

# IMMIGRANT WORKFORCE INTEGRATION AND ETHNIC SEGMENTATION: THE ROLE OF OCCUPATIONAL SKILL COMPOSITION \*

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**Abstract:** We examine how the skill composition of jobs shapes migrants' and natives' job sorting and the consequences for their earnings potential and overall ethnic segmentation in the labour market. Detailed data on jobs, employers and workers in the Swedish hospitality, construction and retail sectors is matched with data on the skill characteristics of those jobs and analysed using descriptive and multivariate statistics. Results reveal strong patterns of ethnic segmentation in the hospitality sector, where immigrants are primarily sorted into routine jobs requiring a higher level of technical skills compared to natives, who are sorted into non-routine jobs requiring interpersonal skills. In the construction and retail sectors, however, both immigrants and natives are mostly found in jobs requiring non-routine skills. We also find that immigrants earn less in the hospitality sector – a pattern that differs in the construction and retail sectors. Initiatives helping immigrants to acquire relevant labour market skills need to consider interpersonal skills in addition to formal training and education.

**Keywords:** Ethnic segmentation, skills, migrants, sector, routine jobs

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## 1. Introduction

Economic shocks such as the financial crisis and the ongoing Covid-19 pandemic have accentuated long-term structural change in labour markets, driving them towards a more diverse workforce in terms of workers' national origin. The nature of work is shifting towards service jobs, while the share of permanent jobs is declining (Thornley, 2006). Moreover, the service jobs available are increasingly polarised towards two types: knowledge-intensive service jobs on the one hand, and low-knowledge-intensity service jobs within high- and low-skill sectors on the other (Autor, 2015; Frank, 2018). At the same time, both these types of service jobs are affected by new technologies allowing for the automation of routine-based and codifiable tasks, such as those involving numerical skills (Autor and Dorn, 2013). Some technical skills based on codifiable routine tasks are rapidly being substituted by digital technologies such as customer relationship management and inventory tracking systems. This ongoing digitalisation means that certain skills beyond cognition, dexterity and machine operation are growing in importance – in particular, interpersonal skills.

These changes in demand for various skills are occurring just as the labour markets of developed nations are becoming more diverse and segmented due to migration. In Sweden – the country we study – around six percent of the active labour force was born outside the country in the 1960s, compared to more than 20 percent in the early 21st century (Statistics Sweden, 2004). Increasingly diverse groups of immigrants join the workforce as students, economic migrants, as family members of current residents or as refugees fleeing conflict and persecution in their home countries. Compared to 1960s economic migrants who integrated into Western European labour markets relatively quickly, today's migrants face greater obstacles in finding jobs – particularly well-paid ones. Sectors such as hospitality, construction and retail are commonly suggested to provide the type of 'entry-level' jobs that are accessible to migrant workers with limited education and training (Åslund, Hensvik & Skans, 2014).

To date, little empirical work has sought to integrate the literatures on skill-biased technological change and ethnic labour-market segmentation, even though the types of workers most affected by these changes largely overlap. This constitutes the theoretical motivation for this paper. Further, we seek to solve the empirical puzzle of why immigrant workers are more likely to find jobs in hospitality than in similar low-skilled sectors such as retail and construction. Thus, our research question is: why are immigrants underrepresented in sectors with similar skill requirements compared to the hospitality sector?

To find the answer, we examine workforce integration and earnings stratification across various immigrant groups in Sweden compared to native workers. We focus specifically on the

hospitality sector, which employs an increasing share of the immigrant workforce (Åslund *et al.*, 2014; Příklad & Kiner, 2020; Sönmez *et al.*, 2020), but where segmentation across ethnic lines is increasing and earnings potential is often limited compared to other sectors. Unlike earlier studies that have examined patterns in migrants' workforce integration, or their segmentation into primarily low-paid jobs (Daunfeldt *et al.*, 2019), we focus on how the composition of skills requirements for jobs in three low-human-capital sectors leads to migrants being sorted into certain types of jobs and native workers into others, with consequences for their respective earnings potential. Jointly, we examine how different ethnic groups may be sorted into different sectors (Åslund *et al.*, 2014). We also examine gender and sectoral differences in how the skills composition of service jobs shapes ethnic labour-market segmentation by comparing the hospitality sector to other service-intensive sectors such as retail and construction.

Our paper combines detailed data on jobs, employers and workers in the Swedish hospitality, construction and retail sectors over the period 2009–13, matched with data on the skills requirements of those jobs based on standardised measures from the International Labour Organization (ILO) and survey data from the United States (Adermon & Gustavsson, 2015). Data on the composition of skills requirements on jobs in the three sectors shows that immigrant workers with low levels of education are overrepresented in hospitality jobs with little demand for interpersonal skills (networking, communication, language skills) but a high demand for technical skills.

Our analyses unearth clear sorting of particular ethnic groups across the three sectors we examine. Regression models characterising workers across the hospitality, construction and retail sectors and predicting mobility from unemployment to employment in these sectors reveal ethnicity-based sorting of workers to specific sectors and jobs. In terms of earnings, we find that more highly skilled immigrants are sorted into jobs requiring technical skills and earn less in hospitality compared to retail and construction on average. Meanwhile, natives with high levels of social skills such as social perceptiveness receive lower salaries in hospitality compared to natives in retail and construction. Our analyses show that native workers in the hospitality sector are more often found in non-routine jobs requiring social skills, whereas immigrants primarily handle routine jobs requiring technical skills – these being the roles specifically exposed to risks of automation (Graetz 2020). These patterns are different from those in the comparable low-skilled sectors of retail and construction, which display much smaller differences within the skills required for jobs occupied by natives or immigrants.

Our paper contributes theoretically by theorizing on and empirically highlighting that the ethnic segmentation of immigrants should be considered in the light of skills biases within

different sectors, including low-skilled ones. This provides implications for both research on the ethnic segmentation of labour and research on how technology affects labour market. For research on ethnic segmentation of labour, the sorting of immigrants from specific birth countries into manual non-routine jobs in some specific sectors (in our study: retail and construction) similar to low-skilled natives, with immigrants from other birth countries into routine jobs in other sectors (in our study: hospitality) which natives are sorted away from, cannot be explained purely by ethnic segmentation. Instead, this can be explained by the increasing importance of non-routine jobs requiring social skills across the labour market, which has specific implications for the type of low-to medium-skilled jobs recent migrants tend to occupy. Our study thus suggests interactive effects of skill-biased technological change and how immigrants from different origin are differentially sorted into labour market sectors, a type of skill-biased ethnic segmentation. The study also has implications for research on skill-biased technological change and the precariousness of low-skilled labour overall. If, as this article shows, immigrants are increasingly sorted into routine jobs requiring technical skills compared to native workers, it may be these immigrants that are specifically exposed to risks of outsourcing or automation (Graetz 2020). The study also comes with potential implications for policymakers seeking to facilitate migrants' labour-market integration. Initiatives aimed at helping immigrants acquire new skills must also consider interpersonal skills such as language and communication, beyond the training and education of technical or task-oriented skills.

## 2. Theory and prior research

### *Skill-biased technological change in service sectors*

Skill-biased technological change (SBTC) explains how shifts in production technology favour skilled (for example, more educated, more able, more experienced) labour over unskilled labour by increasing its relative productivity and, therefore, the relative demand for it. SBTC increases the 'skill premium' – that is, the salary returns to higher levels of specific skills. In recent decades, labour demand for routine tasks based on codifiable skills has increasingly been met by new technology, meaning that the salary returns and demand for workers in jobs with medium to low skill requirements have decreased (Autor & Dorn, 2013; Autor, 2015; Goos *et al.*, 2014). This development has raised concerns about 'job polarisation' within sectors in terms of demand and earnings (Goos *et al.*, 2014)<sup>1</sup>, but has also led to significant between-sector shifts in the structure of employment. These gradual shifts have also increased the ethnic segmentation of labour

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<sup>1</sup> 'Job polarisation' is generally defined as an increase in employment in high- and low-skill occupations relative to middle-skill occupations.

markets – for instance, with more and more immigrants working in the hospitality sector (Baum *et al.*, 2016; Bramwell *et al.*, 2017).

Some technical skills required in the provision of services, such as operating equipment or systems, monitoring operations and similar skills based on codifiable routine tasks, are rapidly being substituted by digital technologies such as customer relationship management (CRM) and inventory tracking systems. This ongoing digitalisation means that skills beyond cognition, dexterity and machine operation are growing in importance – in particular, interpersonal skills such as teamwork, negotiation, persuasion and service orientation. Such interpersonal skills are characteristic of key non-routine tasks in services – yet, they also complement the use of new technologies. Therefore demand for them is growing as technology progresses (Graetz, 2020).

These developments mean that the demand for the technical skills offered by mid-skilled routine workers has fallen with the increasing availability and sophistication of digital automation. This, in turn, has led to job polarisation, in that average earnings in jobs requiring different non-routine social skills have risen (Acemoglu & Autor, 2011; Autor, 2015). Routine jobs require higher education and skills levels compared to non-routine manual jobs. Mid-skilled routine workers are often seen as being most at risk of redundancy, since they fall ‘in the middle’ of the skills distribution: exposed to automation, but with higher reservation salaries than unskilled workers (Kurer, 2019).

