.083***
			(0.011)
Woman × Extra EU			0.098***
			(0.008)
Middle education		-0.047***	-0.045***
		(0.003)	(0.003)
High education		0.065***	0.074***
		(0.003)	(0.003)
Middle education × EU mobile			0.015
			(0.014)
Middle education × Extra EU			-0.011
			(0.009)
High education × EU mobile			-0.062***
			(0.016)
High education × Extra EU			-0.047***
			(0.011)
Country FE	✓	✓	✓
Age FE		✓	✓
Obs.	692,729	692,729	692,729
R^2	0.007	0.022	0.024

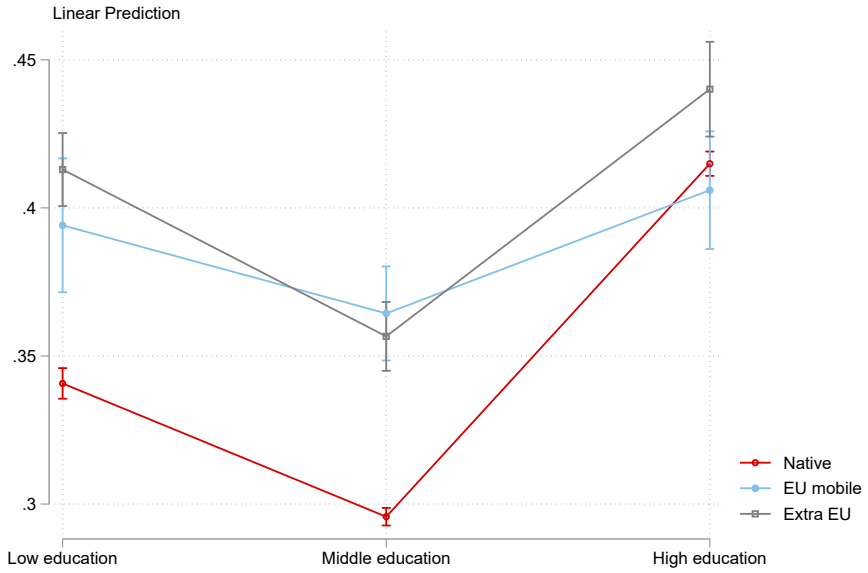
Note: In this table, we regress an indicator variable for being a key worker in 2020 on a set of individual covariates (migrant status, gender, education, age), and host country FEs. Robust standard errors in parentheses: * p < 0.1, ** p < 0.05, *** p < 0.01. The share of key workers among natives is 35% (as reported in Appendix Table A.1).

4.2. Results

Our estimates are presented in Table 1. In column (1), we include the two dummies for EU and Extra EU migrants and condition solely on host country fixed effects. The estimated coefficients on the migrant group dummies imply that the probability of being a key worker is higher for EU migrants (4.7 p.p.) and Extra EU migrants (5.2 p.p.) relative to natives. These estimated migrant-native gaps are barely affected when we control for age, gender, and education in column (2) of Table 1, estimating the baseline specification described in equation (1). To better assess the magnitude of these migrant-native gaps, we can translate them in percentage changes relative to natives' probability of being a key worker, which is 35% in the sample (see Appendix Table A.1). EU and Extra EU migrants are, respectively, 12 percent and 15 percent more likely to be employed as key workers than native workers with similar characteristics. Furthermore, estimates in column (2) of Table 1 show that women are 4.1 p.p. more likely to work in key occupations than men with similar characteristics. Moreover, we observe that the relation between the probability of being a key worker and the level of education is strongly non-monotonic, displaying a distinct V-shaped pattern: having an intermediate level of occupation is associated with a lower probability (minus 4.7 p.p.) relative to low-skilled workers, while that probability is 6.5 p.p. higher for highly educated individuals. Finally, in column (3) we further include interaction terms of migrant status with gender and education dummies. These additional controls halve the estimated coefficients on both the migrant dummies and only the effect for Extra EU migrants remains statistically significant. However, the positive and strongly significant coefficients estimated on the gender-migrant status interaction terms - 8.4 p.p. for EU migrants and 9.9 p.p. for Extra EU migrants - suggest that migrant women are even more over-represented than native women in key occupations relative to men with similar characteristics. When looking at education, we note that having an intermediate level of education reduces the likelihood of being employed in an essential occupation for both natives and

migrants by the same amount (i.e., minus 4.5 p.p.). Indeed, the non-significant coefficients estimated on the interaction terms of middle education with migrant groups suggest no differential effect for the migrant sub-population. Being a highly educated worker, instead, strongly increases the probability of working as a key worker for natives (plus 7.4 p.p.) while the effect is largely attenuated for migrant workers (as highlighted by the negative estimates on the interaction terms: minus 6.8 p.p. for EU migrants and minus 4.8 p.p. for Extra EU migrants.

