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PERSISTENT LOW-SKILL TRAPS: A PROPENSITY
SCORE MATCHING STUDY ON OCCUPATIONAL
MOBILITY OF NATIVE AND MIGRANTS WORKERS
IN EMILIA-ROMAGNA, ITALY

MARIA GIOVANNA BOSCO, ELISA VALERIANI AND LINDA ARMANO

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Abstract

The study rigorously analyzes the occupational trajectories of foreign- and native-born workers in Italy's Emilia-Romagna region. Using a comprehensive administrative dataset spanning 2008-2015, we assess patterns of upward professional mobility and empirically test the widely discussed stepping-stone hypothesis by examining job transitions across skill levels. Our empirical findings reveal a persistent and significant disparity. Specifically, foreign workers have a substantially higher probability of remaining in low-skilled occupations, indicating limited upward mobility. We also separately analyze the stability of initial employment and the incidence of subsequent unemployment spells, revealing clear and quantifiable differences between the two cohorts. These results provide robust evidence for the existence of an ethnicity penalty and a low-skill penalty that systematically impede professional advancement within the regional labor market. This form of occupational segregation, differentiated by ethnic origin, is consistent with patterns observed in other Southern European and Asian economies.

KEYWORDS: Foreign workers, low-skill jobs, occupational mobility

JEL class.: J20, J21, J41

Addresses

Maria Giovanna Bosco: (corresponding author) E-mail address: m.g.bosco@univpm.it - Department of Management, Marche Polytechnic University, Italy. ORCID: 0000-0001-9144-0543. Scopus ID: 18133430000.

Elisa Valeriani: E-mail address: elisa.valeriani@unimore.it - Department of Law, University of Modena and Reggio-Emilia, Italy

Linda Armano: E-mail address: linda.armano@unive.it - Interconnected Nord-Est Innovation Ecosystem - Temporary Project Centre, Ca' Foscari University of Venice. ORCID: 0000-0002-2531-1302

Persistent Low-Skill Traps: A Propensity Score Matching Study on Occupational Mobility of Native and Migrants Workers in Emilia-Romagna, Italy

Maria Giovanna Bosco, Elisa Valeriani and Linda Armano

1 Introduction

Throughout the last three decades, advanced economies have witnessed a parallel increase in globalization and migration, with varying national approaches to migration flows. Northern European countries, alongside Canada and Australia, generally give precedence to the admission of highly skilled foreign workers, limit low-skilled immigration to temporary schemes, and tend to oppose large-scale regularization of undocumented immigrants (Liu-Farrer et al. 2021; Devitt, 2023; Tuckett, 2016; Baldwin-Edwards, 1998; Castles, 2006). In contrast, Southern European nations are characterized by immigration quotas, permanent low-skilled labor programs, substantial levels of irregular immigration, and periodic amnesty initiatives (Devitt, 2023; Baldwin Edwards 1998; Castles 2006; Finotelli and Sciortino 2009; Sciortino 2009; Pastore 2010; Salis 2012; Bonizzoni 2018; Boucher and Gest 2018; Colombo and Dalla-Zuanna 2019; Geddes and Pettrachin 2020; Cantalini et al. 2023). Historically, Italy, similar to Spain and Greece, has been a destination for low-skilled foreign labor (Chletsos and Roupakias, 2019). Research on Italy has examined the overall productivity contribution of foreign workers relative to native workers (Vittori et al. 2023; Casacchia and Polli, 2021), the reduced occupational mobility and higher unemployment probability associated with specific ethnic groups (Liu 2024; Avola and Piccitto, 2020; Avola et al. 2023), and the impact of foreign workers on firm performance (Brunello et al. 2020). Italy's limited attraction for highly skilled immigrants can be attributed to several factors, including the prevalence of traditional industries within its economic structure (De Benedictis, 2005; Larch, 2005), the lower returns on education for immigrants compared to native-born individuals (Bratti and Conti, 2018; Morad et al. 2021), and the reliance of local firms on low-skilled immigrant labor as a primary strategy for cost reduction (Vittori et al. 2023). Notably, Italy exhibits not only the lowest proportion of university-educated immigrants within the European Union (13%) but also the second-lowest percentage of native-born individuals with tertiary education (21%), surpassed only by Romania (19%) (Centro Studi Luca d'Agliano and Collegio Carlo Alberto, 7th Migration Observatory Report, 2023). Analyses of foreign workers' occupational trajectories in Italy at the national level reveal a tendency for these workers to be concentrated in low-skilled positions (Fellini and Guetto, 2019; Avola and Piccitto, 2020), often perceived as bottlenecks due to limited opportunities for upward career progression (Tuckett, 2016). This aligns with findings indicating that, conversely, educated immigrants are more likely to secure better employment and higher wages (Brücker et al. 2021) and

often tend to downgrade upon arrival and compete with native workers at lower occupational levels than expected by their educational attainment because of language barriers, information deficiencies and discrimination (Gentili and Mazzonna 2024; Oesch and Rodríguez Menés, 2011). It is also plausible that the socio-cultural context facilitates the accumulation of experience and skills. In such environments, even low-skilled jobs may serve as stepping-stones toward more specialized roles and higher wages (Mouw et al. 2024), in contrast to other contexts where such opportunities are scarce or suboptimal.

Given that international migration to Italy is predominantly low-skilled, its contribution to local innovation is minimal compared to internal migration (Pinate et al. 2023). Our study investigates the career paths of foreign workers in comparison to Italian workers, testing the stepping-stone hypothesis in relation to the contractually observed skill level within the Emilia-Romagna (ER) region for dependent employment between 2008 and 2015. The stepping-stone hypothesis, initially proposed by Booth et al. (2002), posits that while temporary jobs may be less desirable than permanent positions in terms of satisfaction, training, and wages, they can serve as pathways to permanent employment. The propensity score matching methodology is commonly employed to assess this hypothesis and has also been used to examine transitions from part-time to full-time work (Cai et al., 2014), with consideration of gender dimensions (Bosco and Valeriani, 2023) across various countries and contract types (Autor and Houseman 2010; Addison et al. 2015; Jaramillo Baanante et al. 2023; Bosco and Valeriani 2019; 2018). In 2014, ER ranked as the third Italian region in terms of foreign residents, following Lombardy and Lazio. ER consistently demonstrates economic prominence within Italy, boasting one of the highest per capita incomes and recognized as one of Europe's most affluent regions (Milken Institute, 2017). Despite a rise in the unemployment rate from 3% in 2007 to nearly 9% in 2013 due to the Great Recession (exceeding that of Veneto and Lombardy), the region experienced a significant recovery in the subsequent six years, reducing the rate to 5.5%¹. This figure remained lower than in any other major Italian region, reinforcing ER's leading position in this key indicator (Bianchi et al. 2021). Consequently, ER serves as both a representative dynamic industrial region in Europe and a typical region of Southern Europe.

Utilizing a proprietary, comprehensive administrative database on mandatory communications for ER, we analyze the sequences of formal contracts and periods of non-employment for a substantial sample of dependent workers to identify the primary factors influencing occupational transitions when comparing Italian and foreign workers, based on their initial skill level. Our research aims to determine whether the occupational mobility of foreign workers differs from that of native workers. Starting from low-skill or medium-skill occupations, a differential likelihood of attaining higher-skill occupations could suggest varying initial advantages in career progression, potentially attributable to differences in professional qualifications and initial educational attainment, as well as ethnicity, thus supporting the ethnic penalty hypothesis (Avola, 2014). Our research leverages this extensive observational database and contributes to the existing literature on the role of immigrants within the economy and the occupational mobility of workers from a nationality perspective. Our findings align with previous research in identifying the limited upward mobility of relatively less-skilled foreign

¹ Despite being significantly affected by the economic crisis and experiencing a substantial decline in employment, Italy has seen a continuous increase in the number of legal foreign residents and the demand for immigrant labour since 2008. This trend has been observed across all regions, from north to south, and applies to both men and women (Ambrosini and Panichella, 2016; Avola, 2014, 2018).

workers, offering a novel perspective based on observed contracts and quantifying the differential probability of transitioning to higher-skill positions for Italian and foreign workers. Furthermore, this study enhances the understanding of labor force demographic dynamics, namely concerning the ongoing discussion about the professional qualifications and education levels of immigrant workers compared to Italian nationals and their impact on facilitating occupational mobility.

