Being on the Frontline? Immigrant Workers in Europe and the COVID-19 Pandemic

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Abstract

We provide the first systematic assessment of the impact of COVID-19 on the labor market for immigrant workers in Europe. In 2020, we estimate that extra-EU migrants were twice as likely to experience employment loss relative to comparable natives, while this probability was 1.6 times higher for EU migrants. To understand the determinants of these large gaps, we focus on three job characteristics - *essentiality*, *temporariness*, and *teleworkability* - and document that migrants were overrepresented among essential, temporary, and low teleworkable occupations at the onset of the pandemic. We estimate that prepandemic occupational sorting accounts for 25-35% of the explained native-migrant gaps in the risk of employment termination while sorting into industries accounts for the rest of the explained part. Yet, more than half of the migrant-native gap in job separation probability remains unexplained, even when controlling for occupational characteristics and industry fixed effects. According to our estimates, migrants face a disproportionately large penalty for being employed in low-teleworkable occupations. Although major employment losses were averted thanks to the massive use of short-time work programs in Europe, migrant workers and extra-EU migrants, in particular, still suffered from high economic vulnerability during the pandemic.

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Introduction

How did the COVID-19 pandemic affect migrant workers in Europe? How different was the impact on foreign workers compared to natives with similar sociodemographic characteristics? What was the role played by prepandemic differential sorting of natives and migrants across occupations and industries in explaining their exposure to the risk of employment loss during the pandemic? In particular, what were the implications for the employment status of specific job characteristics such as *essentiality*, *temporariness*, and *teleworkability*?

We address these questions using the most recent release of harmonized microdata on the employment status of native and migrant workers across European Union countries. We study the EU14 area, which hosts the vast majority of nonnative residents in the European Union, and estimate migrant-native gaps in the probability of employment loss during the first year of the pandemic. While existing evidence for previous recession episodes suggests that migrants' employment status tends to be more vulnerable to business cycle fluctuations than natives' employment status, our paper focuses on which particular characteristics of migrants' jobs may explain differential exposure to employment losses in the context of the COVID-19 pandemic. As indicated, we consider three job characteristics that we identify as critical in predicting the risk of employment loss in the COVID-19 crisis: i) *essentiality*, ii) *temporariness*, and iii) *teleworkability*. We first account for the distinction between the *essential* and *nonessential* occupations that many governments introduced when imposing shutdown measures and assess whether working in an essential occupation protected workers from the risk of leaving employment. We then consider the duration of employment contracts, since fixed-term workers are typically the first to experience job separations when negative shocks hit firms and sectors. Third, we evaluate the degree of teleworkability of occupations, which has been rapidly identified as one of the key predictors of job resilience to the COVID-19 recession. Although the core of our empirical analysis focuses on the first pandemic year (2020), we replicate it for two prepandemic years (2018 and 2019) to identify features and patterns that are specific to events associated with the pandemic itself.

Understanding how the COVID-19 pandemic affected migrant workers and explaining the root causes of the differences that we may observe between natives and migrants provides key information for policy making and makes an important contribution to the academic literature on the effects of the pandemic. Researchers in this field have already highlighted the unequal effects of the COVID-19 pandemic, showing that employment losses are concentrated among relatively disadvantaged subgroups of the population, such as young workers, less educated women, and ethnic minorities. The inequalities of the pandemic extend far beyond the labor market: more vulnerable groups have suffered increased health risks, mental distress, and mortality. Well-designed policy interventions can counteract the inequality-enhancing effects of the pandemic. However, to be effective, these actions must be targeted at those in need: identifying affected categories of workers and estimating the size of the damage they are enduring is, therefore, key to the design of optimal response policies. Quite surprisingly, the fate of migrant workers through the pandemic has received relatively

little attention thus far. In this paper, we fill this gap by providing the first systematic assessment of the consequences of the pandemic on migrant workers in Europe.

1 The COVID-19 Pandemic and Migrant Workers

1.1 Literature Review

The costs of recessions are never evenly distributed among the population (Hoynes, Miller and Schaller, 2012). In fact, a growing body of evidence shows that job losses induced by the COVID-19 pandemic are concentrated among low-wage industries and occupations, young and less educated workers, women and ethnic minorities[1] Inequalities in the effects of the pandemic are not limited to the risk of unemployment. Minorities and other vulnerable groups of workers are overrepresented in occupations exposed to a higher risk of contagion (Alsan, Chandra and Simon, 2021; Basso, Boeri, Caiumi and Paccagnella, 2022); they are suffering from severe deterioration in mental health (Proto and Quintana-Domeque, 2021), and their excess mortality is disproportionately high (Platt and Warwick, 2020).

Although the literature has already documented that migrants' employment status is more sensitive to business cycle fluctuations than natives' (Dustmann, Glitz and Vogel, 2010; Orrenius and Zavodny, 2010), the impact of the COVID-19 pandemic on migrant workers is still relatively underresearched. A notable exception is the early work by Borjas and Cassidy (2020) showing that immigrants in the US - and undocumented immigrants in particular - experienced a severe decline in employment relative to natives. They quantify that approximately one-third of this gap is explained by migrant workers who have jobs that are less "remotable" than those of comparable natives. In the context of Nepal and Bangladesh, Barker *et al.* (2020) observe that migrant households suffered a double consequence: their income decreased due to the reduction in migration of household members and fewer remittances, while their health risk increased due to the return of members from national and international destination areas, which were more affected by the spread of the virus. In Europe, our previous work documents the presence of migrants in essential occupations (Fasani and Mazza, 2020b) and the vulnerability of migrants workers at the beginning of the pandemic (Fasani and Mazza, 2020a). In an earlier version of this paper, we use prepandemic data from the EU Labour Force Survey (EU-LFS) to construct an individual measure of exposure to employment risk, and show that migrant workers - and extra-EU migrants in particular - faced a higher job loss probability than comparable natives. A similar approach has been followed by Bossavie *et al.* (2021), who also point out that migrants are exposed to a higher health risk than that of natives. Furthermore, Auer (2022) shows that migrant workers in Germany faced a disproportionately higher risk of layoffs in 2020 compared to

[1]See, among others: Cortes and Forsythe (forthcoming, 2020); Couch, Fairlie and Xu (2020); Alon, Coskun, Doepke, Koll and Tertilt (2021); Albanesi and Kim (2021); Hupkau and Petrongolo (2020); Adams-Prassl, Boneva, Golin and Rauh (2020); Farre, Fawaz, Gonzalez and Graves (2020). Stantcheva (2022) provides a first review of the evidence on the effects of the pandemic on inequalities.

natives with similar observable characteristics. This paper complements this early and partial evidence with a systematic evaluation of the consequences of the pandemic on migrant workers in the European Union.

1.2 Evidence from Europe

At the beginning of the COVID-19 pandemic, the European Union (EU-27) hosted a migrant population of approximately 36.5 million people, representing 8.1% of the EU resident population. Among them, 13.5 million were citizens of another EU member state and the remaining 23 million were citizens of an extra-EU country.[2] In this paper, we focus on EU14 countries, which hosted over 90% of the foreign residents in the European Union.[3]

Figure 1: Employment Rates in EU14 Countries (q1 2006-q1 2022) by Origin

Note: The figure reports the aged 15 to 64 employment rates for native, EU mobile and extra-EU workers in the EU14 from the first quarter of 2006 to the first quarter of 2022. The vertical dotted line marks the beginning of the pandemic. *Source*: Eurostat ergacob series.

[2]These figures exclude the UK, which officially withdrew from the EU on the 31st of January 2020. With a resident population of 67.2 million in January 2020, the UK hosted 6.2 million foreign nationals (9% of the total population), of which 3.4 million were EU citizens.

[3]Appendix Figure A.1 illustrates trends in the migrant population (Panel A.1a) and in migrant inflows (Panel A.1b) in EU14 countries between 2017 and 2020. Panel A.1a shows that both the EU and the extra-EU migrant population experienced a small reduction after the onset of the pandemic, with EU migrants dropping earlier (and then quickly recovering) relative to extra-EU migrants. Panel A.1b illustrates the heterogeneity across EU14 countries in migrant inflows around the pandemic, showing that many countries experienced large reductions. The relatively small reduction in stocks coupled with the larger drop in inflows suggests that COVID-19-related travel restrictions curtailed outflows from the EU14 area.

Figure 1 reports the employment rates of natives, EU and extra-EU migrants in EU14 countries over the period 2006-2021. Before the first outbreak of COVID-19, employment was on a marked upward trend for all three groups of workers, recovering from the minimum level reached in 2014, when the negative effects of the Great Recession on European economies finally faded away. In the last quarter of 2019, the native worker employment rate was 69.9%, slightly outperformed by EU migrants (72.2%) and well above the level recorded for extra-EU migrants (62.2%).[4] Figure 1 conceals substantial gender heterogeneity, both between and within origin groups. Appendix Figure A.2 shows that women (Panel a) had lower employment rates than men (Panel b) in all groups: the gap is particularly large for extra-EU women both relative to women of other origin groups and their male counterparts.

The outbreak of COVID-19 in the early months of 2020 - together with the contagion containment measures that were put in place by all governments - led to a sudden contraction of European economies. In the EU27 area, real GDP fell on average by 5.9% in 2020. This was the first recorded drop since 2009, when the EU GDP declined by 4.3% compared to the previous year.[5] Using the latest figures provided by Eurostat (2021), Figure 2 allows us to take a closer look at the effects of the pandemic on employment rates (Panel a) and hours worked (Panel b) in the EU14 area. Between the last quarter of 2019 and the second quarter of 2020, the employment rate of native workers experienced a 3.3% drop (or 2.7 percentage points, from 69.9% to 67.6%), implying that almost 4 million people left employment in 6 months.[6] For the employed, the pandemic shock affected work hours far more dramatically, leading to a 25% reduction in the first months of the pandemic (Figure 2, Panel b). This sudden dip was then followed by an equally sharp recovery before summer 2020 and by further fluctuations that mirrored those of the pandemic waves.