However, job polarisation may also affect job sorting across sectors in distinct ways, with varying effects across different categories of workers, such as immigrant vs native workers, or workers of different ethnic origin (Lewis, 2013). This line of research is less developed. The SBTC argument predicts that technological innovations and digitalisation mean fewer jobs requiring technical skills, leading to a flow of mid- and low-skilled workers from routine intensive jobs to non-routine jobs within the same sector – or between sectors, such as from manufacturing or retail into services such as hospitality (Acemoglu & Autor, 2011). In turn, job polarisation may decrease employment and earnings for skilled workers in jobs primarily based on routine tasks (Autor & Dorn, 2013). Instead, new technologies have been found to primarily benefit workers with high interpersonal skills, especially those working in knowledge-intensive sectors (Deming, 2017). To date, however, the results of SBTC have mostly been studied in manufacturing, even though digitalisation is changing service sectors just as rapidly. Our study focuses specifically on service sectors, which is also where ethnic segmentation has increased in recent decades in most Western European labour markets (Slavnic & Urban, 2018; Meyer & Vasey, 2020). While the SBTC hypothesis considers the *demand* for various skills, the *supply* of skills in rapidly changing labour markets characterised by high migration rates also has

implications for worker sorting and earnings stratification within and across sectors (Oesch & Rodriguez Menes, 2011). The literature on ethnic labour-market segmentation explains how migrants' backgrounds may affect such processes – in particular, how the supply of skills (and misperception of hard-to-validate skill levels, i.e., statistical discrimination) among immigrants varies by country of origin (Ahmad, 2020; Tani, 2021).

### ***Job skills and ethnic labour-market segmentation***

The theory of SBTC suggests that workers with stronger technical skills will gradually be sorted into upper- or lower-level non-routine jobs, while mid-level routine jobs are substituted by automation. Ethnic labour-market segmentation could shed light on worker sorting and earnings stratification among immigrants and natives, especially in low- to mid-level jobs characterised by routine-based skills. Facing real or perceived shortages in the skills needed for more stable jobs, immigrants can often be found doing such 'risky' jobs (Kogan, 2006). Furthermore, vacancies and recruitments are driven by social network connections between employers and jobseekers, meaning that workplaces or employers characterised by workers or managers with a specific country ancestry are more likely to employ those with similar ancestry (Cortes, 2008; Åslund *et al.*, 2014).<sup>2</sup>

These trends, it has been argued, widen the earnings gap between workers within specific sectors, and also between immigrants and natives (Cassel *et al.*, 2018; Åberg & Müller, 2018). To date, men (both immigrants and natives) in low-skill sectors have been the primary group whose job security and salary levels have suffered from automation and economic shocks (Autor & Dorn, 2013). Highly educated immigrants have been found to largely specialise in jobs with high requirements for routine-task analytical skills (Peri & Sparber, 2011), while low-educated immigrants are more often found in jobs requiring manual technical tasks (Peri & Sparber, 2009). At the same time, the service sector is expanding in terms of employment share, while manufacturing is in decline. As automation is increasingly affecting the service sectors, including hospitality, different segments of the labour market may also be increasingly exposed to salary stagnation and substitution by new technologies, which we scrutinise in the context of native and migrant workers as well as migrant workers of different origin.

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<sup>2</sup> Often termed 'co-ethnic working sorting' or 'ethnicity-based job networks' in the literature (Cortes, 2008; Åslund *et al.*, 2014), despite the fact that analyses such as ours are based on country of origin rather than ethnicity per se.

### ***Immigrants' labour-market segmentation***

According to the classic view in labour-market segmentation theory (Piore, 1979; Dickens & Lang, 1988), the demand side of job characteristics predefines sorting of immigrants into lower tiers of 'bad' and precarious jobs, and natives into more prestigious 'good' ones (Piore, 1983; Boje, 1986; McGovern, 2007). Employers create demand for low-cost immigrant labour to fill labour shortages, particularly in mid-skills jobs. On the demand side, occupational skill requirements, may therefore be considered an empirical measure for the emergence of more distinct labour-market segments among immigrants and natives (Hudson, 2007). On the supply side, immigrants are more likely to accept non-prestigious 'bad' jobs at lower levels of the occupational hierarchy, and also more likely to stay there for longer (Kogan, 2011). Native workers may be unwilling to take on certain jobs not merely because they pay poorly, but also because they imply low status (Leontaridi, 1998). Immigrants, however, may be less picky, due to a so-called 'dual frame of reference' and limited options in host-country labour markets (Friberg & Midtbøen, 2018). This willingness will often be interpreted as a sort of skill, or 'work ethic' (Piore 1979; Wills *et al.*, 2009). The allocation of immigrants in host-country labour markets is thereby closely linked to processes of categorical inequality (Massey, 2007; Ridgeway, 2011), where labour-market hierarchies tend to reflect the social structure of the societies in which they are embedded (Waldinger & Lichter, 2003).

The aforementioned conditions and processes have initiated a stream of research on *ethnic labour-market segmentation* (Noel, 1968; Esser, 2010; Thiel, 2010; Haller *et al.*, 2016; Friberg & Midtbøen, 2018). This stream seeks to explain why some ethnic groups of immigrants are overrepresented in specific sectors or niches, and what the implications are for their long-term labour-market attainment. Labour-market segmentation theory thus provides a potential explanation for why immigrants are disproportionately sorted into employment in the hospitality sector, even if those roles require human-capital resources equivalent to jobs available in other sectors. Comparably more immigrants in Western European nations exhibit comparatively lower levels of formal education, but many have previous experience of work in similar sectors in their native countries. Recent migrants may be sorted away from jobs requiring social skills, due to poorer language abilities relevant to the local labour market (Dustmann, 1999). Further, if their human and social capital characteristics are largely unrecognised by potential employers, statistical discrimination is prevalent (Fevre, Grainger and Brewer, 2011).

### ***Migrant workers in service sectors: The case of Sweden***

We seek to understand the impact of slow-moving structural changes such as immigration and digitalisation on the labour-market conditions of workers in service-sector jobs requiring low-to-medium skills in a mature welfare state: Sweden. Sweden has experienced a significant migration inflow, partly due to a major overhaul of its labour migration laws in 2008 (Kazlou & Klinthall, 2019) and partly due to the significant refugee influx in 2015. Sweden is one of several European countries with high immigration levels over the last few decades. However, labour-market opportunities in Sweden are relatively scarce for migrant workers, and the country exhibits one of the lowest labour-market participation rates for migrants in Europe. This makes Sweden an interesting context in which to study the long-term outcomes of immigrants' integration. Given the country's coordinated labour-market structure (Howell & Givan, 2011), characterised by 'insiders and outsiders' (Lindbeck and Snower, 1986) and well-documented ethnicity-based discrimination (Carlsson & Rooth, 2007; Bursell, 2014), immigrants without formal educational credentials often have very limited chances to find stable jobs. At the same time, the principal of social equity applies to immigrants in Sweden, meaning that residing immigrants have access to the same social benefits as natives, including participation in adult education free of charge (Kazlou, 2019). Access to social benefits allows immigrants to support their living standards even with lower wages.

For these reasons, our study focuses on the distribution of jobs with different skill profiles in low-human-capital sectors: hospitality, retail and construction (MacKenzie *et al.*, 2010). These sectors are increasingly reliant on migrant workers (Vershina *et al.*, 2018), but this broad trend conceals a great deal of within-sector variation in the type of jobs provided, which is the basis for our analysis. In particular, low-skilled hospitality jobs in Sweden – as in other Nordic countries – rely heavily on immigrants (Foged & Peri, 2016; Friberg & Midtbøen, 2019).

The Swedish archetypal co-ordinated political economy with strong industrial bargaining among employer confederations and unions has gradually changes towards decentralisation and liberalisation (Howell and Givan, 2011). In particular, the private service sectors in Sweden is overall less well covered by collective salary agreements than the manufacturing sector (Howell and Givan, 2011). The decreasing density and bargaining power of trade unions in Sweden may make jobs for immigrants in the firms in private service industries more vulnerable (Arai & Vilhelmsson, 2004). Further, various types of immigrant workers tend to be found in distinct types of low-salary jobs. Ethnic segmentation due to sorting into specific sectors of different ethnic groups is also clearly visible in Sweden – for example, with Asian migrants being



overrepresented in restaurants, and immigrants from the Middle East in small grocery outlets (Frank, 2018).

