In Europe, Arduous Jobs Fall On First-Generation Migrants: But Later Generations Benefit From Improved Opportunities

De Economist
https://doi.org/10.1007/s10645-025-09453-x

Vincent Vandenberghe*

Abstract

This paper contributes to the literature on migrants' labour-market disadvantages by considering one dimension that has received limited attention in Europe: their occupations' (relative) physical arduousness. To quantify their arduousness gap, the paper combines *i)* data from the European Labour Force Survey (EU-LFS) informing on occupation and immigration status with *ii)* information on occupational arduousness from the U.S. O*NET database, categorised at the ISCO 3-digit level. The findings reveal that first-generation migrants, particularly women and/or non-EU migrants, are disproportionately concentrated in arduous jobs, experiencing a significant disadvantage in working conditions. However, this disadvantage slowly diminishes over time, with the accumulation of residency in the host country leading to improved occupational outcomes. Notably, second-generation migrants close this gap and even experience a slight advantage in work arduousness compared to native workers, pointing to complete convergence.

Keywords: Work Arduousness, Migrant-Native Arduousness Gap, Working Conditions, Convergence

JEL Codes: J81, J62, J71, O15, J24,

*Economics School of Louvain (ESL), IRES-LIDAM, Université catholique de Louvain (UCL), 3 place Montesquieu, B-1348 Belgium: vincent.vandenberghe@uclouvain.be
Global Labour Organisation (GLO) fellow: https://glabor.org/user/vandenberghev/

1 Introduction

The main objective of this paper is to examine the existence and persistence of a migrant-native work arduousness gap in Europe, expanding on the current literature that primarily focuses on wage and employment rate differences. The topic of (im)migrant's wage and employment gap (or discrimination) has been extensively studied in both North America (Borjas, 1985; Smith and Fernandez, 2017; Aydemir and Skuterud, 2005) and Europe (Zorlu and Hartog, 2012; Kampelmann and Rycx, 2016; Piton and Rycx, 2021; Devos et al., 2024). In their review of the literature on recruitment, Zschirnt and Ruedin (2016) found that, in OECD countries, minorities (including migrants) receive a median callback rate of only 67% compared to native-born whites. This suggests employers often set significantly higher standards for foreign workers or may avoid hiring them altogether. A more recent meta-analysis by Lippens et al. (2023) for Europe essentially confirms this.

Works on (non-pecuniary) working condition differences between migrants and natives, at least by economists, are less numerous.[1] Some have shown that migrants tend to work temporary part-time jobs more than natives (Boffi, 2024). Several works suggest that migrants are often overqualified/educated for their jobs due to difficulties transferring credentials or obtaining recognition for their education and skills (Lu et al., 2009; Montanari, 2024; Pineda-Hernández et al., 2024). Finally, several papers show that there is segregation by industry or occupation, i.e. that migrants are systematically over(under)represented in some professions (Palencia-Esteban, 2022) or economic "niches" (Christopher and Leslie, 2015). There is limited evidence of migrant-native work arduousness gaps and discrimination (i.e. unaccounted residual gaps once the contribution of endowment or biological factors has been considered). Some US papers show that migrants are more exposed to work-related injuries/fatalities (Orrenius and Zavodny, 2009, Zavodny, 2015). But, as far as we know, no economic paper has estimated a migrant-native arduousness gap implied by occupational segregation. In this paper, we intend to fill that gap in the literature by combining EU-LFS data on ISCO 3-digit occupations and O*NET data on working conditions. In line with the literature on migrants and how fast they do (or do not) assimilate (Borjas, 1985, Borjas, 1994), we also assess the persistence of the arduousness gap over time and across successive generations.

Our contribution to the literature on migrant labour market performance and discrimination is fourfold. First, we broaden the scope of analysis beyond wages, employment, re-

[1] There is a distinct literature of work arduousness and health or longevity in the context of retirement policy. Recent contributions to that literature, also using O*NET data, can be found in Vandenberghe (2023).

cruitment, and occupational segregation by focusing on disparities in working conditions and job arduousness. Second, we quantify these factors—working conditions and the physical demands of work—using a detailed and objective description of occupational content.[2] Third, we provide an econometric estimation of how first-generation EU and non-EU migrants differ from natives in their exposure to arduous work driven by occupational segregation at the ISCO three-digit level. Our analysis provides estimates of conditional arduousness gaps, controlling for age, educational attainment, and tenure[3], sector (NACE one-digit level), country, and year. Fourth, we explore several mechanisms underlying these arduousness gaps and their evolution. One such mechanism is the division of roles within migrant families, with wives more likely to accept low-skilled (and potentially more arduous) jobs. Another is the difficulty educated migrants face in getting their foreign degrees and educational credentials recognised due to imperfect information and statistical discrimination. Additionally, administrative and legal barriers to labour market entry and occupational mobility could play a role. Another factor is the role of the wealth gradient in shaping individuals' propensity to accept arduous working conditions, with poorer migrants, at least initially, being relatively more willing to accept these conditions than wealthier natives. Finally, we explore the role of convergence. A detailed discussion of these mechanisms and our approach to assessing them empirically follows in Section 2.

The research findings are essentially twofold. First, they show that overall across Europe, first-generation migrants, especially women[4] and also non-EU migrants, are disproportionately employed in what O*NET data identify as physically demanding and strenuous jobs, having controlled for the usual determinants of work arduousness (age, education, tenure, sector, country or year). This reflects a notable disadvantage in their working conditions and supports the fact that they face several barriers, such as a lack of or insufficient command of the local language, difficulty in getting their educational credentials recognised, or occupational discrimination, to accessing less physically demanding, white-collar employment. Second, our results show that this occupational/arduousness disadvantage is not static; it gradually diminishes over time. As migrants reside longer in the host country, their employment prospects improve (slowly), leading to better job opportunities and working conditions. Remarkably, this gap in job arduousness is closed and reversed by the second generation, with migrants even enjoying a slight advantage over native workers, occupying less strenuous jobs. This trend suggests a process of full occupational integration and convergence across

[2]Some authors (Chiswick et al., 2005) have employed a socioeconomic status index to convert occupational categories into a continuous scalar measure.

[3]Years with the current employer.

[4]Relative to other (native) women as our analysis is conducted separately for each gender.

generations, which contrasts with the findings of the existing European literature, which has focused on wage and employment gaps (Devos et al., 2024).

The rest of this paper is structured as follows. The theoretical background and mechanisms we intend to assess are presented in Section 2, while the empirical analysis is outlined in Section 3. The latter starts with the exposure of the empirical strategy (Section 3.1), followed by the presentation of the EU-LFS and O*NET data (Section 3.2), and that of the econometric results (Section 3.3). Section 4 concludes.

2 Theoretical background

This paper quantifies the migrant-native work arduousness gap in Europe and its evolution. Here, "arduousness" follows the definition established in job demands and job quality literature (Bakker and Demerouti, 2007; Chen et al., 2017), referring *inter alia* to the physical effort required for a job. We will detail how this is measured in our data later (Section 3.2). Prior research has demonstrated that occupations vary in their physical demands, which can impact workers' health and longevity. Note, however, that the long-term health and longevity effects of arduousness are beyond the scope of this paper. What distinguishes our approach from most studies in this field is our ability to precisely quantify the physical arduousness of specific occupations. This is made possible by newly available datasets such as O*NET (discussed in Section 3.2), which provide detailed and standardised descriptions of occupational tasks. We integrate these data with labour force survey information, which captures key factors traditionally associated with physical arduousness – such as gender, age, educational attainment, and tenure/seniority with the employer. This allows us to compute conditional arduousness gaps, isolating differences in work arduousness that cannot be attributed to these biological or endowment factors and may stem from migrants' higher likelihood of self-selecting into, or being segregated into, more arduous occupations.

