Immigrants and the Benefits of Urban Experience

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February 9, 2023

Abstract

This paper studies the static and dynamic determinants of the urban wage premium for natives and immigrants. Using a panel of the full working population in Denmark for the years 1987-2016, we show that there is both a static wage premium to working in a city, and that urban experience is rewarded more in wages than rural experience. Splitting our sample into natives, western immigrants, and non-western immigrants, we show that non-western immigrants do not benefit from the urban experience premium unless they move to a rural area. We interpret these results as evidence that non-western immigrants are strongly tied to cities through non-wage amenities such as the network of co-ethnics.

Keywords: agglomeration economies, learning, wage premium, immigration.

JEL codes: J16, J31, R23.

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1   Introduction

Immigrant populations are more concentrated in large cities than are native populations. One well-studied cause of this pattern is that new immigrants tend to choose large cities when arriving in the destination country. The economic literature has shown that new immigrants are attracted to large cities because of their large populations of co-ethnics and other fellow immigrants (Bartel, 1989; Zavodny, 1999; Bauer et al., 2005; Damm, 2009) and also because economic opportunities on arrival (Borjas, 1999; Foged and Peri, 2016).

The streets of foreign cities are not, however, paved in gold. The high level of amenities that keeps immigrants in cities has implications for the development of immigrants' wages. A recent literature has shown that workers in large cities receive larger wage gains to experience than workers in rural areas, and that most of these gains are portable across locations (Glaeser, 1999; Duranton and Puga, 2001; De la Roca and Puga, 2016). We confirm this result for natives in our data. For non-western immigrants, however, there is almost no city premium on the gains from experience – unless the worker leaves the city and moves to the countryside. We interpret these results as showing that non-wage amenities keep non-western immigrants in cities, even when the wage gains to leaving are large.[1]

More specifically, we use a rich administrative data set for Denmark that follows workers over three decade and across municipalities to estimate the returns to experience in rural and urban areas. We estimate Mincerian wage regressions including time varying observables and worker fixed effects to learn about place-specific wage premia for natives and immigrants separately. Following De la Roca and Puga (2016), we explore the estimated fixed effects to learn about the spatial sorting of workers, to find the static wage premia to a worker's location, and to estimate the value of the experience acquired in different locations. Finally, using the panel structure of the available data, we explore whether the value of experience accumulated in cities is different for natives and immigrants, and if the wage effects of this experience persist after relocating.

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[1]This interpretation is consistent with Farrokhi and Jinkins (2022), who find that refugees in Denmark, a particular type of non-western immigrant, become more and more rooted in their residence location as their experience there grows.

We find that the urban experience premium for one additional year of working in Copenhagen for a native Dane is 1%. That is, relative to a year of working experience in a rural area, a year of city experience gives a native 1% higher wages. The number for a non-western immigrant working in Copenhagen is only 0.2%. Western immigrants resemble natives more than non-western immigrants. Their urban experience premium is 1.5%. The premium for western immigrants is higher than natives partly because western immigrants gain less from rural experience compared with natives.

Our paper adds to a recent literature on cities' providing workers with better opportunities to accumulate human capital (Glaeser, 1999; Duranton and Puga, 2001). This literature has shown that the gains to agglomeration are not acquired instantly upon changing location of employment but are instead accumulated over time (Glaeser and Maré, 2001). Specifically, the literature has focused on the wage returns to experience depending on where it is accumulated and where it is used. Using a panel of Spanish male workers employed in the period 2004-2009, De la Roca and Puga (2016) find that experience accumulated in larger cities to be more highly rewarded, and that a large part of this wage growth is portable. They interpret the portability as evidence that the underlying mechanism of agglomeration is learning rather than matching or knowledge sharing. Using a panel of British workers for the period 1998-2008, D'Costa and Overman (2014) find no evidence for an urban wage growth premium. For Italy is has been found that unskilled workers benefit more from a wage premium accruing over time, while skilled workers enjoy a wage premium when they migrate as well as a wage increase over time (Matano and Naticchioni, 2016). For Germany the portable and non-portable agglomeration effects are found to be of similar importance (Frings and Kamb, 2021). For Norway it has been found that college-educated workers have higher return to labor market experience accumulated in cities (Carlsen et al., 2016). The urban wage premium thus results both from a wage level and from a wage growth effect (Heuermann et al., 2010). We extend this literature by analyzing the returns to experience accumulated in cities comparing natives, western immigrants and non-western immigrants.

In the paper closest to ours, Eckert et al. (2022) show that in Denmark refugees placed in Copenhagen receive a 0.8% urban experience premium. While the sample we look at in our paper is not refugees but the broader group of non-western immigrants,

our results are generally consistent with their findings. We find that the urban experience premium for non-western immigrants is 0.9% if used in a rural area, and 0.2% if used in a city. Besides focusing on non-western immigrants more generally, our paper adds to the literature by studying the differential rural and urban returns to city experience for immigrants. We also use commuting zones to define cities, rather than administrative borders.

Our paper also adds to the literature on measuring the static wage premia to working in cities. A large literature has measured urban wage premia using geographical variation in wages (Combes and Gobillon, 2015). This exercise is complicated by selection: high-skill workers could have stronger preferences for urban amenities resulting higher wages in cities (Combes et al., 2011).[2] On the other hand, the literature has shown that urban wage premium cannot be explained away by worker heterogeneity (D'Costa and Overman, 2014; De la Roca and Puga, 2016) or (endogenous) location decisions (Baum-Snow et al., 2018). In estimating wage premia, we follow the literature by including individual fixed effects to allow for worker sorting on unobservables and have apply historical instruments to control for feedback effects due to worker migration to high wage areas (Combes et al., 2010).[3] We find a wage elasticity to density in Denmark which is positive yet somewhat smaller than other estimates in the literature. We also contribute to the literature by estimating urban wage premia separately for natives, western immigrants and non-western immigrants. We find that static urban wage premia are higher for natives (4.0%) than they are for both western (3.2%) and non-western immigrants (3.3%).

The remainder of the paper is organized as follows. In section 2, we describe the data, provide descriptive statistics and presents several empirical observations that suggest the immigrant status specific differences in the urban (growth) wage premium. Section 3 describes and discusses the empirical model and the estimation strategy. Section 4 presents the empirical results. Section 5 concludes.

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[2]For example, in Denmark, the country of our study, higher educated and wealthier workers are more likely to work in bigger cities and closer to agglomerations (Hybel and Mulalic, 2022; Gutiérrez-i Puigarnau et al., 2016). Combes et al. (2008) suggest that the impact of sorting on the urban wage premium is similar in magnitude as the static advantages.

[3]For an overview of the estimates resulting from this empirical literature see Melo et al. (2009) and Ahlfeldt and Pietrostefani (2019).

2 Data

The data used in the empirical analysis are derived from annual register data from Statistics Denmark. We use a matched worker-establishment panel data set for the period 1987-2016. For each year, we have information on the full population of workers including the workers' residence and workplace locations at the municipality level, worker hourly wages, job tenure, occupational skill level, sector of employment, and a range of explanatory variables such as age, gender, and education.[4] For immigrants, we also observe citizenship and the country of origin. Immigrants are defined as individuals born outside of Denmark with neither parent being both born in Denmark and having Danish citizenship. We distinguish between western immigrants and non-western immigrants based on the country of origin. Western immigrants are defined as immigrants from the EU, European microstates (Monaco, Vatican, San Marino and Andorra), the UK, Canada, the USA, and Australia. Non-western immigrants are immigrants from all the other countries, and stateless immigrants. For an exhaustive list see Appendix A. Moreover, for each establishment we observe the location on a municipality level and at a more spatially detailed level of hectare cells from the Danish National Hectare Grid, the number of workers, and the number of full-time equivalents.

