Agglomeration Effects of Immigrants and Natives:

Heterogeneity Based on Country of Birth

Eric Myran Wee

Department of Economics, Norwegian University of Science and Technology, 7491 Trondheim, Norway

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Abstract

I investigate the urban wage premium for natives and groups of immigrants based on country of birth. The findings presented here add to the scarce literature on the agglomeration effects of immigrants. Using rich administrative data for Norway from 2008-2019 with information on labor participation back to 1993, I find that immigrants from low-income countries lag behind natives and immigrants from high-income countries from a lack of an immediate large-city earnings premium. The gap is increasing over time as immigrants from low-income countries have a lower return to work experience accumulated in cities than natives and immigrants from high-income countries. However, when separating the sample based on educational attainment, the results suggest that the lower return to urban experience for immigrants from low-income countries is mainly driven by primary educated individuals. I find that the return to acquired urban experience is higher for individuals with higher initial ability, as measured with worker fixed effects.

Keywords: Agglomeration effects, immigrants, country of birth
JEL codes: J31, J61, R12, R23

1 Introduction

Average earnings have been documented to be higher in urban than in rural areas. Untangling what is driven by productivity advantages of working in larger cities from sorting on observable and unobservable factors has been a key challenge in the literature. One of the major contributes to the empirical literature on the urban wage premium has been to account for sorting on unobservable factors by controlling for worker fixed effects (e.g. Glaeser and Maré (2001). Additionally, De la Roca and Puga (2017) find that not accounting for the large city benefits accruing over time will overestimate the effect of sorting on the urban wage premium. When allowing for an additional effect of labor experience gained in larger areas, De la Roca and Puga (2017) find that experience accumulated in larger cities is more valuable in the labor market than experience gathered elsewhere. Carlsen et al. (2016) extend the literature by looking at the return of working in large cities across formal skill level. They find that college-educated individuals have a higher return to experience accumulated in cities than lower educated individuals.

What is less known is how the urban wage premium differs between immigrants and natives. Given the importance of geographic sorting and return to working in urban areas in explaining wage differences, the limited focus on how spatial differences affect the immigrant-native wage gap is surprising. Some articles however shed light on this question. For instance, Longhi (2020) analyses the ethnic wage gap in Great Britain and finds that wage gaps calculated at the national level mask actual differences across the geographical plane within Great Britain. Ananat et al. (2018) find that blacks have a lower return to density than whites.

Hybel et al. (2023) and Niebuhr et al. (2022) are to my knowledge the only two papers that allow for both the static and dynamic productivity benefits of working in large areas to vary between natives and immigrants. Based on German data, Niebuhr et al. (2022) show that when the return to experience is allowed to vary between sectors, tasks and establishments, the differences between the return to big city experience between natives and immigrants disappear. Hybel et al. (2023) allow for separate effects for different groups of individuals based on country of birth. Based on Danish data, they find that non-western immigrants do not benefit from acquiring urban experience, unless they use

it in a rural area. However, Hybel et al. (2023) does not allow for the urban premium to differ across skill-level within the different groups studied.

The main focus in this paper is on the difference in economics of agglomeration between natives and groups of immigrants based on both country of birth and across skill-level. I use administrative data back to 1993 to calculate both the total years of experience as well as differentiating between the economic regions in which experience is acquired. The overall findings are consistent with earlier literature, indicating that there exists both a static and dynamic productivity advantage from working in larger economic regions. My findings suggest that natives have a total earnings premium of 16.2% from working in the economic region of Oslo compared to the smallest regions when accounting for sorting on observables and unobservables. The total premium consists of a static premium of 3.3% and a dynamic premium of 12.9% evaluated at the mean experience in the sample of 15.5 years.

Allowing for different effects for immigrants from low-income and high-income countries, interesting heterogeneity emerges. When accounting for sorting on unobservables, immigrants from low-income countries have a small negative static earnings loss of almost 1% from working in larger regions. For these workers, the total earning effect is 9.9%, completely driven by acquired labor market experience in Oslo. The results suggest that immigrants from LIC have a significantly lower return to working in the largest economic region of Oslo, but that the difference mitigate over time. Immigrants from HIC have a similar earnings trajectory as natives, with a total effect of 15.0%.

Categorizing individuals into high- and low-skilled based on worker fixed-effects, the results show that high-skilled individuals have a significantly larger return to urban experience than low-skilled individuals. In addition, when separating the sample based on both country-of-birth and observable educational attainment, I find that the lower return to urban experience for immigrants from LIC is mainly driven by those with a primary education, while the dynamic gain is similar across education group for natives and immigrants from HIC.