The study is organized as follows: the next paragraph illustrates the administrative dataset used in the analysis and the procedure adopted for sample selection. The third paragraph presents the empirical methodology. The fourth paragraph presents the results. The last section discusses the results and concludes. Robustness check and contractual taxonomy are reported in the final Appendixes.

2 Data description

The dataset utilized in this study originates from a specific processing of the Emilia-Romagna (ER)² centralized administrative archive known as Mandatory Communications (Comunicazioni Obbligatorie). Launched in October 2000, this longitudinal database systematically records comprehensive details concerning all hiring announcements, contract amendments, and employment terminations. Data are collected from both private sector entities and public administrative bodies, forming a valuable repository of quantitative and qualitative information on formal employment relationships³. It is important to note that this database exclusively encompasses formal dependent employment; consequently, self-employed individuals with VAT numbers (e.g., lawyers, medical practitioners, engineers, consultants), sole proprietors, and informal workers are not included⁴. The original data have been extracted and reprocessed to analyse the dynamics of dependent employment within the ER region, with the aim of gaining a deeper understanding of the regional labour market's functioning. Specifically, the various communications have been linked at the individual worker level to construct career trajectories based on successive employment contracts. By utilizing employee records, the sequence of different contracts enables the reconstruction of individual career paths, even when a worker receives a new contract from the same employer that is not a simple continuation of a prior agreement. In such instances of seamless transitions between similar contracts with the same employer, the database has been processed to treat them as a single continuous work experience ("wave").

The reliability of the reconstructed data was established from 2008 onwards, prompting the extraction of a worker sample who commenced at least one contract in that year, allowing for the longest possible observation period of their career trajectories. Given that the available data at the time of extraction spanned up to 2015, all communications related to these individuals between 2008 and 2015 were requested. Considering that over 90% of workers within the study period held a maximum of 10 contracts, the analysis was limited to this threshold. All sectors, contractual arrangements, and

² We extend our sincere gratitude to Ervet - (now known as Art-ER) for granting us access to their proprietary database, which is derived from the reprocessing of mandatory communications for the region. We currently lack access to comparable data for other regions in Italy or elsewhere.

³ The databases include only formal employment contracts, excluding informal workers of all nationalities.

⁴ The execution of professional roles often necessitates certifications obtainable solely by qualified personnel. Consequently, it can be inferred that undeclared workers are primarily engaged in manual labor, particularly in agriculture or construction, where specific qualifications or high skill levels are not typically a prerequisite.

provinces within the region were taken into account. The data reconstruction incorporated a range of socio-demographic variables, including age, gender, profession, skill level, contract types, number of contracts, industry, province, nationality, and educational qualifications. It is also pertinent to note that while the total pool of dependent workers in ER exceeded 2 million individuals during the observed period, the database only records the dynamics of the formal labour market and does not include information on individuals employed in previous periods who did not experience subsequent contract changes, representing the majority. From this perspective, our analysis captures only a surface-level dynamic of the labour market but allows us to observe the prevalence of temporary and non-standard forms of contracts that have become commonplace since the early 2000s.

Some descriptive statistics for the initial sample of approximately 600,000 workers observed in 2008 are provided below. Table 1A shows that male foreign workers are younger on average than their female counterparts. This trend is slightly reversed for female Italian workers. Another notable aspect is the average duration of contracts. While Italian males have longer contracts than Italian females, the opposite holds true for foreign workers. The incidence of part-time work is also higher among foreign workers compared to Italian workers. Table 1B illustrates the distribution of workers by skill level, using the taxonomy developed by ISTAT (ISTAT, 2013), which is derived from the International Standard Classification of Occupations (ISCO) by the ILO⁵[4]. This classification is based on the skill criterion, operationally defined by considering the nature of work characterizing the profession, the level of formal education (as described by the International Standard Classification of Education ISCED97), and the extent of training or experience required for adequate task performance (Bosco et al., 2019). Over 50% of foreign workers are employed in low-skill occupations, while this category accounts for only 25% of Italian workers. The representation of foreign workers in high-skill professional categories is negligible.

Table 1A: Emilia Romagna dependent workers, basic data, 2008 starting sample

<i>Workers</i>	<i>N</i>	<i>Females</i>	<i>Males</i>	<i>Females mean age</i>	<i>Males mean age</i>	<i>Females mean contract duration</i>	<i>Males mean contract duration</i>	<i>Part-time</i>	<i>Full-time</i>
<i>Italian</i>	460715	223574	237141	34.99	35.80	349.75	371.64	97258	362983
<i>Foreign</i>	169897	77249	92648	35.02	32.68	307.92	272.47	51522	118175

⁵ <https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/>

Table 1B: Emilia Romagna dependent workers by skill level, professional category and nationality, 2008 starting sample

	<i>Italian</i>	<i>Foreign</i>
<i>Low-skill</i>		
Plant operators, fixed and mobile machinery operators and vehicle drivers	7,8%	8,8%
Unskilled professions	16,9%	45,7%
<i>Medium-skill</i>		
Craftsmen, skilled workers and farmers	14,3%	21,1%
Clerical and administrative support workers	12,4%	2,5%
Skilled workers in commercial and service activities	21,2%	17,1%
<i>High-skill</i>		
Lawmakers, entrepreneurs, and senior executives	1,0%	0,1%
Intellectual, scientific and highly specialized professions	10,8%	1,8%
Technical professions.	15,6%	2,8%

Table 1C: Emilia Romagna dependent workers by sex, citizenship and contract type, 2008 starting sample

	<i>Italian</i>			<i>Foreign</i>		
	<i>Female</i>	<i>Male</i>	<i>Total</i>	<i>Female</i>	<i>Male</i>	<i>Total</i>
Fixed-term contracts	102499	89712	192211	34582	40711	75293
Open-ended contracts	61732	8153	143262	16954	34486	51440
Apprenticeships contracts	10808	13589	24397	2425	4328	6753
Traineeships and internships	5255	3932	9187	566	502	1068
Domestic labour	1478	259	1737	15653	2666	18319
Job on call	4787	4084	8871	1181	573	1754
Para-subordinate work	20308	23715	44023	1981	1908	3889
Temporary agency work	15394	19251	34645	3679	7308	10987

Table 1C summarizes the contract type by sex and nationality, according to the original reclassification of several contractual agreements as reported in the Appendix. Parasubordinate work is a phenomenon that is typical of Italian workers, as this contract arrangement is recurrent in highly qualified professions, such as teachers and researchers, where foreign workers register an insignificant presence. Fixed-term contracts are more easily found among female Italian workers than among males, while the opposite is true for foreign workers. A correlation exists between the high number of Eastern European females employed in caregiving and domestic work and specific migration and welfare policies. These policies, designed to address the growing demand for affordable and adaptable elder care, have historically channelled migrant women (and to a lesser extent, men) into these roles (Marchetti, 2017). Relatively mature Eastern European women self-select in the profession and appear to do so to earn some money in the hope to support the family and finally go back to their country of origin. This specific type of employment is characterized by limited opportunities for career advancement and the acquisition of specific skills and knowledge that could be transferable in the labour market, not only for foreign but also for Italian workers (Barbiano di Belgiojoso et al. 2019). This factor underlies the methodological choice of exclusion, which will be

detailed later. Table 2 highlights the distribution of the top 20 most frequent foreign workers nationalities.