We cluster municipalities into two urban areas associated with the two largest cities in Denmark.[5] The urban areas are constructed using 98 municipalities with 80% of the workers living in the cluster and employed within the cluster. The most dense cluster is associated with the capital Copenhagen employing 40% of the labour force, while the second most dense area is associated with the city of Aarhus (the second-largest city in Denmark) employing 13% of the labour force. The two urban areas are illustrated in Figure 1 and we will henceforth simply refer to the two urban areas as respectively *Copenhagen* and *Aarhus*, while the rest of the municipalities will be referred to as the

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[4]For the establishment's sector we use a 36-level sector classification based on the Danish Industrial Classification (DB) which is a 6-digit classification of industries describing the economic activity directly based on the EU classification of industries NACE. We group workers into occupational skill groups based on the the official classification of job titles in Denmark (DISCO-codes), into *top* including top level managers, *high* including upper level employees, *medium* including medium level employees, and *basic* including basic level employees.

[5]Denmark had in 2016 about 5.7 million inhabitants. Copenhagen metropolitan area accounts for app. one third of Danish population, and Aarhus for about 5% of Danish population. The remaining people live in smaller towns, and rural areas.

rural area.

Figure 1: Urban areas
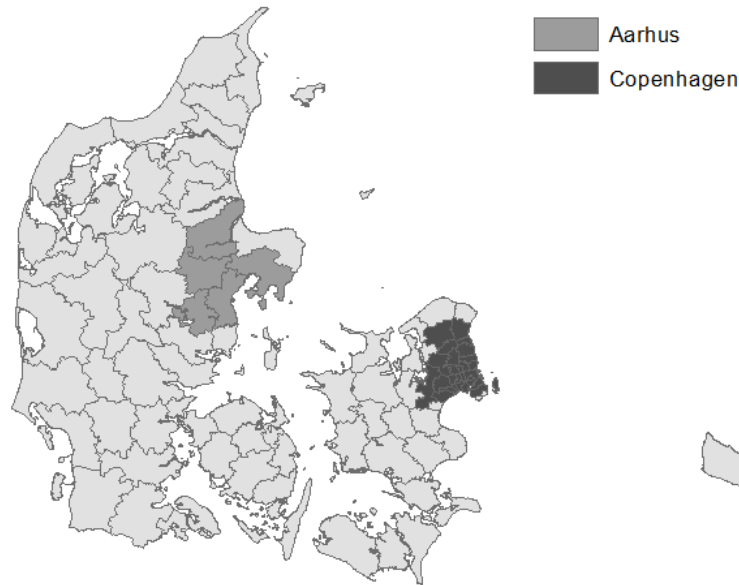
Worker experience for each worker is computed as the cumulative sum of the worker's work activity by area.[6] Specifically, we calculate experience accumulated in the Copenhagen area, experience accumulated in the Aarhus area, and experience accumulated in the rural area. Job tenure is measured as years of employment at the current establishment.

2.1 Selection of sample and descriptive statistics

We restrict our sample to all workers in Denmark of age 25-65 and employed some time during the period of study 1997-2016. We use the first 10 years in our data - the period 1987-1996 - to get a measure of employment experience from the first year in our study period. We exclude observations for workers who work in the public sector (health, education and administration) or in mining and agriculture. Our sample includes 16,406,170 observations and 1,688,685 workers.

Table 1 shows the descriptive statistics. The mean hourly wage for the natives is 211 DKK, slightly higher for the western immigrants (216 DKK), and about 17% lower

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[6]Work activity is measured as the number of days worked during the year in the worker's primary job. We follow Denmark Statistics in defining the primary job as the job where the worker worked the most hours in November of the calendar year.

for the non-western immigrants (176 DKK).[7] The mean job tenure is more than 2 years longer for the natives compared with the immigrants. Job tenure is lowest in less dense areas for all workers. Immigrant workers are better educated, while natives hold top positions more often. The differences in education are in particular pronounced when comparing non-western immigrants and natives, while western immigrants, compared with the natives, more often hold high skilled jobs. Finally, immigrants are younger than natives, in particular non-western immigrants (about 3 years, or about 8%). For all three groups the mean hourly wage, educational level, and skill level are higher in the Copenhagen area and lower in the rural area.

Native workers have accumulated more experience *in Denmark* compared with immigrant workers. The share of the accumulated experience accumulated in a different urban area than the area of the current employment is relatively low. For example, for native workers in the Copenhagen urban area, 10.7 years of experience is accumulated in Copenhagen, while only 0.1 and 0.8 years are accumulated in Aarhus and the rural area respectively. This is even more pronounced for the immigrant workers, in particular the non-western immigrants.

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[7]Figure A.1 in Appendix A shows distributions of the log hourly wages for native workers, western immigrant workers, and non-western immigrant workers.

Table 1: Summary statistics – means for natives and immigrants

	Natives				Western immigrants				Non-western immigrants			
	All	Copenh.	Aarhus	Rural	All	Copenh.	Aarhus	Rural	All	Copenh.	Aarhus	Rural
Hourly wage (DKK)	211.2	240.1	210.6	194.8	216.2	241.6	199.3	190.2	176.0	182.2	171.5	169.1
Age (year)	42.4	42.1	42.1	42.7	40.4	40.0	40.4	40.9	38.9	38.8	38.9	39.0
Job-tenure (year)	6.6	5.9	6.4	7.0	4.3	4.2	4.3	4.4	4.1	3.9	3.9	4.5
Experience (year)	11.8	11.6	11.6	11.8	7.1	7.2	7.2	6.9	6.1	6.0	5.9	6.2
Copenhagen	3.8	10.7	0.3	0.5	3.6	6.9	0.2	0.4	3.1	5.8	0.1	0.3
Aarhus	1.1	0.1	9.9	0.2	0.6	0.0	6.3	0.1	0.5	0.0	5.3	0.1
Rural	6.8	0.8	1.4	11.1	2.9	0.3	0.7	6.4	2.5	0.2	0.5	5.8
Education (share)												
Basic	29.2	28.2	26.1	30.4	21.3	20.5	19.8	22.5	44.5	44.3	45.1	44.6
Short	58.7	52.5	60.2	62.0	47.9	41.1	51.3	55.6	39.0	35.9	40.1	42.6
Medium	7.4	10.4	8.3	5.6	14.9	17.3	14.2	12.0	9.3	10.7	8.9	7.7
Long	4.6	8.9	5.4	2.1	15.9	21.0	14.7	9.8	7.2	9.2	5.9	5.1
Occupational skill (share)												
Basic	47.2	37.2	45.3	53.2	36.9	28.6	37.2	46.4	43.8	36.1	44.8	53.1
Medium	17.3	22.6	18.8	13.9	12.6	15.4	12.9	9.4	5.7	7.0	6.5	3.9
High	9.9	16.5	11.1	6.0	16.4	23.9	14.1	8.1	7.3	9.9	6.7	4.1
Top	5.0	5.7	5.2	4.6	3.7	4.5	3.3	2.9	1.0	1.2	0.8	0.8
Other	20.6	18.0	19.6	22.3	30.3	27.5	32.5	33.2	42.3	45.7	41.2	38.1
Number of workers	1,688,685	663,411	228,237	1,100,634	84,148	44,485	8,480	40,153	106,485	61,146	10,698	48,236
Number of observations	16,406,170	5,366,726	1,605,432	9,434,012	488,221	240,337	39,305	208,579	659,023	337,622	52,588	268,813

Notes: Worker occupational skill groups are top level managers (top), upper level employees (high), medium level employees (medium), and basic level employees (basic). Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree.