This paper contributes to the scarce literature on the urban wage premium for immigrants by allowing for different static and dynamic agglomeration effects for natives and different

groups of immigrants based on country of birth. In addition, the paper contributes to the literature by studying how agglomeration effects differ across skill-level within the different groups of immigrants.

A great contribution to the understanding of the mechanisms behind this urban wage premium is provided in Duranton and Puga (2004). They discuss the microfoundations of urban agglomeration economies and summarize them in three main factors: learning, sharing, and matching. The immediate gain from working in a large city can be attributed, but not limited, to factors such as proximity to customers, sharing of facilities, lower transport cost, and better infrastructure. Such immediate effects are labeled as the static urban premium, and can be viewed as immediate earning gains that are lost when moving away from regions with such benefits.

Gains from agglomerating are however not only immediate. The authors discuss learning and matching mechanisms as sources of agglomeration effects that accrue over time. For instance can proximity to others induce knowledge-spillovers by physical interactions, leading to *learning* over time. If the frequency and intensity of such knowledge-spillovers is increasing in population size, such learning mechanisms could be stronger in cities compared to more rural areas. In addition, larger labor markets and pools of firms can enhance both the frequency and quality of matches between employees and employers, leading to productivity gains over time. These two mechanisms are possibly interlinked as learning from interactions can induce matching.

Other mechanisms can however hamper the potential to reap the full benefits of working in large cities. Firstly, immigrants are expected to have inferior knowledge about the local labor market, potential employers, and opportunities than natives. Secondly, if employers are better at separating out good from bad candidates for individuals in their cultural group, immigrants can, in addition to the lower level of information, face a signaling disadvantage (Cornell & Welch, 1996). The last mechanism can lead to a form of statistical discrimination as a result of more uncertainty about the skill of immigrants in the labor market. Both mechanisms are likely to result in a higher degree of low-paying jobs, typically blue-collar jobs, for immigrants than for natives. Given the findings of Gould (2007) that a worker earns more in the city for white-collar work, but not for blue-collar work, this early disadvantage for immigrants can lead to increasing differences

as immigrants are not able to reap the full learning benefits from working in larger regions. As immigrants acquire more experience and integrate into the labor market, such differences might be reduced over time.

The rest of the paper is organised as following: Section 2 presents the data and econometric strategy, while the estimates of static and dynamic agglomeration effects are given in section 3. Section 4 offers concluding remarks and how this lays a foundation for further analyses.

2 Data and Empirical Specification

The data used in this paper consists of information about the whole Norwegian population in the period 2008 to 2019 and was extracted from microdata.no. For each year, I observe the place of residence, workplace municipality, annual earnings, sector and occupation data, and a battery of worker characteristics such as age, education and gender.[1] For immigrants, country of birth, reason for immigrating, and immigrant category is observed.[2] To investigate whether the urban wage premium differs between individuals with different country of birth, immigrants are allocated to two groups based on their country of birth. Immigrants from high-income countries, henceforth HIC, are defined as individuals from OECD countries (plus Greenland and the Faroe Islands) except Eastern European countries and countries that joined OECD during or after the period I'm studying. Immigrants from low-income countries, henceforth LIC, are individuals from the remaining foreign countries.

Municipalities are aggregated to 89 travel-to-work areas as defined by SSB (n.d.). These areas correspond to EU's definition of upper local administrative units (former NUTS-4) which reflect regions with a common labor market. Individuals are allocated to economic regions based on the municipality of their workplace. I follow Carlsen et al. (2016) and define cities as labor market regions with more than 150.000 inhabitants in 2019. This

[1]The data on immigrants' educational attainment is not complete. There have been two separate surveys in Norway to obtain information on education degree, one sent out to those with missing data on education in the database, and one for immigrants over the age of 19. The data does not distinguish between self-reported educational attainment and actual diplomas.

[2]Immigrants are here defined as individuals born abroad with two non-Norwegian parents, while natives are defined as Norwegian-born individuals with two Norwegian-born parents.

definition lead to eight cities. The capital and region of Oslo is separated out as it is the most inhabited region.[3] The reference group is economic regions with less than 150.000 inhabitants.