Although this study does not thoroughly analyse all mechanisms underlying these (conditional) arduousness gaps, several of our findings can tentatively shed light on the potency of some of the mechanisms proposed in the literature. First, we estimate arduousness levels separately for male and female respondents. While this distinction primarily accounts for systematic gender differences in physical work arduousness, it also allows us – assuming most female respondents migrated in a family context[5] – to assess the relevance of the "migrant

[5]Our data do not allow us to verify the validity of this assumption.

family investment hypothesis" (Long, 1980; Grönlund and Öun, 2025): a key framework for understanding gender differences in migrants' labour market trajectories. According to this hypothesis, women in migrant families are often considered "secondary" earners and tied movers, meaning their labour market decisions are guided by the family's overall utility. As a result, immigrant wives are more likely to accept low-skilled jobs, which may be more arduous, to support their families while their husbands invest in country-specific human capital. Thus, while men work toward re-establishing their careers, women remain in low-skilled and physically demanding jobs (Grönlund and Öun, 2025). This hypothesis suggests that the arduousness gap may be more pronounced among migrant women.

We also systematically distinguish between EU and non-EU migrants, which allows us to explore the role of "barriers to full employment opportunities", frequently cited in the literature (Orrenius and Zavodny, 2009, Zavodny, 2015). These barriers are expected to be more significant for non-EU migrants[6], who are more likely to initially lack legal status and accept less desirable and more arduous jobs.[7] Non-EU migrants often face stricter visa or employment regulations, which confine them to sectors such as agriculture, construction, and domestic work, where working conditions tend to be physically demanding. In contrast, EU migrants benefit from freedom of movement, enabling them to switch jobs more efficiently, negotiate better conditions, and access formal labour protections that mitigate exposure to harsh working environments. Additionally, segmented labour markets may further confine non-EU immigrants to low-tier, labour-intensive jobs due to structural barriers and discrimination.

This paper also examines the migrant-native arduousness gap separately for different levels of educational attainment (within 5 years after arrival). There are arguments for a lower gap among more/highly educated migrants. However, there is also the "lack of linguistic/non-transferability of skills hypothesis", a well-documented concept in migration studies (Chiswick et al., 2005). Newly arrived migrants often face language barriers that limit their proficiency in the local language. This challenge is especially significant for more/highly educated migrants, as it limits their access to less physically demanding but (local)language-dependent white-collar jobs for which they are otherwise qualified. Furthermore, as suggested by signalling and statistical discrimination theories (Arrow, 1973, Spence,

[6] A number of whom might be refugees.

[7] Due to data limitations, we have not been able to consider the difference between the migrants who migrated for work and those who migrated on alternative pathways, such as for family or asylum. The gap in arduousness is expected to be larger for the latter group. Among migrants who migrate for work, non-EU migrants typically require educational degrees for work-related visas. In many EU countries, degrees must be legally recognised to obtain such visas. Therefore, work-related non-EU migrants usually have a lower probability of working in physically demanding jobs.

1973), foreign education credentials and skills may not seamlessly transfer to European job markets.[8] Consequently, all else being equal, educated migrants may – initially – face a more pronounced work arduousness gap than their less-educated counterparts.

Furthermore, this paper examines how the GDP level of the host country affects the magnitude of the arduousness gaps experienced by first-generation migrants. In doing so, it tentatively evaluates the relevance of "job amenities/compensation theory" (Orrenius and Zavodny, 2009), which posits that workplace amenities (including less physically demanding working conditions) are a "normal" good, i.e. their demand increases with wealth. Since migrants generally have lower wealth than natives, they may be more willing to trade job amenities (i.e. less arduous working conditions) for higher wages. Accordingly, we hypothesise that the migrant-native arduousness gap will positively correlate with the host country's GDP level, assuming wealth disparities between natives and migrants rise with the destination country's GDP level.

Finally, this paper provides an in-depth examination of the evolution of the arduousness gap over time. This area of research has been primarily shaped by the assimilation model, developed by economists (Chiswick et al., 2005) and sociologists (Gordon, 1964). According to this model, immigrants typically begin in low-skilled and more demanding jobs, regardless of their education level or previous occupational status in their country of origin. However, they invest in host-country-specific skills over time, facilitating upward occupational mobility. The competing theory in migration economics is the "downward (or segmented) assimilation theory", which suggests that second-generation migrants may face similar or even worse labour market outcomes than first-generation migrants. Empirical research indicates that, in Europe, many second-generation migrants continue to face persistent – although lower than first-generation migrants – wage and employment rate inequalities (Zhou, 1997, Piton and Rycx, 2021, Kanitsar, 2024, Devos et al., 2024).

[8]Migrants coming from countries whose education systems are (perceived as) less good, have much higher problems transferring their qualifications into the host country labour market in terms of making skills transparent to employers.

3 Empirical Analysis

3.1 Empirical Strategy

Our baseline model to capture the existence and quantify (first-generation) contingent migrant-native work arduousness gaps is

$$\begin{aligned} ARDUOUS_i =& \alpha_1^k + \beta_1^{k,EU} MIGRANT_i^{first,EU} + \beta_1^{k,NEU} MIGRANT_i^{first,NEU} \\ &+ \eta_1^k X_i + \epsilon_{1,i}^k \\ k = M, F & \end{aligned} \tag{1}$$

The two coefficients of interest are $\beta_1^{k,EU}$; $\beta_1^{k,NEU}$, i.e. the arduousness gap characterising EU and non-EU first-generation migrants (using all the other respondents as a reference[9]), conditional on a vector of controls/predictors (X_i); here age and educational attainment, tenure with current employer[10], sector (NACE 1-digit), year and country fixed effects. This model is estimated separately for each gender. Thus, estimates are indexed $k = M, F$. The rationale for distinguishing by gender stems from the significant differences in physical arduousness between men and women. Given these disparities, it is more meaningful to compare migrant women to non-migrant women rather than to men and women pooled. Most results reported hereafter are derived from the estimation of the above model, where all the countries are pooled, and country specificities are accounted for via the inclusion of country fixed effects.

Below, we also present the results of two variants of the above model. The first variant re-estimates it separately for each level of educational attainment (still by gender and pooling the 25 EU countries), retaining only migrants who have been present in the country for less than 5 years. We distinguish migrant-native respondents by their educational attainment level: those with less than ISCED 3 (i.e., less than upper secondary), those with exactly ISCED 3, and those with more than ISCED 3 (i.e., tertiary-educated respondents).[11] This allows for a (tentative) assessment of the "lack of linguistic/non-transferability of skills hypothesis" exposed in Section 2. As a second extension, we re-estimate eq.(1), separately for each of the 25 countries present in EU-LFS (thus dropping country fixed effects), still

[9] As we are generally not able to distinguish second-generation migrants, the latter are confounded with natives.

[10] EU-LFS asks about the "Year in which person started working for current employer".

[11] International Standard Classification of Education (ISCED 2011).

distinguishing male and female respondents. We thus retrieve (2 times) 25 pairs of coefficients $\beta_1^{k,c,EU}$; $\beta_1^{k,c,NEU}$. We augment this set of coefficients with GDP per head information in the Penn World Tables (Feenstra et al., 2015). This country-by-country analysis allows us to assess the heterogeneity across Europe regarding the magnitude of the migrant-native work arduousness gap. More specifically, it allows us to explore the role of GDP per head in pushing up this work arduousness gap, as posited by the "job amenities/compensation theory" and the underlying idea that the demand for less arduous working conditions is a normal good.

How do we assess the (non-)persistence of migrant-native arduousness gaps? First, by regressing arduousness (for first-generation migrants only using all the other respondents as a reference) on the years that have elapsed since migration occurred ($YRESID_i$).[12] The estimated model (with all countries pooled, using the same list of controls as in Eq. (1), and still separately for men and women) becomes

$$\begin{aligned} ARDUOUS_i =& \alpha_2^k + \beta_2^{first,EU,k} MIGRANT_i^{first,EU} + \beta_2^{first,NEU,k} MIGRANT_i^{first,NEU} \\ &+ \gamma_2^{first,EU,k} MIGRANT_i^{first,EU} \times YRESID_i \\ &+ \gamma_2^{first,NEU,k} MIGRANT_i^{first,NEU} \times YRESID_i \\ &+ \eta_2^k X_i + \epsilon_{2,i}^k \\ k = M, F & \end{aligned} \tag{2}$$

Conditional on the absence of selection out of employment, a (statistically) negative sign for coefficients $\gamma_2^{EU,k}$; $\gamma_2^{NEU,k}$ would suggest that the arduousness gap diminishes over time, i.e. decreases as the number of years of residence increases.[13]

To further assess whether this gap persists or fades over time, we adopt a second approach by simultaneously examining its incidence among first- and second-generation EU and non-EU migrants. This comes at a cost in terms of the number of observations. EU-LFS only began distinguishing between first- and second-generation migrants in 2021. Consequently, our analysis is constrained to the two available data waves. The model we estimate, incorporating all respondents from 2021 and 2022 (and still pooling the 25 European countries,

[12] That variable is set to zero for all respondents with a non-migrant background.