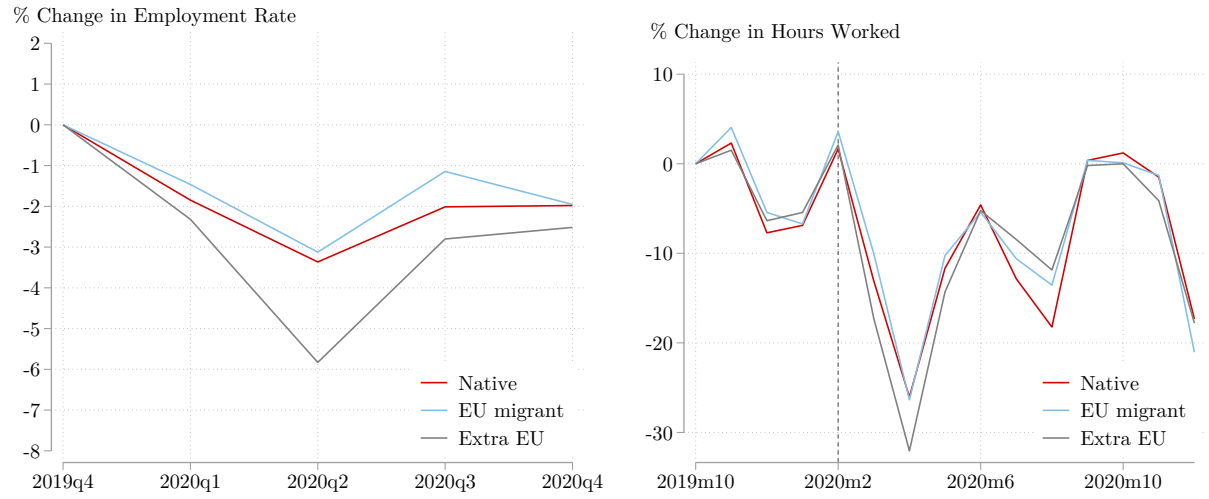
A comparison of the COVID-19-induced recessions in Europe and the US shows very similar responses in terms of GDP and hours worked reductions.The employment rate, however, has been much more volatile in the US, plummeting by approximately 10 percentage points between January and May 2020. Although in the United States lost hours were predominantly determined by layoffs, in Europe the extensive use of subsidized short-time work schemes allowed for a large reduction in working hours while mitigating the detrimental impact on employment (Gros and Ounnas, 2021; Giupponi and Landais, forthcoming).

[4]Trends in unemployment rates over the period 2006-2021 for the three groups of workers are reported in Appendix Figure A.3.

[5]The pandemic shock to EU economies was highly heterogeneous: Spain suffered the greatest drop (-10.8%), followed by Greece (-9.0%), Italy (-8.9%), Portugal (-8.4%), Malta (-8.2%), Croatia (-8.1%) and France (-7.9%). Ireland was the only EU country to register an increase in GDP in 2020 (+5.9%).

[6]The impact on the unemployment rate was equally contained, as shown in Appendix Figure A.3. During the same period, Eurostat estimates a significant 14% increase in the labor market slack - a measure that includes unemployed, underemployed part-time workers, workers seeking jobs but not available to work, and workers available to work but not actively seeking jobs - from 12.5 to 14.3%.

Figure 2: Percentage Change in Employment Rate and Hours Worked in EU14 Countries by Origin (2019q4-2020q4)



(a) Employment Rate

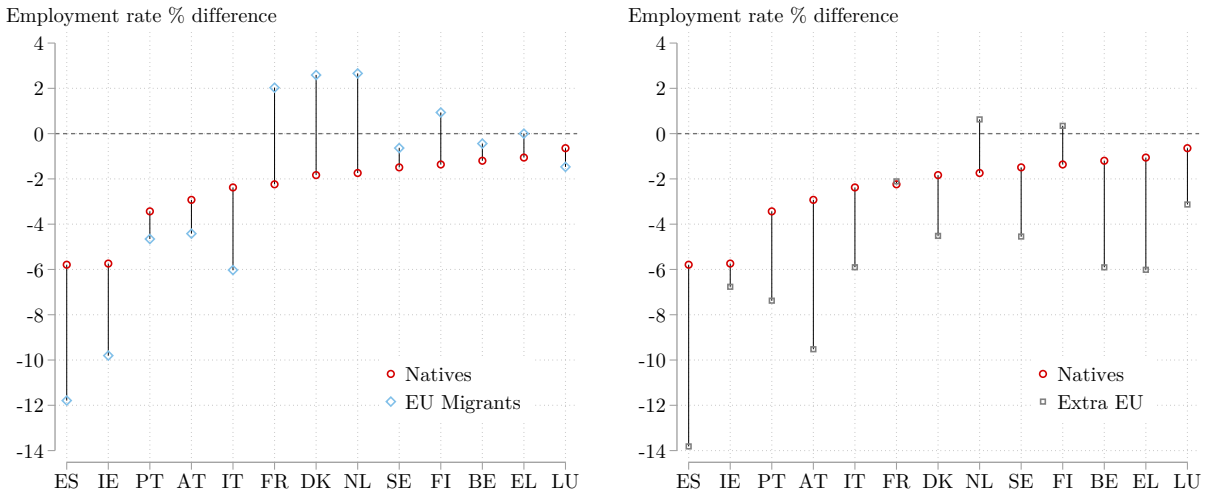
(b) Hours Worked

Note: Data for Panel 2a come from the Eurostat ergacob series. Data for Panel 2b come from our own elaboration of the EU-LFS microdata. Hours worked are conditional on working.

The impact of COVID-19 on migrant workers in the EU14 area has been much more pronounced than that on native workers. As Panel (a) of Figure 2 shows, between the last quarter of 2019 and the first quarter of 2021, the employment rate of migrant workers born outside the European Union dropped by almost 6%, while for EU migrant workers, the loss of employment was closer to that experienced by natives, at approximately 3.1%. Panel (b) of Figure 2 instead reveals relatively minor differences in changes in hours worked between natives and migrants (conditional on being in employment): extra-EU migrants did experience a larger drop at the onset of the pandemic but then closely matched the trends of the other two groups of workers. Figure 3 displays the disproportionate impact of the COVID-19 pandemic on the employment of migrant workers in each host country in our sample. The left panel compares the changes in employment rates between the last quarter of 2019 and the second quarter of 2020 for natives and EU migrant workers in each country in the EU14 area. The right panel performs the same comparison for natives and extra-EU workers. The figure shows substantial heterogeneity both in the overall impact of the pandemic and in its relative size on native and foreign workers. Although native workers in countries such as Spain, Ireland, Portugal, Austria, Italy, and France suffered employment losses between 2% and 6% during the first six months of the pandemic, the change in their employment rate was closer to zero for the other countries in the sample. Panel (a) of Figure 3 suggests that EU mobile workers faced larger employment losses than natives in the five most affected countries, while their performance was similar (if not better) to that of natives

in all other countries.[7] The pattern is more unambiguously negative for extra-EU workers (Panel b), who experienced more severe drops in their employment rate in all but two EU14 countries, with employment losses in excess of 4% in nine countries.

Figure 3: Change in Employment Rates in the EU-14 Area by Origin and Country of Residence (2019q4-2020q2)



(a) Natives vs. EU Migrants

(b) Natives vs. extra-EU Migrants

Note: The figure reports employment rate changes between the last quarter of 2019 and the second quarter of 2020 in each of the EU14 countries for natives and EU-mobile workers in Panel (a); natives and extra-EU workers in Panel (b). Countries are sorted by the size of the employment rate change for natives. *Source*: Eurostat ergacob series.

2 Empirical Strategy, Data and Definitions

2.1 Estimating Equation

In the previous section, we document that migrants - and extra-EU migrants, in particular - experienced disproportionately larger reductions in employment relative to natives in the EU14 area during the first outbreak of the pandemic. In our empirical analysis, we provide estimates of this differential impact and assess how much of the observed migrant-native gap is explained by individual controls and by sorting into specific occupational characteristics (i.e. *essentiality*, *temporariness* and *teleworkability*) and industries. We use cross-sectional data from the European Labour Force Survey collected in 2020 (see Section 2.2), restrict the sample to those who reported being in employment at the beginning of the year (that

[7] Actually, the employment rate of EU migrants slightly increased in a few countries (i.e. France, Denmark, Netherlands and Finland), probably driven by selective return to home countries by nonemployed workers.

is, before the pandemic started), and study their probability of having experienced a job separation since then. In particular, we estimate the following regression equation:

$$JobSep_i = \alpha + \boldsymbol{X_i'}\boldsymbol{\beta} + \gamma EU_i + \theta ExtraEU_i + \delta JobChar_i + \psi_c + \epsilon_i \quad (1)$$

where $JobSep_i$ is an indicator variable for having experienced a job separation in 2020; $\boldsymbol{X_i}$ is a vector of individual controls (sex, age and education); the dummies EU_i and $ExtraEU_i$ identify migrant workers from the EU and extra-EU, respectively; $JobChar_i$ are alternative indicators of job characteristics; ψ_c are country of residence fixed effects; and ϵ_i is an idiosyncratic shock.

We focus our analysis on three job characteristics that we identify as critical in predicting the risk of employment loss in the COVID-19 crisis: i) *essentiality*; ii) *temporariness*; and iii) *teleworkability*. We first account for the distinction between the *essential* and *nonessential* occupations that many governments introduced when imposing shutdown measures (Fasani and Mazza, 2020b). Despite variations in definitions and enforcement across countries, workers employed in key sectors and occupations could generally continue their activities, although with enhanced safety and health measures. Outside these essential occupations, workers and firms were instead subject to severe restrictions that often implied that workers had to stay home while their workplaces were kept entirely or partially closed. The second dimension that we consider is the duration of employment contracts: having lower firing costs than workers on permanent contracts, fixed-term workers are the first to be laid off when negative shocks hit firms or sectors (Blanchard and Landier, 2002; Boeri and Garibaldi, 2007). Third, we assess the degree of teleworkability of occupations, which has been identified as one of the most important predictors of job loss in the COVID-19 crisis (Dingel and Neiman, 2020; Mongey, Pilossoph and Weinberg, 2021; Adams-Prassl, Boneva, Golin and Rauh, 2020).

We estimate equation (1) with a linear probability model (LPM) and use robust standard errors in all regressions. We first obtain baseline migrant-native gaps in employment loss probability by including migrant status dummies and host country fixed effects only. We then condition on individual and job characteristics in the specification and establish whether they significantly affect the probability of employment separation and with the expected sign. To assess to what extent gaps vary once we control for the differential sorting into occupations before the outbreak of the COVID-19 pandemic, we include indicators for essential occupations, temporary jobs, and occupational degree of teleworkability. Finally, we account for prepandemic sorting into industries by including a full set of industry fixed effects. The comparison of estimated migrant-native gaps in the baseline specification with those obtained when we gradually control for sorting allows us to quantify the contribution of each set of regressors to the observed gaps. We formally make this comparison by implementing a Gelbach decomposition (Gelbach, 2016).