Figure 5 — Probability of Being a Key Worker and Education, by Origin Group



Note: The lines report the probabilities of being a key worker for each educational level and origin. The bars represent the 95% confidence intervals. The probabilities are estimated from regression equation (1).

To better visualize the role education plays in shaping the sorting of workers into key occupations, Figure 5 displays the predicted probability of being a key worker at each level of education (low, middle, and high) and for each of the three national groups of workers (natives, EU migrants, and Extra EU migrants). We observe two interesting patterns. First, the graph illustrates a distinct V-shaped relationship between the level of education and sorting into key occupations, with the probability

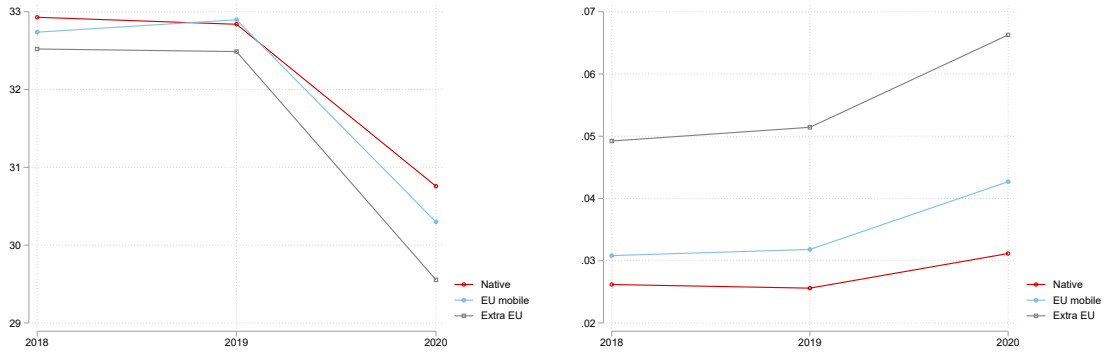
of employment in a key occupation being substantially higher for low- and highly-educated workers compared to those with an intermediate level of education. This pattern applies to all workers, regardless of the migrant status. Second, migrant workers with low and middle education are substantially more likely to be key workers than natives with a similar level of education. At the same time, this gap shrinks remarkably (becoming non-statistically significant for EU migrants) for workers with the highest level of education. Appendix Figure A.2 reports the same estimated probabilities for each educational level and origin group, while further disaggregating by gender of the workers. As the figure shows, the V-shaped pattern of the relationship between education and individual probability of being employed in a key occupation holds for any subgroup of the workforce. However, the probability of being a key worker for EU and Extra EU migrant women is substantially higher (by about 10 p.p.) at any level of education than for any other group of workers (migrant men, native men, and native women). Therefore, the appendix Figure A.2 highlights that the migrant-native gap in the likelihood of being employed in essential occupations observed in Figure 5 is almost entirely driven by migrant women.

5 — Pandemic Effects on Migrant and Native Workers in Key Occupations

This section studies the relative labor market performance of migrant and native workers during the Covid-19 crisis in 2020 and contrasts it with the patterns observed in two pre-pandemic years (2018 and 2019). The empirical analysis is based on three consecutive waves of the EU-LFS (2018, 2019, 2020) which we pool in a single estimation sample (see Appendix Table A.2), as discussed in Section 2. We focus our attention on two labor market outcomes. First, we consider the number of weekly hours worked. Since most governments adopted policies aimed at preventing layoffs, the economic slowdown generated by the pandemic and the ensuing

social distancing measures was felt primarily on the intensive margin in European countries (Gros and Ounnas, 2021). The U.S. experience was markedly different, displaying a major - although temporary - increase in unemployment. Despite legal restrictions on layoffs, employers still decided to terminate contracts and not renew temporary employment positions. To assess whether migrants were disproportionately involved in these layoffs, the second outcome we consider in our analysis is the probability of job separation.

Figure 6 — Weekly Hours Worked and Job Loss Probability: Average Values by Origin Group (2018-2020)



(a) Weekly Hours Worked, by Origin **(b) Job Loss Probability, by Origin**

Note: Panel 6a reports the average weekly hours worked by origin between 2018 and 2020. Panel 6b reports the share of workers who lost their job in the reference year. Sample: EU-LFS data for the years 2018, 2019 and 2020.