### **3. Methods and data**

For our analysis, we use detailed micro-data for Sweden that provides us with information on individuals, establishments, firms and households covering the period 2009–13. Using Statistics Sweden’s longitudinal integrated database for health insurance (LISA) and occupation-education information at the individual level, we have access to comprehensive information such as the demographics and education of immigrants and natives in different occupations. We combine LISA with data on skill types and skill levels across jobs using harmonised data from the International Labour Organization (ILO) and data from O\*NET (Occupational Information Network), which is a broad survey of occupational demands in the United States (Autor *et al.*, 2003; Acemoglu & Autor, 2011). Our data construction is based on the fundamental premise that different jobs require different skill levels. Type of jobs are reported according to the Swedish Standard Classification of Occupations (SSYK), which is fully harmonised with the International Labour Organization’s (ILO) occupational classification categories. This allows us to match the occupational information from O\*NET to individual-level panel data on the entire Swedish population (Adermon & Gustavsson, 2015). Thus, we utilise the best aspects of both countries’ data: the U.S. data allows us to characterise occupational employment growth and control for anticipated changes in demand, while the Swedish data lets us follow individuals who differ in their exposure to declining occupations, but are otherwise very similar. We select three sectors that are generally considered as ‘low- to medium-skilled sectors’ exhibiting fair entry rates for immigrant workers, but also differ in terms of the structure of specific skill requirements: hospitality, construction and retail.

#### ***Skill requirements across jobs***

Our measures of skill characteristics among jobs are constructed on the basis of O\*NET data, using the approach in Kurer (2019). We classify jobs into three groups: *routine, non-routine manual* and *non-routine cognitive*. The O\*NET data further distinguishes between *social* and *technical* skills in various jobs. Social skills include coordination by adjusting one’s own actions in relation to others’ actions; they include instruction (teaching others how to do something), negotiation and persuasion. Social skills also include service orientation (looking for ways to help people) and social perceptiveness. Technical skills include equipment maintenance (performing routine maintenance on equipment and determining when and what kind of maintenance is needed),

equipment selection (determining the kind of tools and equipment needed to do a job), installation, etc. (see Table A1 for details). This data allows us to address several issues raised in prior literature, such as why immigrants are more often employed in hospitality.

Following Deming (2017), we focus on social and technical skills in our analysis. We compare the immigrants' prevalence in jobs with higher or lower demands for these two types of skills to native workers, and further analyse by gender. Since O\*NET offers rich and detailed data on occupations, its task measures are often merged with country-specific data sources, which are used to calculate the task content of jobs in countries other than the U.S. (Arias *et al.*, 2014, Goos *et al.*, 2014). However, this depends on the assumption that occupational demands in the U.S. and other countries are nearly identical. While the World Bank (2016) and other cross-national studies have applied the occupational typologies based on O\*NET to all countries worldwide, earlier comparative studies such as Handel (2012) and Cedefop (2013) assess the validity of using O\*NET to construct occupational measures in specific developed countries.

This combination of data allows us to examine both cross-sectional patterns and the temporal dynamics of labour-market segments exposed to structural change. We examine skills requirements and compare the skills structure of immigrants and natives in the three low-skilled sectors – hospitality, retail and construction – and trace labour-market dynamics in the presence of structural changes. All three sectors employ hundreds of thousands of people across hundreds of different jobs. In our descriptive statistics, we aggregate the level of skills from the job title level to the sector level, weighted by the number of people (in the sector) with a specific job.

The descriptive statistics provided below in Table 1 highlight that both immigrants and natives earn less in hospitality, on average, compared to their counterparts in retail and construction. Immigrants' salaries in hospitality are 18% lower than those of natives. Immigrants also have lower levels of education compared to natives in hospitality and construction, and the same level as natives in retail. Both immigrants and natives in hospitality are on average younger (32.8 and 38.8 years of age respectively) compared to employees in the other sectors. Around one-third of immigrants employed in hospitality have residence permits as students (35.1%), with a similar proportion in retail (41%). Seventy-two percent of immigrants employed in hospitality are men, compared to just 29% of native workers in the sector who are men. Immigrants employed in hospitality are more likely to have children.

[ INSERT TABLE 1 HERE ]

Correlation matrices in the Appendix provide insights regarding the sample average relationships between education, skills, demographic variables and salaries. Table A3 shows that gender correlates with technical (for men) and social (for women) skills requirements among jobs in all the three sectors studied. For example, the correlation between gender (men =1) and required level of technical skills in the hospitality sector is 0.55 for immigrants, indicating that immigrant men employed in hospitality are primarily found in jobs requiring a high level of technical skills. The correlation for social skills is negative (-0.42) for male immigrant workers in the hospitality sector. A much lower but still positive correlation (0.24) is observed for the required level of technical skills, and a negative correlation (-0.21) among native men employed in hospitality. The correlation between skill requirements and salaries in the hospitality sector (see Table A3 in the Appendix) shows social (technical) skill to be positively (negatively) correlated with salaries for both immigrant workers (0.15 and -0.23, respectively) and natives (0.14 and -0.22, respectively). The skewed histogram regarding the distribution of social and technical skill requirements in the jobs of immigrant vs native workers in hospitality suggests that immigrants are primarily working in jobs requiring a higher level of technical skills, while natives are primarily working in jobs requiring lower levels of technical skills. Table A2 also shows that social and technical skills are strong substitutes in the hospitality sector for both immigrants (correlation coefficient -0.71) and natives (-0.57). Table A2 also suggests that male immigrants aged 30–40 and younger native women are overrepresented in hospitality.

## 4. Results

### *Descriptive results*

Figure 1 shows boxplots of average salaries (in natural logarithm) and education levels (in number of years) in jobs held by immigrant and native workers across the three sectors: hospitality, construction and retail. The left-hand boxplots show that log-salaries (on the vertical axis) in hospitality are lower on average among immigrants compared to the two other sectors, and the lowest levels of distribution reach very low salaries. The right-hand boxplots show that the level of education (in years on the vertical axis) in hospitality is lower compared to natives in the same sector, but comparable to the level of education in construction. Figure 1 thus illustrates the puzzle that immigrants with similar or slightly lower levels of education tend to earn much less than natives when employed in the hospitality sector.

[ INSERT FIGURE 1 HERE ]

In the following description, we focus first on four main groups of skill requirements: social skills, technical skills, intellectual skills and resource-management skills (see Table A1 in Appendix for definitions). The composite skill levels across individual jobs within each of the three sectors are shown on the vertical axis in Figures 2 and 3, with separate boxplots for native and immigrant workers. We see in both figures that the boxplots are equally distributed in the retail and construction sectors for social skills requirements. In the hospitality sector, however, Figure 2 shows clear differences between immigrant workers sorting into hospitality jobs with higher requirements for technical skills and native workers being found slightly more often in jobs with higher requirements for social skills. Neither retail nor construction exhibit such obvious differences, although immigrants employed in construction tend to have jobs with slightly lower social-skill requirements more often than natives.

[ INSERT FIGURE 2 HERE ]

To probe more deeply into the differences among skill distribution in jobs held by natives and immigrant workers in terms of social and technical skills – the skill types highlighted as being differentially exposed to automation – we next present a set of more detailed measures of social and technical skills in the same three sectors, shown in Figures 3 and 4.

Figure 3 shows four specific skills included within the overall category of social skills (see Table A1 in Appendix for definition). Immigrant workers are here found more in jobs requiring lower levels of social skills (service orientation, social perceptiveness, negotiation, persuasion). These are also the types of skills frequently highlighted as important in person-to-person interaction and service-intensive work, such as in hospitality (Clark, 1993; Ivanov, 2020). Figure 3 thus illustrates the level of social skills required for jobs in hospitality occupied by immigrant and native workers. We clearly see that immigrants in the hospitality sector are sorted into jobs with higher requirements for technical skills, while natives lean towards jobs with higher requirements for social skills – which is not the case in either construction or retail.

[ INSERT FIGURE 3 HERE ]

Taken together, the boxplots in Figure 3 highlight the stark differences in ethnically based job segregation in the three sectors studied, where immigrants and natives are found in jobs with very distinct skills requirements in the hospitality sector, but not in the construction or retail sectors.

More detailed specification of technical skills (see Table A1) shows even more sharply that immigrants are sorting into jobs requiring higher levels of technical skills, such as equipment installation and maintenance (see Table A1 in Appendix for definitions).

Overall, our descriptive results indicate that immigrant workers in the service-intensive hospitality sector are overrepresented in jobs requiring hard technical (routine) skills, while native workers in the same sector are more often found in jobs with higher requirements for social skills. Since routine-based technical skills related to machinery operations, monitoring and control are the skills most susceptible to automation, this makes immigrants' employment in the hospitality sector more vulnerable.

### ***Individual-level analyses of human capital and demographics among hospitality workers***

We next turn to analysing the individual-level predictors of working in the hospitality sector, focusing specifically on human capital and demographics, and skills measures. Employers demand various types of skills, and individual workers possess various skills based on their education, training and experience; salaries function as the price mechanism. Systematic differences between native workers and various immigrant groups are thus attributed to variations in their level of basic and country-specific human capital. Labour-market ethnic segmentation explains why some ethnic groups of immigrants are overrepresented in specific sectors or niches. Distinguishing between job tasks and job skills allows for a deeper understanding of how immigrant workers can perform different tasks in different sectors by applying the same skills, or what skills they need to develop in order to carry out a specific task.