[13] Selection effects may arise if individuals with lower labour market prospects and/or greater exposure to arduous work are likelier to exit employment. This could lead to overestimating convergence in work arduousness among those who remain employed.

with separate estimations for men and women), is as follows:

$$\begin{aligned} ARDUOUS_i =& \alpha_3^k + \beta_3^{first,EU,k} MIGRANT_i^{first,EU} + \beta_3^{first,NEU,k} MIGRANT_i^{first,NEU} \\ &+ \beta_3^{second,EU,k} MIGRANT_i^{second,EU} + \beta_3^{second,NEU,k} MIGRANT_i^{second,NEU} \\ &+ \eta_3^k X_i + \epsilon_{3,i}^k \\ k = M, F \end{aligned} \tag{3}$$

A reduction of the magnitude (or a change of sign) of coefficients $\beta_3^{second,EU,k}$; $\beta_3^{second,NEU,k}$ compared to the equivalent coefficients for first-generation respondents would suggest that the work arduousness gap is reduced (or vanishes) with the change of generation.

3.2 Data

3.2.1 EU-LFS

The European Labour Force Survey (EU-LFS) provides information on individuals' immigration background and occupations at the ISCO 3-digit level, i.e. an essential prerequisite for assessing their exposure to work arduousness—but only since 2011. EU-LFS systematically informs on respondents being first-generation EU or non-EU migrants, based on the country of birth they report. The information on respondents' second-generation migrant background[14] is only available for the two most recent waves (2021, 2022). EU-LFS also collects the respondents' employment status (our sample here only consists of respondents who declare they are in employment, as defined by the ILO). It contains many background characteristics that may drive arduousness independently of the migrant vs native status and that we use to *i)* estimate equations separately (gender) or *ii)* as control variables: age, educational attainment (ISCED levels (ISCED 2011).), years with the current employer (tenure hereafter[15]), the (broadly defined) sector/industry (NACE 1-digit)), the country and the year during which the interview was carried out.[16]

[14]Meaning that the respondent is born in the country where he/she is interviewed and at least one of her/his parents is born outside.

[15]It may capture the positive effect of on-the-job learning in terms of reduced work arduousness gap.

[16]The latter three enter the equations as fixed effects

3.2.2 O*NET

EU-LFS contains information about people's occupations at ISCO 3-digits. However, it falls short of providing information about the arduousness of occupations. To overcome that limitation, we turn to O*NET from the US.[17]

O*NET contains over 1,000 distinct items documenting the content of more than 800 occupations.[18] These items are organised into different modules (job tasks, work context, skills, abilities, etc.). The data is continuously updated through a rolling survey process, providing detailed and comprehensive insights into the characteristics of different occupations. For this study, we focus on the `Work Context` module, as its variables appear to align well with the definition of physical arduousness found in the job demands and job quality literature (Bakker and Demerouti, 2007; Chen et al., 2017). Items composing the module's version used here were collected in 2021. They explicitly describe working conditions (e.g. exposition to contaminants, spending time bending or twisting the body, working in very hot or cold temperatures), structural job characteristics (e.g. consequence of error, time pressure, freedom to decide), and interpersonal/managerial relationship at work (e.g. contact with others, responsibility for other's health and safety, face-to-face discussions). We use principal component (PC) analysis to obtain a summary indicator of occupational arduousness. More information (1^{st} and 2^{nd} principal components, eigenvalues and loading factors) is reported in the Appendix A.1.1. Only the 1^{st} PC is used in the paper to quantify each occupation's physical arduousness. We show in Table A.1 in the Appendix that it correlates relatively well with working conditions items associated with physical arduousness (e.g. "Exposed to Contaminants", "Pace (of work) determined by the speed of Equipment", "Sounds noise levels are distracting or uncomfortable"). We also show that the 2^{nd} Principal Component correlates more with managerial vs. non-managerial work content: a dimension that is a priori less relevant here. In the Appendix A.1.1, Figure A.2 presents our O*NET 1^{st} principal component (PC) for a list of ISCO 2 level occupations. As expected, typical manual/outdoor occupations (e.g., building and related trades) translate into high arduous PC values. In contrast, more intellectual/indoor occupations (e.g., business and administration) display much lower values.

One possible concern with using O*NET is that the resulting career arduousness indices are based on data collected in the United States, reflecting working conditions specific to US jobs, whereas the EU-LFS is about Europe. The assumption is, of course, that work-

[17] https://www.onetcenter.org/database.html

[18] At the equivalent of the ISCO 4 digits level.

ing conditions across occupations likely share many similarities. Still, differences may also exist. We do not assess that risk in this paper. The interested reader is invited to refer to Vandenberghe (2023) for that. That paper compares the US O*NET-based measure of career arduousness with a European measure derived from the European Working Conditions Survey (EWCS). Due to data limitations with the European data, this comparison was limited to the ISCO-2 level. However, the results reported by Vandenberghe (2023) indicate a strong rank correlation overall; in other words, the most arduous occupations, according to O*NET, also tend to be the most arduous ones in EWCS.

3.2.3 Descriptive statistics

Tables 1, 2 contain the descriptive statistics regarding the key variables entering our regression analysis. The 2nd column reports the (average) arduousness index[19] calculated using ISCO 3-digit and O*NET data. The following three columns report the shares of natives[20], first-generation migrants with an EU background and finally, those with a non-EU origin. The following columns report the (average) ISCED education attainment, the number of years spent with the current employer (tenure) and age. The last column reports the standard deviation of our work arduousness variable.

Additional descriptive statistics regarding the distribution of ISCO 3-digit occupation within each of our 25 European countries, distinguishing male and female respondents, can be retrieved from the online Appendix on ISCO 3-digit distribution of respondents.

[19] Corresponding to the right-hand term in Eq (1),(2),(3).

[20] In the absence of information in EU-LFS, this also includes second-generation migrants.

Table 1: Descriptive statistics - Male

	Mean							Std
	$ARDOUS^a$	$MIGRANT^b$			Educ.^{c}	Tenure^d	Age	$ARDOUS^a$
		0	1	2				
AT	0.2214	0.8336	0.0760	0.0904	3.6038	11.6368	41.8179	0.918
BE	0.0890	0.8308	0.0821	0.0871	3.6474	11.9251	42.4603	0.929
BG	0.4487	0.9983	0.0006	0.0011	3.4134	9.1439	45.3564	0.818
CH	-0.0276	0.6448	0.2432	0.1120	3.9493	10.5725	44.1548	0.917
CY	0.1788	0.7936	0.1110	0.0954	3.5912	11.3835	43.8436	0.931
DE	0.1463	0.9163	0.0312	0.0525	3.7191	12.1610	43.5826	0.900
DK	0.0401	0.9236	0.0302	0.0462	3.4665	8.4596	41.6065	0.878
EE	0.3722	0.9063	0.0075	0.0862	3.6668	8.2482	43.5576	0.933
ES	0.2445	0.9087	0.0292	0.0621	3.3983	12.8854	44.2492	0.900
FI	0.1635	0.9472	0.0235	0.0293	3.7059	10.6771	43.1960	0.923
FR	0.1989	0.8902	0.0287	0.0810	3.4971	12.1601	42.6321	0.892
GR	0.2495	0.9221	0.0130	0.0649	3.1199	15.0464	44.5203	0.848
HR	0.4027	0.9058	0.0129	0.0813	3.3637	12.3346	43.5250	0.845
HU	0.5354	0.9809	0.0137	0.0054	3.3372	9.1036	42.4283	0.838
IT	0.2275	0.8756	0.0387	0.0857	3.0214	14.1827	45.0768	0.902
LT	0.3659	0.9489	0.0047	0.0464	3.9298	7.5166	45.5380	0.885
LU	-0.2128	0.5145	0.4029	0.0826	3.8301	11.6215	42.4287	0.932
LV	0.4817	0.9083	0.0106	0.0810	3.4604	8.0291	43.1676	0.863
NO	0.0670	0.9178	0.0669	0.0153	3.6642	9.9106	42.5433	0.925
PL	0.4176	0.9961	0.0012	0.0027	3.5812	11.6504	42.8527	0.873
PT	0.3213	0.9198	0.0211	0.0591	2.3751	14.0054	46.2761	0.880
RO	0.5804	0.9992	0.0002	0.0006	3.1873	10.4642	43.9812	0.785
SE	0.0659	0.8654	0.0409	0.0937	3.6305	9.1665	42.8150	0.900
SI	0.2374	0.9014	0.0198	0.0788	3.5628	12.3531	42.4952	0.889
UK	-0.0240	0.8456	0.0581	0.0963	3.6048	9.8234	43.0691	0.903