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During the study period 1997-2016, the Danish population rose from 5.27 to 5.71 million. In the same period the number of immigrants in Denmark rose from 260.000 to 540.000 increasing the immigrant share of the danish population from 4.9% to 9.5%.[8] More importantly for our study, the immigrant workers accumulate and use the accumulated experience more intensively in high density areas compared to the native workers. Table 2 shows that the worker mobility between urban areas is limited. Only 0.31% of observations involve a worker moving from one city to another.

Table 2: Worker relocation, number of observations and shares

	To Copenhagen	To Aarhus	To rural
From Copenhagen	4,242,055	18,683	148,659
	(33.56%)	(0.15%)	(1.18%)
From Aarhus	20,787	1,155,599	68,113
	(0.16%)	(9.14%)	(0.54%)
From rural	142,375	68,591	6,775,186
	(1.13%)	(0.54%)	(53.60%)

Notes: A map of the urban areas is shown in Figure 1. Observation shares are in parentheses. The number of observations is 16,406,170.

3   The econometric model

We follow De la Roca and Puga (2016) and introduce a reduced form wage model that includes the dynamic effects of experience. We use w_{ait} to denote the log wage of worker i in time period t employed in area a and assume that the log wage is given by the equation

$$w_{ait} = \sigma_a + \mu_i + l_{ait} + \mathbf{X}_{it}^\top \beta + \varepsilon_{ait}, \tag{1}$$

where σ_a is the area fixed effect, μ_i is the individual fixed effect, l_{ait} is a function of experience to be specified later, $\mathbf{X}_{it}$ is the vector of time-varying observable worker characteristics, β is a vector of parameters, and ε_{ait} is unobservable error term. We assume ε_{ait} shocks are IID, and are observed by workers only after they have made their location choices.[9]

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[8]Figure A.2 in the Appendix A shows the share of the western immigrants and the share of the non-western immigrants over the years in our sample.

[9]We need an assumption like this to guarantee that the error term is uncorrelated with the regressors. If the workers made location decisions after having observed the error term, it would introduce correlation

The *static* advantages of working in high density areas are the advantages gained while working there but lost immediately upon being employed elsewhere. A worker changing area of employment from a to a' will immediately experience a change in wage due to the difference in the area fixed effects $\sigma_{a'} - \sigma_a$. This change is immediately reverted should the worker move back to the area a. The wage equation (1) therefore allows for a static earnings premium of being employed in a high density area if area fixed effects σ_j are positively correlated with the density.

Learning effects l_{ait} capture the value of a worker's experience distinguished by where the experience was accumulated and where it is used. We specify the learning effects as

$$l_{ait} = \sum_{j=1}^{J} [\alpha + \lambda_j + \delta_{ja}] \, e_{jit}, \tag{2}$$

where we normalize coefficients for a reference location λ_1 and δ_{j1} to be zero for all locations j.[10] That is, α is the value of experience in the reference location used in the reference location, λ_j is the additional value of experience from location j used in the reference location, and δ_{ja} is the additional value of experience from location j if used in location a.

If we make the rural area our reference location, $\lambda_j > 0$ supports the hypothesis that experience accumulated in cities is worth more even when used outside of cities. If $\delta_{ja} > 0$, then there is a premium to experience accumulated in j if used in a city. The premium λ_j is the *portable part* of the urban experience premium, while δ_{ja} is the *non-portable* part of the urban experience premium.

We refer to workers with an above-average value of μ_i as initial high wage earners. The inclusion of the unobserved individual fixed effect μ_i allows also for sorting on unobservable characteristics. If initial high wage earners are predominantly employed in areas of high density, $\mathbb{E}[\mu_i|a] > \mathbb{E}[\mu_i]$ for an dense urban area a.[11]

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and make our regression estimates biased and inconsistent. As long as the shocks are noisy, we could allow for some serial correlation in the error term. For more discussion of these assumptions, see Appendix B in Combes et al. (2008).

[10]The estimated specification also includes quadratic terms, but we omit these now for ease of presentation.

[11]Previous literature has found that high-wage workers are more likely to choose to live in dense urban areas. One way to understand this pattern is that high density areas offer certain amenities favoured by the high productivity workers (high wage earners). The initial high productivity workers are therefore

4 Estimation results

This section presents the empirical results. In section 4.1, we pool our data and estimate the urban experience premium. This allows us to compare our results to those in the literature. In section 4.2, we estimate our wage equation for natives and immigrants separately.

4.1 The urban experience premium: pooled results

Table 3 reports the estimation results for the urban experience premium estimated on our pooled sample of natives and immigrants. In column (1) we only control for the year fixed effects and observables. Specifically, we control for experience, job-tenure, occupational skill-level, education, gender, immigration status, and sector fixed effects. The urban wage premium indicates that hourly wages are on average 11.6% higher in Copenhagen and 3.4% higher in Aarhus when compared to the rest of the country.[12] The return to experience is concave. The first year of experience increases wages by 1.6%, while the fifth year of experience increases wages only by 1.2%.[13] Job tenure is also concave with the first year of the tenure rewarded 0.9% and the fifth year 0.6%. Wages increase with the level of occupational skill and with the level of education. Male workers have higher wages than female workers, and immigrants have lower wages than natives, with non-western immigrant wages 10.5% lower than native workers. Western immigrant workers have only 2.6% lower wages compared with native workers.

In column (2) of Table 3 we include worker fixed effects to control for sorting on unobserved attributes. This reduces the static urban wage premium for Copenhagen by 56%, or 6.9 percentage points.[14] The return to experience for the first year increases

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less deterred by the higher housing prices of high density areas as suggested by e.g. Glaeser and Maré (2001).

[12]When we only control for the year fixed effects and the sector fixed effects, then the hourly wages, compared to the rest of the country, are on average 14.5% higher in Copenhagen and 5.4% higher in Aarhus. This *raw urban wage premium* for Copenhagen is lower than the raw urban premium for Oslo in Norway where it is 18.7% (Carlsen et al., 2016) and for London in the UK where it is 35% (D'Costa and Overman, 2014).

[13]The first year increase is calculated as $(exp(0.016 - 0.0004) - 1) \cdot 100$, and the fifth year increase as $(exp((0.016 \cdot 5 - 0.0004 \cdot 5^2) - (0.016 \cdot 4 - 0.0004 \cdot 4^2)) - 1) \cdot 100$.

[14]The reduction for Copenhagen is larger than the 40% for Oslo reported by Carlsen et al. (2016) and smaller than the 70% reduction found for London by D'Costa and Overman (2014).