Figure 6 reports the average values of hours worked (panel a) and job loss probability (panel b) over the three years and for each origin group. For both outcomes and all origin groups, we note little variation from 2018 to 2019 and sharp changes in 2020 with the outbreak of the Covid-19 pandemic. For native workers, the average hours worked declined from approximately 33 to 31 hours per week (red line in panel a). Migrants started with slightly fewer hours in 2018 and 2019 and experienced a more marked decline in 2020, with Extra EU migrants (gray line) displaying a larger reduction than EU migrants (blue line). Panel b shows that the average probability of job separation differed between the three origin groups already before the

pandemic, being lowest for natives (2.7%), intermediate for EU migrants (3.1%) and highest for Extra EU migrants (5%). This probability increased for all three groups in 2020, although the change was steeper for migrants and Extra EU migrants, in particular.

5.1. Empirical Strategy

We estimate the following equation:

$$\begin{aligned} y_{it} = \alpha + \boldsymbol{X_{it}'}\boldsymbol{\beta} + \gamma EU_{it} + \theta ExtraEU_{it} + \\ + \mu_1 y2019_t + \mu_2 y2020_t + \delta_1(EU_{it} \times y2019_t) + \delta_2(EU_{it} \times y2020_t) + \\ + \delta_3(ExtraEU_{it} \times y2019_t) + \delta_4(ExtraEU_{it} \times y2020_t) + \psi_c + \epsilon_{it} \end{aligned} \tag{2}$$

The variables in equation (2) are as follows: y_{it} is an individual labor market outcome (weekly hours worked or probability of job separation) measured in year t (with $t = 2018, 2019, 2020$); $\boldsymbol{X_{it}}$ is a vector of individual controls (gender, age, and education); the dummies EU_{it} and $ExtraEU_{it}$ identify EU and Extra EU migrant workers, respectively; $y2019_t$ and $y2020_t$ are year dummies; ψ_c are country of residence fixed effects; finally, ϵ_{it} is an idiosyncratic shock. We estimate this equation with OLS. In this specification, the year dummies identify any systematic change in average labor market outcomes that occurred in 2019 and in 2020 relative to 2018, enabling us to directly test whether hours worked dropped and job separations became more frequent during the pandemic compared to the previous two years. Furthermore, the interaction terms of the migrant dummies with the year dummies allow us to test for any differential effect of the pandemic on migrant workers relative to natives. In particular, the coefficients δ_1 and δ_2 capture any additional change in the labor market outcomes experienced by EU migrant workers in 2019 and 2020, respectively, while the coefficients δ_3 and δ_4 estimate the same effects for Extra EU migrants.

Table 2 — Weekly Hours Worked

	(1) Full Sample	(2) Non-key Workers	(3) Key Workers
2019	-0.050**	-0.049*	-0.070*
	(0.023)	(0.027)	(0.042)
2020	-2.322***	-2.726***	-1.583***
	(0.027)	(0.033)	(0.048)
EU mobile	0.230***	0.293***	0.294**
	(0.069)	(0.084)	(0.121)
Extra EU	-0.368***	-0.120*	-0.521***
	(0.052)	(0.064)	(0.087)
2019 $\times$ EU mobile	0.072	-0.021	0.207
	(0.098)	(0.118)	(0.171)
2019 $\times$ Extra EU	-0.024	-0.034	-0.042
	(0.073)	(0.091)	(0.124)
2020 $\times$ EU mobile	0.112	-0.271*	0.765***
	(0.119)	(0.147)	(0.202)
2020 $\times$ Extra EU	-0.388***	-0.821***	0.229
	(0.089)	(0.114)	(0.144)
Country FE	✓	✓	✓
Age FE	✓	✓	✓
Education dummies	✓	✓	✓
Female dummy	✓	✓	✓
Obs.	2,732,329	1,787,350	939,089
R^2	0.063	0.062	0.073

Note: In this table, we report the results for estimating equation (2) on the full sample (column 1) and then separately on the sub-samples of non-key workers (column 2) and key workers (column 3). The outcome variable is weekly hours worked and we estimate this regression equation with OLS. Robust standard errors in parentheses: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Sample: EU-LFS data for 2018, 2019 and 2020.

In our analysis, we estimate this equation first on the full sample of workers and then separately for non-key workers and key workers. The latter sample split allows us to precisely assess to what extent being employed in an occupation deemed essential during the pandemic shielded workers from labor market uncertainty and the economic downturn. Our interest in studying the effect of being a key worker implies that we need to restrict our sample to workers who were employed at the beginning of each year and for whom we can observe the occupation (see Section 2).