Source: EU-LFS (2011-2022; for the UK, 2019 is the last year of observation), O*NET
a : Arduousness index (O*NET based), corresponding to the right-hand term in Eq (1),(2),(3)
b : Migrant status (0: native 1: EU 2: non-EU (1st gen.)
c : Highest educational attainment (ISCED 1-6)
d : Duration spent in current job

Table 2: Descriptive statistics - Female

	Mean							Std
	$ARDOUS^a$	$MIGRANT^b$			Educ.^{c}	Tenure^d	Age	$ARDOUS^a$
		0	1	2				
AT	-0.3351	0.8285	0.0913	0.0802	3.6109	9.6762	41.4023	0.663
BE	-0.3828	0.8394	0.0892	0.0714	3.9473	11.4638	41.8817	0.651
BG	-0.1077	0.9969	0.0004	0.0027	3.8060	9.7444	46.1189	0.767
CH	-0.3980	0.6639	0.2215	0.1146	3.7291	8.5807	43.1160	0.617
CY	-0.3005	0.6904	0.1169	0.1927	3.8790	9.3551	41.8594	0.719
DE	-0.3768	0.9231	0.0316	0.0452	3.6780	10.8129	43.3633	0.622
DK	-0.3930	0.9224	0.0312	0.0463	3.7307	7.6533	40.9358	0.582
EE	-0.2798	0.8989	0.0065	0.0946	4.2347	9.1465	45.3815	0.719
ES	-0.2480	0.8938	0.0317	0.0746	3.7789	11.2731	43.8833	0.671
FI	-0.3612	0.9502	0.0220	0.0278	4.0757	10.1683	43.5800	0.613
FR	-0.3065	0.8981	0.0306	0.0714	3.6483	11.9960	43.1100	0.686
GR	-0.1184	0.9175	0.0228	0.0596	3.3715	13.5165	44.1371	0.761
HR	-0.1952	0.9015	0.0143	0.0842	3.6143	12.7462	43.9109	0.718
HU	-0.1472	0.9788	0.0151	0.0061	3.5256	9.1035	43.4225	0.729
IT	-0.2988	0.8562	0.0606	0.0833	3.4243	12.5549	44.8379	0.670
LT	-0.2483	0.9505	0.0039	0.0457	4.3348	8.7797	46.2955	0.718
LU	-0.5470	0.5126	0.4016	0.0857	3.8538	10.3489	41.4323	0.637
LV	-0.2278	0.8973	0.0106	0.0921	3.9980	9.6072	45.3751	0.714
NO	-0.4165	0.9234	0.0575	0.0191	3.9095	9.3008	41.9421	0.536
PL	-0.2230	0.9960	0.0007	0.0033	4.0819	11.7704	42.7832	0.721
PT	-0.1392	0.9037	0.0253	0.0710	2.9110	13.7505	45.2208	0.708
RO	0.0811	0.9996	0.0001	0.0003	3.3131	11.1680	44.1904	0.743
SE	-0.4142	0.8637	0.0490	0.0872	3.9552	9.5128	43.0907	0.571
SI	-0.2618	0.9122	0.0226	0.0652	3.9367	12.9547	42.9883	0.743
UK	-0.4231	0.8518	0.0642	0.0840	3.7612	8.4426	42.1227	0.565

Source: EU-LFS (2011-2022; for the UK, 2019 is the last year of observation), O*NET
a : Arduousness index (O*NET based), corresponding to the right-hand term in Eq (1),(2),(3)
b : Migrant status (0: native 1: EU 2: non-EU (1st gen.)
c : Highest educational attainment (ISCED 1-6)
d : Duration spent in current job

3.3 Econometric results

3.3.1 First-generation EU and non-EU migrants v.s. natives

Pooled analysis The key results about the first-generation (EU and non-EU) migrants' arduousness gap (ref. all the other respondents), using our entire (2011-2022) EU-LFS dataset[21], and pooling all 25 European countries, are in Table 3. The first two lines report the point estimates $\beta_1^{k,EU}$ $\beta_1^{k,NEU}$, i.e. the (conditional) arduousness gap characterising respectively EU and non-EU first-generation migrants v.s. the natives.[22] The first column of Table 3 suggests a .093 arduousness handicap[23] for first-generation EU male migrants, on average, across the 25 (pooled) European countries. The corresponding handicap for non-EU migrants of .127 is larger.[24] As for female first-generation migrants, the gaps are larger overall. Those with an EU background display an arduousness handicap of .117 (against .093 for men); while those with a non-EU background suffer at .171 handicap.[25]

Table 3: Econometric estimation of the arduousness gap (Male, Female, 1st generation)

	Male	Female
$MIGRANT^{EU}$ (1st gen.)	0.093***	0.117***
	(0.015)	(0.031)
$MIGRANT^{NEU}$ (1st gen.)	0.127***	0.171***
	(0.024)	(0.035)
Education	Yes	Yes
Tenure[a]	Yes	Yes
Age	Yes	Yes
Sector(NACE 1d)	Yes	Yes
Country	Yes	Yes
Year	Yes	Yes
N	9,616,671	8,506,225
R^2	0.49	0.44

* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses
a: Years with the current employer
Source: EU-LFS, O*NET

[21] EU-LFS exists before 2011 but only informs on people's occupation at ISCO 3-digits (but only since that year.

[22] Which, in the absence of information in EU-LFS, also comprise second-generation migrants.

[23] Representing 10.3% of a standard deviation of our O*NET-based arduousness metric.

[24] It represents 14.1% of a standard deviation.

[25] Respectively 17% and 25% of a standard deviation.

Pooled analysis: distinguishing educational attainment and focusing on recent migrants In Table 4, we present the results of re-estimating our baseline model (Eq. (1)) separately by educational attainment, still pooling all 25 countries and focusing exclusively on migrants with less than five years of residence ($YRESID < 5$). The arduousness gaps reported are thus derived solely from comparing these "recent" migrants to natives with the same level of education.

For both men and women, the findings are consistent with our previous results obtained when pooling the data from all countries: arduousness gaps are larger for women than for men, and non-EU migrants face greater disadvantages than their EU counterparts. Furthermore, we find no substantial differences in the magnitude of these gaps across educational levels. In particular, there is no evidence that recent tertiary-educated EU migrants experience more pronounced arduousness gaps than their less-educated peers – if anything, the opposite appears to be true. Overall, the group experiencing the most significant (short-term) arduousness handicap consists of EU and non-EU migrants with an upper secondary education. For men, the gaps are .147 and .174, while for women, they reach .249 and .29, respectively.