We next analyse individual-level predictors of working in the hospitality sector, focusing specifically on human capital and demographics, and skills measures. Table A2 shows that immigrants of various ethnic backgrounds (approximated by country of origin) are unequally distributed across the three low-skilled sectors. The hospitality sector is dominated by ethnic groups from Turkey (12.63%) and Iraq (10.58%), followed by Thailand (6.87%), China (5.06%) and Iran (4.42%) (as percentages of all immigrants employed in the sector). The largest ethnic groups in retail are immigrants from Iraq (10.57%), Finland (8.51%) and former Yugoslavia (5.89%). The construction sector is dominated by immigrants from Poland (20.81%), followed by Finland (14.12%) and Lithuania and Latvia (4.31%).

We now take a closer look at the relationships between the skill levels required by jobs, individual level of education and country of origin, as independent variables, and the likelihood of working in hospitality. To do so, we present the results of a set of logit regressions providing deeper insights regarding (1) the likelihood of being employed in hospitality as a function of

individual workers' characteristics and skill requirements; (2) the likelihood of entering new employment in each of the three sectors; and (3) earnings regression for workers in each of the three sectors.

[ INSERT TABLE 2 HERE ]

***Likelihood of being employed in hospitality***

Table 2 shows the results of the logit regression model of being employed in hospitality and the two comparative sectors for both immigrants and natives. Longer education is positively associated with the likelihood of being employed in retail, but negatively with the likelihood of being employed in hospitality. Younger immigrants and natives are more likely than older ones to be employed in hospitality, as suggested by negative coefficients for age (-0.017 and -0.030 respectively), similar to retail. Positive coefficients for the dummy variables of workers born in Turkey, Syria, Iraq and other Middle Eastern countries support the observation in the descriptive statistics that immigrants from these countries are more likely to work in the hospitality sector (results omitted for brevity but available upon request).

Looking specifically at the skills variables, we find that social skills are important characteristics of jobs in the hospitality and retail sectors (positive coefficients), while technical skills are less important (negative coefficients). Both technical and social skills are positively correlated with the probability of being employed in the hospitality sector for immigrants, which is not the case for other sectors. Technical skills negatively influence the chances of being in the hospitality sector among natives (but not construction or retail). Even though natives are sorted mostly into jobs requiring social skills – the higher-potential jobs, according to SBTC – the demographic structure of native workers in hospitality mostly consists of relatively young women. Immigrant workers in hospitality, however, are more often men of all working ages, employed in jobs requiring mostly manual technical skills.

***Likelihood of taking up a new job in hospitality***

Table 3 shows the probability of immigrants taking up a new job in hospitality and the two other sectors in 2013. We see in Table 3 that individuals' level of education level beyond elementary school (omitted baseline category) is negatively associated with entry to the hospitality and retail sectors. Secondary and 'unknown' education are positively associated with entry to construction (which is typical for low-skilled sectors).

[ INSERT TABLE 3 HERE ]

Table 3 also shows that individuals' age is negatively associated with starting a job in hospitality and retail, but positively associated with a construction role, which confirms that younger immigrants find jobs in hospitality more often. Positive coefficients for gender suggest that male immigrants dominate all three sectors considered (the coefficient is negative for hospitality when comparing immigrants and natives). Negative coefficients for the dummy variable *Stockholm* suggest that immigrants are less likely to start their job in hospitality in the greater Stockholm area (the primary agglomeration district) than in the rest of the country. Positive coefficients for *Social skills* and negative ones for *Technical skills* in the regression model for natives suggest that they are more likely to take a job in hospitality that requires social skills, whereas the same coefficients for immigrants suggests they are more likely to take a job in hospitality requiring technical skills.

### ***Earnings stratification***

It has been shown that social skills generate more earnings increases over time compared to technical skills (Heckman & Kautz, 2012; Deming, 2017). Therefore, we next analyse earnings among hospitality workers based on the type of skills required in their jobs, while also probing the existence of ethnically based earnings stratification. We compare immigrants' earnings to natives' in the three comparable sectors in terms of salaries. Like Fang and Heywood (2006), we stratify results by ethnic group (country of birth). Table 4 shows the earnings regressions of individual hospitality workers during 2013, including skill measures for the jobs they do.

Results reveal that education (measured in number of years' study) is positively associated with salaries for both natives and immigrants in the hospitality sector, just as it is in retail and construction. Doing a job that demands more technical skills holds back salary earnings (coefficients of -0.038 for immigrants and -0.023 for natives). At the same time, detailed regression results show a positive association with earnings for some social skills, such as social perceptiveness in hospitality and retail, but a negative association in construction (results omitted for brevity but available on request).

In summary, the results from earnings regressions among all individuals (separated into natives and immigrants) employed in hospitality, construction and retail in Sweden show the following key findings. First, when we classify the jobs into the three groups of *routine*, *non-routine cognitive* and *non-routine manual*, we see that natives are more likely to be found in non-routine jobs requiring social skills, while immigrants are more likely to be found in routine jobs requiring technical skills in hospitality (see Table A5 in Appendix). Salaries are negatively associated with

technical skills in hospitality. Second, we found an explicit ethnic segmentation in hospitality with prevailing immigrants from Turkey and the Middle East, while immigrants from Poland and Lithuania dominate among immigrants in the construction sector.

[ INSERT TABLE 4 HERE ]

## 5. Discussion

In this paper, we set out to solve the puzzle of why immigrant workers are more likely to find jobs in hospitality than in similar low-skilled service sectors such as retail and construction. By using detailed data on the skill characteristics of jobs across the three sectors, we explore the extent to which these differences are driven by differential requirements of ‘soft’ and ‘hard’ skills (Heckman & Kautz, 2012) or by co-ethnic sorting. Our work takes an important first step towards integrating research on skill-biased technological change (SBTC) (Autor & Dorn, 2013; Autor, 2015; Goos et al., 2014) with research on labour-market segmentation (Piore, 1983; Dickens & Lang, 1988; McGovern, 2007) by examining the probability of entering jobs requiring either social or technical skills in relation to salary differences, and by looking more deeply into ethnic sorting of jobs in the three selected low-skilled sectors.

We show that the empirical trend of immigrants being found more often in hospitality than in retail and construction can be explained by processes of job polarisation and labour-market ethnic segmentation. Hospitality jobs involve more tasks that are manual but codifiable. Further, there is a relatively strong co-ethnic segmentation of workers of similar national background within hospitality as well as in the construction section. In the retail sector, most jobs are non-routine manual or non-routine cognitive roles at lower risk of automation, which are occupied by natives. The workforce composition in the three service sectors we examined differs starkly in terms of workers’ ethnicity and immigration status (economic migrant, former student, kinship migrant or refugee). It thus seems that low-skill service sectors differ in skills demand and ethnic structures. In hospitality, it seems that immigrants frequently enter precarious, co-ethnically related jobs that are at high risk of automation.

We find that natives are more often sorted into non-routine cognitive jobs requiring social skills or non-routine manual jobs. If social skills are increasingly valuable in low- and middle-skilled jobs due to automatization as SBTC theory suggests, then language seems to play an increasingly important role among such skills. Importantly, however, SBTC’s prediction that mid- and low-skill routine jobs are disappearing due to technological substitution (Goos *et al.*, 2014; Ivanov, 2020) is not borne out by our findings. Instead, in hospitality, such roles are filled by



immigrants, who predominantly find routine jobs mostly requiring technical skills. This is not the case in the construction or retail sectors.

Together, our findings lend support to the notion of what we call ‘skill-biased ethnic segmentation’. We use the SBTC argument to shed light on the routine-based, risky jobs that immigrants take on in hospitality, and develop theory based on ethnic segmentation to explain why immigrants still turn to those jobs in some sectors, based on social-ethnic ties (McGovern, 2007), but not in others. The SBTC thesis aptly explains the polarisation of jobs occupied by natives: increasing employment in high-skilled non-routine cognitive and low-skilled non-routine manual positions, alongside fewer mid-skilled routine jobs, particularly in the hospitality sector. However, SBTC theory fails to account for the increasing employment of immigrants in mid-skilled routine jobs, as we find no similar polarisation among immigrants and natives into technical and social-skills jobs in the retail sector. In construction, immigrants fulfil manual non-routine technical skills jobs. These findings explain imperfect immigrant-native substitutions in the labour market, and support the notion of an increasingly large ‘technological knowledge biases’ due to immigration (Gil *et al.*, 2020).