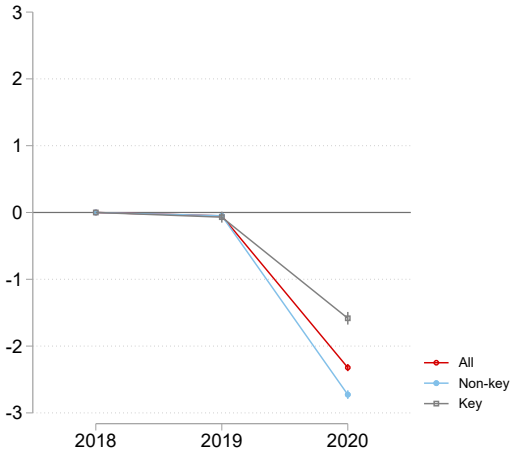
5.2. Results: Hours Worked

Table 2 reports the estimated coefficients from equation (2) when the outcome variable is the number of weekly hours worked. Column (1) displays estimates for the full sample, while columns (2) and (3) show estimates for non-key and key workers, respectively. When considering the full sample (column 1), the estimated coefficients on the year dummies indicate a slight reduction in hours worked in 2019 relative to 2018, and a sizeable drop in 2020, when workers worked, on average, 2.3 fewer hours per week (a 7% reduction from an average of approximately 33 hours; see Figure 6). This reduction was experienced by both non-key and key workers (columns 2 and 3), although the effect is 70% larger for the former group (minus 2.7 hours per week, versus minus 1.5 hours). The coefficients on the migrant group dummies are both statistically significant, but display opposite signs: EU migrants tend to work a bit more than natives, while the Extra EU migrants work fewer hours. However, both gaps are small. The coefficients on the interaction terms between year and migrant status dummies reveal no differential impact on migrants in 2019 relative to the previous year, but identify significant differences in 2020, when the Covid-19 pandemic impacted European economies. Foreign-born workers in non-key occupations experienced a further reduction in hours worked relative to natives with comparable characteristics. This additional reduction was 3.5 times larger for Extra

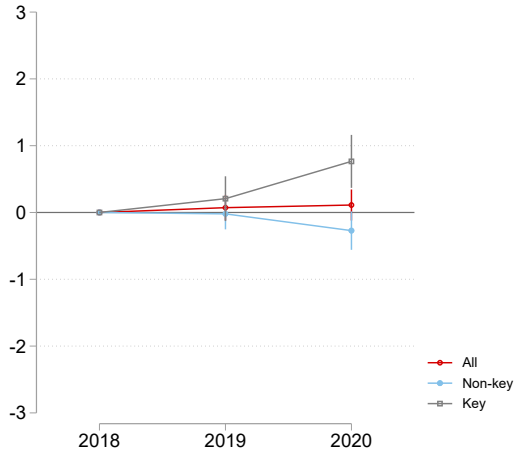
EU than for EU migrants (minus 0.82 hours for the former and minus 0.27 for the latter). For key workers, instead, we observe an effect of the opposite sign: both coefficients are positive, suggesting an increase in hours worked. However, the estimate is statistically different from zero solely for EU migrants (who worked 0.76 hours more than comparable natives in 2020).

Figure 7 visualizes the patterns identified in the coefficients reported in Table 2. The graph illustrates the differences in weekly working hours in 2019 and 2020, relative to 2018, for the full sample (red line), non-key workers (blue line), and key workers (gray line). We distinguish between natives (Panel 7a) EU migrants (Panel 7b) and Extra EU migrants (Panel 7c). In all cases, the differences in hours worked in 2019 compared to the previous year are centered around zero and are not statistically significant. Substantial changes are instead observed in 2020. For natives, a considerable drop in working hours is observed for both key and non-key workers, although the reduction is smaller for the former group, as expected from the fact that key occupations were less affected by social distancing restrictions. The pattern is quite distinct for the two migrant groups, showing diverging effects for key and non-key workers: both EU and Extra EU immigrants employed in key occupations worked more hours during the pandemic than in the previous two years, while those in non-key occupations experienced a drop in hours.