Table 4: Econometric estimation of the arduousness gap, by educational attainment (Male, Female, 1st generation with less than 5 years of residence)

	Male			Female		
	$<$ Sec.[a]	Sec.[a]	Tert.[a]	$<$ Sec.	Sec.	Tert.
$MIGRANT^{EU}$	0.124***	0.147***	0.025	0.127**	0.249***	0.118**
	(0.027)	(0.029)	(0.031)	(0.063)	(0.070)	(0.059)
$MIGRANT^{NEU}$	0.064*	0.174***	0.167***	0.095**	0.298***	0.208**
	(0.038)	(0.040)	(0.053)	(0.037)	(0.062)	(0.081)
Tenure[a]	Yes	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes	Yes
Sector(NACE 1d)	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	1,762,306	4,710,832	2,385,124	1,260,343	3,761,807	2,770,771
R^2	0.36	0.36	0.27	0.40	0.32	0.16

a: Based on ISCED
levels(ISCED 2011): $<$ Sec.: $<$ ISCED 3; Sec.: $=$ ISCED 3; Tert: $>$ ISCED 3
* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses
Source: EU-LFS, O*NET
a: Years with the current employer

Country-level heterogeneity In this subsection, we report the results of the re-estimation of our baseline model (Eq. (1)), separately for each of the 25 European countries.[26] Point estimates of the β's are displayed horizontally in Figure 1.[27] They point to heterogeneity across European countries regarding the magnitude of the arduousness gaps. Also, a visual inspection of Figure 1 suggests that Scandinavian countries do not exhibit the convergence advantages they often do.

Correctly understanding these cross-country differences is beyond the scope of this paper. Still, we found interesting results when carrying out some simple regression analysis of the 100 country-specific point estimates of the male/female, EU/NEU β's on display in Figure 1. The results are reported in Table 5.

In line with the family investment hypothesis, and with the results obtained when pooling

[26] And, logically, removing country fixed effects
[27] Not statistically significant estimates are set to zero.

all countries, the results show that *ceteris paribus*, the female gaps[28] are larger (+ .085), and that NEU gaps are .113 larger than EU gaps.

What is more, in line with the job amenities/compensation theory, gaps are larger the higher the GDP per head[29] in the destination country. A 10,000 US$ increment leads to a .039 increment of the arduousness gap.

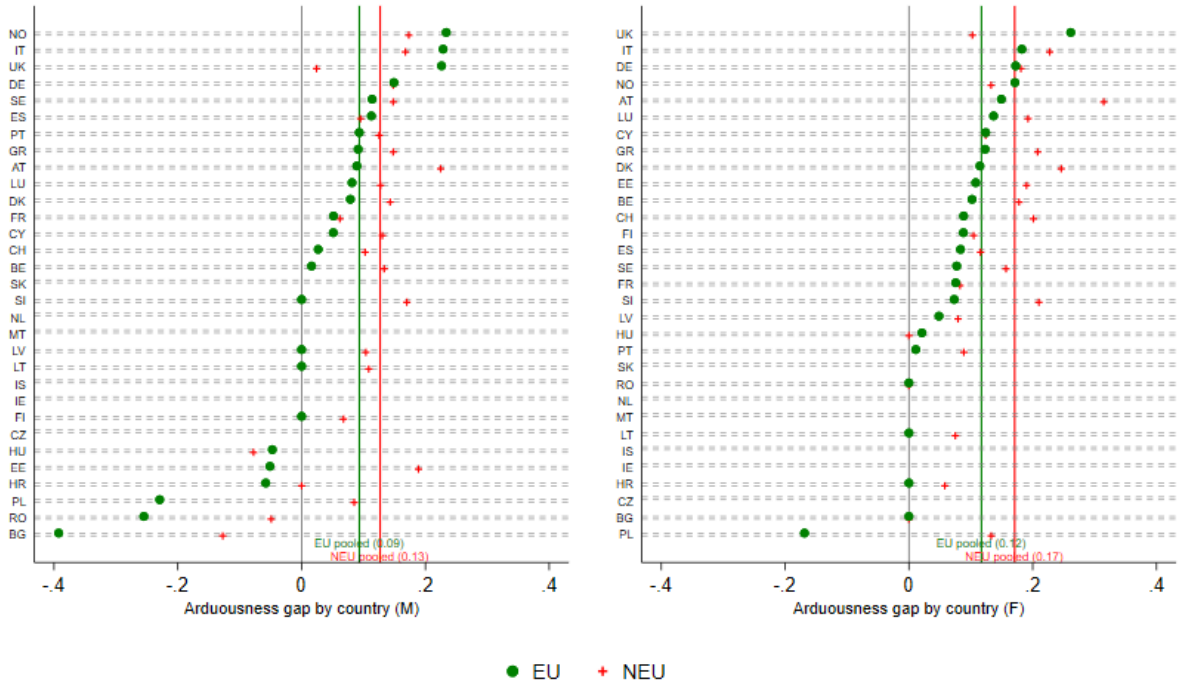


Figure 1: Country heterogeneity: point estimates of arduousness gap by gender, country and EU vs NEU 1st generation immigrant status

Note: Non-statistically significant estimates are set to zero. The green and red vertical bars correspond to the gaps estimated when pooling the 25 countries and reported in Table 4.

[28] estimated using male gaps as ref.

[29] As reported in the Penn World tables in PPP US$, for the years 2015-2019 (Feenstra et al., 2015).

Table 5: Country heterogeneity: regression analysis of point estimates of arduousness gap by gender, country and EU vs NEU 1st generation immigrant status

	Ardusousness gaps
Female	0.085*
	(0.048)
$MIGRANT^{NEU}$	0.113**
	(0.048)
GDP per head (10th US$)	0.039***
	(0.010)
Female × *GDP per head* (10th US$)	-0.009
	(0.011)
$MIGRANT^{NEU}$ × *GDP per head* (10th US$)	-0.012
	(0.011)
Constant	-0.131***
	(0.042)
N	100
R^2	0.34

* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses
Source: EU-LFS, O*NET

Key findings on first-generation migrants v.s. natives gaps In short, the pooled and country-by-country estimates reported above confirm the greater arduousness gap observed for women. This result aligns with the "migrant family investment hypothesis" (Grönlund and Öun, 2025). Migrant wives are more likely to accept physically demanding jobs to support their families, enabling their husbands to invest in country-specific human capital and transition into less arduous occupations. Furthermore, our data show that non-EU migrants consistently face a greater arduousness disadvantage than EU migrants. This supports the prediction that they encounter more significant "barriers to full employment opportunities", as frequently highlighted in the literature (Orrenius and Zavodny, 2009, Zavodny, 2015). These barriers include legal status restrictions, stricter visa regulations limiting employment to specific sectors, reduced freedom of movement, and heightened discrimination. However, due to data limitations, a more rigorous investigation is needed to confirm the precise role of each of these mechanisms.

Regarding the role of the host country's GDP level, we find a positive correlation with the magnitude of first-generation migrants' arduousness gaps. This finding tentatively validates

the "job amenities/compensation theory" (Orrenius and Zavodny, 2009), which posits that workplace amenities – including less physically demanding conditions – are a normal good. However, the robustness of these conclusions warrants further scrutiny.

By contrast, our analysis by educational attainment does not support the hypothesis that more educated migrants suffer from the "lack of linguistic skills/non-transferability of skills hypothesis", a well-documented concept in migration studies (Chiswick et al., 2005). Nonetheless, given the constraints of our data, we cannot rule out the possibility that alternative explanations or unobserved factors may be influencing this (absence of) result.

3.3.2 Evidence of the (non-)persistence of the arduousness gap

What can we say about the persistence over time of the arduousness gap affecting EU and non-EU first-generation migrants?

First generation: the role of years since migration We approach this question by regressing arduousness on the years since migration ($YRESID$) (Eq.(2)).[30] Table 6 presents the results. The coefficients $\beta_2^{first,EU,k}$ and $\beta_2^{first,NEU,k}$ represent the arduousness gap upon arrival in the host country (i.e., when $YRESID = 0$). The negative signs of the coefficients γ – all statistically significant – indicate that the arduousness gaps decrease over time.

To better assess convergence speed, the lower part of Table 6 reports the estimated number of years required to close the arduousness gap, as implied by our econometric results. This estimate is calculated as $\frac{\widehat{\beta}}{-\widehat{\gamma}}$, using the point estimates reported in the upper part of Table 6. These estimates are conditional in that they account for heterogeneity among respondents in terms of age, educational attainment, and tenure; as well as sector, country and year fixed effects. Following these calculations, the average time required to close the gap across the 25 countries considered is between 50 and 60 years.