I combine information on which economic region an individual works in with annual earnings and worker characteristics to identify both the static and dynamic part of the urban wage premium. Labor market experience is calculated by setting an earnings cutoff equal to the pay grade 19 from the Basic Collective Agreement,[4] which is the public sector's collective agreement, for each individual year back to 1993. If individual i has earnings that exceeds the cutoff in that particular year, one year of experience is added. This is combined with the workplace municipality to calculate both the overall acquired labor market experience as well as years of experience acquired in the regions defined above.

2.1 Sample Restrictions and Descriptive Statistics

I restrict the sample to workers in Norway between 25-65 years of age that are in a full-time position, defined as working at least 30 hours a week. In the data set, I am only able to observe whether individuals are full time workers in November each year. To minimize the number of individuals that began a full time position late each year, or individuals that are falsely reported as having a full time position, observations where an individual earned less than the salary grade 19 in the Norwegian state salary scale adjusted for weekly working hours of 30 instead of 37.5 are excluded.[5] I exclude worker-year observations in which individuals worked in the public sector (this includes health care, education and public administration) because of highly nationally regulated wages. The primary sectors of fishing, agriculture, forestry, mining and mineral extraction (including oil and gas) are excluded due to their location-dependent activities that is not related to agglomeration. Observations with missing data on education, sector of work or workplace location are removed. These observations are however used when calculating acquired experience.

[3]The remaining seven cities are Bergen, Bærum/Asker, Drammen, Fredrikstad, Lillestrøm, Stavanger and Trondheim.

[4]Adjusted for weekly working hours of 30 instead of 37.5.

[5]If there is an actual wage premium of working in large regions, setting a country-wide cutoff is potentially problematic. Alternative restrictions will be applied to assess the robustness of the main specification, including region-varying cutoffs.

Individuals that changed their degree after first appearing in the data set as full-time workers (in the period 2008-2019) are removed.

The data does not contain work experience acquired overseas. This can be problematic when analysing the immigrant sample, as this type of experience can be valuable in the labor market. To mitigate this issue and to obtain more precise estimates of the work experience of immigrants, I restrict the immigrant sample to those immigrating before 1994 as I only have earnings from 1993, or if they were under the age of 26 when immigrating to Norway. Relying only on such immigrants comes at the cost of studying a potentially specific group of individuals. However, to get credible estimates of the return to labor market activity, this seems like a necessary trade-off. As a robustness check, the full sample will be analysed. The sample restrictions give a data set of 8.804.798 worker-year observations, with almost 1.200.000 different individuals. Of those are 29.307 immigrants from HIC, 73.258 immigrants from LIC, and 1.093.398 natives.

Descriptive statistics for annual deflated earnings, work experience, age and education across the different economic regions and immigrant groups are presented in table 2.1. The average immigrant from a low-income country is 38.1 years of age, has an annual earning of about 462.000 NOK and with 9.7 years of experience. Natives earn on average 592.000, have 15.8 years of experience, and are on average 7 years older than the average immigrant from LIC. Immigrants from HIC have average values in-between those of natives and immigrants from LIC. Interestingly, immigrants from HIC earn more in the other largest seven regions than in Oslo. This contrasts the findings for LIC-immigrants and natives whose earnings are highest in Oslo and lowest in the rural areas. The average annual earnings for immigrants from LIC relative to natives is 79% in the rural areas, 77% in the largest seven regions, but is only 72% in Oslo. For immigrants from HIC, the relative difference is smallest in the other seven largest regions and highest in Oslo.

The length of work experience is shorter in Oslo than in the other economic regions for natives and immigrants from HIC. This is related to the somewhat younger group of workers in the city. Immigrants from LIC, however, are older and have on average more work experience in the capital than in the rest of the country. Additionally, a larger proportion of immigrants from LIC have primary school as the highest level of completed education compared to natives and immigrants from HIC. The share of primary school