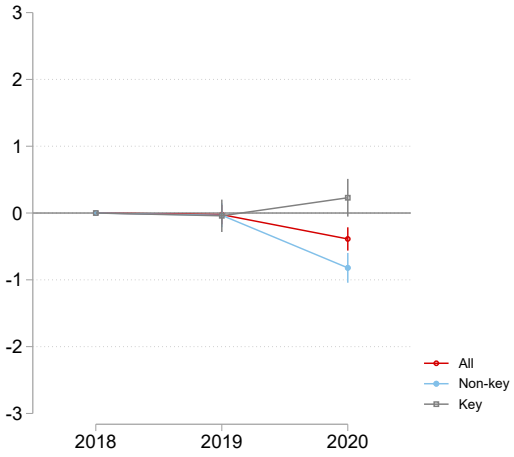
Figure 7 — Differences in Weekly Hours Worked by Origin: 2018 vs. 2019 vs. 2020



(a) Natives



(b) EU mobile



(c) Extra EU

Note: The figure reports the differences in weekly working hours in 2019 and 2020, relative to 2018, for the full sample (red line), non-key workers (blue line) and key workers (gray line). The figure distinguishes between natives (Panel 7a) EU migrants (Panel 7b) and Extra EU migrants (Panel 7c). The bars represent the 95% confidence intervals. Sample: EU-LFS data for 2018, 2019 and 2020.

5.3. Results: Job Separation Probability

Estimates from Equation (2) for the probability of job separation are presented in Table 3. The outcome variable is now a dummy taking value one if the worker experienced a job separation in the reference year and zero otherwise. The estimated coefficients on the year dummies displayed in Table 3 indicate that there was no change in the probability of job separation in 2019 relative to 2018, while a significant increase occurred in 2020. According to the estimated coefficient on the full sample, workers in EU countries experienced a 22% (or 0.6 p.p.) increase in the probability of job loss in the year of the pandemic relative to the previous two years (when this probability was 2.7 percent). Notably, the effect is only slightly larger for non-key workers (0.6 p.p.; column 2) than for key-workers (0.5 p.p.; column 3), suggesting that being employed in key occupation did not effectively shield workers from employment risk. Both groups of migrants face a higher probability of job loss over the three years considered - as shown by the estimates on the migrant group dummies - and the gap is larger for Extra EU migrants (1.7 p.p.) than for EU migrants (1 p.p.). As far as the interaction terms are concerned, we find no differential effect for migrants in 2019, while we estimate positive and strongly significant coefficients for both groups in 2020. This suggests that migrants experienced an additional risk of separation during the first pandemic year than comparable native workers. The size of the estimated effect is substantial. EU migrants faced a risk of separation that was more than twice that of natives in 2020, while for Extra EU migrants it was three times as large. When comparing the estimates for key and non-key workers we observe a lower probability of separation for the latter group, but the difference is small, especially for Extra EU migrants.

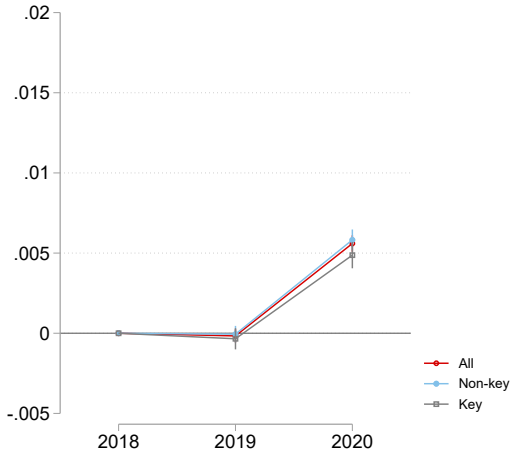
Table 3 — Probability of Job Separation

	(1) Full Sample	(2) Non-key Workers	(3) Key Workers
2019	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
2020	0.006***	0.006***	0.005***
	(0.000)	(0.000)	(0.000)
EU mobile	0.010***	0.009***	0.011***
	(0.001)	(0.001)	(0.001)
Extra EU	0.017***	0.015***	0.020***
	(0.001)	(0.001)	(0.001)
2019 × EU mobile	0.000	0.001	-0.001
	(0.001)	(0.001)	(0.002)
2019 × Extra EU	0.001	0.002	0.000
	(0.001)	(0.001)	(0.002)
2020 × EU mobile	0.008***	0.010***	0.005**
	(0.001)	(0.002)	(0.002)
2020 × Extra EU	0.013***	0.014***	0.012***
	(0.001)	(0.002)	(0.002)
Country FE	✓	✓	✓
Age FE	✓	✓	✓
Education dummies	✓	✓	✓
Female dummy	✓	✓	✓
Obs.	2,821,576	1,846,553	968,309
R^2	0.018	0.018	0.018