Table 2. Foreign workers by country of origin (top 20)

<i>Country of origin</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
Romania	20818	18812	39630
Morocco	4942	14575	19517
Albania	4825	9072	13897
Ukraine	8295	1741	10036
Poland	6636	3221	9857
Moldova	6155	2982	9137
China	3506	4003	7509
Tunisia	801	5023	5824
Senegal	527	3388	3915
India	899	2943	3842
Pakistan	164	3618	3782
Ghana	1081	2178	3259
Philippines	1807	1230	3037
Nigeria	1503	1278	2781
Bulgaria	1328	1285	2613
Bangladesh	244	2037	2281
North Macedonia	436	1324	1760
Sri Lanka	387	1258	1645
Russia	1371	228	1599
Egypt	74	1393	1467

The predominance of Romanians, Moroccans, and Albanians among the immigrant workers is primarily attributed to a confluence of historical, geographical, and economic factors. Romania, as a neighbouring country with a significant Romanian diaspora, has long-standing cultural and economic ties with Italy. Morocco, situated across the Mediterranean Sea, has experienced a surge in migration to Italy due to economic disparities and political instability. Albania, also geographically proximate, has witnessed a similar trend driven by economic opportunities and social unrest. These factors, coupled with the specific policies and labour market conditions in Italy, have contributed to the prominence of these three nations among the immigrant population. Language proximity and the European Union (EU) accession in 2007 also explain the Romanian population prevalence. Global North (Todaro and Smith, 2006) immigrants are virtually absent from this top 20. Table 3 maps the transition between the first and second contracts, depending on the initial skill level of the first contract, after dropping those Italian and foreign workers engaged as domestic workers on the first contract observed and keeping workers with two contracts only⁶.

⁶ We also computed the transition matrixes for higher orders of transitions (workers with more than two contracts), but results in terms of skills are basically unchanged. Workers with two contracts represent 18% of the sample, while those with one contract only, therefore without mobility, represent 32% of the sample.

Table 3. Transitions in skill levels from the first to the second contract, by nationality

<i>First contract skill</i>	<i>Low Level</i>	<i>Italian</i>	<i>Foreign</i>
	<i>Second contract skill</i>		
	1. High Level	5.48%	1.03%
	2. Medium Level	28.20%	28.85%
	3. Low Level	66.32%	70.12%
<i>First contract skill</i>	<i>Medium Level</i>		
	<i>Second contract skill</i>		
	1. High Level	12.31%	2.88%
	2. Medium Level	75.90%	71.60%
	3. Low Level	11.79%	25.52%
<i>First contract skill</i>	<i>High Level</i>		
	<i>Second contract skill</i>		
	1. High Level	77.86%	70.81%
	2. Medium Level	19.18%	21.58%
	3. Low Level	2.95%	7.61%

Workers tend to preserve their skill levels. This implies that the large majority of workers starting with a low-skill job have a low skill-job on the second contract. This is in line with the evidence of persistent segregation into unskilled jobs found by Avola and Piccitto (2020) and in line with evidence for Germany hinting that low-skilled foreign workers receive a lower return to experience even in dense regions (Niebuhr et al. 2024). When looking at the upper pane of Table 3, we observe that this effect is stronger for foreign workers, where over 70% keep a low skilled job, against the 66% of Italian workers. Interestingly, a slightly larger share of foreign workers flows into a medium-skilled job as second job with respect to Italian workers: this can be interpreted in two complementary ways. First, Italian workers flow from a low-skilled to a high-skilled job in the 5.5% of cases, while for foreign workers this figure is a dismal 1%. Therefore, for some Italian workers there is a higher probability of progression not only to the next-level category of medium-skilled jobs, but straight to the high-skilled category. Second, foreign workers flow relatively more easily to the medium-skilled category, hinting for a potential replacement effect for those jobs left vacant and not re-taken by Italian workers. This is also in line with Gianfreda et al. (2024), finding for Italy that when migrant and native workers are similar in their demographic and occupational related characteristics, natives resort to their comparative advantages, such as language to upgrade their positions, and partially overlaps with the findings by Fusaro et al. (2021; 2024), who state that the impact of immigration on natives in Italy depends on the compositions and features of the native workforce, and might have stimulated employment of the highly-educated natives. This would also be consistent with the complementarity outcomes for the migration of unskilled and medium-skilled workers in Germany (Granato et al. 2015).

If the starting job is medium-skilled, the probability of remaining in the same situation is even stronger, with three-quarters of Italian workers and slightly less foreign workers remaining in the same slot. But in this case, we also observe a stepping-down the skill ladder, since over one-quarter of foreign workers starting as medium-skilled flow into low-skilled jobs. Finally, the lower pane

analyses the flow from high-skilled jobs. Italian workers tend to remain in this category, while for those very few foreign workers in a high-skill job (about 1,000 people), they have more than a double probability with respect to Italian workers to end up in a low-skill job as next contract. The next empirical analysis separately quantifies the estimated probability of obtaining a high-skill or a medium-skill job after a previous low-skill or medium-skill job, for Italian and foreign workers separately. We expect to find the traces of the dominant immobility found in Table 3.

3 Empirical methodology

The initial criteria for inclusion in this empirical analysis centred on individuals who possessed employment contracts within the specified period of 2008 to 2015, with a constraint on the total number of contracts held (a minimum of one and a maximum of ten). As previously mentioned, this upper limit on the number of contracts serves a twofold purpose. Firstly, it enhances computational efficiency by decreasing the overall size of the dataset under examination, thereby making computationally intensive procedures more manageable. Secondly, it functions as a method for controlling outliers. Workers with a significantly larger number of contracts within the defined timeframe (more than ten) constitute a small fraction of the total working population (less than 10%). A subsequent selection stage further refines the sample. Workers who held only a single contract during the observation window (spanning 2008-2015) are excluded from the analysis. This exclusion is warranted because such individuals could not demonstrate any contractual mobility within the timeframe, which is the key aspect of interest in this study. We retain workers with at least two contracts within the 2008-2015 period. An additional refinement is implemented to specifically examine the phenomenon of transitioning between periods of employment. Workers who held overlapping contracts during the observation window are excluded. This exclusion ensures that the analysis focuses on the "pure" transition effect, where an individual moves sequentially from one contractual arrangement to another, rather than holding multiple positions simultaneously. Finally, as also previously noted, we exclude those workers whose initial contract was in domestic labour, given the negligible likelihood of developing technical skills or professional expertise leading to higher-skilled employment in this sector. Table 4 presents descriptive statistics for the final sample utilized in the empirical assessment.