Table 2.1: Descriptive Statistics

	Combined	Oslo	Largest seven	Rest of the country
Earnings (in 2015 NOK)				
Combined	585 993	657 179	601 219	545 440
LIC-immigrants	462 056	483 248	466 951	435 253
HIC-immigrants	564 722	585 558	587 054	518 751
Natives	592 149	673 845	608 016	549 223
Work experience				
Combined	15.48	14.96	15.41	15.75
LIC-immigrants	9.71	10.45	9.54	9.1
HIC-immigrants	12.5	12.2	12.6	12.8
Natives	15.8	15.4	15.7	16.0
Age				
Combined	44.9	44.1	44.7	45.5
LIC-immigrants	38.1	39.3	37.9	37.2
HIC-immigrants	42.8	41.5	43.0	44.0
Natives	45.3	44.6	45.0	45.8
Primary school				
Combined	0.18	0.14	0.18	0.20
LIC-immigrants	0.34	0.33	0.32	0.36
HIC-immigrants	0.18	0.15	0.20	0.20
Natives	0.18	0.13	0.18	0.20
Secondary school				
Combined	0.52	0.39	0.51	0.59
LIC-immigrants	0.36	0.33	0.35	0.38
HIC-immigrants	0.42	0.40	0.38	0.48
Natives	0.53	0.40	0.52	0.60
College				
Combined	0.29	0.47	0.31	0.21
LIC-immigrants	0.31	0.34	0.33	0.26
HIC-immigrants	0.40	0.45	0.43	0.32
Natives	0.29	0.48	0.31	0.21

1 Descriptive statistics for the sample studied. Work experience and age are measured in years, while primary, secondary and university are shares.

educated immigrants from LIC in the different regions is fairly equal, while the share of primary educated natives and HIC-immigrants is lowest in Oslo. The share of natives in Oslo with a college degree is 48%, 31% in the other seven largest regions, and only 21% in the rural areas. This trend is also apparent for both groups of immigrants, however, for these groups the share of workers in Oslo and the other seven largest regions with a college degree is fairly equal.

The raw data suggests that there is an income gap between immigrants and natives, and that treating immigrants as one common group could mask actual differences between immigrants based on country of birth. In addition, the greater difference between the annual earnings of LIC-immigrants and natives in Oslo gives rise to the question of whether the benefits of agglomeration economies differ across these groups.

2.2 Empirical Specification

To estimate the static urban earnings premium, I begin with equation 2.1,

$$log\, w_{it} = \alpha * Oslo_{it} + \beta * City_{it} + X_{it}\gamma + \lambda_t + u_i + \epsilon_{it} \tag{2.1}$$

where w_{it} is annual earnings for individual i in time t, which includes labor earnings, taxable benefits, sickness benefit and child allowance, deflated with the Norwegian consumer price index with 2015 as base year. The two dummy-variables $Oslo_{it}$ and $City_{it}$ equal 1 if individual i works in Oslo or one of the other seven largest economic regions in Norway at time t. The static earnings premium of working in Oslo and the other largest seven economic regions is captured by α and β, respectively. As elaborated earlier, these static advantages are lost immediately when individuals move to the smaller economic regions.

The vector of observable worker characteristics X includes gender, highest educational attainment, total experience, total experience squared and country of birth. The cost of such characteristics in the labor market is given by the vector γ. Year dummies are represented by λ_t, while ϵ_{it} is the idiosyncratic error term. Worker fixed effects, noted by u_i, are accounted for in later specifications.

In the specifications without worker fixed effects, the assumption $E[u_i|Oslo_{iT}, City_{iT}, X_{iT}] = 0$ has to hold to obtain unbiased estimates. This rules out sorting into economic regions based on unobserved time-constant factors. If for instance individuals with higher unobserved productivity sort into larger economic regions, the assumption is violated and the estimated effects will be upwardly biased. This assumption is however unlikely to hold.

To address the issue of sorting on unobservables, I control for worker fixed effects. Since Glaeser and Maré (2001), this has been the go-to strategy in the literature on urban wage premium. However, accounting for unobserved heterogeneity comes at the cost of only relying on movers for identification, potentially analysing a non-representative sample.[6] Such caveats create identification issues, but in the absence of randomization of workplace region, following individuals over time and across space is to my knowledge the best identification strategy at hand.[7] The other estimates are identified by changes over time for both stayers and movers.

The specification with worker fixed effects allows for sorting based on unobserved time-constant ability, but rules out individuals moving based on time-varying factors not accounted for. For instance, the specifications does not allow for individuals' moving decision to be based on particularly good wage offers. If this is the case, the estimated static wage premium will be upwardly biased as the unusually high wage offer is attributed to the city effect.[8]

Descriptive statistics of movers and non-movers are given in table 2.2 to see whether these groups differ in observable characteristics. As is evident, movers are on average younger, have less work experience, but earn on average more than non-movers. We also note that a larger share of movers have completed a university degree than non-movers, with a lower share of movers having primary school as highest completed education.