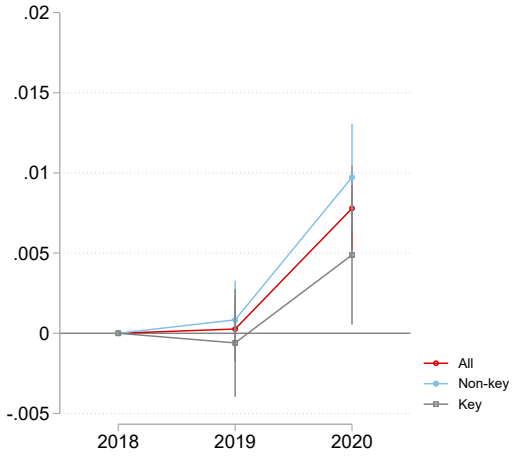
Note: In this table, we report the results for estimating equation (2) on the full sample (column 1) and then separately on the sub-samples of non-key workers (column 2) and key workers (column 3). The outcome variable is a dummy variable taking value one if the worker experienced a job separation and we estimate this regression equation with a Linear Probability Model (OLS). Robust standard errors in parentheses:* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample: EU-LFS data for 2018, 2019 and 2020.

The patterns described in Table 3 are graphically summarized in Figure 8. Following the same structure as in Figure 7, the figure displays the differences in the probability of job loss (with 95% confidence intervals) in 2019 and 2020, relative to 2018, for the full sample (red line), non-key workers (blue line) and key workers (gray line). The figure distinguishes between natives (Panel 8a), EU migrants (Panel 8b), and Extra EU migrants (Panel 8c). In all cases, the estimates for 2019 are centered around zero, showing no significant increase in the probability of job separation relative to the previous year for any of the groups considered. However, with the Covid-19 pandemic, the likelihood of job loss increased sharply for both natives and migrants, although the impact was far more negative for the latter - especially for Extra EU migrants - than for the former. Notably, the probability of job loss for key workers (in red) is below that of non-key workers (in gray); however, the difference is tiny for natives and Extra EU migrants and only slightly more pronounced for EU migrants. This pattern suggests that being employed in a key occupation did not provide significantly greater protection against loss of jobs for workers.

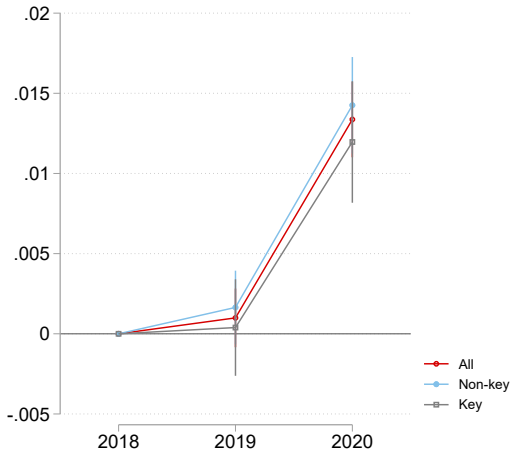
Figure 8 — Differences in Probability of Job Separation by Origin: 2018 vs. 2019 vs. 2020



(a) Natives



(b) EU



(c) Extra EU

Note: The figure reports the differences in the probability of job separation in 2019 and 2020, relative to 2018, for the full sample (red line), non-key workers (blue line) and key workers (gray line). The figure distinguishes between natives (Panel 8a), EU migrants (Panel 8b) and Non-EU migrants (Panel 8c). The bars represent the 95% confidence intervals. Sample: EU-LFS data for 2018, 2019 and 2020.

6 — Concluding Remarks

In this paper, we first document the presence of immigrants in key occupations during the pandemic. We show that approximately 38% of the workers in EU14 countries were employed in key occupations at the onset of the Covid-19 pandemic in 2020. Approximately 16% of the key workers were migrant workers. Since migrant workers accounted for 13% of the workforce, they were overrepresented in key occupations relative to natives. We document that this over-representation of migrants is particularly intense in low-skilled key occupations (e.g. cleaners and helpers, laborers in mining and construction, personal care workers).

We then study the selection into essential occupations, focusing on migrant-native differences, and obtain three main and novel findings. First, we observe a distinct V-shaped relationship between the level of education and sorting into key occupations, with the probability of employment as a key worker being substantially higher for low- and high-skilled workers compared to those with an intermediate level of education. This pattern applies to all workers, regardless of migrant status. Second, migrant workers with low and middle education are substantially more likely to be key workers than natives with a similar level of education, while this gap shrinks remarkably (becoming non-statistically significant for EU migrants) for workers with the highest level of education. Third, the probability of being an essential worker is higher for women than for men for both natives and migrants and any level of education; the gender gap is particularly large for migrant women who primarily determine the observed migrant-native gap.