Our analysis shows that immigrants are sorted away from jobs requiring social skills – a finding that can be explained by their weaker language abilities relevant to the local labor market (Dustmann, 1999). Immigrants from some regions are sorted into specific sectors, which is partly explained by ethnic labour-market segmentation of immigrants (Noel, 1968; Esser, 2010; Haller, Eder & Stolz, 2016). Ethnic sorting of immigrants has also been previously reported for Norway (Friberg & Midtbøen, 2018, 2019) and the UK (Ram & Smallbone, 2002; Thiel, 2010; Vershinina *et al.*, 2018). Native workers are less represented in low-skilled routine jobs in general and in hospitality in particular, which can be explained by the lower salaries and status such roles provide (Leontaridi, 1998). Immigrants, in contrast, are overrepresented in low-skilled routine and non-routine jobs, either because they are less picky due to their limited options in host-country labour markets (Friberg & Midtbøen, 2018) or because they hold a stronger ‘work ethic’ (Piore, 1979; Wills *et al.*, 2009).

However, that social structure also opens up opportunities for network-based recruitment in labour-market segments that are socio-ethnically segregated. Employers might also use their employees as sources of referrals and networking contacts to reduce the costs of finding good matches (Holzer, 1987; Montgomery, 1991). Such ethnicity-based job sorting cannot readily be explained by job polarisation, but can be explained by theories of network-based recruitment and ethnic ‘niche formations’ in labour-market segments, whereby co-ethnic migrants sort into specific sectors (Friberg & Midtbøen, 2019; Waldinger, 2000). Various labour-market niches thus

tend to be structured hierarchically in ways that may coincide with the social status of immigrant groups, resulting in divisions of labour along ethnic lines. Earnings for some ethnic groups, such as immigrants from Lithuania and Poland, improved after those countries' accession to the EU; and our results in this regard are similar to those previously reported (Barrett, McGuinness & O'Brien, 2012). Employees might also be sorted into different firms based on their language skills. A number of studies (e.g., García-Pérez, 2009; Hellerstein & Neumark, 2008; Wilson & Portes, 1980) have previously indicated that employers prefer to recruit employees who speak the same language as each other. This implies that immigrants are recruited by firms where fluency in the native language is less important, or where the majority of the employees speak their own language.

Yet, labour-market segmentation theory alone does not explain how and why immigrants are initially sorted into hospitality but not into other low-skilled sectors. To solve this puzzle, it helps to understand the effect of substituting natives with immigrants in precarious routine jobs. Our study thus sheds light on the mechanism of sorting migrant workers into low-skilled sectors by considering both segmentation and skill-biased technological change. Immigrants enter jobs that demand manual routine technical skills, which are easy to automate, while natives turn to jobs that depend on 'flexible interpersonal communication' (Autor & Dorn, 2013: 1590) in hospitality, which is a less codifiable (Ivanov, 2020) and therefore more sustainable skill. In this case, medium-skill jobs are not disappearing because of technological substitution, as predicted by the SBTC argument (Autor & Dorn, 2013), but are instead occupied by immigrants.

## 6. Conclusions

The findings presented in this paper suggest that skill-biased technological change, together with ethnic segmentation theories, can provide insights into the patterns of immigrants sorting into jobs requiring technical skills and into sectors where their compatriots already work. The tendency can be described as skill-biased ethnic stratification into sectors.

We examine the experiences of immigrants in three low-skilled sectors – hospitality, retail and construction – regarding their chances of finding employment and their earnings once in post. Hospitality, by providing entry-level jobs, employs most immigrants – as previous studies showed (Åslund *et al.*, 2014; Daunfeldt *et al.*, 2019). We looked more deeply into the trend to understand which skills are mostly required in hospitality and not in other low-skill sectors. We found that immigrants are more often employed in hospitality to do routine jobs requiring technical skills. Immigrant men from Turkey and the Middle East have a higher probability of finding employment in the hospitality sector – even though SBTC theory predicts that the

technical skills required in these roles are highly codifiable and at risk of automation, which makes these jobs more precarious for immigrants. Hospitality also provides jobs for younger native women in jobs requiring social skills, even though they earn less compared to natives in other sectors. We also find the hospitality sector to be ethnically dominated by immigrants from Turkey and Middle Eastern countries, while construction is dominated by immigrants from Poland and the Baltic states, showing clear ethnic sorting between sectors.

We distinguish two opposing effects that influence the employment of immigrants and can explain immigrants' labour-market integration into low-skilled sectors. First, according to SBTC theory, automation erodes mid-skilled routine jobs requiring codifiable technical skills, leaving non-routine manual and non-routine cognitive jobs available. As immigrants cannot offer the high level of social skills required – such as interpersonal communication in the host language – they turn to non-routine manual jobs with lower social skills requirements in retail and construction. In the hospitality sector, however, immigrants are primarily sorted into routine jobs requiring a higher level of technical skills. We find that natives occupy non-routine cognitive jobs in hospitality that require better social skills, but it is mostly younger native women who are employed in this sector. Second, labour-market segmentation theory suggests that immigrants are segmented within sectors by ethnicity when immigrant business owners or managers employ co-ethnics. We study immigrants' distribution within hospitality, construction and retail by their country of origin, and find strong patterns of compatriots sorting into the same sectors.

Overall, this study has implications for both research on the ethnic segmentation of labour and research on how technology affects labour markets. The sorting of immigrants from specific birth countries into manual non-routine jobs in some specific sectors while not others cannot be explained purely by ethnic segmentation, but by the increasing importance of non-routine jobs requiring social skills across the labour market. This suggests interactive effects of skill-biased technological change and how immigrants from different origin are differentially sorted into labour market sectors, a type of 'skill-biased ethnic segmentation'. Future research is needed to examine the skill composition of jobs among immigrants and natives in other European nations and its institutional contingencies. Can on-the-job training like that prevalent in Germany shape these processes? Does skill-biased ethnic segmentation documented in welfare states like the Scandinavian countries differ across less regulated labour markets like the United Kingdom or Ireland, or in more corporatist labour markets in Central Europe?

The study also has implications for research on skill-biased technological change and the precariousness of low-skilled labour overall. If immigrants are indeed increasingly sorted into routine jobs requiring technical skills compared to native workers, worker ethnicity needs to be

accounted for also when gauging the risks of outsourcing or automation in different labour market segments (Graetz 2020). Here, policy makers and specifically active labour market policy may play an important role in facilitate migrants' labour-market integration and potentially also decreasing their sorting into the most precarious types of jobs. For example, the European Commission has a specific goal to reduce labour-market segmentation and promote inclusive and anti-discriminatory labour markets (European Commission, 2017). Our study suggests that programmes aimed at helping immigrants acquire new skills also need to consider the acquisition of interpersonal skills, in addition to formal training and education. Since unionization rates are comparatively lower among recent migrants, policies for labour market integration may also benefit from involving trade unions in the integration process (Alberti *et al.*, 2013). The increasing rates of migration globally and to Western Europe specifically during the latest decades are not likely to decrease, rather on the contrary. Migrant workers also fill important vacancies in European countries dominated by aging domestic workforces. More research is needed to examine how migration trends affect the ethnic segmentation of jobs, and to what extent institutional arrangements or active labour market policies may counter the trend documented in the current paper towards an increasingly skill-biased ethnic segmentation of labour.

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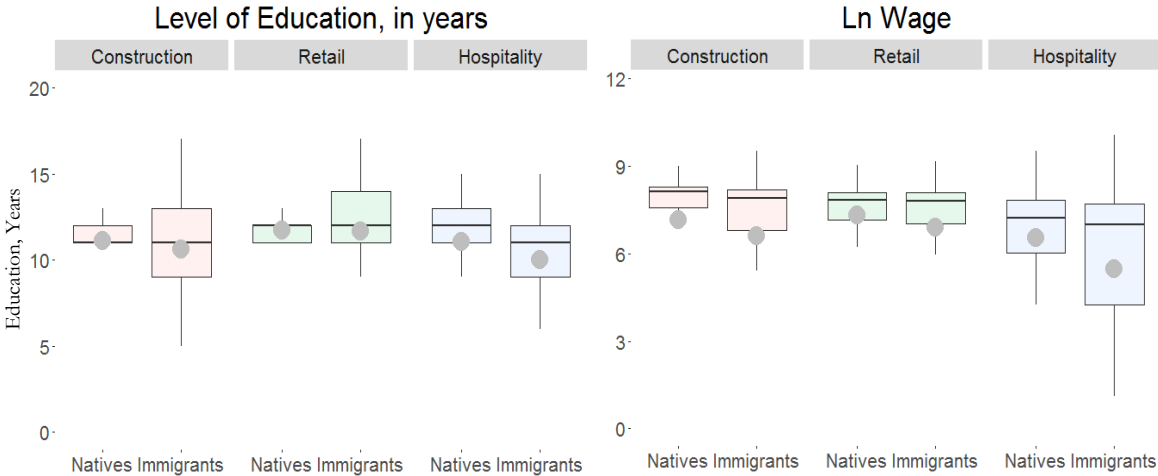
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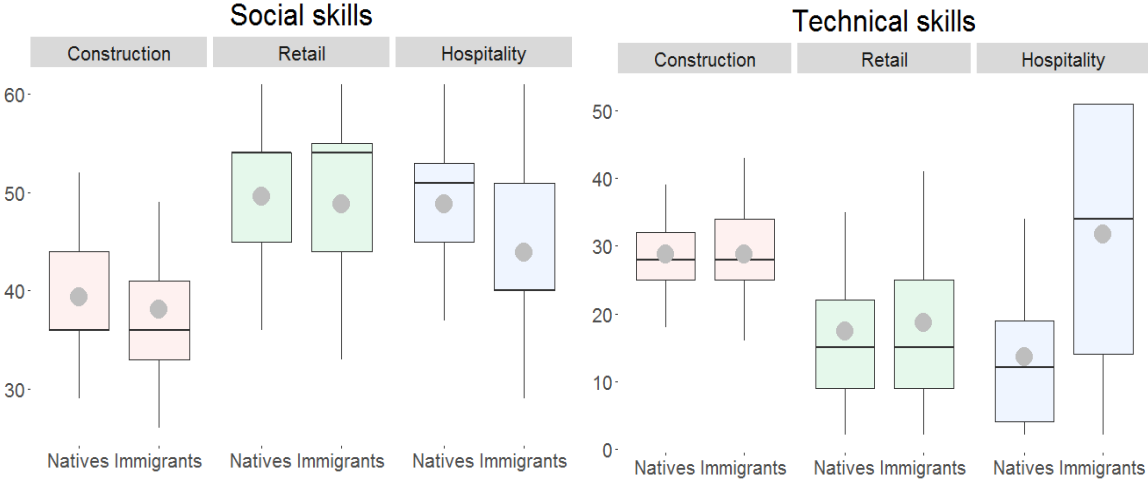