Table 3: Urban wage premium

	Dependent variable: log hourly wage			
	(1)	(2)	(3)	(4)
Copenhagen (highest density)	0.116***	0.052***	0.047***	0.039***
	(0.0004)	(0.001)	(0.001)	(0.001)
Aarhus (second highest density)	0.034***	0.011***	0.008***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Experience	0.016***	0.024***	0.020***	0.020***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Experience squared	−0.0004***	−0.0005***	−0.0003***	−0.0003***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Experience in Copenhagen			0.009***	0.010***
			(0.0001)	(0.0003)
Experience in Copenhagen squared			−0.0003***	−0.0004***
			(0.00001)	(0.00002)
Experience in Aarhus			0.005***	0.009***
			(0.0002)	(0.0004)
Experience in Aarhus squared			−0.0002***	−0.0004***
			(0.00001)	(0.00002)
Experience in rural used in city				0.004***
				(0.0003)
Experience in Copenhagen used in city				−0.0002
				(0.0003)
Experience in Aarhus used in city				−0.004***
				(0.0004)
Experience in rural				−0.0002***
× experience used in city				(0.00001)
Experience in Copenhagen				0.0001***
× experience used in city				(0.00002)
Experience in Aarhus				0.0002***
× experience used in city				(0.00002)
Jobtenure	0.009***	0.007***	0.007***	0.007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Jobtenure squared	−0.0003***	−0.0002***	−0.0002***	−0.0002***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Top skilled occupation	0.418***	0.100***	0.099***	0.099***
	(0.001)	(0.001)	(0.001)	(0.001)
High skilled occupation	0.219***	0.041***	0.041***	0.041***
	(0.001)	(0.001)	(0.001)	(0.001)
Medium skilled occupation	0.154***	0.022***	0.022***	0.022***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)
Long education	0.251***			
	(0.001)			
Medium education	0.155***			
	(0.001)			
Short education	0.033***			
	(0.0005)			
Male	0.173***			
	(0.0004)			
Western immigrant	−0.026***			
	(0.002)			
Non-western immigrant	−0.105***			
	(0.001)			
Individual fixed effects	no	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Sector fixed effects	yes	yes	yes	yes
Observations	17,189,248	17,553,414	17,553,414	17,553,414
R^2	0.363	0.749	0.749	0.749

Notes: Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree. We distinguish between western immigrants and non-western immigrants based on the country of origin, see Appendix A. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

from 1.6% to 2.4% and for the fifth year of experience from 1.2% to 2.0%, suggesting that unobserved abilities are negatively correlated with experience. This suggests that unobserved abilities are likely more important for young workers with less experience. The wage payoff of job tenure is also slightly reduced, with a wage increase for the first year of employment of 0.7% (versus 0.9%), while the wage increase of the fifth year of employment is reduced to 0.2% (versus 0.3%). In this specification, the wage increases with the level of occupational skill. These estimates are however less robust to the addition of the individual fixed effects and are associated with significantly higher wage payoffs.

Finally, in column (3) of Table 3 we add controls for experience accumulated in Copenhagen and Aarhus, and in column (4) of Table 3 we further add controls for whether the origin specific experience is used in dense areas – Copenhagen or Aarhus – or in the rest of the country. Adding these controls reduces the urban wage premium even further. The urban wage premium for Copenhagen falls to 3.9% and for Aarhus to 0.5%. Furthermore, the coefficient on experience drops from 0.024 to 0.020 consistent with the experience accumulated in Copenhagen and Aarhus being rewarded respectively 1.0 and 0.9 percentage points higher than experience accumulated elsewhere. Experience accumulated in cities is on average rewarded more than experience gained elsewhere. This indicates that part of the total urban wage benefit is gained by workers over time, as they accumulate urban experience, rather than instantaneously when they change their area of employment.

Finally, when controlling for whether the experience is used in cities or rural areas, experience gained in the rural area increases wages 0.4% per year when used in Copenhagen or Aarhus. For Copenhagen the gains are portable as indicated by the insignificant coefficient on experience accumulated in Copenhagen and used in a city. A worker who accumulated experience in Copenhagen and then relocated to the rural area maintains the full urban experience premium. For Aarhus the experience is also portable, however to a lesser extent. The first year of experience accumulated in Aarhus results in 0.9% higher wages. The experience premium is however reduced by 0.4 percentage points when not used in Aarhus. In sum, experience accumulated in cities is rewarded more than rural experience, regardless of where it is used. All of our results in this section are comparable to the finds of De la Roca and Puga (2016) for Spain.

As a robustness check, we estimate the models in Table 3 columns (2)-(4) with municipality fixed effects or the interaction of the municipality and year fixed effects. These results are presented in Table B.1 and Table B.2 in Appendix B. The estimates of the coefficients on experience as well as those on other variables are analogous to those presented in Table 3. The only difference worth mentioning is that, compared with the baseline model, experience accumulated in Copenhagen is rewarded slightly more when used in Copenhagen.

We have also estimated the elasticity of the static wage premium with respect to municipality density. Table B.3 in Appendix B shows the results of regressing the estimates of the municipality fixed effects against the log employment density of the area. The elasticity of wages with respect to density is estimated to be 0.040, see column (1). When controlling for individual fixed effects, learning effects and using historical instruments the elasticity of the wages with respect to density is reduced to 0.012, see column (3).[15]

4.2 The urban wage growth premium: natives and immigrants

In this section we estimate the wage model separately for natives and immigrants. The results are reported in Table 4. The impact of job tenure, and occupation are more or less similar for the native workers and the immigrant workers.[16] The urban wage premium is a bit higher for natives than for immigrants. In Copenhagen, the static wage premium is 3.2% for immigrants and 4.0% for natives. In Aarhus, natives receive a static premium of 0.5%, and immigrants get no significant static return to working in Aarhus.

We now focus on the rewards of experience both gained and used outside the cities. Here we find that the wage gains to experience are lower for the immigrant workers than for the native workers. The first year of experience is associated with a 2.0% wage increase for the native workers compared to a lower 1.3% wage increase for the immigrant workers. For native workers and non-western workers, experience accumulated in the rural areas

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[15]The log density of the area is measured as the experienced density as described by Duranton and Puga (2020). To construct the variable called 'experienced density' we have used 3 different measures of local employment activity and for each of these have chosen 10 different values for the distance parameter. The estimates in Table B.3 are robust to the choice of measure of local employment activity and the choice of value for the distance parameter. Specifically, the variation in the estimate of the elasticity of agglomeration is no larger than 0.002 as a consequence of this choice.

[16]Immigrant workers appear to get significantly higher returns from the high-skill occupation category.