In short, we find statistically significant evidence of convergence for both EU and NEU migrants. Although the convergence rate is higher for NEU migrants, their initially larger gap means that full closure takes longer. These findings also suggest that arduousness gaps are unlikely to be eliminated within a typical European career span of 40 to 45 years.

[30] Remember that it is set to zero for all natives.

Table 6: Econometric estimation of *i)* gap at arrival *ii)* annual rate of convergence and *iii)* implied time for full convergence, (Male, Female, first generation)

	Male	Female
$MIGRANT^{EU}$ (1st gen.)	0.151***	0.195***
	(6.08)	(3.67)
$MIGRANT^{NEU}$ (1st gen.)	0.202***	0.258***
	(5.69)	(4.85)
$MIGRANT^{EU}$ (1st gen.) × *YRESID*	-0.00293***	-0.00388***
	(-5.03)	(-3.34)
$MIGRANT^{NEU}$ (1st gen.) × *YRESID*	-0.00379***	-0.00429***
	(-5.88)	(-4.28)
Education	Yes	Yes
Tenure[a]	Yes	Yes
Age	Yes	Yes
Sector (NACE1d)	Yes	Yes
Country	Yes	Yes
Year	Yes	Yes
R^2	0.490	0.436
N	9,616,671	8,506,225
Implied years to achieve full-convergence		
Years (EU)	51.331***	50.315***
Years (NEU)	53.132***	60.082***

* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses
Source: EU-LFS, O*NET
a: Years with the current employer

Comparing second and first generations A second approach to assessing convergence is to examine the gap affecting second- vs first-generations of migrants. The EU-LFS has only distinguished between first- and second-generation non-EU migrants since 2021, providing us with just two waves of data for analysis. The results, presented in Table 7, reveal a stark contrast between first- and second-generation EU and non-EU migrants in terms of work arduousness. Compared to natives[31], first-generation migrants experience arduousness gaps ranging from .101 to .130 for male and female EU migrants and from .136 to .175 for their non-EU counterparts. In contrast, second-generation migrants exhibit statistically significant negative gaps, indicating lower work arduousness than natives. Specifically, second-generation male and female EU migrants experience gaps of -.049 and -.029, respectively, while second-generation non-EU migrants display gaps of -.050 and -.026.

Table 7: Econometric estimation of the arduousness gap (Male, first- and second- generation [only for years 2021-22])

	Male	Female
$MIGRANT^{EU}$ (1st gen.)	0.101***	0.130***
	(0.017)	(0.032)
$MIGRANT^{NEU}$ (1st gen.)	0.136***	0.175***
	(0.026)	(0.035)
$MIGRANT^{EU}$ (2nd gen.)	-0.049***	-0.028***
	(0.008)	(0.007)
$MIGRANT^{NEU}$ (2nd gen.)	-0.050***	-0.026**
	(0.017)	(0.012)
Education	Yes	Yes
Tenure	Yes	Yes
Age	Yes	Yes
Sector (NACE1d)	Yes	Yes
Country	Yes	Yes
Year	Yes	Yes
N	1,091,946	971,020
R^2	0.50	0.42

* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses
Source: EU-LFS, O*NET

[31] Who, by definition, no longer include second-generation migrants.

4 Conclusion

This paper builds on existing research on migrants' labour market disadvantages. The primary aim of this paper was to test the hypothesis that first-generation migrants face not only wage and employment disparities (a phenomenon abundantly demonstrated by the existing literature) but also an occupational gap synonymous with a work arduousness penalty. Additionally, it sought to assess whether these disparities diminish over time as predicted by the convergence/assimilation theory of migration (Chiswick et al., 2005).

4.1 Key results

The findings are essentially twofold. First, EU and non-EU first-generation migrants in Europe are disproportionately concentrated in physically demanding jobs, even after controlling for factors like education, age, tenure[32], sector/industry and country of residence. Second, while first-generation migrants face significant job arduousness gaps, these gradually reduce. Moreover, the gap completely disappears for the second generation. Notably, the two trends hold across diverse economic and cultural contexts characterising the 25 European countries considered in the analysis, suggesting that the underlying mechanisms are universal rather than country-specific. Moreover, the second result – particularly for second-generation migrants – deviates from the patterns commonly found in the literature when using wages, employment rates, or job application data as indicators of migrant (non)integration. Studies in Europe typically suggest that wages and employment rates do not necessarily converge with the length of time spent in the host country, even for second-generation migrants.

Beyond these core findings, our analysis reveals that arduousness gaps are systematically more significant for female migrants, supporting the strength of the "migrant family investment hypothesis" (Grönlund and Öun, 2025). This result suggests that migrant wives accept more demanding jobs to support their families while their husbands invest more in their careers and partially manage to reduce their gap. Also, compared to EU-migrants, non-EU ones experience an additional arduous disadvantage, likely due to structural barriers such as legal restrictions, limited job mobility or discrimination (Orrenius and Zavodny, 2009, Zavodny, 2015). Conversely, our findings do not support the hypothesis that (recent) educated migrants face more significant difficulties due to linguistic barriers or skill non-transferability (Chiswick et al., 2005). Another key finding is that while this study does not

[32]With current employer.

explore country-specific variations in migrants' arduousness handicaps in detail, it does confirm their existence. Moreover, it finds a positive correlation between a host country's GDP and the arduousness gap for first-generation migrants. This result aligns with the predictions of the "job amenities/compensation theory" of labour, which suggests that work arduousness is a normal good. Further research is needed to better understand the country-level heterogeneity reported in this paper. Drawing from recent literature in migration economics, potential research avenues include: *i)* the specific migration history of each European country, whether recent or longstanding, marginal or significant; *ii)* the impact of factors such as education, language, religion, and discrepancies in female employment rates between origin and destination countries; and *iii)* the capacity (or lack thereof) of destination countries to effectively assimilate migrants.

Some of the above results should be interpreted cautiously due to significant data limitations and the potential influence of unobserved or unaccounted factors. In particular, findings that suggest "convergence" for first-generation individuals may, at least in part, be driven by non-random selection into non-employment over time. Some individuals – potentially those with lower labour market prospects and/or more exposure to arduousness – may be (relatively) more likely to exit employment, leading to an overestimation of convergence among those employed. Fully addressing the risk of selection bias would require a more detailed analysis using individual-level panel data, which could track employment trajectories over time and across generations.

4.2 Policy Implications

Despite these limitations, our results provide valuable insights for policymakers. At a minimum, they highlight the need to look beyond traditional labour market inequalities – such as wage gaps and (un)employment rates – also to consider disparities in job quality, working conditions, and their evolution over time. In particular, targeted interventions should address the overrepresentation of first-generation non-EU and/or female migrants in physically demanding jobs and its persistence over time. Policies that promote fairer job assignments, such as reducing hiring biases and ensuring transparent recruitment processes, could help mitigate initial disparities. Additionally, enhancing pathways to occupational mobility – through skills recognition programmes, career development initiatives, and access to upskilling or retraining opportunities – could enable first-generation migrants to transition faster into less arduous, higher-quality jobs.

Our findings about a second-generation arduousness advantage should ideally be confirmed by more advanced analysis. And if so, it would be essential to investigate the factors contributing to this advantage beyond those taken into account here (i.e. age, educational attainment...). While policy efforts for first-generation migrants should prioritise improving job quality and reducing occupational segregation, initiatives for second-generation migrants could focus on other facets of labour-market inequality, such as wages and employment. By acknowledging these nuanced generational differences, policymakers can design more precise and long-term solutions that foster faster and sustainable career advancement for migrant communities.

Declarations

Availability of data and material

The Stata code used for this paper is available on GitHub: https://github.com/VVandenberghe/ardu_imm/blob/main/LFS_ONET2.do. The primary dataset comprises EU-LFS microdata, which is restricted to use within the premises of the authoring research entity and is accessible only to authorised users.

Funding

This research was partially financially supported by convention ARC No 18-23-088.

Authors' contributions

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that we are the only authors and that no other persons have satisfied the criteria for authorship.