It is important to note that the estimated coefficients on job characteristics in equation (1) do not isolate the causal effect of these variables on the job separation probability during

the pandemic (as if they had been randomly assigned to workers). Those coefficients combine the effects of the job attributes with those of the observable and unobservable characteristics of the workers who selected into those particular occupations. Indeed, how different occupations fare during the pandemic in terms of employment losses is determined both by differential exposure to the macro-economic shock induced by COVID-19 and by heterogeneity in the types of workers they employ. In our empirical analysis, we document the extent of selection on observables (section 2.4) and propose estimates that attempt to hold occupational sorting constant by using data from two pre-pandemic years (section 3.1.3).

2.2 Data and Estimation Sample

Our analysis is based on individual-level data from the latest wave of the EU-LFS, a large household survey that combines and harmonizes microdata from the Labour Force Surveys collected by the national statistical institutes of each EU member state. These data refer to interviews conducted in 2020, and were released in November 2021, allowing researchers to assess the impact of COVID-19 on workers across European countries. In addition, the previous two waves of the EU-LFS - collected in 2018 and 2019 - are used in some parts of our empirical analysis.

In our main empirical application, we evaluate how the characteristics of the occupation held at the beginning of the pandemic influenced the probability of leaving employment over the course of 2020. The EU-LFS is particularly well suited for our objective because it reports, in case of job separation, both the occupation held and the sector of employment in the last 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, for both workers who were employed and those who were not in employment at the time of the interview, the job history throughout 2020: in particular, we can determine whether a job separation occurred in 2020, and we can observe the characteristics (i.e., essentiality, duration of contract, degree of teleworkability, industry) of the occupation held at the beginning of the year. We focus our analysis on EU14 countries and workers aged 15-64 years, restrict our sample to those who were gainfully employed at the beginning of 2020 and drop respondents for whom retrospective information on one of our job characteristics of interest is missing.[8] We distinguish workers into the three origin groups based on their country of birth and current residence: natives are born in the current country of residence, EU migrants are born in an EU member state other than the one where they currently work and reside, and extra-EU migrants are born outside of the EU.

[8]We drop Ireland from our sample as the information on the last job held is missing for Irish workers.

Table 1: Summary Statistics

	Native	EU migrants	Extra EU	Total
Became unemployed in 2020	0.02	0.04	0.05	0.03
	(0.15)	(0.19)	(0.22)	(0.16)
Woman	0.49	0.52	0.45	0.49
	(0.50)	(0.50)	(0.50)	(0.50)
Primary education	0.18	0.19	0.37	0.20
	(0.39)	(0.40)	(0.48)	(0.40)
Secondary education	0.51	0.49	0.40	0.50
	(0.50)	(0.50)	(0.49)	(0.50)
Tertiary education	0.30	0.31	0.23	0.30
	(0.46)	(0.46)	(0.42)	(0.46)
Age	44.85	43.73	43.44	44.68
	(11.40)	(10.27)	(10.57)	(11.29)
Essential worker in 2019	0.36	0.40	0.43	0.37
	(0.48)	(0.49)	(0.49)	(0.48)
Temporary contract in 2019	0.08	0.09	0.13	0.09
	(0.27)	(0.29)	(0.33)	(0.28)
Low teleworkable job in 2019	0.61	0.70	0.81	0.63
	(0.49)	(0.46)	(0.39)	(0.48)
N	417,672	21,961	40,586	480,219

Note: The table reports means and standard deviations (in parentheses) of the main variables used in our analysis for each origin group (natives, EU migrants and extra-EU migrant) and for our entire estimation sample. Source: EU-LFS data for 2020.

After applying these selection rules, our main sample includes 480,219 individuals, of which 417,672 (87% of the sample) are natives, 21,961 (4.6%) are EU migrants, and the remaining 40,586 (8.4%) are extra-EU migrants. Table 1 reports the summary statistics, disaggregated by migrant status, for the main variables used in our analysis. In our sample, the probability of leaving employment (for those who were employed at the beginning of 2020) is 2.6%, being 2.3% for native workers and increasing to 3.8 and 5.1% for EU and extra-EU migrants, respectively. Table A.1 shows that the most common reason for experiencing job termination is the end of a temporary contract (30%), followed by layoffs (20%), other reasons (13%) and normal retirement (12%). These four reasons account for three-quarters of job terminations. In our empirical analysis, we focus exclusively on those who lost their job but are still active; therefore, we exclude people who left the labor market to

retire, study, or assume family responsibilities.[9] Regarding the sociodemographic characteristics of the workers in our sample, Table 1 shows that the share of women is 49% among natives, 52% for EU migrants, and 45% for extra-EU migrants. Natives and EU migrants show very similar educational profiles: almost 20% of workers completed primary (or less) education, approximately 50% acquired secondary education, and the remaining 30% received tertiary education. Extra-EU workers are substantially less educated: 37% of them have primary, 40% secondary, and 23% tertiary education. Finally, the average age in the sample is approximately 44 years, with small differences among the three origin groups.

2.3 Essential Workers, Temporary Contracts and Teleworkability

We use the following definitions for the three job characteristics that we study in this paper:

1. *Essential workers.* For the definition of essential workers, we follow the Communication from the European Commission on guidelines concerning the exercise of the free movement of workers during the COVID-19 outbreak, supplemented with the Dutch definition of essential workers. We identify essential workers based on ISCO-08 occupations at three digits, which is the most detailed classification available in the EU-LFS.[10]

2. *Temporary Workers.* The EU-LFS survey includes information on the type of employment contract that allows us to distinguish employees who have a fixed-term contract from those who have a permanent contract.

3. *Teleworkability.* Our measure of *teleworkability* is taken from Dingel and Neiman (2020). This measure is based on responses to two Occupational Information Network (O*NET) surveys covering "work context" and "generalized work activities". The index runs from 0 to 100, and we use a threshold value of 60 to classify jobs above the cutoff as teleworkable and jobs below the cutoff as nonteleworkable. We then apply the crosswalk provided in the replication package by Dingel and Neiman (2020) to merge the SOC classification of occupations provided by the Bureau of Labor Statistics (BLS) with the ISCO-08 classification available in the EU-LFS.

[9] In unreported robustness checks, we also consider these people as having lost their job. Our main results are not affected by the inclusion of these groups. The results are available on request.

[10] A full list of our essential professions is provided in Appendix Table A.2 and can be accessed at the repository https://github.com/jacopoto/fm-migrant-key-workers. Note that both the Commission's and the Dutch Government's definitions often refer to a finer ESCO four-digit classification. ESCO is the European implementation of ISCO, and therefore the two classifications can be easily mapped to each other. Therefore, our definition is necessarily broader than the original one. See Fasani and Mazza (2020b) for more information on the classification of essential workers in Europe. For a related discussion of the definition of essential and frontline workers in the US context, see Blau *et al.* (2021).

2.4 Prepandemic Sorting into Job Characteristics: Natives vs. Migrants

In this section, we investigate migrant-native differences in prepandemic sorting into essential, temporary, and low-teleworkable occupations. Differential sorting into these job attributes in EU countries helps us understand the potentially heterogeneous impacts of the pandemic shock on native and migrant workers, which has not yet been documented in the literature.

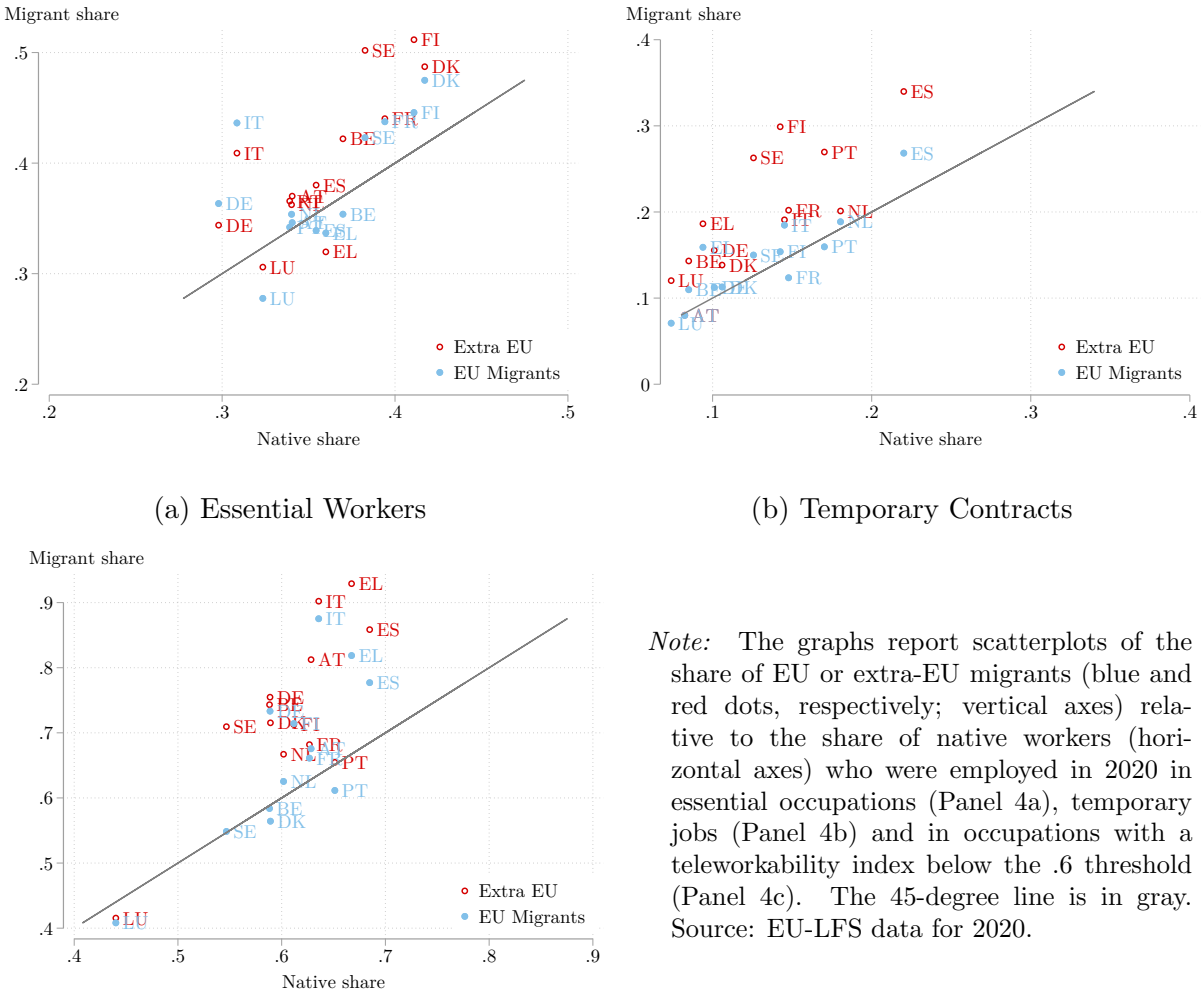
However, before delving into these differentials, Appendix Table A.3 details the extent of prepandemic sorting by workers' observable characteristics into these three occupational attributes. We note that less educated workers tend to be more concentrated in temporary jobs and low-teleworkable occupations, while essential occupations display a more polarized distribution of workers' education than that of nonessential jobs. Furthermore, workers in temporary occupations are substantially younger (approximately 8 years) than those with permanent contracts; gaps are relatively minor (approximately 1 year) for essential and low-teleworkable occupations. Finally, women are overrepresented in essential occupations and temporary jobs and underrepresented in teleworkable occupations. Native-migrants differences in sorting into the three job attributes are reported in the last rows of Table 1. Migrants - and extra-EU migrants in particular - are more likely to be employed in essential occupations, to be hired with a temporary contract and to have a low-teleworkable job. In particular, the share of workers employed in essential occupations is 36% among natives, 40% among EU migrants and 43% among extra-EU migrants. Furthermore, 8% of native workers have a temporary contract. The share is only marginally higher for EU migrants (9%) while it increases to 13% among extra-EU migrants. Finally, low-teleworkable occupations employ 61% of native workers, 70% of EU migrants, and 81% of extra-EU migrants. The selection on observables into job characteristics that we observe in Appendix Table A.3 suggests that workers are likely to sort into occupations also along dimensions that are not observable in our data.