Table 4: Urban wage premium by immigrant status

	Dependent variable: log hourly wage			
	Natives	All immigrants	Western immigrants	Non-Western immigrants
	(1)	(2)	(3)	(4)
Copenhagen	0.040***	0.032***	0.032***	0.033***
	(0.001)	(0.005)	(0.008)	(0.006)
Aarhus	0.005***	−0.001	0.013	−0.012
	(0.002)	(0.006)	(0.009)	(0.008)
Experience	0.020***	0.013***	0.011***	0.013***
	(0.0002)	(0.001)	(0.001)	(0.001)
Experience squared	−0.0003***	−0.0004***	−0.0003***	−0.0004***
	(0.00000)	(0.00002)	(0.00003)	(0.00003)
Experience in Copenhagen	0.010***	0.011***	0.015***	0.009***
	(0.0003)	(0.002)	(0.003)	(0.002)
Experience in Copenhagen squared	−0.0004***	−0.001***	−0.001***	−0.001***
	(0.00002)	(0.0001)	(0.0001)	(0.0001)
Experience in Aarhus	0.009***	0.004	0.008**	0.001
	(0.0005)	(0.003)	(0.004)	(0.004)
Experience in Aarhus, squared	−0.0004***	0.0001	−0.0001	0.0002
	(0.00002)	(0.0001)	(0.0002)	(0.0002)
Experience in rural used in city	0.004***	0.004**	0.005**	0.003
	(0.0003)	(0.002)	(0.002)	(0.002)
Experience in Copenhagen used in city	0.00003	−0.005***	−0.002	−0.007***
	(0.0003)	(0.002)	(0.002)	(0.002)
Experience in Aarhus used in city	−0.004***	0.003	−0.002	0.006
	(0.0005)	(0.003)	(0.004)	(0.004)
Experience in rural × experience used in city	−0.0002***	−0.0002***	−0.0003**	−0.0002*
	(0.00001)	(0.0001)	(0.0001)	(0.0001)
Experience in Copenhagen × experience used in city	0.0001***	0.0003***	0.0002	0.0004***
	(0.00002)	(0.0001)	(0.0001)	(0.0001)
Experience in Aarhus × experience used in city	0.0002***	−0.0002*	−0.0001	−0.0003
	(0.00002)	(0.0001)	(0.0002)	(0.0002)
Jobtenure	0.007***	0.008***	0.009***	0.008***
	(0.0001)	(0.0003)	(0.001)	(0.0004)
Jobtenure squared	−0.0002***	−0.0003***	−0.0002***	−0.0003***
	(0.00000)	(0.00002)	(0.00003)	(0.00002)
Top skilled occupation	0.098***	0.119***	0.125***	0.102***
	(0.001)	(0.004)	(0.005)	(0.007)
High skilled occupation	0.039***	0.070***	0.069***	0.072***
	(0.001)	(0.003)	(0.004)	(0.005)
Medium skilled occupation	0.021***	0.032***	0.036***	0.031***
	(0.0004)	(0.002)	(0.003)	(0.004)
Individual fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Sector fixed effects	yes	yes	yes	yes
Observations	16,406,170	1,147,244	488,221	659,023
R^2	0.748	0.749	0.801	0.675

Notes: Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree. We distinguish between western immigrants and non-western immigrants based on the country of origin, see Appendix A. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

receives a higher return if used in a city. For the first year of rural experience, a non-western immigrant workers get an additional 0.5% wage increase when working in a city, while the native workers get a slightly lower additional wage increase of 0.4%.

Turning to experience gained in cities, for all workers the experience accumulated in Copenhagen is rewarded more than the experience gained elsewhere, when used outside

Copenhagen. This additional gain from accumulated experience is higher for the western immigrant workers and lower for the non-western immigrant workers, when compared with the native workers. Our results imply that the first year of experience accumulated in Copenhagen rewards the native workers with an additional 1.0% wage increase, while the western immigrant workers and the non-western immigrant workers receive 1.4% and 0.8% additional wage increases, respectively. These results are all for experience in Copenhagen when used in rural areas. The comparative percentages for the experience accumulated in Aarhus are somwhat smaller, but statistically significant for natives and western immigrants.

Echoing our pooled results, natives get no additional wage bump from experience gained in Copenhagen when it is used in Copenhagen. As discussed above, this result is consistent with the results in De la Roca and Puga (2016) for Spain. When we split the sample, however, a different story emerges for immigrants. Non-western immigrants in particular have a wage penalty of almost 0.7% from using their Copenhagen experience in a city. Put another way, the Copenhagen experience of non-western immigrants barely affects their wages differently compared with rural experience, if used in Copenhagen. City experience for non-western immigrants is only more valuable than rural experience if they leave the city. For Copenhagen, the gains for the native workers and the western immigrant workers are portable as indicated by the insignificant coefficient on experience accumulated in Copenhagen and used in a city. For non-western workers, the city experience is not portable, in the sense that the returns depend on where the experience is used.[17,18]

There are many coefficients in Table 4. To help with interpretation, we illustrate some sample wage paths implied by the model in Figure 2. An additional reason to present these simple simulations is that the results in Table 4 apply to one year increments of experience. Even small differences in growth rates can have large effects as workers accumulate experience.

Figure 2a illustrates the additional wage gains from experience accumulated in Copen-

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[17]Experience in Aarhus is portable for the immigrant workers are portable, but not quite portable for the native workers (although the coefficient is small at -0.4%).

[18]We have also compared the non-western immigrant workers with the low educated native workers, see Table B.4 in Appendix B. The results are consistent with the results in Table 4.

hagen for native workers, western immigrant workers, and non-western immigrant workers who leave the city. We assume that all workers initially have zero years of experience and each year accumulate one year of experience from the area of current employment. For the first five years the workers are assumed to work in Copenhagen area, then they migrate to the rural area. Figure 2b shows the a similar picture, but for wage gains from the experience accumulated in rural area for workers migrating into Copenhagen.

The first result to note is that native workers have quicker wage gains than immigrants in both scenarios. Natives overall have higher returns to experience than immigrants. Along similar lines, the slope of the returns to rural experience for natives is much steeper than immigrants, as can be seen in the second half of Figure 2a, and the first half of Figure 2b. The two immigrant types also display different patterns. Non-western immigrants have nearly the same slope for experience gained in Copenhagen as they have for rural experience. They get a big wage bump in Figure 2a when moving to a rural area, because as discussed above, city experience for them is only more useful if used in a rural area. Western immigrants are more similar to natives, except that their returns to rural experience are markedly lower.

Figure 2: Accumulated gains from experience when migrating within Denmark

(a) Moving from Copenhagen area   (b) Moving to Copenhagen area
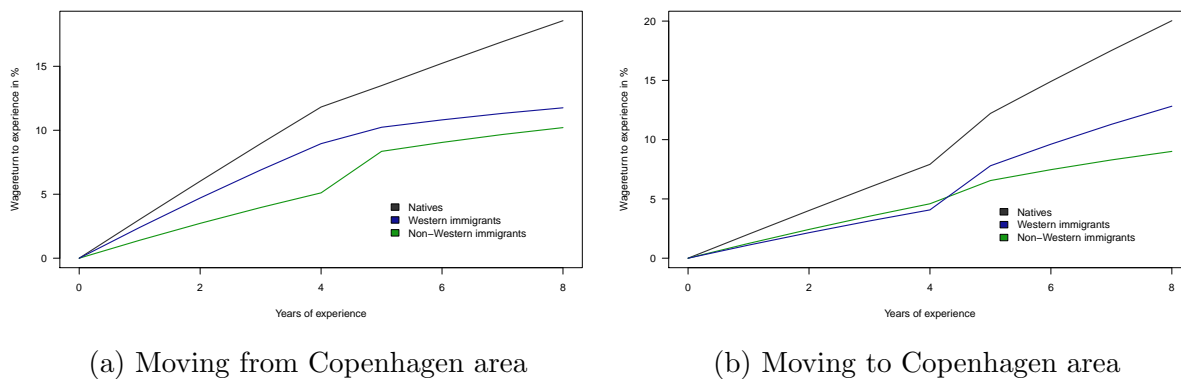
Note: Wage path for workers who initially have zero years of experience. Each year they accumulate one year of experience from the area of current employment. Workers move between Copenhagen and the rural area after five years.

17

5 Conclusion

The often-observed concentration of immigrants in big cities is a long-standing phenomenon and its origins are multidimensional. Empirically, we know very little about the impact of agglomeration economies on this phenomenon. This article seeks to identify the determinants of the urban wage premium for natives and immigrants.