Table 4. Descriptive statistics, final sample in the empirical assessment

	<i>Italian</i>			<i>Foreign</i>			<i>Overall Total</i>
	<i>Female</i>	<i>Male</i>	<i>Total</i>	<i>Female</i>	<i>Male</i>	<i>Total</i>	
<i>Low-skill</i>	12634	12553	25187	1050	463	1513	26700
<i>Medium-skill</i>	20103	19425	39528	5050	6161	11211	50739
<i>High-skill</i>	5898	12433	18331	4291	8982	13273	31604
<i>n.a.</i>	2		2				2
<i>Total</i>	38637	44411	83048	10391	15606	25997	109045

The sample includes 109,045 workers, with foreign workers representing less than one fourth of the total. We employ propensity score matching (PSM), a well-established method for analysing observational data, to investigate the influence of prior low-skill (and medium-skill) jobs on the transition to upper skill-level jobs for both Italian and foreign workers. This approach aligns with the prevalent literature on temporary and part-time contracts acting as stepping stones to permanent or full-time positions. Recognizing that higher-skill jobs can be a consequence of active labour market policies, we adopted PSM, similarly to the way it is applied in evaluating such programs by Heckman et al. (1999). Our specific focus is to determine whether Italian workers, compared to foreign workers, experience a different transition probability from low or medium-skill jobs to upper-skill jobs. PSM is a statistical technique used to estimate the causal effect of a treatment or intervention on an outcome of interest. It is particularly useful when the treatment is not randomly assigned, such as in observational studies. PSM works by estimating the probability of receiving the treatment for each individual based on their observed characteristics (propensity score). Individuals with similar propensity scores are then matched between the treatment and control groups, creating a balanced comparison. This reduces the bias caused by confounding variables that might influence both the treatment assignment and the outcome. By comparing the outcomes of matched individuals, PSM aims to isolate the causal effect of the treatment, providing a more accurate estimate of its impact. Our hypothesis is that the initial work experience provides skills and abilities that facilitate the attainment of more complex positions in subsequent employment contracts. Indeed, in addition to educational qualifications, on-the-job training is also a means of acquiring new competencies (Cappellini et al. 2019; Kvasnicka, 2009; De La Rica et al. 2022).

The present study benefits from a large sample size, providing a robust foundation for causal inference. The conceptual framework for evaluating causal effects between events is attributed to Rubin (1974). He defined the causal effect of a measure on an individual as the differential between the expected outcome with participation in the measure and the expected outcome without participation. While the treatment (e.g., a low-skill job) may not be randomly assigned due to ethical and practical constraints (forcing workers into a given-skill role is not feasible), we harness pre-treatment information (e.g., age, gender, citizenship, education) that can influence the likelihood of treatment assignment or self-selection bias. This pre-treatment data is crucial for addressing potential confounding factors. Although random treatment assignment is not feasible in this context, we possess pre-treatment data that may influence the likelihood of treatment participation or indicate self-selection into treatment. If we let Y_1 be the outcome of an individual's participation in the low-skill (or medium-skill) treatment, and Y_0 as the outcome otherwise, for a given individual i , the effect of undergoing the treatment can be defined as:

$$\Delta i = Y_{1i} - Y_{0i}$$

Let D represent an indicator variable, where D equals 1 for individuals who participate in the intervention (treatment group) and 0 for those who do not (control group). Additionally, let X be a vector of covariates that influence an individual's decision to accept a low-skill or medium-skill job, as well as their subsequent employment outcomes (medium-skill or high-skill). Under these conditions, we can assess various measures of influence. Initially, we can assess the 'absolute' benefit of undergoing a specific intervention for all individuals, irrespective of their actual participation in the measure (average treatment effect, ATE):

$$E(\Delta) = E(Y_1 - Y_0)$$

If this is positive, the given treatment should be in principle mandatory for everybody, because the net gain would be a plus no matter the effective initial skill-level. Secondly, we can evaluate the impact of the intervention solely for those individuals who actively participated in the measure (average treatment effect on the treated, ATT).

$$E(\Delta|D = 1) = E(Y_1 - Y_0|D = 1) = E(Y_1|D = 1) - E(Y_0|D = 1)$$

If this is positive, those workers who underwent the low-skill (or medium-skill) job treatment increased their probability of entering a medium-skill (or high skill) job as the next contract. A fundamental challenge lies in the inability to definitively answer the counterfactual question: 'What would have been the outcome if individuals had not attained a medium-skill (or high-skill) job following their low-skill (or medium-skill) position?' This counterfactual scenario is inherently unobservable. To address this limitation, the data must fulfill a specific set of conditions that enable us to identify suitable 'counterfactuals' serving as proxies for the hypothetical situation under consideration.

The first condition is known as the conditional independence assumption, stipulating that only observed covariates (X) influence both treatment assignment and potential outcomes. When this condition is met, and no unobservable variables affect treatment assignment or potential outcomes, we can establish conditional independence between the potential outcomes and the treatment, given the observed covariates. Formally, $Y_1, Y_0 \perp D|X$, the conditional independence assumption holds under two circumstances: (1) when the treatment is randomised or (2) when treatment and control observations can be matched using a relatively rich set of covariates. The database is extremely rich in terms of individual characteristics and local labour market conditions; thus, we can rely on the use of the control group to estimate the missing data:

$$E(Y_0|D = 1, X) = E(Y_0|D = 0, X)$$

The average causal effects of low-skill (medium-skill) workers can be consistently estimated using a group of non-low-skill (medium-skill) workers with a distribution of exogenous variables similar to the distribution of the treated group. The second condition is the common support assumption (Rubin, 1974) or overlap assumption, requiring that, for each treated worker in the treatment group, another nontreated worker in the control group can be used as a matched comparison observation. In essence, the overlap assumption necessitates that everyone possesses a non-zero probability of being assigned to any treatment level.

While the conditional independence assumption lacks a formal statistical test, we rely on the comprehensiveness of the covariates to assume its validity. The common support assumption is, instead, empirically verified by examining histograms that compare the treated individuals distribution to the untreated individuals' group. The propensity score histograms (Figures 1 and 1A) reveal evidence of overlapping distributions for treated and untreated individuals, since the upper and lower histograms for both Italian and foreign workers have not-so dissimilar shapes and do not include unmatched individuals or too many extreme outliers.

Figure 1: Propensity score histogram, Italian workers

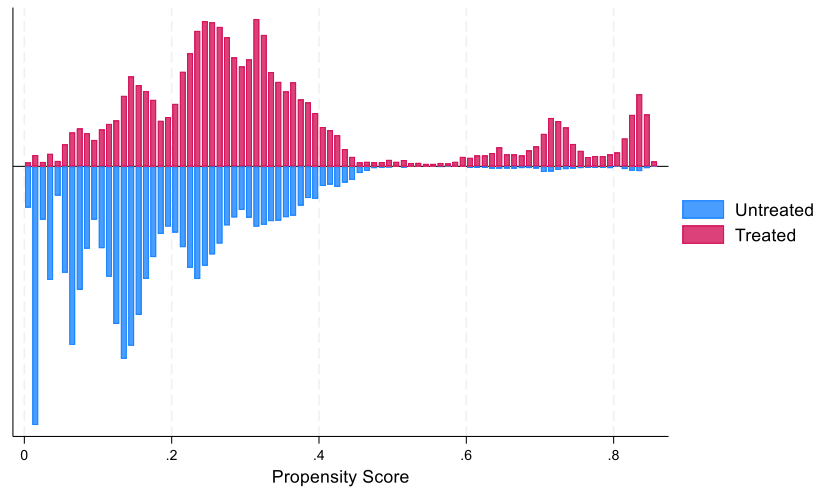
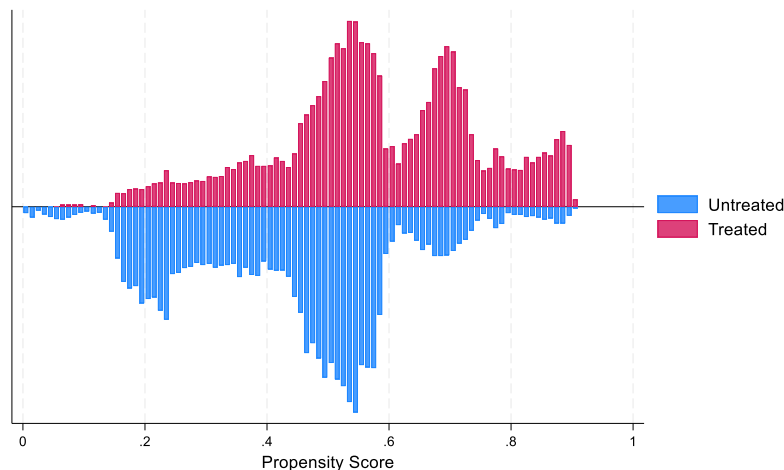