Figure 4 reveals wide cross-country variation in job sorting patterns. It reports scatterplots of the shares of employment in essential occupations (Panel 4a), temporary contracts (Panel 4b) and low-teleworkable jobs (Panel 4c) for each of the two groups of migrants (EU migrants in blue and extra-EU migrants in red) compared to those of native workers. Panel 4a shows that before the first outbreak of the COVID-19 pandemic, extra-EU migrants tended to be more concentrated in essential occupations than natives in all countries except Greece and Luxembourg. The pattern is more nuanced for EU migrant workers, whose shares in essential occupations relative to native workers are scattered around the 45-degree line.[11]

[11] On average, in 2019, one essential worker out of five (20%) was a foreign-born worker. Since immigrants represent 15.8% of the employed workers in the area (EU mobile migrants account for 5.9% and extra-EU for 9.9%), they were clearly overrepresented among essential occupations Fasani and Mazza (2020b). These figures are remarkably similar to estimates available for the US, which suggest that foreign-born workers

Panel 4b clearly illustrates the overrepresentation of migrants in temporary jobs, showing a migrant-native gap that is especially wide for extra-EU migrants. Finally, Panel 4c shows how extra-EU migrants - and, to a lesser extent, EU migrants - have far larger shares of employment in low-teleworkable occupations than that of native workers.

Figure 4: Share of Workers by Job Characteristic in 2020, by Host Country and Origin



(a) Essential Workers

(b) Temporary Contracts

(c) Low Teleworkable Jobs

Note: The graphs report scatterplots of the share of EU or extra-EU migrants (blue and red dots, respectively; vertical axes) relative to the share of native workers (horizontal axes) who were employed in 2020 in essential occupations (Panel 4a), temporary jobs (Panel 4b) and in occupations with a teleworkability index below the .6 threshold (Panel 4c). The 45-degree line is in gray. Source: EU-LFS data for 2020.

Overall, the pattern shown in these graphs leads to ambiguous predictions about the relative exposure of migrants and natives to the risk of employment loss during the pandemic. On the one hand, the overrepresentation of migrants in essential occupations would suggest

account for 19% of the US workers in front-line key industries while making up approximately 17% of the employed workforce (Gelatt, 2020).

that foreign workers may be more protected by the negative consequences of the economic downturn (although they may face a higher risk of being infected by the virus; see Basso *et al.* 2022). On the other hand, the higher concentration of migrants in temporary and low-teleworkable jobs should make them more vulnerable to the risk of dismissal. Which of the two effects prevails in each EU-14 country will ultimately depend on the relative role played by each of these three job characteristics in determining employment risk and on the within-country correlation in the distribution of migrants along these three dimensions.

We conclude this section with a speculative remark regarding the extent to which workers could predict how sorting in some type of occupation would have affected their future probability of remaining in employment. The pandemic shock, indeed, suddenly increased the salience of job attributes that had little or no relevance in a prepandemic labor market.[12] Although having a temporary contract is associated with higher employment risk under any circumstances, the fact that being employed in an essential or teleworkable occupation resulted in a relative reduction in employment risk during the COVID-19 pandemic (as we document in the next section) was probably an unexpected event for many of the workers involved.

3 Results

In this section, we present and discuss our estimation results. We first focus on the probability of job separation (Section 3.1) - which is the main outcome of our empirical analysis - and report findings from estimating equation (1) (Section 3.1.1). We explore the heterogeneous impact by migrant status (Section 3.1.2) and extend the scope of our analysis to include two prepandemic years (Section 3.1.3). We then consider additional outcomes, namely, hours worked and labor income (Section 3.2).

3.1 Main Results

3.1.1 Probability of Job Separation and Occupational Sorting

In Table 2, we report the estimation results of regression equation (1) for the probability of employment separation in 2020. Estimates from our baseline specification, with dummies for migrant status (EU and extra-EU) and host country fixed effects, are displayed in Column 1. The positive coefficients on both migrant group indicator variables imply a substantially higher exposure of foreign-born workers to employment risk. EU migrants face

[12] Appendix Figure A.4 effectively demonstrates changes in the salience of these three job dimensions by reporting worldwide Google search data for the terms "essential workers", "temporary employment" and "telework" between January 2004 and June 2022. As the graph shows, the dimensions of teleworkability and, even more, the concept of essential workers became extremely salient after the onset of the pandemic, while having been far less salient relative to the notion of "temporary workers" in all prepandemic years. In fact, these data document that the term "telework" has been generating some internet traffic since 2004, while the term "essential workers" was searched by virtually no one in the 16 years before January 2020.

a 65% (1.7 p.p.) higher probability of employment termination relative to natives - whose baseline probability of job separation is 2.6% - and the gap further increases for extra-EU migrants, whose probability is more than twice as large (2.8 p.p.) than that of comparable natives. We condition on individual characteristics in Column 2. The migrant gap is unchanged for EU migrants, while it marginally shrinks for extra-EU migrants (from 2.8 to 2.5 p.p.). Women in our sample are 0.3 p.p. more likely to experience job separation relative to men, which corresponds to an 11% higher probability relative to the baseline. This positive and strongly significant coefficient confirms previous findings in the literature on the disproportionate negative effect of the COVID-19 pandemic recession on women (that is, the so-called "she-cession"; Albanesi and Kim (2021); Alon *et al.* (2021)). Finally, the negative coefficients on secondary and tertiary education suggest that the risk of job separation has more intensively affected workers with low levels of human capital: workers with secondary and tertiary education are 46% (1.2 p.p.) and 84% (2.2 p.p.) less likely to become unemployed, respectively.[13] This first set of results implies that migrants, women, and low-educated individuals have disproportionately endured negative employment effects from the 2020 pandemic. These results also underscore the double penalty to which migrant women were subjected: the combined effect of the gender and migrant gaps translated into a probability of job termination that was more than twice that of native men.

In Columns 3 to 5 of Table 2, we alternatively include the three job characteristics - i.e. essential occupation, temporary contract, and low teleworkability - discussed in Section 2.3. The estimated coefficients on these three variables are all statistically significant and display the expected sign: being an essential worker reduces the job-loss probability by 23% (0.6 p.p.) while having a temporary contract and being employed in a nonteleworkable occupation imply considerable increases in the probability of job loss. The effect is particularly large for temporary workers (8.3 p.p.), but it is also substantial for low teleworkable occupations (0.9 p.p. or 35% relative to baseline).[14] In Column 6, we jointly condition on all three job characteristics at the same time: the estimated coefficients remain virtually unaffected in both size and statistical significance compared to those reported in Columns 3-5, implying that each characteristic captures a distinct and independent dimension of occupational heterogeneity. The inclusion of these controls for job characteristics reduces the estimated gaps between migrants and natives relative to the specification in Column 2 by 12% for EU migrants and by 16 % for extra-EU migrants, suggesting that differential sorting into occupations may partially explain the disadvantage that migrants face in their exposure to the

[13] In the U.S., the evidence on the employment impact of COVID-19 by level of education is mixed: while Montenovo *et al.* (2022) find that employment losses were smaller for groups with low or high (vs. medium) education, Cortes and Forsythe (forthcoming) show a negative and monotonic relationship between employment losses and workers' educational achievement.

[14] In Appendix Table A.4, we report the same set of estimates while conditioning for a full set of subnational area fixed effects (NUTS II) to capture variation in the regional intensity of the COVID-19 pandemic, and differences in residential patterns between natives and migrants. The inclusion of this additional set of dummies leaves our estimates unchanged.

Table 2: Migrant-Native Gaps in the Probability of Job Separation in 2020

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU migrant	0.017***	0.017***	0.018***	0.015***	0.016***	0.015***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Extra EU migrant	0.028***	0.025***	0.026***	0.022***	0.024***	0.021***	0.015***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Woman		0.003***	0.003***	0.002***	0.003***	0.002***	0.002***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Secondary education		-0.012***	-0.012***	-0.008***	-0.010***	-0.007***	-0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Tertiary education		-0.022***	-0.021***	-0.020***	-0.016***	-0.013***	-0.008***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Essential worker in 2019			-0.006***			-0.008***	-0.003***
			(0.000)			(0.000)	(0.001)
Temporary contract in 2019				0.083***		0.083***	0.082***
				(0.002)		(0.002)	(0.002)
Low teleworkable job in 2019					0.009***	0.010***	0.005***
					(0.000)	(0.000)	(0.001)
Country FE	✓	✓	✓	✓	✓	✓	✓
Age FE		✓	✓	✓	✓	✓	✓
Industry FE							✓
Obs.	480,219	480,219	480,219	480,219	480,219	480,219	477,694
Mean Outcome	0.026	0.026	0.026	0.026	0.026	0.026	0.026

Note: In this table, we regress an indicator variable for having lost a job during 2020 on a set of individual covariates (migrant status, gender, education, age), job characteristics, host country FEs and industry FEs. Robust standard errors are in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

pandemic.[15] Controlling for job attributes also implies a 30% reduction in the gap between women and men. Finally, in Column 7, we consider the role played by prepandemic sorting into industries and include a full set of industry fixed effects.[16] Controlling for industry sorting implies a further and large reduction in the estimated immigrant gaps: relative to the specification with all job attributes (Column 6), the gap drops by 40% for EU migrants and by 28% for extra-EU migrants. This extended model is able to capture about half of the gap that we estimate in the baseline model in Column 1, but still leaves the other half unexplained.