**Figure 1. Salaries and education: immigrants vs natives (construction, retail and hospitality, 2013)**



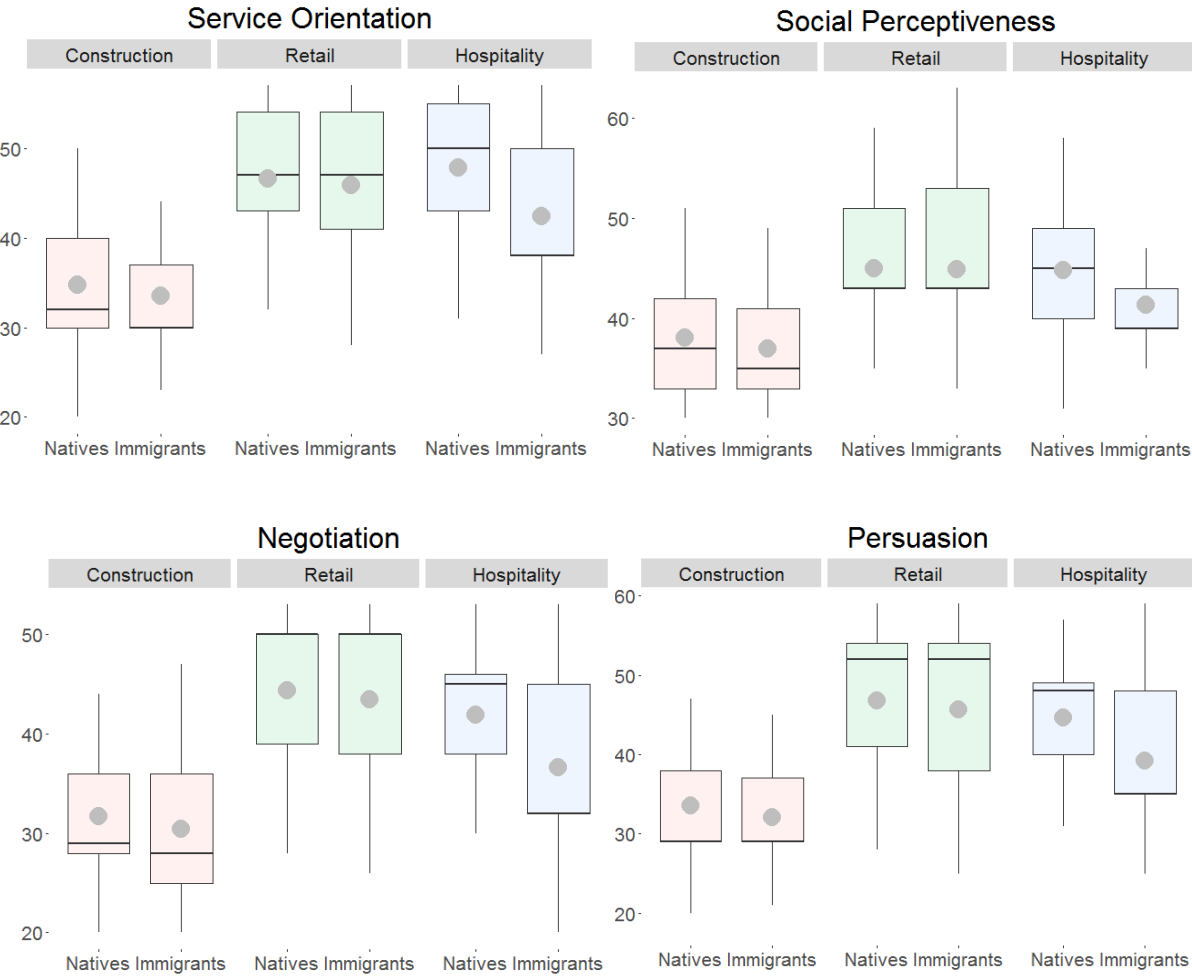
Note: Number of observations: Construction (Natives: 144,174; Immigrants: 13,084), Retail (Natives: 281,909; Immigrants: 35,830), Hospitality (Natives: 22,526; Immigrants: 8,288).

**Figure 2. Skill requirements in jobs: Immigrants vs natives in construction, retail and hospitality, 2013**



Note: Number of observations: Construction (Natives: 144,174; Immigrants: 13,084), Retail (Natives: 281,909; Immigrants: 35,830), Hospitality (Natives: 22,526; Immigrants: 8,288).

Figure 3. Social skills in jobs: Immigrants vs natives in construction, retail and hospitality, 2013



Note: Number of observations: Construction (Natives: 144,174; Immigrants: 13,084), Retail (Natives: 281,909; Immigrants: 35,830), Hospitality (Natives: 22,526; Immigrants: 8,288).

**Table 1. Descriptive statistics**

	Hospitality		Construction		Retail	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
	N=22,526	N=8,288	N=144,174	N=13,084	N=281,909	N=35,830
Salary, Swedish krona per year	157,000	128,400	300,800	245,500	250,400	241,200
Education level, number of years	11.1 (3.66)	10.00 (3.90)	11.1 (2.10)	10.6 (4.10)	11.7 (2.26)	11.7 (3.21)
Social skills level	48.8 (6.29)	43.9 (6.57)	39.4 (5.77)	38.1 (5.60)	49.6 (7.17)	48.9 (7.93)
Technical skills level	13.6 (10.6)	31.7 (19.5)	28.9 (9.11)	28.8 (8.74)	17.4 (12.0)	18.6 (12.5)
Age, years	32.8 (14.3)	38.8 (11.3)	43.1 (13.9)	42.6 (11.9)	37.5 (14.1)	39.9 (12.4)
Gender (Male = 1)	29%	72%	93 %	92%	47%	54%
Number of children	0.60 (0.93)	0.91 (1.16)	0.63 (0.96)	0.69 (1.00)	0.60 (0.92)	0.77 (1.05)
Reason for Residence Permit:						
for study		2,361 (35.1%)		1,421 (18.3%)		10,000 (41.3%)
for family		2,010 (29.9%)		1,897 (24.4%)		7,672 (31.7%)
refugee		1,454 (21.6%)		1,561 (20.1%)		4,434 (18.3%)
for work		893 (13.3%)		2,892 (37.2%)		2,084 (8.62%)
other categories		7,718 (18.9%)		7,771 (40.6%)		24,190 (32.5%)

**Table 2. Logit models: likelihood of being employed in hospitality, construction and retail, 2013**

	Hospitality		Construction		Retail	
	Immigrants	Natives	Immigrants	Natives	Immigrants	Natives
Education level, years	-0.072*** (0.003)	-0.117*** (0.002)	-0.004 (0.003)	-0.001 (0.002)	0.053*** (0.003)	0.045*** (0.002)
Social skills level	0.035*** (0.002)	-0.036*** (0.001)	-0.164*** (0.002)	-0.148*** (0.001)	0.104*** (0.002)	0.132*** (0.001)
Technical skills level	0.064*** (0.001)	-0.071*** (0.001)	-0.030*** (0.001)	0.001** (0.0004)	-0.013*** (0.001)	0.005*** (0.0004)
Stockholm (1/0)	-0.178*** (0.027)	0.057*** (0.016)	0.301*** (0.026)	-0.054*** (0.010)	-0.114*** (0.022)	0.032*** (0.009)
Gothenburg (1/0)	-0.092** (0.040)	0.108*** (0.022)	0.004 (0.039)	-0.065*** (0.013)	0.067** (0.033)	0.026** (0.012)
Gender (1/0)	-0.479*** (0.033)	-0.877*** (0.017)	1.787*** (0.039)	1.944*** (0.013)	-0.656*** (0.026)	-1.010*** (0.009)
Age, years	-0.017*** (0.001)	-0.030*** (0.001)	0.015*** (0.001)	0.019*** (0.0003)	0.001 (0.001)	-0.007*** (0.0003)
Constant	-3.148*** (0.131)	2.745*** (0.075)	4.471*** (0.108)	3.608*** (0.042)	-3.930*** (0.097)	-5.093*** (0.038)
Pseudo R <sup>2</sup> (McFadden)	0.105	0.107	0.211	0.356	0.282	0.246
Observations	<b>57,202</b>	<b>448,609</b>	<b>57,202</b>	<b>448,609</b>	<b>57,202</b>	<b>448,609</b>
Log Likelihood	-21,180.84	-79,734.89	-22,084.2	-181,547.7	-29,816.65	-22,3061.5
Akaike Inf. Crit.	42,377.68	159,485.8	44,184.4	363,111.5	59,649.3	446,139