Figure 1A: Propensity score histogram, foreign workers



4 Estimation and results

We ran different estimations according to the starting skill level of the contract observed, low-skill or medium-skill. The ‘treatment’ was defined as $D_{LS} = 1$, denoting ‘having a low-skill job (medium-skill) as the second-to-last contract observed in the 2008–2015 time span’. The outcome, Y_{MS} , is the skill (medium or high) level of the last contract observed in workers’ lives, no matter how long it takes to transit from the previous one, where $Y_{1,MS,LS}$ indicates ‘having a medium-skill (high-skill) job as the last contract when the second-to-last contract was a low-skill (medium-skill) work assignment’, whereas $Y_{0,NMS,LS}$ denotes ‘having a contract different from a medium-skill (high-skill) contract as the last contract when the second-to-last contract was a low-skill (medium-skill) work assignment’. The empirical model employed in this study adheres to the framework established by Amuedo-Dorantes, Malo, and Muñoz-Bullón (2008) as applied to the transition from temporary to permanent employment in Spain and condensed in equation [1]:

$$\begin{aligned}
MS_{i,t} = & \alpha + \beta LS_{i,t-1} + \gamma Age_{i,t} + \delta Age_{i,t}^2 + \zeta Sex_i + \zeta Full_{i,t-1} + \eta Perm_{i,t-1} + \vartheta UnemSpell_i \\
& + \lambda SameEmployer + \mu University_t + \sigma Sector_{i,t-1} + \tau Sector_{i,t} \\
& + \varphi Prov. Unemployment_t + \psi ValueAddedpc_t + \varepsilon
\end{aligned} \tag{1}$$

where MS represents the outcome variable, a binary choice between a medium-skill (high-skill) job and any other type of skill working arrangement for worker i at time t ⁷. The regressor of interest is LS, a low-skill (medium-skill) job as the previous contract. The control variables include a variety of worker and contract characteristics. As in Devicienti et al. (2018) and Bosco and Valeriani (2023), we included age and age² as to capture the non-linear effects of experience. Other controls include being a female worker ($Sex = 1$), a dummy $Full$ equal to 1 if the starting contract was full-time, a dummy $StableEmpl$ equal to 1 if the initial contract was permanent. The latter two controls contribute to controlling for the stepping stone/stumbling block effect of fixed term/ part-time contracts with respect to stable and full-time agreements. $UnemplSpell$ measures the number of days elapsing between the end of the first contract and the beginning of the second contract, informing about the potential search costs when transitioning from a job to the next. We also include a control related to the stability of the working career, as $SameEmployer$ is a dummy equal to 1 if the worker remains with the same employer in both contracts. We include a dummy for the presence of a university degree and the sector on both contracts in t and $t-1$. As local labour market related variables, we include the employer's province unemployment rate and value-added per capita. Finally, ε is an error term. To mitigate the potential confounding effect of a strong selection bias towards low-skilled jobs for foreign workers, propensity score estimates were generated for Italian and foreign workers separately. This national disaggregation allows for a more precise evaluation of the causal impact of a low-skilled (or medium-skilled) initial job on the probability of transitioning to a medium-skilled (or high-skilled) job in the subsequent employment contract. The `psmatch2` software for Stata (Leuven and Sianesi, 2003) was employed to conduct one-to-one matching on a probit propensity score. Table 5 and 5a report results for transitions from low-skill to medium-skill jobs and from medium-skill to high-skill jobs, respectively. The analysis presented here excludes workers with overlapping contracts, domestic workers and unknown skill levels on the first job and is restricted to workers with a maximum of two contracts in 2008-2015.

Probit estimates in Table 5 report a significant Chi² statistics, rejecting the null hypothesis of all coefficients being not statistically different from zero, and most explanatory variables are statistically significant at 95%. The effect of age is positive for both Italian and foreign workers, suggesting that an older age might have a role in explaining the passage from low to medium skill tasks, likely proxying for experience. The nonlinear effects of age squared is positive and significant for both Italian and foreign workers, supporting the experience role in transitions, but is of negligible size. Sex is a dummy variable equal to 1 for female workers. The coefficient is negative and significant for both types of workers, and in this case, there could be a double interpretation: either women show a higher level of immobility because of their specific choice, or firms tend to grant advancements more often to male than to female workers. This would be unfortunately in line with the empirical evidence

⁷ Note that the time variable t does not have the usual meaning found in time series or panel analyses, but indicates logically consecutive periods, which can be successive months, but also years or days. We focus here on the logical-temporal sequence of events.

on gender discrimination at work (Heilman, Caleo and Manzi, 2024) as women rarely succeed in realizing strong upward occupational mobility because of the *glass ceiling* effect (Reskin and Ross, 1990). A novel insight stems from the first contract being full-time (rather than part-time) and permanent (rather than fixed-term), as we observe negative and significant coefficients for Italian workers, but positive and significant coefficients for foreign workers. This heterogeneity in the mobility pattern suggests that low skill but full-fledged jobs tend to persist rather to advance with higher likelihood for Italian workers. A potential interpretation could be attributed to the greater dynamism of foreign workers, who are on average younger and more likely to attempt to change their employment status, in contrast to native workers who tend to maintain stable, risk-free job positions until retirement. This, of course, would necessitate a psycho-sociological investigation into the attitudes and expectations of workers. The length in the unemployment spell between contracts has a positive and significant effect for Italian workers, even with a very small coefficient.

Table 5: From 1st to 2nd contract: probability of observing a medium-skill job as last contract if the previous was a low-skill job.