Acknowledgements

We warmly thank anonymous referees for the very useful comments and suggestions for improvements on the previous version of this paper. Computational resources have been provided by the supercomputing facilities (CISM/UCLouvain) and the Consortium des Équipements de Calcul Intensif en Fédération Wallonie Bruxelles (CÉCI) funded by the Fond de la Recherche Scientifique de Belgique (F.R.S.-FNRS) under convention 2.5020.11 and by the Walloon Region.

Conflict of interest

None

References

Arrow, Kenneth J. (1973). *The Theory of Discrimination*. Publication Title: Discrimination in Labor Markets. Princeton University Press.

Aydemir, Abdurrahman and Mikal Skuterud (2005). "Explaining the deteriorating entry earnings of Canada's immigrant cohorts, 1966 - 2000". In: *Canadian Journal of Economics* 38.2, pp. 641–672.

Bakker, Arnold B and Evangelia Demerouti (2007). "The job demands-resources model: State of the art". In: *Journal of managerial psychology* 22.3, pp. 309–328.

Boffi, Giacomo (2024). "Temporary employment of first-generation migrants in the Netherlands". en. In: 25.1. Publisher: Springer Science and Business Media LLC, pp. 1–35.

Borjas, George J (1985). "Assimilation, changes in cohort quality, and the earnings of immigrants". In: *Journal of labor Economics* 3.4. Publisher: University of Chicago Press, pp. 463–489.

Borjas, G.J. (1994). "The economics of immigration". In: *Journal of Economic Literature* 32, pp. 1667–1717.

Chen, Yang, Shuang Li, Qing Xia, and Chao He (2017). "The Relationship between Job Demands and Employees' Counterproductive Work Behaviors: The Mediating Effect of Psychological Detachment and Job Anxiety". In: *Frontiers in Psychology* 8, pp. 1–15.

Chiswick, Barry R., Yew Liang Lee, and Paul W. Miller (2005). "A longitudinal analysis of immigrant occupational mobility: a test of the immigrant assimilation hypothesis". In: *The International Migration Review* 39.2. Publisher: [Center for Migration Studies of New York, Inc., Wiley], pp. 332–353.

Christopher, S. Carter and Timothy F. Leslie (2015). "Assessing immigrant niches across large American metropolitan areas". In: *Population, Space and Place* 21.2, pp. 171–192.

Devos, Louise, Louis Lippens, Dries Lens, François Rycx, Mélanie Volral, and Stijn Baert (2024). "Labour market disadvantages of citizens with a migration background in Belgium: A systematic review". In: *De Economist*. Publisher: Springer Science and Business Media LLC.

Feenstra, Robert C., Robert Inklaar, and Marcel P. Timmer (2015). "The next generation of the penn world table". In: *American Economic Review* 105.10, pp. 3150–82.

Gordon, M.M. (1964). *Assimilation in American life: the role of race, religion, and national origins*. OUP e-books. tex.lccn: 64015010. Oxford University Press.

Grönlund, Anne and Ida Öun (2025). "Shackled by double disadvantage? Gender, segregation and immigrants' occupational attainments". In: *Acta Sociologica* 68.1, pp. 83–101.

Kampelmann, Stephan and François Rycx (2016). "Wage discrimination against immigrants: measurement with firm-level productivity data". en. In: *IZA J. Migr.* 5.1. Publisher: Springer Science and Business Media LLC.

Kanitsar, Georg (2024). "The same social elevator? Intergenerational class mobility of second-generation immigrants across Europe". In: *European Sociological Review* 41.1. tex.eprint: https://academic.oup.com/esr/article-pdf/41/1/1/56642178/jcae007.pdf, pp. 1–16.

Lippens, Louis, Siel Vermeiren, and Stijn Baert (2023). "The state of hiring discrimination: A meta-analysis of (almost) all recent correspondence experiments". In: *European Economic Review* 151, p. 104315.

Long, James E. (1980). "The effect of americanization on earnings: Some evidence for women". In: *Journal of Political Economy* 88.3, pp. 620–629.

Lu, C., R. G. Frank, Y. Liu, and J. Shen (2009). "The impact of mental health on labour market outcomes in China". In: *The journal of mental health policy and economics* 12.3, pp. 157–166.

Montanari, Maria Giulia (2024). "Better-off abroad? The overqualification of eastern migrants to Western Europe". In: *International Sociology* 0.0, pp. –.

Orrenius, Pia M. and Madeline Zavodny (2009). "Do immigrants work in riskier jobs?" In: *Demography* 46.3, pp. 535–551.

Palencia-Esteban, Amaia (2022). "Occupational segregation of female and male immigrants in Europe: Accounting for cross-country differences". In: *International Labour Review* 161.3, pp. 341–373.

Pineda-Hernández, Kevin, François Rycx, and Mélanie Volral (2024). "Immigrant overeducation across two generations: the role of gender and part-time work". In: *Oxford Economic Papers*.

Piton, Céline and François Rycx (2021). "A broken social elevator? Employment outcomes of first- and second-generation immigrants in Belgium". en. In: *Economist (Leiden)* 169.3. Publisher: Springer Science and Business Media LLC, pp. 319–365.

Smith, William C. and Frank Fernandez (2017). "Education, skills, and wage gaps in Canada and the United States". In: *International Migration* 55.3, pp. 57 –73.

Spence, Michael (1973). "Job market signaling". In: *The Quarterly Journal of Economics* 87.3. Publisher: Oxford University Press, pp. 355–374.

Vandenberghe, Vincent (2023). "Career arduousness and instability: Both matter for health beyond 50". In: *LABOUR* 37.3, pp. 343–384.

Zavodny, Madeline (2015). "Do immigrants work in worse jobs than U.S. natives? Evidence from california". In: *Industrial Relations: A Journal of Economy and Society* 54.2, pp. 276–293.

Zhou, Min (1997). "Segmented assimilation: Issues, controversies, and recent research on the new second generation". In: *The International Migration Review* 31.4. Publisher: [Center for Migration Studies of New York, Inc., Sage Publications, Inc.], pp. 975–1008.

Zorlu, Aslan and Joop Hartog (2012). "Employment assimilation of immigrants in the netherlands: Dip and catchup by source country". In: *International Journal of Population Research* 2012.1. tex.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1155/2012/634276, p. 634276.

Zschirnt, Eva and Didier Ruedin (2016). "Ethnic discrimination in hiring decisions: a meta-analysis of correspondence tests 1990–2015". In: *Journal of Ethnic and Migration Studies* 42.7. Publisher: Taylor & Francis, pp. 1115–1134.

Appendix

A.1.1 O*NET Principal Components, Load Factors

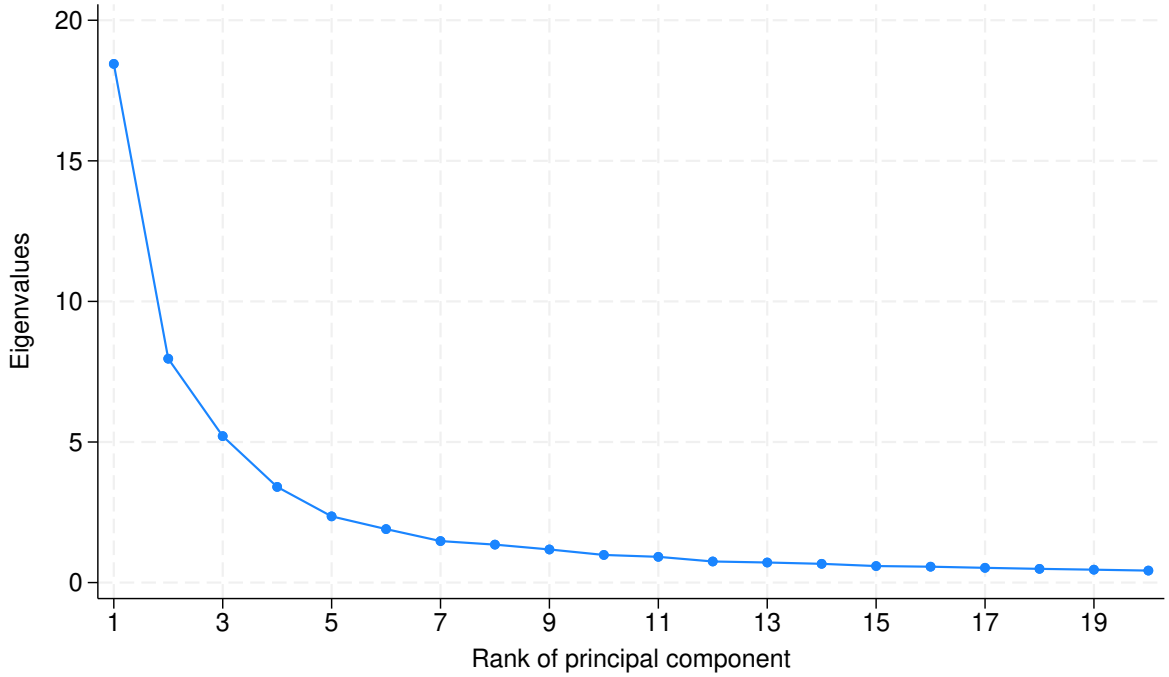


Figure A.1: O*NET arduousness items (ISCO4): proportion of variance explained by first (and following) principal components (i.e. eigenvalues)