The discussion of the contribution of each group of covariates to narrowing the migrant-native gap in the probability of employment separation - which we provided in the previous paragraph - may depend on the specific sequential inclusion of controls that we follow in Table 2. To address this path dependence, we apply an order-invariant decomposition proposed by Gelbach (2016) and report our findings in Table 3. In the table, we compare the estimated gaps for both migrant groups in the baseline and the full models of Table 2 (Columns 1 and 7, respectively). The first row shows the explained gap for each migrant group (that is, the estimated drop in the gap once we move from the baseline to the full specification), while the other rows report the estimated contribution of each group of covariates to reducing the gap relative to the baseline. According to Table 3, 20% of the reduction in the migrant-native gap observed in Table 2 for EU migrants is explained by having fewer teleworkable occupations than comparable native workers and only 6% by a higher incidence of temporary contracts, while individual characteristics and being an essential worker play negligible roles. For extra-EU migrants, instead, 8% of the explained gap is due to differences in individual characteristics compared to natives, their relative overrepresentation in essential occupations implies a 6% increase in the gap, while their overrepresentation in low teleworkable and temporary occupations accounts for 31 and 8% of the explained gap, respectively.[17] For both migrant groups, the role of industry sorting in explaining those gaps is substantial: as the table shows, industry sorting accounts for three-quarters of the native-EU migrant gap and almost two-thirds of the native-extra-EU gap. However, as we mentioned, even

[15]To identify which migrant groups were most affected by the pandemic, Appendix Figure A.5 reports the estimated coefficients for each macro area of origin from the specification that just conditions on individual controls and from that conditional on job characteristics (i.e. Columns 2 and 6 of Table 2). All migrant groups - except for those from EFTA (European Free Trade Association) countries - experienced a significantly higher probability of job separation than that of natives: we estimate the smallest gap for EU27 nationals and the largest for migrants from North Africa, the Middle East, and Latin America. In all cases, controlling for job characteristics tends to reduce the estimated native-immigrant gaps.

[16]The inclusion of industry fixed effects leads to a minor loss of approximately 2.5 thousand respondents due to missing information.

[17]It is interesting to note that controlling for sorting into temporary occupations accounts for a smaller fraction of the explained migrant-native gap in job separation probability than controlling for low-teleworkable occupations (see Table 3). Although having a fixed-term contract has the largest effect on the probability of job loss (see Table 2), it is much less common among workers than being employed in a low-teleworkable occupation, as shown in Table 1 and Figure 4.

when accounting for sorting into occupations and industries, slightly more than half of the native-migrant gaps remain unexplained.

Table 3: Gelbach (2016) Decomposition of the Explained Migrant-Native Gaps

	EU Migrants		Extra EU Migrants	
	Δ Coeff.	% Expl.	Δ Coeff.	% Expl.
Decomposition of Table 2				
Total	**0.008*** **		**0.013*** **	
	(0.000)		(0.000)	
Individual Controls	0.000	0	0.001**	8
	(0.000)		(0.000)	
Essential Worker	-0.000**	-1	-0.000***	-6
	(0.000)		(0.000)	
Low Teleworkability	0.001***	20	0.004***	31
	(0.000)		(0.000)	
Temporary Contracts	0.000***	6	0.001***	8
	(0.000)		(0.000)	
Industry FEs	0.006**	75	0.008***	61
	(0.000)		(0.000)	
Obs.	477,694		477,694	

Note: The table reports estimates from a Gelbach (2016) decomposition of the explained gaps for EU and extra-EU migrants reported in Table 2. The baseline and full specifications correspond to Columns 1 and 7 of Table 2. Robust standard errors are in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

Table 4: Migrant-Native Gaps in the Probability of Job Separation in 2020: Differential Effects of Job Characteristics

	(1)	(2)	(3)
EU migrant	0.020***	0.017***	0.010***
	(0.002)	(0.001)	(0.002)
Extra EU migrant	0.027***	0.022***	0.015***
	(0.002)	(0.001)	(0.002)
Essential worker in 2019	-0.005***		
	(0.000)		
Essential worker in 2019 × EU migrant	-0.005**		
	(0.003)		
Essential worker in 2019 × Extra EU migrant	-0.003		
	(0.002)		
Temporary contract in 2019		0.084***	
		(0.002)	
Temporary contract in 2019 × EU migrant		-0.015**	
		(0.007)	
Temporary contract in 2019 × Extra EU migrant		-0.002	
		(0.005)	
Low teleworkable job in 2019			0.008***
			(0.000)
Low teleworkable job in 2019 × EU migrant			0.009***
			(0.002)
Low teleworkable job in 2019 × Extra EU migrant			0.011***
			(0.002)
Country FE	✓	✓	✓
Individual Controls	✓	✓	✓
Obs.	480,219	480,219	480,219
Mean Outcome	0.026	0.026	0.026

Note: In this table, we regress an indicator variable for having lost a job during the year 2020 on a set of individual covariates (migrant status, gender, education, age), host country FEs, and job characteristics and their interaction with migrant dummies. Robust standard errors are in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

3.1.2 Heterogeneous Effects of Job Attributes

The analysis presented in the previous section did not allow the effects of job attributes to vary by migrant status. We now relax this restriction by interacting each job attribute with migrant dummies. The estimates are reported in Table 4. We find that being employed in an essential occupation is associated with a half-percentage point reduction in the probability of job loss for natives. The effect is not significantly different for extra-EU migrants, while for EU migrants we estimate a further reduction of half a percentage point (Column 1). Furthermore, EU migrants enjoyed a slightly lower job-loss risk associated with being on a temporary contract than that of natives and extra-EU migrants (Column 2). Regarding the degree of teleworkability, we find that migrants suffered a large additional penalty from having sorted into low-teleworkable jobs. According to our estimates, being in a low-teleworkable occupation at the onset of the pandemic implied a probability of employment separation that was 2.1 times higher for EU migrants, and 2.4 times higher for extra-EU migrants than for natives (Column 3). This result might have implications for the future of migrants' employment in Europe. If the share of jobs done from home is bound to grow in the future (see Barrero *et al.* (2021), for example), the employment of migrants could suffer from the combined effect of their higher concentration in a declining segment of the labor market and their greater propensity to be dismissed within those occupations.

3.1.3 Job Separations and Occupational Sorting in Pandemic and Prepandemic Years

Our results from estimating equation (1) imply that being a worker in a nonessential, temporary or low-teleworkable occupation during the first year of the COVID-19 pandemic was associated with a significantly higher probability of experiencing job separation (see Table 2). However, one must be careful in interpreting those estimates as effects determined by the pandemic. In fact, those job attributes, and the groups of workers sorting into them (see Section 2.4), may have already experienced higher separation rates *before* the pandemic. This concern is evident for temporary workers, whose employment status is always more vulnerable, and may also apply to essential workers and low-teleworkable jobs. To address this concern, we extend our main empirical exercise and include the two years before the onset of the pandemic. We use the 2018 and 2019 EU-LFS waves in addition to the 2020 wave and, for each wave, we restrict the sample to workers who were employed at the beginning of each year and whose job characteristics are observed in the surveys.[18] We then pool workers for the three waves in a single estimation sample and estimate the following equation for each of the three job attributes:

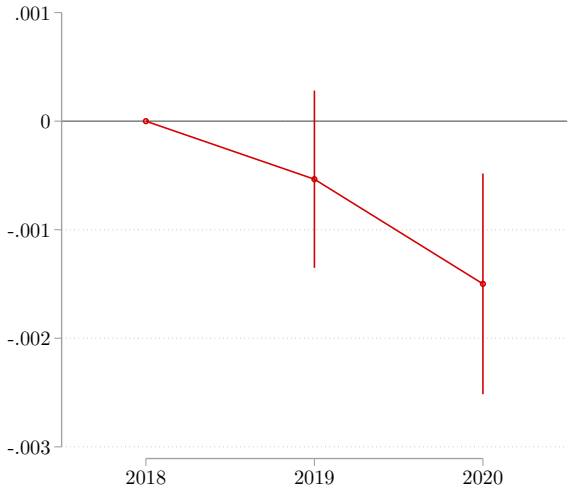
[18]The 2018 and 2019 waves of the EU-LFS are larger than the 2020 wave because the latter was fielded largely during the pandemic and its collection was affected by the social distancing measures in place at the time. For this reason, our 2018 and 2019 samples comprise 1,113,129 and 1,041,183 observations, respectively.

$$JobSep_{it} = \alpha + \boldsymbol{X'_{it}}\boldsymbol{\beta} + \gamma EU_{it} + \theta ExtraEU_{it} + \mu_1 y2019_t + \mu_2 y2020_t + \delta_1 JobChar_{it} + \\ + \delta_2(JobChar_{it} \times y2019_t) + \delta_3(JobChar_{it} \times y2020_t) + \psi_c + \epsilon_{it} \quad (2)$$

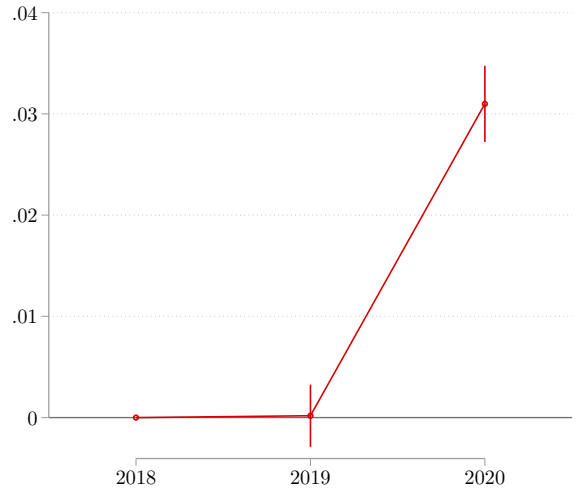
This is an augmented version of our main estimating equation (1) which allows us to separately estimate the effect of job characteristics in each of the three years in an event-study fashion. The variables in equation (2) are as follows: $JobSep_{it}$ is an indicator variable for having experienced a job separation in year t (with $t = 2018, 2019, 2020$); $\boldsymbol{X_{it}}$ is a vector of individual controls (sex, age, and education); the dummies EU_{it} and $ExtraEU_{it}$ identify EU and extra-EU migrant workers, respectively; $y2019_t$ and $y2020_t$ are wave dummies; $JobChar_{it}$ are alternative indicators of job characteristics (essentiality, temporariness and low-teleworkability); ψ_c are country of residence fixed effects; and ϵ_{it} is an idiosyncratic shock. In this specification, the wave dummies identify any systematic change in average job separation rates over the three years of data and allow us to directly test whether job separations became more frequent during the pandemic. Furthermore, the coefficient δ_1 captures the effect of being a worker employed in a job with a given attribute in 2018, while the coefficients on the interaction terms δ_2 and δ_3 test whether this effect was significantly different in 2019 and 2020, respectively. All other coefficients can be interpreted as in equation (1). Thus, estimating equation (2) allows us to isolate the effect associated with each job attribute during the pandemic, netting out the effects that may have existed even before the pandemic started. Note that the occupational sorting is measured *before* the pandemic started in all three waves in our sample. For each wave, in fact, we use information on job attributes for the job that was held in January of each year. Therefore, even for the 2020 wave, the sorting that we observe was determined a few months before the COVID-19 outbreak.[19] As long as sorting into occupations did not change systematically between 2018-19 and 2020 for reasons other than the pandemic, the fact that workers with given characteristics tend to self-select into particular job attributes (e.g., more vulnerable workers in temporary contracts) would be absorbed by the coefficient δ_1, while the coefficients on the interaction terms δ_2 and δ_3 would isolate the effects of changed economic conditions (if any) on each job attribute. Still, even if we hold sorting constant, the effects of certain (observable and unobservable) workers' characteristics on job loss probability may have changed during the pandemic, contributing to the occupational performance we observe.