<i>Dependent variable</i> Medium-skill job as final job	<i>Italian</i>						<i>Foreign</i>					
	Probit regression		Number of obs.		78133		Probit regression		Number of obs.		24454	
			LR chi ² (20)		12414.05				LR chi ² (16)		3672,89	
			Prob > chi2		0.0000				Prob > chi2		0.0000	
	Log likelihood = -34809,454		Pseudo R ² =		0.1528		Log likelihood = -15105,028		Pseudo R ² =		0.1084	
	<i>Coef.</i>	<i>Std.Err.</i>	<i>z</i>	<i>P>z</i>	<i>[95% C.I.]</i>		<i>Coef.</i>	<i>Std.Err.</i>	<i>z</i>	<i>P>z</i>	<i>[95% C. I.]</i>	
Age	0,0188	0,0025	7,4400	0,0000	0,0139	0,0238	0,0237	0,0054	4,4100	0,0000	0,0132	0,0342
Age ²	-0,0001	0,0000	-4,2300	0,0000	-0,0002	-0,0001	-0,0002	0,0001	-2,7300	0,0060	-0,0003	-0,0001
Sex	-0,3585	0,0120	-29,9300	0,0000	-0,3819	-0,3350	-0,3833	0,0194	-19,8100	0,0000	-0,4212	-0,3454
Full-time_1	-0,0489	0,0156	-3,1500	0,0020	-0,0794	-0,0184	0,0958	0,0212	4,5200	0,0000	0,0543	0,1374
Perm Job_1	-0,1399	0,0130	-10,7900	0,0000	-0,1654	-0,1145	0,1826	0,0192	9,5000	0,0000	0,1449	0,2203
Unem. spell	0,0001	0,0000	7,2200	0,0000	0,0001	0,0001	0,0000	0,0000	0,8500	0,3960	0,0000	0,0000
Same employer	0,0406	0,0132	3,0700	0,0020	0,0147	0,0665	0,0134	0,0199	0,6700	0,5000	-0,0255	0,0523
University degree	-1,1293	0,0279	-40,4300	0,0000	-1,1841	-1,0746	-0,6803	0,0535	-12,7200	0,0000	-0,7851	-0,5755
<i>Industry on the last-to-second contract</i>												
Trade and Tourism	-1,5637	0,0363	-43,0300	0,0000	-1,6349	-1,4924	-1,1638	0,0494	-23,5600	0,0000	-1,2606	-1,0670
Construction	-1,1875	0,0423	-28,0800	0,0000	-1,2704	-1,1046	-0,9585	0,0529	-18,1100	0,0000	-1,0622	-0,8548
Manufacturing	-0,8293	0,0346	-23,9500	0,0000	-0,8972	-0,7615	-0,9002	0,0464	-19,4200	0,0000	-0,9911	-0,8094
Education	-1,1723	0,0558	-20,9900	0,0000	-1,2817	-1,0628	-1,4169	0,1502	-9,4300	0,0000	-1,7113	-1,1226
Services	-1,1315	0,0349	-32,4400	0,0000	-1,1999	-1,0631	-0,5122	0,0460	-11,1400	0,0000	-0,6023	-0,4221
<i>Industry on the last contract</i>												
Trade and Tourism	-0,2687	0,0369	-7,2900	0,0000	-0,3410	-0,1965	-0,3318	0,0484	-6,8600	0,0000	-0,4267	-0,2370
Construction	-0,0776	0,0433	-1,7900	0,0740	-0,1625	0,0074	-0,1505	0,0529	-2,8400	0,0040	-0,2542	-0,0468
Manufacturing	-0,2061	0,0361	-5,7100	0,0000	-0,2769	-0,1354	-0,1752	0,0464	-3,7700	0,0000	-0,2662	-0,0842
Education	-0,3184	0,0568	-5,6000	0,0000	-0,4297	-0,2070	-0,9149	0,1598	-5,7300	0,0000	-1,2281	-0,6017
Services	-0,2356	0,0359	-6,5700	0,0000	-0,3058	-0,1653	-0,2036	0,0443	-4,6000	0,0000	-0,2903	-0,1169
Province unemployment	-0,0171	0,0060	-2,8500	0,0040	-0,0288	-0,0053	-0,0210	0,0090	-2,2900	0,0220	-0,0380	-0,0030
Per capita value added	0,0000	0,0000	-0,3400	0,7330	0,0000	0,0000	0,0000	0,0000	1,4800	0,1390	0,0000	0,0000
constant	0,3678	0,0946	3,8900	0,0000	0,1824	0,5533	0,3457	0,1533	2,2500	0,0240	0,0451	0,6462
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat	Sample	Treated	Controls	Difference	S.E.	T-stat
Medium-Skill as second job	Unmatched	0,2809	0,5329	-0,2520	0,0042	-59,6400	Unmatched	0,2857	0,6538	-0,3681	0,0059	-62,0500
	ATT	0,2809	0,5522	-0,2713	0,0070	-38,8600	ATT	0,2857	0,6194	-0,3337	0,0099	-33,7200
	ATU	0,5329	0,3438	-0,1891	.	.	ATU	0,6538	0,3488	-0,3050	.	.
	ATE			-0,2071	.	.	ATE			-0,3197	.	.

Table 5A: From 1st to 2nd contract: probability of observing a high-skill job as last contract if the previous was a medium-skill job.

<i>Dependent variable</i> High-skill job as final job	<i>Italian</i>						<i>Foreign</i>					
	Probit regression		Number of obs.		78133		Probit regression		Number of obs.		24454	
			LR chi ² (20)		16249,97				LR chi ² (16)		3304,51	
			Prob > chi2		0.0000				Prob > chi2		0.0000	
	Log likelihood = -45907,314		Pseudo R ² =		0.1504		Log likelihood = -15036,739		Pseudo R ² =		0,099	
	<i>Coef.</i>	<i>Std.Err.</i>	<i>z</i>	<i>P>z</i>	<i>[95% C.I.]</i>		<i>Coef.</i>	<i>Std.Err.</i>	<i>z</i>	<i>P>z</i>	<i>[95% C. I.]</i>	
Age	-0,0303	0,0023	-13,0000	0,0000	-0,0349	-0,0257	-0,0218	0,0054	-4,0600	0,0000	-0,0323	-0,0113
Age ²	0,0003	0,0000	9,3000	0,0000	0,0002	0,0003	0,0002	0,0001	2,7200	0,0070	0,0001	0,0003
Sex	0,2714	0,0104	26,0300	0,0000	0,2510	0,2919	0,2296	0,0194	11,8100	0,0000	0,1915	0,2677
Full-time_1	-0,3641	0,0135	-26,9500	0,0000	-0,3906	-0,3376	-0,1754	0,0212	-8,2900	0,0000	-0,2169	-0,1340
Perm Job_1	-0,0303	0,0124	-2,4500	0,0140	-0,0545	-0,0060	-0,1558	0,0201	-7,7500	0,0000	-0,1952	-0,1164
Unem. spell	0,0000	0,0000	-0,6700	0,5030	0,0000	0,0000	-0,0001	0,0000	-6,0100	0,0000	-0,0002	-0,0001
Same employer	-0,1532	0,0119	-12,8900	0,0000	-0,1765	-0,1299	-0,1049	0,0199	-5,2700	0,0000	-0,1438	-0,0659
University degree	-0,4556	0,0162	-28,0800	0,0000	-0,4874	-0,4238	-0,1672	0,0502	-3,3300	0,0010	-0,2657	-0,0688
<i>Industry on the last-to-second contract</i>												
Trade and Tourism	1,1049	0,0351	31,4600	0,0000	1,0360	1,1737	1,0427	0,0493	21,1700	0,0000	0,9461	1,1392
Construction	0,8758	0,0408	21,4600	0,0000	0,7958	0,9558	0,8393	0,0529	15,8500	0,0000	0,7355	0,9431
Manufacturing	0,4352	0,0344	12,6400	0,0000	0,3677	0,5027	0,7520	0,0465	16,1800	0,0000	0,6609	0,8431
Education	-0,4882	0,0515	-9,4800	0,0000	-0,5891	-0,3873	-0,1973	0,1323	-1,4900	0,1360	-0,4566	0,0620
Services	0,3517	0,0344	10,2200	0,0000	0,2842	0,4192	0,2282	0,0462	4,9300	0,0000	0,1375	0,3188
<i>Industry on the last contract</i>												
Trade and Tourism	0,1823	0,0356	5,1300	0,0000	0,1126	0,2520	0,2848	0,0484	5,8900	0,0000	0,1900	0,3796
Construction	0,0753	0,0417	1,8100	0,0710	-0,0065	0,1571	0,1103	0,0530	2,0800	0,0370	0,0064	0,2142
Manufacturing	0,0158	0,0353	0,4500	0,6540	-0,0534	0,0850	0,1305	0,0466	2,8000	0,0050	0,0392	0,2218
Education	-0,4655	0,0511	-9,1100	0,0000	-0,5657	-0,3654	-0,0368	0,1383	-0,2700	0,7900	-0,3078	0,2342
Services	-0,0057	0,0350	-0,1600	0,8720	-0,0742	0,0629	0,0937	0,0445	2,1100	0,0350	0,0065	0,1809
Province unemployment	-0,0032	0,0030	-1,0800	0,2790	-0,0091	0,0026	0,0555	0,0056	9,9100	0,0000	0,0445	0,0665
Per capita value added	0,0000	0,0000	-6,7600	0,0000	0,0000	0,0000	0,0000	0,0000	3,1300	0,0020	0,0000	0,0000
constant	0,7334	0,0748	9,8000	0,0000	0,5868	0,8800	-0,7932	0,1404	-5,6500	0,0000	-1,0684	-0,5181
Variable	Sample	Treated	Controls	Difference	S.E.	T-stat	Sample	Treated	Controls	Difference	S.E.	T-stat
Medium-Skill as second job	Unmatched	0,1248	0,4806	-0,3558	0,0031	-115,9300	Unmatched	0,0295	0,0833	-0,0538	0,0031	-17,5900
	ATT	0,1248	0,3715	-0,2467	0,0058	-42,8100	ATT	0,0295	0,0833	-0,0538	0,0049	-10,9200
	ATU	0,4806	0,1782	-0,3024	.	.	ATU	0,0833	0,0283	-0,0550	.	.
	ATE			-0,2761	.	.	ATE			-0,0545	.	.