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 3. Logit models: likelihood of taking up a new job in hospitality, 2013**

	Entry Hospitality		Entry Construction		Entry Retail	
	Immigrants	Natives	Immigrants	Natives	Immigrants	Natives
Education level, years	-0.073*** (0.006)	-0.178*** (0.003)	-0.020*** (0.006)	-0.089*** (0.003)	0.005 (0.004)	-0.062*** (0.002)
Social skills	-0.016*** (0.004)	-0.043*** (0.002)	-0.099*** (0.003)	-0.055*** (0.001)	0.025*** (0.003)	0.020*** (0.001)
Technical skills	0.009*** (0.002)	-0.045*** (0.002)	-0.013*** (0.002)	0.009*** (0.001)	-0.014*** (0.002)	-0.010*** (0.001)
Stockholm (1/0)	-0.234*** (0.054)	-0.041 (0.027)	0.107** (0.051)	0.022 (0.021)	-0.075** (0.033)	0.183*** (0.013)
Gothenburg (1/0)	-0.199** (0.082)	-0.038 (0.036)	0.008 (0.079)	-0.055* (0.028)	-0.104** (0.050)	0.025 (0.018)
Gender (1/0)	-0.511*** (0.061)	-0.948*** (0.028)	0.798*** (0.078)	0.807*** (0.028)	-0.060* (0.034)	-0.286*** (0.013)
Age, years	-0.038*** (0.002)	-0.059*** (0.001)	-0.015*** (0.002)	-0.020*** (0.001)	-0.039*** (0.001)	-0.048*** (0.0005)
Constant	-0.318 (0.236)	3.221*** (0.118)	1.272*** (0.212)	-0.131 (0.084)	-1.787*** (0.163)	-0.760*** (0.064)
Observations	57,202	448,609	57,202	448,609	57,202	448,609
Pseudo R <sup>2</sup> (McFadden)	0.038	0.151	0.089	0.076	0.050	0.067
Log Likel.	-7,323.595	-35,085.760	-7,469.074	-57,071.050	-15,807.350	-112,031.700
Akaike. Crit.	14,663.190	70,187.530	14,954.150	114,158.100	31,630.690	224,079.400

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 4: Earnings regressions including skill level measures on current job in hospitality, construction and retail sectors; natives and immigrants, 2013**

Dependent Variable: Salary (Ln)	<i>Hospitality</i>		<i>Construction</i>		<i>Retail</i>	
	Immigrants	Natives	Immigrants	Natives	Immigrants	Natives
Education, years	0.001 (0.009)	0.127*** (0.004)	0.014** (0.006)	0.121*** (0.003)	0.044*** (0.004)	0.079*** (0.001)
Age	0.044*** (0.017)	0.202*** (0.005)	0.083*** (0.014)	0.175*** (0.003)	0.148*** (0.006)	0.219*** (0.001)
I(age2)	-0.001*** (0.0002)	-0.003*** (0.0001)	-0.001*** (0.0002)	-0.002*** (0.00003)	-0.002*** (0.0001)	-0.003*** (0.00002)
Gender (Male = 1)	0.021 (0.085)	-0.040 (0.025)	-0.024 (0.098)	0.064** (0.026)	-0.272*** (0.027)	0.231*** (0.006)
Stockholm (1/0)	0.608*** (0.074)	0.205*** (0.027)	0.301*** (0.059)	-0.091*** (0.015)	0.299*** (0.029)	0.127*** (0.007)
Malmö (1/0)	-0.178 (0.115)	-0.122*** (0.037)	-0.145* (0.082)	-0.045** (0.021)	0.027 (0.038)	-0.015* (0.009)
Gothenburg (1/0)	0.179* (0.104)	0.095*** (0.035)	0.246*** (0.086)	-0.034* (0.020)	0.041 (0.041)	0.047*** (0.009)
Social skills	-0.015** (0.007)	-0.002 (0.002)	0.056*** (0.005)	0.011*** (0.001)	-0.025*** (0.002)	0.004*** (0.0005)
Technical skills	-0.038*** (0.003)	-0.020*** (0.001)	0.002 (0.003)	-0.010*** (0.001)	-0.001 (0.001)	-0.0001 (0.0003)
Constant	7.252*** (0.487)	2.217*** (0.141)	2.876*** (0.391)	2.832*** (0.084)	5.438*** (0.173)	2.194*** (0.039)
Observations	8,288	22,526	13,084	144,174	35,830	281,909
Adjusted R2	0.102	0.264	0.028	0.092	0.068	0.149

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## APPENDIX

**Table A1: Skills descriptions<sup>3</sup>**

<b>O*NET skill</b>	<b>Description</b>
Social skills	Developed capacities used to work with people to achieve goals
Technical skills	Developed capacities used to design, set up, operate and correct malfunctions involving application of machines or technological systems
<b>Social skills</b>	
Negotiation	Bringing others together and trying to reconcile differences
Persuasion	Persuading others to change their minds or behaviour
Service orientation	Actively looking for ways to help people
Social perceptiveness	Being aware of others' reactions and understanding why they react as they do
<b>Technical skills</b>	
Equipment maintenance	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed
Installation	Installing equipment, machines, wiring or programs to meet specifications
Operation control	Controlling operations of equipment or systems
Quality control analysis	Conducting tests and inspections of products, services or processes to evaluate quality or performance
Repairing	Repairing machines or systems using the required tools
Troubleshooting	Determining causes of operating errors and deciding what to do about them

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<sup>3</sup> National Center for O\*NET Development. <http://www.onetcenter.org>

**Figure A1. Technical skills in jobs: Immigrants vs natives in construction, retail and hospitality, 2013**



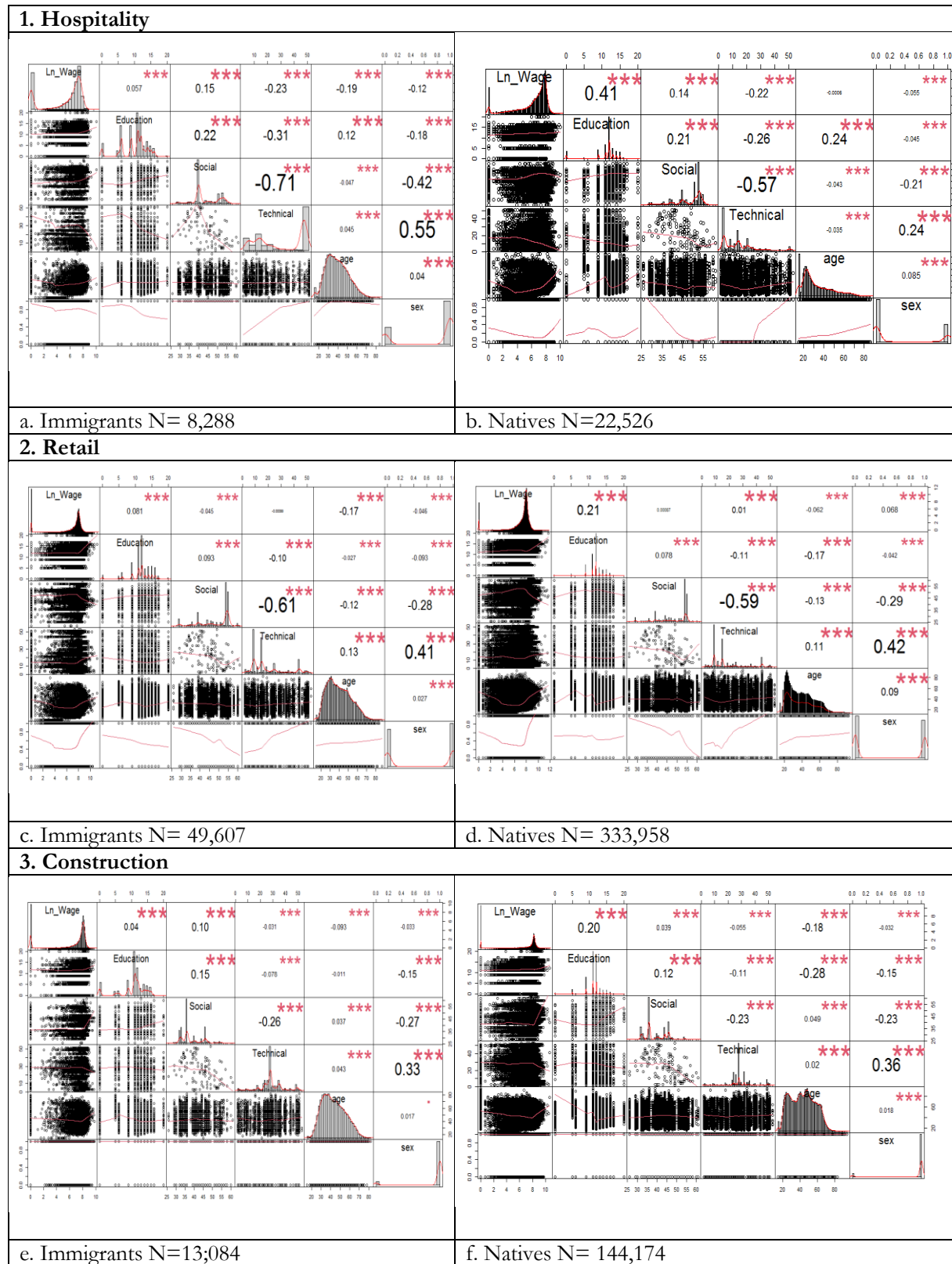
Note: Number of observations: Construction (Natives: 144,174; Immigrants: 13,084), Retail (Natives: 281,909; Immigrants: 35,830), Hospitality (Natives: 22,526; Immigrants: 8,288).