Using panel data for workers in Denmark, we first demonstrate the existence of both a static urban wage premium and an urban experience premium for wage growth for both native workers and western immigrant workers. The estimated effects imply individual-level compensating differentials for agglomeration economies as predicted by urban economic models that allow for productivity advantages emerging from improved sharing, matching or learning in dense labour markets (Duranton and Puga, 2004; De la Roca and Puga, 2016). Then we show that non-western immigrants get more or less no big city premium on the gains from experience, unless they move away from big cities.

Policymakers and academics who are interested in immigration issues, agglomeration economies, and urbanization may be interested in our results. Our empirical findings suggest that non-wage amenities, such as large cohorts of co-ethnics and other immigrants, keep non-western immigrants in big cities, even when their wage gains to leaving are large. We emphasize that our results do not say anything explicitly about the general equilibrium effects of the immigrants' residence location choices, but do suggest that non-western immigrant workers gain less from agglomeration. In order to better understand the underlying mechanisms of these results, we hope economists will study the urban experience premium of immigrants in countries with different sizes, immigration patterns, and institutions.

References

Ahlfeldt, Gabriel M. and Elisabetta Pietrostefani, "The Economic Effects of Density: A Synthesis," 2019, *111*, 93–107.

Bartel, Ann P., "Where Do the New U.S. Immigrants Live?," *Journal of Labor Economics*, 1989, *7* (4), 371–391.

Bauer, Thomas, Gil S. Epstein, and Ira N. Gang, "Enclaves, Language, and the Location Choice of Migrants," *Journal of Population Economics*, 2005, *18* (4), 649–662.

Baum-Snow, Nathaniel, Matthew Freedman, and Ronni Pavan, "Why Has Urban Inequality Increased?," 2018, *10* (4), 1–42.

Borjas, George, "Immigration and Welfare Magnets," *Journal of Labor Economics*, 1999, *17* (4), 607–37.

Carlsen, Fredrik, Jørn Rattsø, and Hildegunn E. Stokke, "Education, experience, and urban wage premium," *Regional Science and Urban Economics*, 2016, *60*, 39–49.

Combes, P.-P., G. Duranton, and L. Gobillon, "The Identification of Agglomeration Economies," 2011, *Vol. 11*, 253–266.

Combes, Pierre-Philippe and Laurent Gobillon, "The Empirics of Agglomeration Economies," in "Handbook of Regional and Urban Economics," Vol. 5, Elsevier, 2015, pp. 247–348.

_ , **Gilles Duranton, and Laurent Gobillon**, "Spatial wage disparities: Sorting matters!," *Journal of Urban Economics*, 2008, *63* (2), 723–742.

_ , _ , _ , **and Sébastien Roux**, *1. Estimating Agglomeration Economies with History, Geology, and Worker Effects*, Chicago: University of Chicago Press,

Damm, Anna Piil, "Determinants of Recent Immigrants' Location Choices: Quasi-Experimental Evidence," *Journal of Population Economics*, 2009, *22* (1), 145–174.

D'Costa, Sabine and Henry G. Overman, "The urban wage growth premium: Sorting or learning?," *Regional Science and Urban Economics*, 2014, *48*, 168–179.

Duranton, Gilles and Diego Puga, "Nursery Cities: Urban Diversity, Process Innovation, and the Life Cycle of Products," 2001, *91* (5), 1454–1477.

_ **and** _ , "Chapter 48 Micro-foundations of Urban Agglomeration Economies," in "Handbook of Regional and Urban Economics," Vol. 4, Elsevier, 2004, pp. 2063–2117.

_ **and** _ , "The Economics of Urban Density," 2020, *34* (3), 3–26.

Eckert, Fabian, Mads Hejlesen, and Conor Walsh, "The return to big-city experience: Evidence from refugees in Denmark," *Journal of Urban Economics*, 2022, *130*, 103454.

Farrokhi, Farid and David Jinkins, "Root Growing and Path Dependence in Location Choice: Evidence from Danish Refugee Placement," 2022.

Foged, Mette and Giovanni Peri, "Immigrants' Effect on Native Workers: New Analysis on Longitudinal Data," *American Economic Journal: Applied Economics*, April 2016, *8* (2), 1–34.

Frings, Hanna and Rebecca Kamb, "What Explains the Urban Wage Premium? Sorting, Non-Portable or Portable Agglomeration Effects?," 2021.

Glaeser, Edward L., "Learning in Cities," 1999, *46*, 254–277.

Glaeser, Edward L. and David C. Maré, "Cities and Skills," *Journal of Labor Economics*, 2001, *19* (2), 316–342.

Heuermann, Daniel, Benedikt Halfdanarson, and Jens Suedekum, "Human Capital Externalities and the Urban Wage Premium: Two Literatures and Their Interrelations," 2010, *47* (4), 749–767.

Hybel, Jesper and Ismir Mulalic, "Transportation and quality of life: Evidence from Denmark," *Transportation Research Part A: Policy and Practice*, 2022, *157*, 107–125.

i Puigarnau, Eva Gutiérrez, Ismir Mulalic, and Jos N. van Ommeren, "Do Rich Households Live Farther Away from Their Workplaces?," 2016, *16* (1), 177–201.

la Roca, Jorge De and Diego Puga, "Learning by Working in Big Cities," *The Review of Economic Studies*, 07 2016, *84* (1), 106–142.

Matano, Alessia and Paolo Naticchioni, "What Drives the Urban Wage Premium? Evidence along the Wage Distribution.," 2016, *56* (2), 191–209.

Melo, Patricia C., Daniel J. Graham, and Robert B. Noland, "A Meta-Analysis of Estimates of Urban Agglomeration Economies," 2009, *39* (3), 332–342.

Zavodny, Madeline, "Determinants of Recent Immigrants' Locational Choices," *The International Migration Review*, 1999, *33* (4), 1014–1030.

A Additional data description

A.1 Western and non-western immigrants

We distinguish between western immigrants and non-western immigrants based on the country of origin.
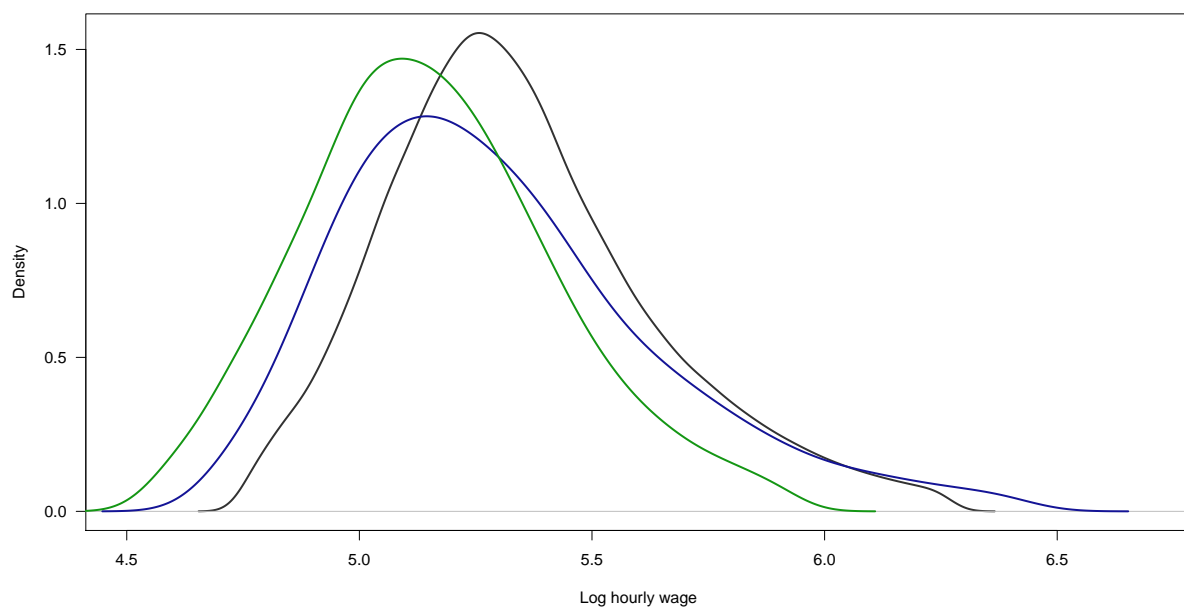
The *western immigrants* are defined as immigrants from: Finland, Iceland, Liechtenstein, Luxembourg, Monaco, Norway, Sweden, Andorra, Belgium, Bulgaria, Czechoslovakia, France, Greece, Netherlands, Ireland, Italy, Malta, Poland, Portugal, Romania, San Marino, Switzerland, Spain, the UK, Hungary, Vatican, Germany, Austria, Canada, United States, Cyprus, Australia, Estonia, Latvia, Lithuania, Slovenia, Czech Republic, and Slovakia.