[19]The World Health Organization announced the first pandemic caused by a coronavirus on the 11th of March 2020: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

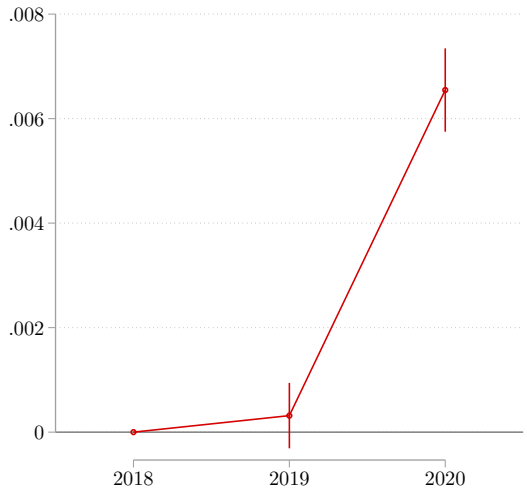
Figure 5: Differences in Probability of Job Separation by Job Characteristic: 2018 vs. 2019 vs. 2020



(a) Essential Workers



(b) Temporary Contracts



(c) Low Teleworkability

Note: The figure reports the differences in the probability of job loss among 2020, 2019 and 2018 for essential and nonessential occupations (Panel 5a), temporary and permanent jobs (Panel 5b) and occupations with a teleworkability index below the .6 threshold or above it (Panel 5c). The bars represent the 95% confidence intervals. EU-LFS data for 2018, 2019 and 2020.

We report the estimated coefficients δ_2 and δ_3 on the two interaction terms (and their confidence intervals) in Figure 5 and the full set of estimates in Appendix Table A.5. Figure 5 clearly illustrates that the effect on the probability of job separation of each job attribute in 2019 is not significantly different from the effect estimated in 2018. The differential effect became substantially larger and strongly significant in 2020 (relative to 2018) when the pandemic shock hit European labor markets. A closer look at the estimated coefficients reported in Appendix Table A.5 allows us to see that each of the three job attributes displayed a sig-

nificant correlation with the probability of job separation before the onset of the pandemic, supporting the concern we expressed at the beginning of this section. Column 1 shows that being an essential worker implied a significantly lower probability of layoff already in 2018; the effect was not significantly different in 2019 but doubled in magnitude in 2020. Similarly, workers in low-teleworkable occupations faced a higher employment risk before the pandemic (without statistically significant differences between 2018 and 2019), but the coefficient more than tripled in size in 2020 (Column 2). Further, the probability of layoff was significantly higher for temporary workers than for workers with a permanent contract in both prepandemic years (again, with no statistically significant difference between 2018 and 2019) and increased further in 2020 (Column 3). Although this last job characteristic has the largest impact on employment risk, the percentage increase we estimate in 2020 (relative to 2018) is approximately 27%, much smaller than the pandemic-related increases we estimate for the other two job attributes.

Beyond the job characteristics, the estimated coefficients on the year dummies ($y2019_t$ and $y2020_t$) reported in Appendix Table A.5 imply that the probability of job separation was not significantly different in the two years before the pandemic and then increased by 10-35%, depending on the specification, in 2020 (relative to a baseline of 2.25% in both 2018 and 2019.). Finally, we find significantly higher probabilities of layoff for migrants over the 3-year period we consider: similar to the estimates for 2020 presented before (see Tables 2 and 4), the gap is substantially larger for extra-EU migrants than for EU migrants, confirming the higher vulnerability of the former group of migrant workers relative to the latter.

3.2 Additional Outcomes: Hours Worked and Labor Income

In this section, we look at migrant-native gaps in hours worked and study labor income. We explore how these two variables were affected by the pandemic for the sample of workers who were employed at the beginning of 2020. Our empirical analysis is based on a set of regressions similar to Equation (1), where we replace the dependent variable *JobSep* with the hours worked in the week before the interview and with a dummy indicator for belonging to the top half of the labor income distribution. Note that in the EU-LFS data, information on labor income - defined as the monthly take-home pay from the main job of respondents who are employed - is exclusively available as income deciles of country of residence distribution. The starting sample is the same as the one used throughout our main empirical analysis, and further restrictions are determined by missing information on either hours worked or on the position in the labor income distribution.[20] We present our estimation results in Table 5: the outcome variable is the number of hours worked (in the last week) in Columns 1-4 and a dummy for being in the top half of the income distribution in Columns 5-6. For each outcome, we first estimate models that do not condition on job attributes (odd columns) and then include the three dummies for essential, temporary, and low-teleworkable occupations

[20]Information on labor income is not available in Austria, Germany, Spain, and Sweden, reducing our sample size to approximately 283,000 observations.

(even columns).

Hours worked. When looking at hours worked, we use the full sample in Columns 1-2 of Table 5 and restrict it to people who were employed at the time of the interview in Columns 3-4. In the first case, we consider both the extensive and intensive margins of employment, while in the second case, we focus exclusively on the latter. When reading our results, we should exercise caution. Our data do not allow us to disentangle whether the drop in hours worked is driven by workers who usually work long hours leaving their employment or by a generalized decrease in hours worked among the employed workforce. In addition, when attempting to isolate the intensive margin in Columns 3-4 we are not modeling non-random selection into employment.

Column 1 of Table 5 shows that EU migrants have worked, on average, 0.4 more hours per week than natives. The effect becomes larger (0.96 hours) once we concentrate exclusively on the intensive margin (Column 3), implying that EU migrants were more likely than natives to leave employment in 2020 (as shown in Section 3.1), but they worked almost an hour more per week, conditional on remaining employed. The pattern is quite distinct for extra-EU migrants: overall, they worked 0.7 fewer hours per week than natives (Column 1), the effect being entirely driven by the extensive margin, showing a nonsignificant difference in hours worked for those who remained in employment (Column 3).

When we condition on prepandemic sorting into our job attributes of interest (i.e. *essentiality*, *temporariness* and *teleworkability*, we find negative and significant coefficients for all three variables both in the full sample (Column 2) and in the sample restricted to individuals in employment (Column 4). This negative effect on hours worked is consistent with the higher probability of job separation that we estimate in Table 2 for workers in temporary and low-teleworkable occupations. The negative sign is instead puzzling for essential workers, for whom we have observed a lower probability of leaving employment. The comparison of the size of the estimated coefficient in the full sample (Column 2) and in the subsample of employed workers allows us to shed some light on these results. We note that the estimated coefficients for temporary workers and workers in low-teleworkable occupations drop by two-thirds and one-third, respectively, from Column 2 to Column 4, implying that for these groups of workers the observed hours reduction is determined both by workers leaving employment and by employed workers working fewer hours. For essential workers, instead, we observe that the estimated coefficient is actually larger in magnitude in Column 4 than in Column 2: being employed in an essential occupation reduced the risk of layoff and, at the same time, was associated with a reduction in hours worked for those who remained employed.

Table 5: Migrant-Native Gaps in Hours Worked and Labor Income in 2020

	Hours Worked				*Top Half Income*	
	(1)	(2)	(3)	(4)	(5)	(6)
EU migrant	0.416***	0.637***	0.960***	1.100***	-0.101***	-0.073***
	(0.116)	(0.116)	(0.113)	(0.113)	(0.004)	(0.004)
Extra EU migrant	-0.682***	-0.366***	0.082	0.275***	-0.131***	-0.101***
	(0.087)	(0.087)	(0.084)	(0.085)	(0.003)	(0.003)
Woman	-5.782***	-5.721***	-5.851***	-5.804***	-0.253***	-0.260***
	(0.046)	(0.046)	(0.045)	(0.045)	(0.002)	(0.002)
Secondary education	1.271***	0.915***	0.956***	0.736***	0.206***	0.153***
	(0.065)	(0.066)	(0.063)	(0.065)	(0.002)	(0.002)
Tertiary education	2.682***	2.173***	2.074***	1.823***	0.503***	0.370***
	(0.071)	(0.079)	(0.070)	(0.077)	(0.002)	(0.003)
Essential worker in 2019		-0.863***		-1.131***		0.030***
		(0.049)		(0.048)		(0.002)
Temporary contract in 2019		-3.393***		-0.979***		-0.176***
		(0.094)		(0.090)		(0.003)
Low teleworkable job in 2019		-0.822***		-0.551***		-0.201***
		(0.054)		(0.053)		(0.002)
Country FE	✓	✓	✓	✓	✓	✓
Age FE	✓	✓	✓	✓	✓	✓
Obs.	477,156	477,156	464,589	464,589	283,800	283,800
Mean Outcome	29.241	29.241	30.032	30.032	0.551	0.551

Note: Columns 1 and 2 report a regression of hours effectively worked in the reference week on a set of individual covariates (migrant status, gender, education, age), host country FEs, and job characteristics, for the full sample, while Columns 3 and 4 report the same regression on the subsample of people employed at the time of the interview. Columns 5 and 6 report regression results of the probability of earning an income in the top half of the income distribution on the same set of covariates. Robust standard errors are in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

Labor income. Finally, in Columns 5 and 6 of Table 5, we study the probability of belonging to the upper half of the income distribution. As expected, we estimate a negative income gap for migrants relative to natives, which is smaller for EU migrants (10 percentage points lower probability of belonging to the top half of the income distribution)

than for extra-EU migrants (13 percentage points lower probability). The gap shrinks by approximately 25-30% for both migrant groups when we account for their prepandemic sorting into occupational characteristics (Column 6). The estimated coefficients on the three job attribute dummies are all strongly significant and their signs are consistent with the effects we estimated on the probability of job loss in Section 3.1. In fact, being an essential worker is associated with a marginally higher probability (3 p.p.) of having a labor income above the median, whereas temporary jobs and low-teleworkable occupations substantially reduce that probability (by 17 and 20 p.p., respectively).