**Table A2. Ethnic composition of immigrants employed in hospitality (N=64,904), retail (N=73,717) and construction (N=34,285), 2013**

<b>Hospitality sector</b>		% sector employees	Total number in Sweden	% employees/ total number (age 20-70)
Turkey	8,388	12.63%	38,754	21.64%
Iraq	7,031	10.58%	98,814	7.12%
Thailand	4,565	6.87%	27,744	16.45%
China	3,360	5.06%	20,814	16.14%
Iran	2,935	4.42%	57,615	5.09%
Syria	2,912	4.38%	22,548	12.91%
Lebanon	2,185	3.29%	22,717	9.62%
Vietnam / Cambodia	2,144	3.23%	12,816	16.73%
Former Yugoslavia	1,969	2.96%	55,127	3.57%
Poland	1,733	2.61%	59,167	2.93%
Africa	1,612	2.43%	25,946	6.21%
<b>Total:</b>	64,904	100.00%		
<b>Retail sector</b>				
Iraq	7,790	10.57%	98,814	7.88%
Finland	6,272	8.51%	92,991	6.74%
Former Yugoslavia	4,344	5.89%	55,127	7.88%
Bosnia & Hercegovina	4,328	5.87%	48,961	8.84%
Iran	4,134	5.61%	57,615	7.18%
Poland	4,109	5.57%	59,167	6.94%
Turkey	2,597	3.52%	38,754	6.70%
Lebanon	2,221	3.01%	22,717	9.78%
Norway	2,145	2.91%	23,854	8.99%
Denmark	1,910	2.59%	26,272	7.27%
Germany	1,861	2.52%	25,739	7.23%
Syria	1,681	2.28%	22,548	7.46%
<b>Total:</b>	73,717	100.00%		
<b>Construction sector</b>				
Poland	7,135	20.81%	59,167	12.06%
Finland	4,840	14.12%	92,991	5.20%
Lithuania/Latvia	1,478	4.31%	11,110	13.30%
Bosnia & Hercegovina	1,423	4.15%	48,961	2.91%
Yugoslavia	1,318	3.84%	55,127	2.39%
Romania	1,182	3.45%	17,907	6.60%
Serbia/Albania	1,063	3.10%	16,141	6.59%
Former Soviet Union	990	2.89%	20,175	4.91%
Germany	969	2.83%	25,739	3.76%
Iraq	943	2.75%	98,814	0.95%
Chile	851	2.48%	24,343	3.50%
Denmark	832	2.43%	26,272	3.17%
<b>Total:</b>	34,285	100.00%		

**Table A3. Correlations matrixes for main variables, separately for hospitality, retail and construction sectors (2013)**



**Table A4. Natives and immigrants in routine vs non-routine jobs in hospitality, construction and retail, 2013**

	Hospitality				Construction				Retail			
	Natives		Immigrants		Natives		Immigrants		Natives		Immigrants	
<b>Non-routine cognitive</b>	2,091	0.10	365	0.04	27,480	0.19	1,925	0.15	40,881	0.15	5834	0.16
<b>Routine</b>	8,953	0.43	5,562	<b>0.68</b>	36,322	0.25	3,242	0.25	54,133	0.19	6496	0.18
<b>Non-routine manual</b>	9,672	0.47	2,234	0.27	79,515	0.55	7,892	0.60	184,169	0.66	23365	0.65
Total	20,716	1.00	8,161	1.00	143,317	1.00	13,059	1.00	279,183	1.00	35695	1.00

**Table A5. Distribution of jobs in the sample: immigrants; hospitality**

Jobs	ISCO-88	N	Share	
Electrical mechanics and fitters	7412	3,896	47.74%	<b>Routine</b>
Contact centre information clerks	4222	917	11.24%	<b>Non-routine Manual</b>
Shop sales assistants	5222	1,039	12.73%	<b>Non-routine Manual</b>
Shopkeepers	5221	270	3.31%	<b>Non-routine Manual</b>
Bookmakers, croupiers and related gaming workers	4211	255	3.12%	<b>Routine</b>
Manufacturing labourers not elsewhere classified	9320	147	1.80%	<b>Non-routine Manual</b>
Car, taxi and van drivers	8321	139	1.70%	<b>Non-routine Manual</b>
Bartenders	5132	123	1.51%	<b>Non-routine Manual</b>
Dispensing opticians	5224	113	1.38%	<b>Non-routine Manual</b>
Hairdressers	5141	108	1.32%	<b>Non-routine Manual</b>
Building caretakers	5152	97	1.19%	<b>Non-routine Manual</b>
Broadcasting and audio-visual technicians	3431	81	0.99%	<b>Routine</b>
Personal care workers in health services not elsewhere classified	5227	68	0.83%	<b>Non-routine Manual</b>
Music organisers	2330	66	0.81%	<b>Non-routine Cognitive</b>
Mechanical machinery assemblers	8211	58	0.71%	<b>Routine</b>
Managing directors and chief executives	2419	38	0.47%	<b>Non-routine Cognitive</b>
Gardeners, horticultural and nursery growers	6113	37	0.45%	<b>Routine</b>
Other artistic and cultural associate professionals	3433	36	0.44%	<b>Non-routine Cognitive</b>
Crop farm labourers	9210	36	0.44%	<b>Routine</b>
Insulation workers	7123	35	0.43%	<b>Routine</b>
Accountants	2411	31	0.38%	<b>Non-routine Cognitive</b>

**Table A6. Distribution of jobs in the sample: natives**

<b>Jobs</b>	<b>ISCO-88</b>	<b>N</b>	<b>Share</b>	
Enquiry clerks	4222	6,469	31.23%	<b>Routine</b>
Shop sales assistants	5223	3,080	14.87%	<b>Non-routine Manual</b>
Shop sales assistants	5222	1,627	7.85%	<b>Non-routine Manual</b>
Shopkeepers	5221	1,460	7.05%	<b>Non-routine Manual</b>
Bookmakers, croupiers and related gaming workers	4211	588	2.84%	<b>Routine</b>
Electrical mechanics and fitters	7412	537	2.59%	<b>Routine</b>
Personal care workers in health services not elsewhere classified	5227	432	2.09%	<b>Non-routine Manual</b>
Bartenders	5132	425	2.05%	<b>Non-routine Manual</b>
Hairdressers	5141	408	1.97%	<b>Non-routine Manual</b>
Secondary education teachers	2330	329	1.59%	<b>Non-routine Cognitive</b>
Building caretakers	5152	319	1.54%	<b>Non-routine Manual</b>
Photographers	3431	308	1.49%	<b>Non-routine Cognitive</b>
Service station attendants	5225	299	1.44%	<b>Non-routine Manual</b>
Hand packers	9320	283	1.37%	<b>Non-routine Manual</b>
Dispensing opticians	5224	249	1.20%	<b>Non-routine Manual</b>
Managing directors and chief executives	2419	246	1.19%	<b>Non-routine Cognitive</b>
Accountants	2411	222	1.07%	<b>Non-routine Cognitive</b>
Other artistic and cultural associate professionals	3433	216	1.04%	<b>Non-routine Cognitive</b>
Financial analysts	2413	199	0.96%	<b>Non-routine Cognitive</b>
Transport clerks	4223	191	0.92%	<b>Routine</b>
Construction supervisors	3121	148	0.71%	<b>Non-routine Cognitive</b>