The *non-western immigrants* are immigrants from: Albania, Serbia and Montenegro, Soviet Union, Turkey, Algeria, Angola, Botswana, Burundi, Ethiopia, Comoros, Eritrea, Gambia, Ghana, Equatorial Guinea, Guinea-Bissau, Guinea, Cape Verde, Kenya, Lesotho, Liberia, Libya, Mozambique, Madagascar, Mali, Morocco, Mauritius, Nigeria, Namibia, Marshall Islands, Sierra Leone, Sudan, Eswatini, South Sudan, South Africa, Tanzania, Tunisia, Uganda, Egypt, Tuvalu, Kiribati, Vanuatu, Central African Republic, Cameroon, Congo, Democratic Republic of Congo, Republic o Benin, Ivory Coast, Gabon, Mauritania, Niger, Rwanda, Senegal, Somalia, Chad, Togo, Burkina Faso, Zimbabwe, Zambia, Malawi, Seychelles, Argentina, Bahamas, Bolivia, Barbados, Brazil, Guyana, Antigua and Barbuda, Nauru, St. Vincent and the Grenadines, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Grenada, Haiti, Suriname, Dominica, St. Lucia, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, El Salvador, Trinidad and Tobago, Uruguay, Venezuela, West Indies, Yemen, United Arab Emirates, Afghanistan, Bahrain, Bhutan, Bangladesh, Brunei, Myanmar, Cambodia, Sri Lanka, Taiwan, India, Indonesia, East Timor, Iraq, Iran, Israel, Japan, Jordan, China, Kuwait, Laos, Lebanon, Maldives, Malaysia, Mongolia, Oman, Nepal, North Korea, Viet-

nam, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Syria, Thailand, Qatar, Tonga, Fiji, New Zealand, Samoa, Djibouti, Belize, Papua New Guinea, Pacific Islands, Sao Tome and Principe, Solomon Islands, St. Kitts and Nevis, Russia, Ukraine, Belarus, Armenia, Azerbaijan, Moldova, Uzbekistan, Kazakhstan, Turkmenistan, Kyrgyzstan, Tajikistan, Georgia, Croatia, Bosnia and Herzegovina, North Macedonia, Serbia, Yugoslavia, Montenegro, Kosovo, Cook Islands, Faroe Islands. We define few observed stateless workers as non-western immigrants.

A.2   Additional data descriptives

Figure A.1: Distributions of the log hourly wages for the native workers (black), the western immigrant workers (blue) and the non-western immigrant workers (green)

Notes: This figure depicts the kernel density distribution of the hourly wages by immigrant status for the period 1997 until 2016.

Figure A.2: Share of the western immigrant workers and the non-western workers from 1997-2016
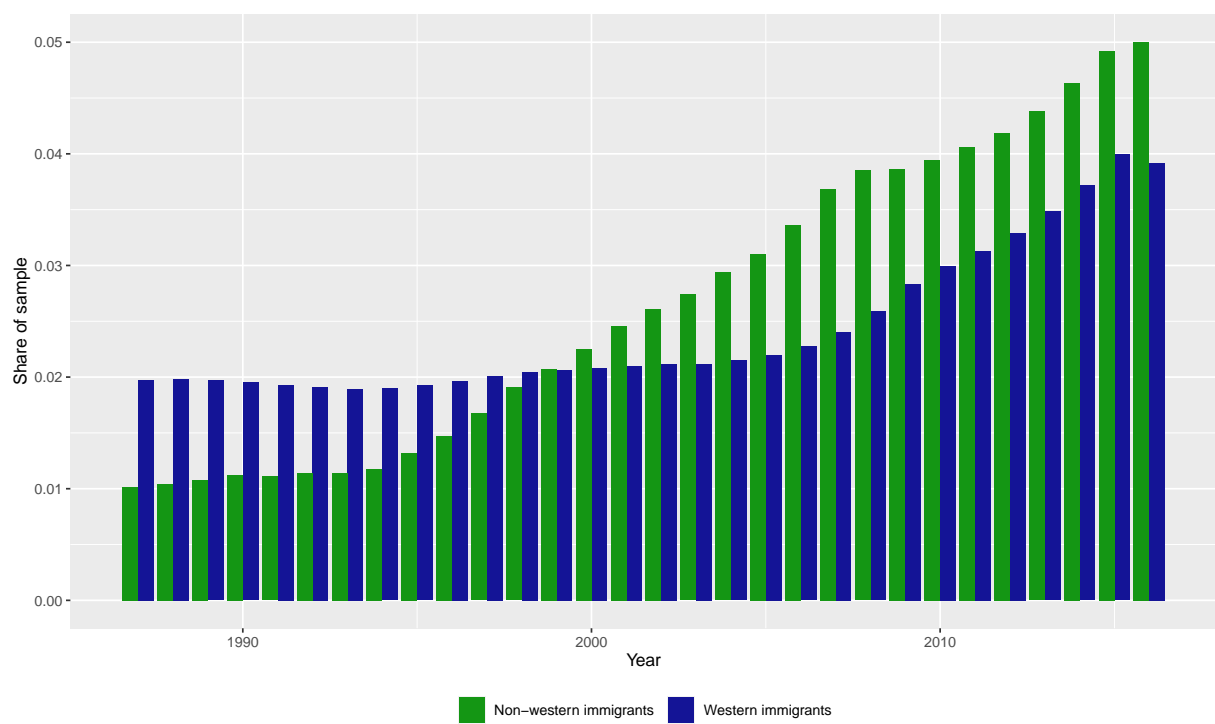
B Additional estimation results