Taken together with the previous results on hours worked, our findings on labor income imply that employed migrant workers in Europe suffered larger income losses relative to comparable natives despite working a similar, or even larger, number of hours than native workers.

4 Policy Discussion and Concluding Remarks

Drawing from the most recent release of harmonized microdata on European labor markets covering the continent in the first year of the pandemic, in this paper, we focus on the labor market impact of the pandemic on migrant workers in EU14 countries. We find that migrant workers, especially those born outside of the European Union, have suffered larger employment losses than natives. After accounting for differences in observable sociodemographic characteristics, we estimate that the probability of job separation in 2020 for extra-EU migrants was almost twice as large as that of natives. We estimate a smaller gap for EU migrants whose probability of leaving employment was 1.6 times larger than that of comparable natives. We also estimate a double penalty for migrant women who had to face a high probability of job termination because of their gender and of their origin. To identify the source of these disparities, we focus on three job characteristics that have been identified as salient in the COVID-19 crisis: whether the worker is employed in an essential occupation, holds a permanent contract, and is employed in a job that is amenable to distance working. We first document that migrants were overrepresented among essential, temporary and low-teleworkable occupations at the onset of the pandemic. We then show that these job characteristics significantly affect the probability of job loss and are relevant to explaining the dynamics of the European labor market in 2020. Furthermore, we estimate that prepandemic occupational sorting accounts for 25-35% of the explained native-migrants gaps in the risk of employment termination, while sorting into industries accounts for the remaining 65-75%. More than half of the migrant-native gap in job separation probability remains unexplained even when controlling for occupational characteristics and industry fixed effects. According to our estimates, migrants face a disproportionately large penalty for being employed in low-teleworkable occupations.

Recognizing the severity of the COVID-19 shock, European governments have implemented a series of interventions aimed at cushioning its worst consequences on economies. In addition to generous fiscal stimuli and accommodating monetary policies, virtually all

of them have implemented one type or another of joint retention schemes (JRS) to prevent severe labor market contractions (Gruss *et al.*, 2022). These schemes took on different forms depending on the country, ranging from blanket bans on economic layoffs (e.g., in Italy, Greece, and Spain) to adjustments to the unemployment benefit system (e.g., in Belgium, Ireland, and Sweden). JRS were mostly available to natives, EU and extra-EU migrants alike, but some additional interventions targeted migrants and migrant workers specifically.[21] For example, in most European countries foreign-born workers were offered longer periods of job search in case of dismissal before withdrawing their residence permits: in Italy, Portugal, and Spain, for instance, residence permits for third-country citizens were automatically extended. In the case of income losses, although having sufficient means of subsistence remained a prerequisite for the renewal of residence permits, a certain degree of flexibility was introduced. European governments also tried to facilitate the access of migrants to healthcare during the pandemic by removing some of the existing barriers. In many EU countries, governments have launched information campaigns aimed at increasing foreign citizens' awareness about their entitlement to healthcare access. At the same time, undocumented migrants were offered more access to emergency health services.

At the beginning of the crisis, the prospects for migrants looked extremely dire. In 2020, the World Bank predicted that remittance flows to low- and middle-income countries (LMICs) would have declined by 7.2 percent (minus $ 40 billion) in 2020, followed by a further decline of 7.5 percent (minus $ 40 billion) in 2021 (World Bank, 2020a). What actually happened to global remittances was a remarkable resilience of flows in the second half of 2020 that almost fully compensated for the contraction suffered during the first half of the year: overall, remittance flows in 2020 declined by a modest 1.7% in the face of one of the deepest global recessions ever observed. In 2021, the World Bank revised its forecast of remittance flows to low- and middle-income countries (LMICs) upward. These are now expected to reach $589 billion in 2021, a 7.3% increase over 2020 (World Bank, 2021). Echoing these initial concerns, organizations such as the World Bank (2020b) and the OECD (2020) advocated the urgency of implementing measures to support migrant workers during the pandemic. As we show in this paper, the picture we draw of the impact of the COVID-19 pandemic on migrants working in Europe is more nuanced than one could have anticipated at its very beginning. Employment rates in Europe have fallen, but at a lower rate than in the US. Migrants certainly lost ground relative to natives in 2020, but their fall has been halted by a quick recovery that was already felt in the second half of 2020. Although major employment losses were averted thanks to the massive use of short-time work programs in Europe, migrant workers - and extra-EU migrants in particular - still suffered from high economic vulnerability during the pandemic. They experienced larger losses than natives: they served as a form of buffer employment at the height of the crisis when their employment and hours worked were slashed promptly, but they recovered quickly once containment measures were gradually lifted. The rapid rebound is a good indication

[21] See EMN/OECD (2020) and EMN/OECD (2021) for detailed reviews of interventions in support of migrants in EU and other OECD countries.

that the "scarring" effect of the COVID-19 recession should be minor. However, our analysis also uncovers that in occupations where working from home is difficult, migrants have suffered disproportionate employment losses. As many commentators suggest that the share of jobs done from home will grow in the future (Barrero *et al.*, 2021), this phenomenon could pose a threat to the employment prospects of migrants in the medium and long term. However, focusing on the present, our findings imply that migrant workers in Europe would have experienced vastly more negative consequences than natives had the economic contraction lasted longer.

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Appendix A Appendix Tables

Table A.1: Reason for Job Separation in 2020

	.
Dismissed or made redundant	0.20
	(0.40)
A job of limited duration has ended	0.30
	(0.46)
Looking for children or incapacitated children	0.03
	(0.16)
Other personal or family responsibilities	0.02
	(0.15)
Own illness or disability	0.09
	(0.29)
Education or training	0.05
	(0.21)
Early retirement	0.06
	(0.25)
Normal retirement	0.12
	(0.32)
Compulsory military or community service	0.00
	(0.04)
Other reasons	0.13
	(0.33)
Obs.	155,002

Note: The table displays the share of workers who have left their previous employment in 2020 by reason of job termination. Standard deviations in parentheses. Source: EU-LFS data for 2020.

Table A.2: Essential 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

Table A.3: Observable Characteristics by Job Attribute and Test of Differences of Means

	Essential Occupations			Temporary Contracts			Low Teleworkable Jobs		
	(1) 0 Mean/SE	(2) 1 Mean/SE	T-test Difference (1)-(2)	(3) 0 Mean/SE	(4) 1 Mean/SE	T-test Difference (3)-(4)	(5) 0 Mean/SE	(6) 1 Mean/SE	T-test Difference (5)-(6)
Primary education	0.178	0.183	-0.004***	0.169	0.278	-0.108***	0.036	0.264	-0.229***
	(0.001)	(0.001)		(0.001)	(0.002)		(0.000)	(0.001)	
Secondary education	0.553	0.436	0.117***	0.518	0.438	0.081***	0.376	0.589	-0.213***
	(0.001)	(0.001)		(0.001)	(0.002)		(0.001)	(0.001)	
Tertiary education	0.269	0.382	-0.113***	0.312	0.284	0.028***	0.588	0.147	0.442***
	(0.001)	(0.001)		(0.001)	(0.002)		(0.001)	(0.001)	
Age	42.892	43.954	-1.062***	44.068	35.898	8.171***	43.908	42.906	1.002***
	(0.021)	(0.027)		(0.017)	(0.061)		(0.026)	(0.022)	
Woman	0.459	0.512	-0.052***	0.475	0.505	-0.029***	0.535	0.445	0.090***
	(0.001)	(0.001)		(0.001)	(0.003)		(0.001)	(0.001)	
N	170,707	293,082		424,002	39,787		171,190	292,599	

Note: For each of the three job characteristics (essential occupations, temporary contracts, low-teleworkable jobs), the table reports mean values of individual worker characteristics, standard deviations (in parentheses) and t-test of the differences. The value displayed for t-tests are the differences in the means across the groups. Observations are weighted using sampling weights. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

Table A.4: Migrant-Native Gaps in the Probability of Job Separation in 2020: Regional FEs

	(1)	(2)	(3)	(4)
EU migrant	0.018***	0.018***	0.016***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Extra EU migrant	0.026***	0.026***	0.022***	0.025***
	(0.001)	(0.001)	(0.001)	(0.001)
Woman	0.003***	0.003***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Secondary education	-0.011***	-0.012***	-0.008***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Tertiary education	-0.022***	-0.021***	-0.020***	-0.016***
	(0.001)	(0.001)	(0.001)	(0.001)
Essential worker in 2019		-0.006***		
		(0.000)		
Temporary contract in 2019			0.082***	
			(0.002)	
Low teleworkable job in 2019				0.009***
				(0.000)
Country FE	✓	✓	✓	✓
Age FE	✓	✓	✓	✓
Region (NUTS II) FE	✓	✓	✓	✓
Obs.	480,219	480,219	480,219	480,219
Mean Outcome	0.026	0.026	0.026	0.026

Note: In this table, we regress an indicator variable for having lost a job during the year 2020 on a set of individual covariates (migrant status, gender, education, age), job characteristics and host country FEs. Robust standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. EU-LFS data for 2020.