Source: O*NET 2021, Work Context Items.

Table A.1: O*NET arduousness items: Loading factors for 1^{st} and 2^{nd} Principal Component[a]

	Load factors	
	1^{st} **princ. comp.**	2^{nd} princ. comp.
Consequence_of_Error	0.10	0.18
Contact_With_Others	-0.06	0.23
Coordinate_or_Lead_Others	-0.03	0.25
Cramped_Work_Space_Awkward_Positions	0.20	0.07
Deal_With_External_Customers	-0.08	0.21
Deal_With_Physically_Aggressivity	0.01	0.16
Deal_With_Unpleasant_or_Angry_	-0.01	0.18
Degree_of_Automation	-0.00	0.00
Duration_of_Typical_Work_Week	0.00	0.12
Electronic_Mail	-0.16	0.15
Exposed_to_Contaminants	0.20	0.02
Exposed_to_Disease_or_Infections	-0.01	0.15
Exposed_to_Hazardous_Condition	0.18	0.05
Exposed_to_Hazardous_Equipment	0.20	0.02
Exposed_to_High_Places	0.17	0.07
Exposed_to_Minor_Burns_Cuts_Bi	0.21	-0.00
Exposed_to_Radiation	0.04	0.11
Exposed_to_Whole_Body_Vibrations	0.17	0.04
Extremely_Bright_or_Inadequate	0.19	0.07
Face-to-Face_Discussions	-0.03	0.22
Freedom_to_Make_Decisions	-0.07	0.16
Frequency_of_Conflict_Situations	-0.03	0.25
Frequency_of_Decision_Making	0.02	0.25
Impact_of_Decisions_on_Coworkers	0.00	0.27
Importance_of_Being_Exact_or_Accurate	-0.01	0.08
Importance_of_Repeating_Same_Task	0.01	0.07
In_an_Enclosed_Vehicle_or_Equipment	0.10	0.14
In_an_Open_Vehicle_or_Equipment	0.18	0.03
Indoors_Environmentally_Controlled	-0.17	0.06
Indoors_Not_Environmentally_Controlled	0.18	0.04
Letters_and_Memos	-0.12	0.21
Level_of_Competition	-0.04	0.10
Outdoors_Exposed_to_Weather	0.15	0.10
Outdoors_Under_Cover	0.14	0.11
Pace_Determined_by_Speed_of_Equipment	0.16	-0.07
Physical_Proximity	0.05	0.12
Public_Speaking	-0.10	0.11
Responsibility_for_Outcomes_an	0.06	0.21
Responsible_for_Others_Health_	0.15	0.16
Sounds_Noise_Levels_Are_Distraction	0.18	0.04
Spend_Time_Bending_or_Twisting	0.20	-0.03
Spend_Time_Climbing_Ladders_Scaffolds	0.17	0.04
Spend_Time_Keeping_or_Regaining_Balance	0.19	0.03
Spend_Time_Kneeling_Crouching_	0.18	0.00
Spend_Time_Making_Repetitive_M	0.10	-0.11
Spend_Time_Sitting	-0.17	0.04
Spend_Time_Standing	0.17	-0.05
Spend_Time_Using_Your_Hands_to_Handle_objects	0.16	-0.08
Spend_Time_Walking_and_Running	0.17	-0.01
Structured_versus_Unstructured	-0.10	0.15
Telephone	-0.11	0.23
Time_Pressure	0.02	0.10
Very_Hot_or_Cold_Temperatures	0.20	0.04
Wear_Common_Protective_or_Safety_Equipment	0.19	0.03
Wear_Specialized_Protective_or_Safety_Equipment	0.16	0.08
Work_Schedules	0.09	-0.01
Work_With_Work_Group_or_Team	-0.01	0.21

Source: O*NET 2021, Work Context Items. [a] Only the 1^{st} Principal component is used in this paper to compute career arduousness $CAR^{ard}_{i,j}$ in equation (1). It correlates with items associated with arduousness (e.g. Exposure to Contaminants, Pace (of work) determined by the speed of Equipment, Sounds, noise levels are distracting or uncomfortable. ... The second principal component correlates more with social-, teams- or outbound-oriented work content, i.e. a less relevant dimension in an exercise centred on physical arduousness.

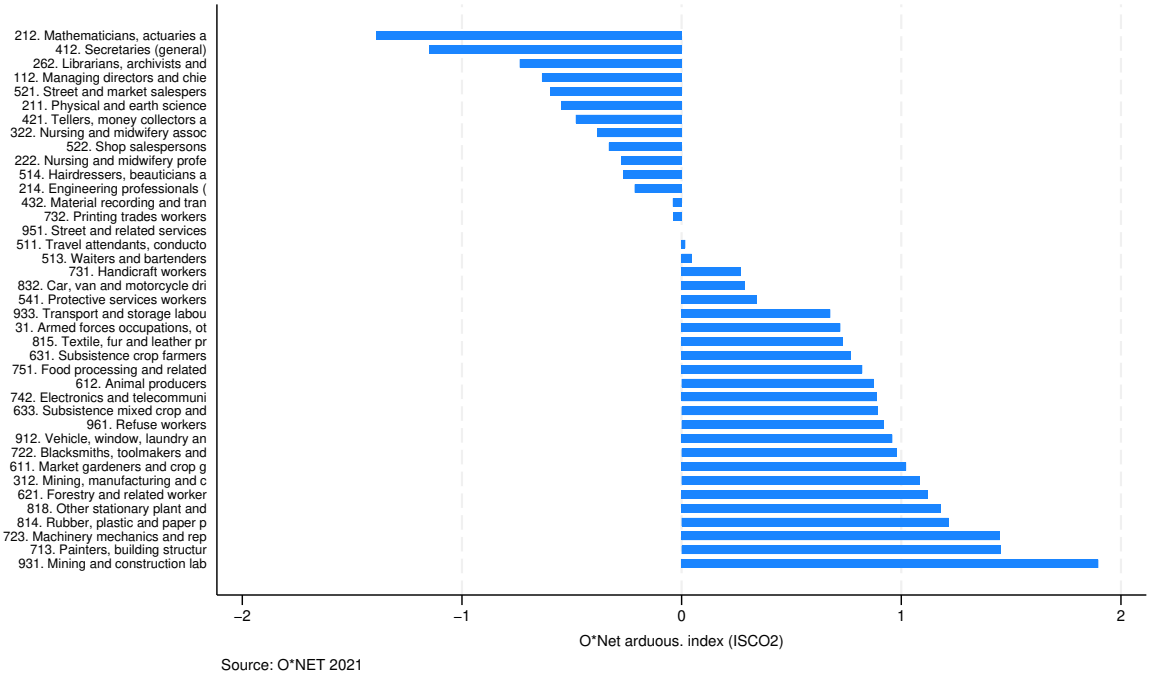


Figure A.2: O*NET career arduousness indices by ISCO 2 occupation

Indices reported on the X axis are First Principal Components of items forming the O*NET *Work Context* module.