Table B.1: Urban wage premium - municipality fixed effects

			Dependent variable: log hourly wage		
			log hourly wage		
	(1)	(2)	(3)	(4)	(5)
Copenhagen (highest density)			0.047***		
			(0.001)		
Aarhus (second highest density)			0.008***		
			(0.001)		
Experience	0.016***	0.023***	0.020***	0.020***	0.019***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Experience squared	−0.0004***	−0.0005***	−0.0003***	−0.0003***	−0.0003***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Experience in Copenhagen			0.009***	0.009***	0.011***
			(0.0001)	(0.0001)	(0.0002)
Experience in Copenhagen squared			−0.0003***	−0.0003***	−0.0003***
			(0.00001)	(0.00001)	(0.00001)
Experience in Aarhus			0.005***	0.005***	0.005***
			(0.0002)	(0.0002)	(0.0003)
Experience in Aarhus squared			−0.0002***	−0.0002***	−0.0002***
			(0.00001)	(0.00001)	(0.00001)
Jobtenure	0.009***	0.007***	0.007***	0.007***	0.007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Jobtenure squared	−0.0003***	−0.0002***	−0.0002***	−0.0002***	−0.0002***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Top skilled occupation	0.416***	0.100***	0.099***	0.099***	0.099***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
High skilled occupation	0.216***	0.041***	0.041***	0.040***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Medium skilled occupation	0.151***	0.021***	0.022***	0.021***	0.022***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Long education	0.248***				
	(0.001)				
Medium education	0.154***				
	(0.001)				
Short education	0.033***				
	(0.0004)				
Male	0.173***				
	(0.0004)				
Western immigrant	−0.028***				
	(0.002)				
Non-western immigrant	−0.107***				
	(0.001)				
Individual fixed effects	-	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	no
Municipality fixed effects	yes	yes	no	yes	no
Municipality × year fixed effects	no	no	no	no	yes
Sector fixed effects	yes	yes	yes	yes	yes
Observations	17,189,248	17,553,414	17,553,414	17,553,414	17,553,414
R^2	0.368	0.749	0.749	0.749	0.750

Notes: Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table B.2: Urban wage premium - interaction of the municipality and the year fixed effects

	Dependent variable: log hourly wage				
	(1)	(2)	(3)	(4)	(5)
Copenhagen			0.039***		
			(0.001)		
Aarhus			0.005***		
			(0.001)		
Experience	0.016***	0.023***	0.020***	0.019***	0.019***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Experience squared	−0.0004***	−0.0005***	−0.0003***	−0.0003***	−0.0003***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Experience in Copenhagen			0.010***	0.009***	0.010***
			(0.0003)	(0.0003)	(0.0004)
Experience in Copenhagen squared			−0.0004***	−0.0004***	−0.0003***
			(0.00002)	(0.00002)	(0.00002)
Experience in Aarhus			0.009***	0.009***	0.008***
			(0.0004)	(0.0005)	(0.0005)
Experience in Aarhus squared			−0.0004***	−0.0004***	−0.0003***
			(0.00002)	(0.00002)	(0.00002)
Experience in rural used in city			0.004***	0.004***	0.005***
			(0.0003)	(0.0003)	(0.0003)
Experience in Copenhagen used in city			−0.0002	0.001*	0.001***
			(0.0003)	(0.0003)	(0.0003)
Experience in Aarhus used in city			−0.004***	−0.004***	−0.003***
			(0.0004)	(0.0004)	(0.0005)
Experience in rural			−0.0002***	−0.0002***	−0.0002***
× experience used in city			(0.00001)	(0.00001)	(0.00001)
Experience in Cph.			0.0001***	0.00005***	0.00000
× experience used in city			(0.00002)	(0.00002)	(0.00002)
Experience in Aarhus			0.0002***	0.0002***	0.0002***
× experience used in city			(0.00002)	(0.00002)	(0.00002)
Jobtenure	0.009***	0.007***	0.007***	0.007***	0.007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Jobtenure squared	−0.0003***	−0.0002***	−0.0002***	−0.0002***	−0.0002***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Top skilled occupation	0.416***	0.100***	0.099***	0.099***	0.099***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
High skilled occupation	0.216***	0.041***	0.041***	0.040***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Medium skilled occupation	0.151***	0.021***	0.022***	0.021***	0.022***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Long education	0.248***				
	(0.001)				
Medium education	0.154***				
	(0.001)				
Short education	0.033***				
	(0.0004)				
Male	0.173***				
	(0.0004)				
Western immigrant	−0.028***				
	(0.002)				
Non-western immigrant	−0.107***				
	(0.001)				
Individual fixed effects	no	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	no
Municipality fixed effects	yes	yes	no	yes	no
Municipality × year fixed effects	no	no	no	no	yes
Sector fixed effects	yes	yes	yes	yes	yes
Observations	17,189,248	17,553,414	17,553,414	17,553,414	17,553,414
R²	0.368	0.749	0.749	0.749	0.750

Notes: Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table B.3: Agglomeration effect - elasticity of the wage premium with respect to municipality density

	Dependent variable: area indicator					
	(1)	(2)	(3)	(4)	(5)	(6)
Log density	0.040**	0.03**	0.021**	0.015**	0.017**	0.012**
	(0.0030)	(0.0055)	(0.0019)	(0.0035)	(0.0018)	(0.0034)
Individual fixed effects	no	no	yes	yes	yes	yes
Learning effects	no	no	no	no	yes	yes
Historical instruments	no	yes	no	yes	no	yes
Observations	98	98	98	98	98	98
R^2	0.66		0.57		0.49	

Notes: $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table B.4: Urban wage premium - lower educated natives and non-western immigrants

	Dependent variable: log hourly wage	
	Low educated natives	Non-Western immigrants
	(1)	(2)
Copenhagen	0.039***	0.033***
	(0.003)	(0.006)
Aarhus	0.003	−0.012
	(0.003)	(0.008)
Experience	0.015***	0.013***
	(0.0003)	(0.001)
Experience squared	−0.0003***	−0.0004***
	(0.00001)	(0.00003)
Experience in Copenhagen	0.008***	0.009***
	(0.001)	(0.002)
Experience in Copenhagen squared	−0.0003***	−0.001***
	(0.00003)	(0.0001)
Experience in Aarhus	0.008**	0.001
	(0.001)	(0.004)
Experience in Aarhus, squared	−0.0003***	0.0002
	(0.00004)	(0.0002)
Experience in rural used in city	0.003***	0.003
	(0.001)	(0.002)
Experience in Copenhagen used in city	0.00002	−0.007***
	(0.00003)	(0.002)
Experience in Aarhus used in city	−0.003**	0.006
	(0.001)	(0.004)
Experience in rural × experience used in city	−0.0002***	−0.0002*
	(0.00002)	(0.0001)
Experience in Copenhagen × experience used in city	0.0002	0.0004***
	(0.0001)	(0.0001)
Experience in Aarhus × experience used in city	0.0002***	−0.0003
	(0.00004)	(0.0002)
Jobtenure	0.007***	0.008***
	(0.0001)	(0.0004)
Jobtenure squared	−0.0002***	−0.0003***
	(0.00005)	(0.00002)
Top skilled occupation	0.096***	0.102***
	(0.002)	(0.007)
High skilled occupation	0.054***	0.072***
	(0.001)	(0.005)
Medium skilled occupation	0.030***	0.031***
	(0.001)	(0.004)
Individual fixed effects	yes	yes
Year fixed effects	yes	yes
Sector fixed effects	yes	yes
Number of observations	7,710,900	659,023
R^2	0.7294	0.675

Notes: Basic education includes: basic school, general upper secondary school, and vocational upper secondary school; short education includes: vocational education, and short-cycle higher education; medium education includes: bachelor and medium-cycle higher education; and long education includes: long-cycle higher education and PhD-degree. We distinguish between western immigrants and non-western immigrants based on the country of origin, see Appendix A. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.