This might hint that it takes time for an Italian worker to change jobs when an upgrade in skill requirements is at stake. The coefficient is not significant for foreign workers. Maintaining the same employer has a positive and significant effect for Italian workers, while the coefficient for foreign workers is not significant. One could hypothesize that native Italian workers are more easily admitted into internal training programs or acquire sufficient experience to gain the trust of their employer, who then more readily allows them to progress in their roles. It could also be argued that Italian workers self-select into companies that offer internal career advancement opportunities, while foreign workers may need to change employers to aspire to more skilled positions. The coefficient for university degree does not leave room for interpretation: the effect is negative, for Italian workers almost twice as much as for foreign workers. This relates to the fact that probably those workers starting with low-skilled tasks do not have a university degree, especially in the case of Italian workers, and sometimes foreign degrees are not accepted and easily converted into national degrees (Tani, 2023). The issue of credential recognition in determining labor market segmentation is particularly relevant in Southern European markets (Piccitto et al. 2025).

The categorical variables coefficients for the industrial sectors are negative and significant for both Italian and foreign workers, leaving room for further analyses as to investigate this particular result. Higher unemployment rates at the province level do not facilitate obtaining medium-skill jobs, suggesting that negative business cycles are not the ideal moment to tap onto better positions and jobs. The coefficient of per-capita value-added is positive but negligible. The total number of observations is slightly lower than the final sample reported in Table 4, since the propensity score routine drops those observations for which not all the control variables are included. The overall impact of low-skill jobs can be grasped by the average treatment effects at the bottom of Table 5. The average treatment effect (ATE), evaluating the effect of a low-skill job for all the subjects in the sample, is negative and significant for both Italian and foreign workers, with the effect being stronger for foreign workers. The average effect on the treated (ATT) specifies that for those workers actually engaged in a low-skill job in the last-to-second contract, the difference between foreign and Italian workers is still about 7%, at foreign workers' disadvantage. Both indicators confirm the persistence in the same skill-level found in Table 3. The analysis was also replicated for higher-order transitions (i.e., from the second to the third contract, from the third to the fourth, and so on). The results obtained were consistent with those presented in Table 5 and are therefore omitted from this presentation.

Table 5a reports the analysis of transitions from medium skill to high skill jobs. Patterns are pretty different from previous results, as age and age² have reversed signs hinting for different dynamics concerning careers. The negative role of age might be interpreted as a sign that only youngsters exhibit the features and motivation to move along the abilities ladder, while for older workers, they should rely on expertise and practice to proceed into high-skill jobs. Being female represents here a definite advantage, since we observe a positive and significant coefficient for both Italian and foreign workers. This is in line with the Italian case, as women are more educated than men: in 2023, 68.0% of women aged 25-64 had at least a high school diploma or a vocational qualification (compared to 62.9% of men). Additionally, 24.9% of women held a tertiary degree, while this figure was 18.3% for men. However, this educational advantage for women does not translate into a professional advantage in the labor market (ISTAT, 2024). The stability and modality of the initial contract has for Italian workers the same negative impact as observed in Table 5, and we also observe the same pattern for foreign workers. The unemployment spell is not significant for Italian workers while it becomes negative and significant for foreign workers. This might suggest that, given the low number

of skilled foreign workers in the region, remaining unemployed for too long hinders their ability to obtain highly skilled positions, as they might find more easily an occupation into mansions that require less education of expertise than the one achieved in their country of origin. Remaining with the same employer is also a factor hindering the transition, in contrast with Table 5. This might be heavily related to sectors as, depending on the industry, it might be possible to cumulate just given levels of specialization and training, while high-skilled jobs should be reachable with higher levels of education only. Though, we find the same negative effect of tertiary education as found for Italian and foreign workers in Table 5, but coefficients are smaller as probably mediated by the fact that typically tertiary education is associated with more skilled positions.

As for the ATE and ATT indicators, we still find a sign of immobility, as values are again negative for both Italian and foreign workers but given the minimal presence of foreign workers in high skill jobs, the difference between treated and controls in this instance is minimal. For Italian workers the ATT coefficient is slightly larger than in Table 5, suggesting that it is harder to flow from a medium to a high-skill job than from low-skill to a medium-skill job. The analysis above considered all workers, regardless of whether or not they experienced an alternation between different skill types. This approach included as controls those who, during the entire observation period, held only contracts belonging to the same skill level. Consequently, the scope of inferences regarding a potential realignment of skill levels between Italian and foreign workers is conceivably confounded by the careers of those who did not experience significant skill changes, perhaps due to obtaining higher education qualifications or professional training experiences. To narrow the focus on the issue of realignment, we repeated the analysis for only those individuals who had at least one change in skill level between the contracts they held in 2008-2015. Summary results are reported in Table 6.

Table 6. Subset with skill alternation only

<i>Transition</i>	<i>Workers</i>	<i>Sample</i>	<i>Treated</i>	<i>Controls</i>	<i>Difference</i>	<i>S.E.</i>	<i>T-stat</i>
<i>From Low-skill to Medium-skill</i>	Italian	Unmatched	0,836	0,321	0,516	0,007	75,540
		ATT	0,836	0,295	0,542	0,011	51,500
		ATU	0,321	0,803	0,482	.	.
		ATE			0,499	.	.
	Foreign	Unmatched	0,966	0,091	0,874	0,006	155,900
		ATT	0,966	0,105	0,861	0,009	91,150
		ATU	0,091	0,955	0,863	.	.
		ATE			0,862	.	.
<i>From Medium-skill to High-skill</i>	Italian	Unmatched	0,514	0,086	0,428	0,006	77,110
		ATT	0,514	0,092	0,422	0,007	57,990
		ATU	0,086	0,523	0,437	.	.
		ATE			0,430	.	.
	Foreign	Unmatched	0,102	0,031	0,071	0,006	12,700
		ATT	0,102	0,032	0,070	0,008	9,050
		ATU	0,031	0,114	0,083	.	.
		ATE			0,078	.	.

While results in Tables 5 highlight the relative immobility of skill-levels, here we analyse cases with transitions only, and find a confirmation for the intuition drawn above: Italian workers have more

difficulty than foreign workers in flowing from low to medium skilled jobs, while the reverse is true when moving from medium-skill to high skill-jobs.