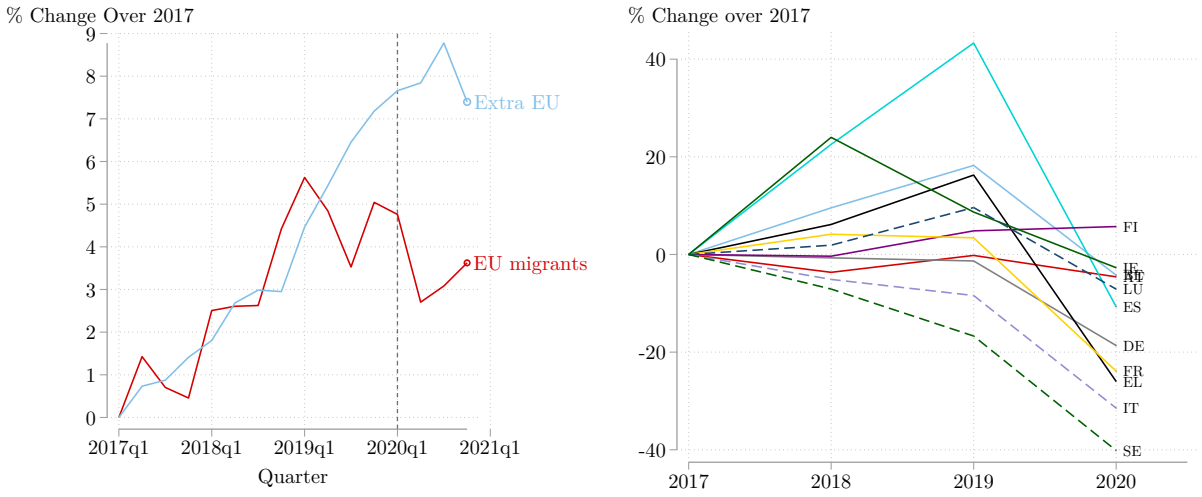
Table A.5: Migrant-Native Gaps in the Probability of Job Separation in 2018, 2019 and 2020

	(1)	(2)	(3)
EU migrant	0.011***	0.008***	0.010***
	(0.000)	(0.000)	(0.001)
Extra EU migrant	0.021***	0.014***	0.017***
	(0.000)	(0.000)	(0.001)
y2019	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
y2020	0.008***	0.002***	0.006***
	(0.000)	(0.000)	(0.000)
Essential worker	-0.001***		
	(0.000)		
y2019 × Essential worker	-0.001		
	(0.000)		
y2020 × Essential worker	-0.001***		
	(0.001)		
Low telework.		0.003***	
		(0.000)	
y2019 × Low telework.		0.000	
		(0.000)	
y2020 × Low telework.		0.007***	
		(0.000)	
Temporary contr.			0.114***
			(0.001)
2019 × Temporary contr.			0.000
			(0.002)
2020 × Temporary contr.			0.031***
			(0.002)
Country FE	✓	✓	✓
Individual Controls	✓	✓	✓
Obs.	2,814,862	2,562,109	2,286,760

Note: In this table, we report the results for estimating equation (2). "Individual Controls" include dummies for gender, education and age groups. Robust standard errors in parentheses:* p < 0.1, ** p < 0.05, *** p < 0.01. EU-LFS data for 2018, 2019 and 2020.

Appendix B Appendix Figures

Figure A.1: Stock and Inflows of Migrants in EU14 Countries (2017-2020)

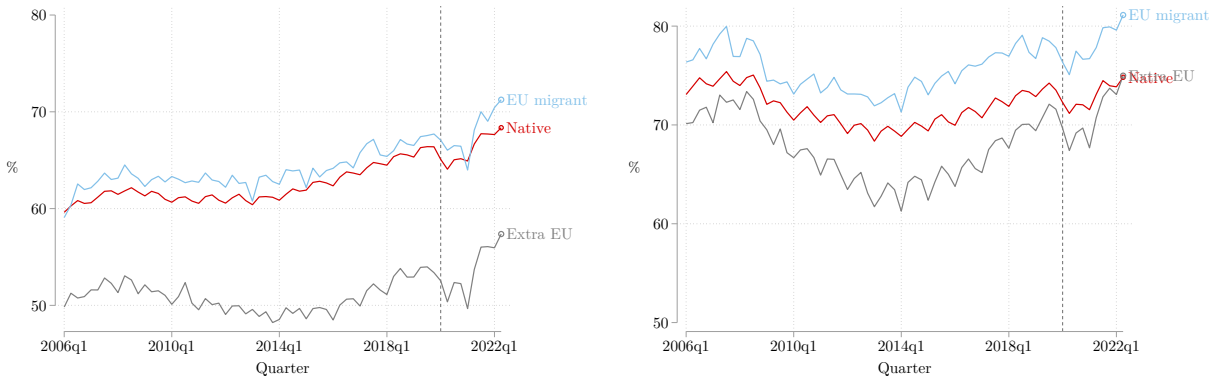


(a) Stock of Migrants

(b) Inflow of Migrants

Note: The figure reports trends in migrant population (Panel A.1a) and inflows (Panel A.1b) in EU14 countries between 2017 and 2020. Both Panels display percentage changes relative to the first period in the sample: q1-2017 for stocks (quarterly data) and year 2017 for inflows (yearly data). The vertical dotted line in Panel A.1a marks the beginning of the pandemic. *Source*: Eurostat lfsq_pgacw (stock) and migr_imm3ct (flows) series.

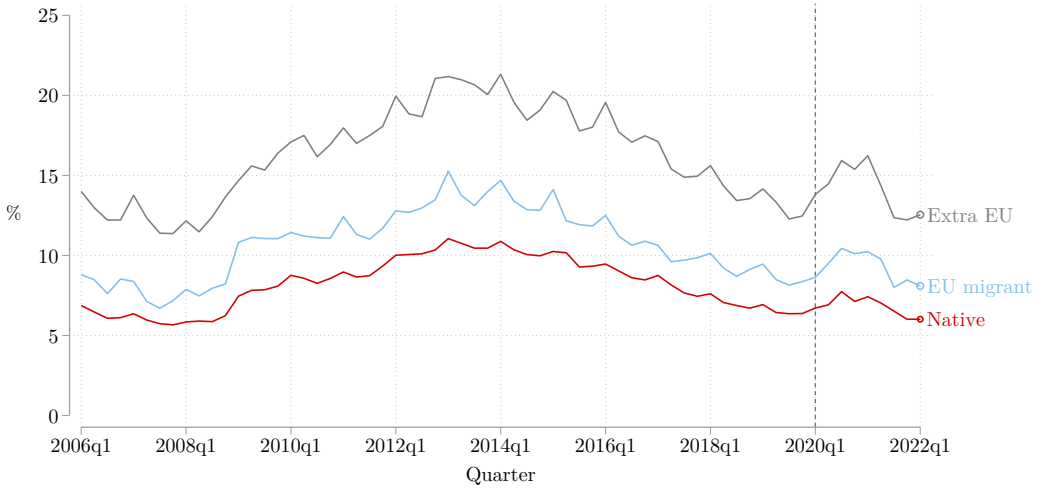
Figure A.2: Employment Rates (2006-2022), by Origin and Sex



(a) Women (b) Men

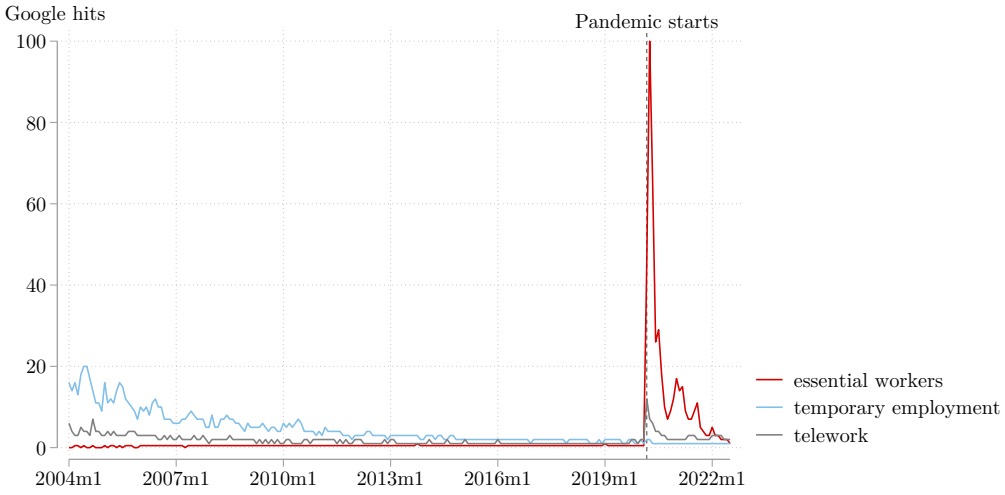
Note: The figure reports the employment rates for the three origin groups from the first quarter of 2006 to the first quarter of 2022, by sex. The vertical dotted line marks the beginning of the pandemic. Source: Eurostat ergacob series.

Figure A.3: Unemployment Rates in EU14 countries (q1 2006-q1 2022), by Origin



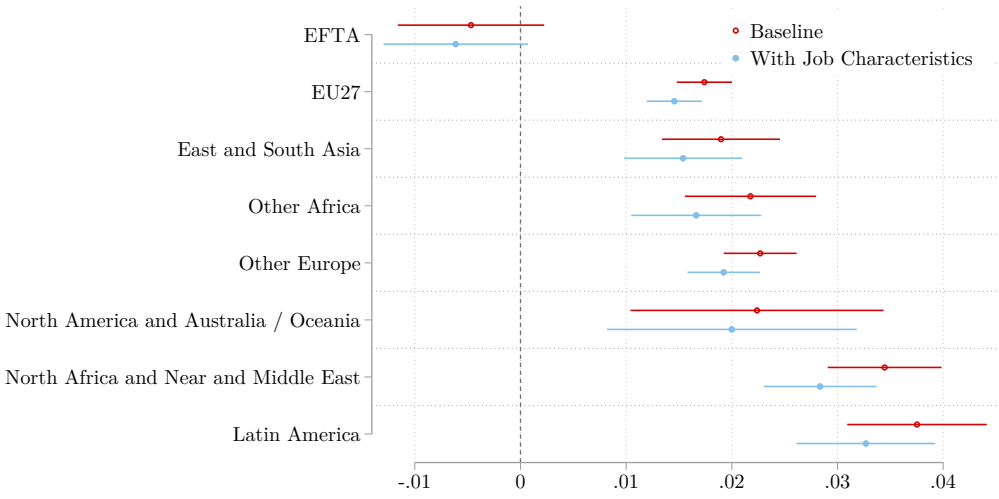
Note: The figure reports the 15 to 64 unemployment rates for native, EU mobile and extra-EU workers in EU14 from the first quarter of 2006 to the first quarter of 2022. The vertical dotted line marks the beginning of the pandemic. *Source*: Eurostat urgacob series.

Figure A.4: Google searches for the terms 'essential workers'; 'temporary employment'; 'telework' between 2004 and 2021



Note: *Source*: Google trends, last accessed 07/14/2022.

Figure A.5: Migrant-Native Gap in Probability of Job Loss, by Macro Region of Origin



Note: Each dot represents the estimated coefficient on a macro-region of origin dummy from a LPM regression of the probability of employment separation. The specifications are as in Column 2 ("baseline") and Column 6 ("with job characteristics") of Table 2. The bars represent the 95% confidence intervals. Standard errors robust to heteroskedasticity. EFTA (European Free Trade Association) countries are: Iceland, Liechtenstein, Norway and Switzerland. EU-LFS data for 2020.