Finally, we estimate the impact of the pandemic on the hours worked and job separation probability of native and migrant workers. Our evidence highlights a distinct experience for natives and migrants in European labor markets during the Covid-19 pandemic. The estimates in section 5.2 reveal that the economic downturn of 2020 led to a clear reduction in hours worked for native workers, regardless of whether

they were employed in essential or non-essential occupations (although the drop was slightly larger for non-key workers). In contrast, the fate of migrant workers was heavily influenced by the type of occupations they held at the onset of the pandemic: they had to extend their working hours if employed in key occupations while experiencing a larger drop in hours than natives if they were not. On the contrary, the effects of the pandemic on the probability of job separation (Section 5.3) followed the same direction for both natives and migrants, but the latter group faced a disproportionate increase in that probability relative to comparable native workers. According to our estimates, the risk of layoff was twice as high for EU migrants and three times higher for extra EU migrants than for natives. For this outcome, being a key worker had a limited impact on reducing employment risk, irrespective of workers' origin areas. Therefore, key migrant workers had to work more during the pandemic and were, nevertheless, exposed to a higher risk of layoff than natives.

The differential sorting of migrant and native workers into essential occupations and, in particular, migrants' concentration in low-skilled key occupations, may contribute to explaining their weaker labor market performance in the midst of the pandemic recession. Other factors related to the more general weaknesses of migrants' labor market attachment - such as their higher concentration in temporary contracts (Fasani and Mazza, 2023) - have also played a role. Similar to other vulnerable segments of the workforce, such as women or minority individuals, the Covid-19 pandemic has exacerbated existing inequalities, widening existing gaps in the labor market, and exposing the weakest workers to the hardest conditions. From a policy point of view, our findings stress the importance of taking into serious consideration interventions aimed at offering immediate support to migrant workers facing temporary economic distress, but also long-run migration policy reforms that could structurally remove barriers and ease migrants' access to labor market, social protection and basic services such as health care.

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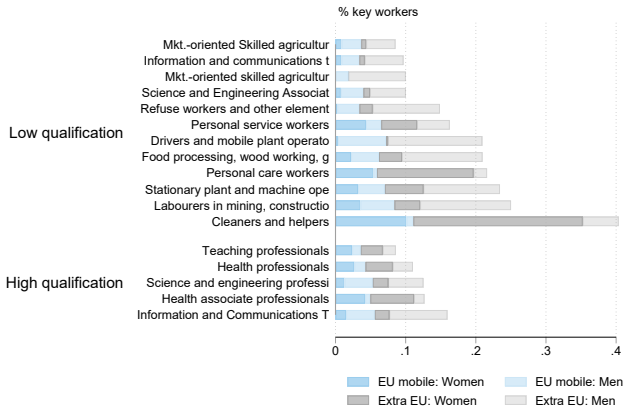
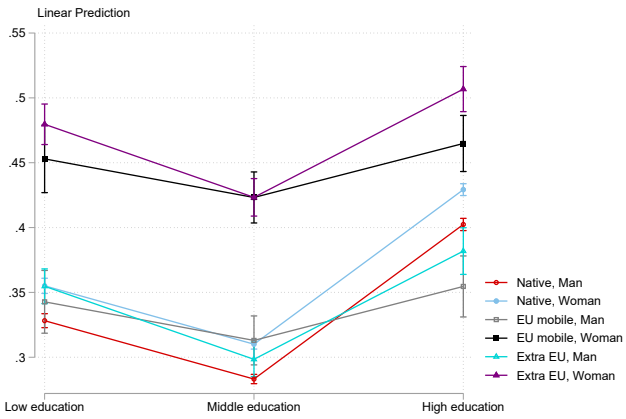
Appendix A — Appendix Figures

Figure A.1 — Share of Immigrants among Key Workers, by Key Occupation, Origin and Gender



Note: The bars report the percentage of immigrants over total key workers for each ISCO 2-digit occupation and by gender. We define "high qualification" occupations as all occupations whose workforce median educational level is above ISCED level 3, while "low qualification" occupations are those whose workforce median level of education is equal to or below that level. Sample: EU-LFS data for the year 2019.