5 Robustness check though CEM (coarsened exact matching)

Propensity score matching (PSM), the most prevalent matching method for causal inference, has attracted consistent criticism. King and Nielsen (2019) argue that PSM can paradoxically lead to "increased imbalance, inefficiency, model dependence, research discretion, and statistical bias" between the treated and untreated groups (p. 435). This phenomenon, known as the PSM paradox, suggests that improved covariate balance through data pruning via matching can actually weaken causal inferences. However, when data imbalance is so severe that valid causal inference requires extensive modelling assumptions, the paradox becomes less relevant. In such cases, PSM may effectively reduce imbalance, but the resulting data may have limited value for causal inference regardless of the method employed. To address these limitations and enhance the robustness of our empirical investigation, we opted for coarsened exact matching (CEM), a method belonging to the class of monotonic imbalance bounding (MIB) matching techniques (Iacus et al., 2008; Blackwell et al., 2009). CEM offers several advantages: allows researchers to pre-determine the maximum allowable level of model dependence and bias in causal effect estimation, reduces imbalance, restricts data to the common support of the covariates, eliminating the need for a separate procedure. Furthermore, CEM adheres to the congruence principle, ensuring consistency with randomized controlled trials under specific conditions, exhibits relative insensitivity to measurement error, effectively balances nonlinearities and interactions within the sample, not just in expectation, improves outlier control. The primary objective of CEM is to refine the data by removing observations to achieve superior covariate balance between treatment and control groups. In simpler terms, CEM strives to make the empirical distributions of the covariates (X) more similar across the two groups. The procedure entails two key steps:

1. *Coarsening*: Coarsening resembles stratification or constructing a multidimensional histogram. It involves grouping observations into categories based on predetermined cut-points for each covariate.
2. *Exact Matching*: Following coarsening, observations are sorted into strata with identical values for all the coarsened pre-treatment covariates. Any stratum lacking observations for each unique treatment value is subsequently discarded.

Subsequently, the weights automatically generated by CEM are utilized to estimate the causal effect of the treatment (low skill or medium skill job on the first contract). As previously mentioned, the treatment effect is inherently unobserved: $\Delta i = Y_{1i} - Y_{0i}$. The CEM procedure produces the sample average treatment on the treated (SATT):

$$SATT = \frac{1}{n_T} \sum_{i \in T} \Delta i$$

to be compared with our propensity score matching results. Table 7 reports the estimates for the SATT coefficients for Italian and foreign workers for transitions from low-skill to medium-skill jobs and from medium-skill to high-skill (for the 1st to the 2nd contract only).

Table 7. SATT coefficients estimates

Transition	Workers	SATT Coefficient	Std. err.	t	P>t	[95% conf.interval]	
<i>From Low-skill to Medium-skill</i>	<i>Italian</i>	0,541	0,009	60,74	0,000	0,523	0,558
	<i>Foreign</i>	0,871	0,008	107,40	0,000	0,855	0,887
<i>From Medium-skill to High-skill</i>	<i>Italian</i>	0,448	0,007	60,43	0,000	0,434	0,463
	<i>Foreign</i>	0,070	0,008	8,54	0,000	0,054	0,086

The positive SATT coefficients confirm the findings of the PSM estimates, with a stronger permanence of low-skill jobs and a negligible effect toward high-skill jobs for foreign workers.

6 Conclusions and policy implications.

This research exploited a regional administrative database for the dependent labour market in ER to investigate the probability of transition of Italian and foreign workers from lower-skill to medium and high-skill jobs. Our findings suggest that foreign immigrants in the region are prevalently low-skilled workers, that tend to remain segregated into low-skill jobs, just as national workers, but with higher probability. Foreign workers able to move upwards flow with ease toward medium-skilled jobs but basically fail to attain high-skilled jobs. The presence of initial full-time and permanent jobs discourages Italian workers from shifting from low skill to medium skill jobs, while the opposite is true for foreign workers. This might highlight a different attitude in Italian workers, more likely to aim at keeping their job until retirement, even if without a perspective to improve their positions, in contrast to foreign workers, perhaps more likely to face the risk of changing employer and sector in the hope of improving their economic and social position. The transition to high skill hobs exhibits a positive bias for female workers, reflecting the higher percentage of tertiary education attainment among Italian female workers with respect to male, although this passage is not clearly significant for foreign workers, since their passage from medium to high skill jobs is rare and hindered, perhaps, by the issue of degree recognition.

Our results are in line with findings in the literature assessing a low-skill and/or ethnic penalty in analysing the role of foreign workers within the economy and add a regional perspective to the mainly nation-level studies on the subject. If difficulties in upward mobility for foreign workers may depend on the education gap with respect to Italian workers, motivations might also be found on the labour demand side. If national firms, struggling to achieve competitiveness, are offering low wages that can only be accepted by low-skilled workers, even medium-skilled tasks might be awarded to foreign immigrants, as Italian workers are not available to work for excessively low wages. As also emerging from the literature, there might be competition and substitution of Italian workers for those tasks

offered at lower wages on the market. High-skilled positions, instead, are virtually exclusively attainable by national workers, both because of their own education levels and experience and because the education profile of immigrant workers is insufficient anyway.

The advantage of the database we use lies in the possibility to reconstruct individual workers careers', with a privileged look on the specific contracts awarded. We found that the apparently easy transition to medium skill-jobs by foreign workers is matched by an almost impossible transition toward high-skill tasks, suggesting a changing profile of the labour market where there might be a substitution for Italian workers in lower-skill jobs coupled with complementarity with respect to higher-skill jobs.

The absence of wage rates unfortunately does not allow us to delve further into the puzzling change of the national-foreign workers skill-mix. An evident limit of our study is found in the absence of data on independent and informal workers. We are aware of the "empty" time lapses between contracts that could be described as unemployment, but could also be read as informal working periods. The methodology adopted is recurrent in studies concerning active labour market policies and has been tested also by the CEM approach that basically confirms our findings.

Our study contributes to the literature concerning the interconnections between foreign and domestic labour, but more generally, to the literature concerning the industrial dynamics in Italy, where most foreign immigrant workers are low-skilled and where the debate about the risks of substitutability and changing business models is always lively.

The policy implications of our analysis encompass both immigration policies pursued by the country in recent years and educational and industrial policies. The low attractiveness of the country system for high-skilled professionals is a problem that primarily affects young Italians, who have long been contributing to the brain drain phenomenon. It is easy to imagine, therefore, that even highly skilled foreigners have no interest in moving to Italy, in the absence of specific incentives and professional recognition. As far as education policy is concerned, it is essential to try to involve the new generations of immigrants in formal, upper levels of education, to contrast the high school dropout rates and the persistent dualism compared to Italian workers in the labour market. More generally, an industrial policy is needed that discourages cost savings as the only lever of competitiveness, considering that the globalization process has exacerbated the search for cost advantage and accentuated the Italian tendency towards a low upward mobility of workers (towards higher professional positions) not only on an intergenerational but also intragenerational basis.

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Appendix

A. Reclassification of Labour Contractual Agreements

<i>Categories</i>	<i>Description</i>
Open-ended contracts	Open-ended contracts Open-ended dependent labor in the public administration Open-ended job sharing Open-ended domestic labor Open-ended labor in the Arts & Show sector Maritime open-ended contracts
Apprenticeships contracts	Apprenticeship leading to a profession Apprenticeship to fulfil the duty-responsibility of education/training Apprenticeship to obtain a diploma or higher education programmes Apprenticeship as per art.16. Law 196/97. Access-to-work contracts Contracts for line-up type a1 Porting
Fixed-term contracts	Fixed-term contracts Fixed-term dependent labor in the public administration Fixed-term job sharing Fixed-term labor in the Arts & Show sector Maritime fixed-term contracts Fixed-term contracts for substitution Fixed-term contracts in Agriculture
Temporary agency work	Open-ended temporary agency work Fixed-term temporary agency work
Jobs on call	Open-ended jobs on call Fixed-term jobs on call
Domestic labor	Open-ended domestic labor Fixed-term domestic labor
Para-subordinate work	Project contracts/continued and coordinated collaboration Casual work Open-ended association in participation Fixed-term association in participation Autonomous work in the Arts & Show sector Open-ended agency contracts Fixed-term agency contracts
Traineeships	Traineeships, internships Community service