Figure A.2 — Probability of Being a Key Worker and Education, by Origin Group and Gender



Note: The lines report the probabilities of being a key worker for each educational level, origin group and gender. The bars represent the 95% confidence intervals. The probabilities are estimated from regression equation (1).

Appendix B — Appendix Tables

Table A.1 — Descriptive Statistics: EU-LFS 2019

	Native	EU mobile	Extra EU	Total
Woman	0.47	0.51	0.45	0.47
	(0.50)	(0.50)	(0.50)	(0.50)
Education:				
Low education	0.18	0.22	0.36	0.20
	(0.39)	(0.41)	(0.48)	(0.40)
Middle education	0.54	0.49	0.41	0.53
	(0.50)	(0.50)	(0.49)	(0.50)
High education	0.28	0.29	0.23	0.27
	(0.45)	(0.45)	(0.42)	(0.45)
Age	43.43	43.37	42.40	43.33
	(12.34)	(11.11)	(11.04)	(12.18)
Key Worker	0.35	0.38	0.40	0.35
	(0.48)	(0.49)	(0.49)	(0.48)
N	955,071	49,118	97,295	1,101,484

Note: Standard deviations in parentheses. Sample: EU-LFS data for 2019.

Table A.2 — Descriptive Statistics: Estimation Sample EU-LFS 2018, 2019, 2020

	2018	2019	2020	Total
Woman	0.47	0.47	0.47	0.47
	(0.50)	(0.50)	(0.50)	(0.50)
Education:				
Low education	0.20	0.20	0.21	0.20
	(0.40)	(0.40)	(0.41)	(0.40)
Middle education	0.53	0.53	0.50	0.52
	(0.50)	(0.50)	(0.50)	(0.50)
High education	0.27	0.27	0.29	0.28
	(0.45)	(0.45)	(0.45)	(0.45)
Origin:				
Native	0.87	0.87	0.88	0.87
	(0.34)	(0.34)	(0.33)	(0.34)
EU mobile	0.04	0.04	0.04	0.04
	(0.20)	(0.21)	(0.20)	(0.20)
Extra EU	0.09	0.09	0.08	0.09
	(0.28)	(0.28)	(0.28)	(0.28)
Age	43.14	43.33	43.84	43.38
	(12.15)	(12.18)	(12.10)	(12.15)
Key Worker	0.36	0.35	0.36	0.36
	(0.48)	(0.48)	(0.48)	(0.48)
N	1,186,630	1,101,484	725,610	3,013,724

Note: Standard deviations in parentheses. Sample: EU-LFS data for 2018, 2019 and 2020.

Table A.3 — Key Workers Occupations

ISCO-08 2 digits	ISCO-08 3 digits
Science and Engineering Prof.	Life science professionals
	Engineering professionals
Health Professionals	Health professionals
	Medical doctors
	Nursing and midwifery
	Traditional and compl. medicine
	Paramedical practitioners
	Other health professions
Teaching Professionals	University and higher education teachers
	Vocational education teachers
	Secondary education teachers
	Primary school and early childhood teachers
	Other teaching professionals
ICT Professionals	Information and communication technology
	Software and applications developers
	Database and network professionals
Science & Eng. Associate prof.	Sci. and engineering assoc. professionals
	Physical and engineer science technicians
	Mining, manufacturing and constructions
	Process control technicians
	Life science technicians
	Ship and aircraft controllers and technicians
Health associate professionals	Medical and pharmaceutical technicians
	Nursing and midwifery
ICT Technicians	Information and communications technicians
	ICT operations and user support technicians
	Telecommunications and broadcasting technicians
Personal Service Workers	Travel attendants, conductors and guides
	Other personal services workers
Personal Care Workers	Personal care workers

	Child care workers and teachers' aides
	Personal care workers in health services
Market-oriented Skilled Agricultural Workers	Market-oriented skill agricultural workers
	Market gardeners and crop growers
	Animal producers
	Mixed crop and animal producers
Market-oriented Skilled Forestry Fishery	Fishery workers, hunters and trappers
Food Processing, etc.	Food processing and related trades workers
Stationary Plant and Machine Operators	Food and related products machine operators
Drivers and Mobile Plant Operators	Locomotive engine drivers
	Car, van and motorcycle drivers
	Heavy truck and bus drivers
	Ships' deck crews
Cleaners and Helpers	Domestic, hotel and office cleaners and helpers
	Vehicle, window, laundry and other cleaning workers
Labourers in Mining, Construction, Manufacturing	Transport and storage labourers
Refuse Workers	Refuse Workers