[6]Movers are individuals that change their workplace region between the three groups of economic regions; Oslo, largest seven and rest of the country. Out of the approximately 1.196.000 different individuals I observe, a little more than 193.805 moved. Around 11.500 out of the 73.256 immigrants from LIC, 5.000 out of 29.309 immigrants from HIC, and 177.000 out of 1.093.398 natives moved at least once in the period of 2008-2019.

[7]One notable exception that use randomization of locations as identification is Eckert et al. (2022).

[8]Note that if this applies for both those moving from small to large regions and vice versa, the bias can be small.

Table 2.2: Descriptive Statistics - Movers and Non-movers

	Movers	Non movers
Earnings (in 2015 NOK)		
LIC-immigrants	492 788	453 761
HIC-immigrants	595 652	555 032
Natives	641 670	580 060
Work experience		
LIC-immigrants	9.75	9.70
HIC-immigrants	12.30	12.58
Natives	15.26	15.94
Age		
LIC-immigrants	37.21	38.37
HIC-immigrants	40.53	43.49
Natives	42.70	45.95
Primary school		
LIC-immigrants	0.31	0.34
HIC-immigrants	0.16	0.19
Natives	0.16	0.18
Secondary school		
LIC-immigrants	0.34	0.36
HIC-immigrants	0.43	0.41
Natives	0.48	0.55
College		
LIC-immigrants	0.35	0.30
HIC-immigrants	0.41	0.40
Natives	0.36	0.27

[1] Descriptive statistics for movers and non-movers. Work experience and age are measured in years, while primary, secondary and university are shares.

Given the potential biases in the estimated static premium, the ideal identification strategy would be to instrument the city dummies to isolate the exogenous variation in the individual migration decision. For such an instrument to work, it must have an effect on work location, but not on the potential outcomes itself. What has been usual in the literature is to instrument a continuous population density variable to alleviate the endogeneity concerns. Different instruments have been suggested and used in previous work e.g. historical population data as in Ciccone and Hall (1996), Combes et al. (2008), and De la Roca and Puga (2017), historical mines as in Carlsen et al. (2016) and historical land fertility as in Combes et al. (2010) and De la Roca and Puga (2017), mostly concluding with a minor change in the return to density.

Assessing the validity of the different instruments has to be done for each individual case and setting, and one could make a strong argument for each instrument not being valid. In addition, instrumenting a density variable with historical data addresses the potential

endogeneity issues at the regional level, not at the individual level. To my knowledge, there are no such instruments at the individual level that has been proposed in the literature. Based on the marginal change from instrumenting found in the literature so far and the discussion above, I do not use an instrument in this paper. Given the potential for sorting based on unobserved time-varying factors, the estimated level-effect should be interpreted as correlations and not something causal.

As discussed in the introduction, gains from working in larger economic regions are not only immediate, but can accrue over time. De la Roca and Puga (2017) note that failure to control for the dynamic effects of working in larger regions might bias the estimated static wage premium even when accounting for unobserved heterogeneity. When controlling for worker fixed effects, the city effect is estimated by comparing the earnings in time t to the average for the individual. If all individuals move from small regions to large regions, the extra value from experience gained in larger areas compared to the average is attributed to the city effect, overestimating the static effect.[9] To account for this, experience acquired in Oslo and the other seven largest regions are added to the specification as seen in equation 2.2.

$$log\, w_{it} = \alpha * Oslo_{it} + \beta * City_{it} + \theta * exp\_Oslo_{it} + \sigma * exp\_City_{it} + X_{it}\gamma + u_i + \lambda_t + \epsilon_{it} \tag{2.2}$$

Since the total years of experience is included in the specification, θ and σ tells us whether work experience acquired in Oslo and the other seven largest regions is more valuable than experience acquired elsewhere. Other dynamic gains that covary with the accumulation of experience in the largest regions are also captured in these terms. This could for instance reflect that as individuals acquire more experience, they work for more productive firms, in more productive industries or sectors, or that experience lead to a better match between the worker and the firm. If this productivity climbing is more intense in larger cities, this effect will be attributed to the return to urban experience. Quadratic terms are included, but not shown.

[9]For a more technical description, see De la Roca and Puga (2017).

It is usual in the literature to account for both occupation and sector to isolate the urban premium that is not due to sorting into more productive occupations and sectors. Whether to control for such factors or not is a temporal question. If individuals sort into regions based on the occupation and sector they work in, not accounting for such differences will bias the estimates. However, it can be argued that the industry and occupation in which an individual work is a *result* of living in larger areas, and in the language of Angrist and Pischke (2009) can be considered a bad control. Without a more sophisticated model that accounts for endogenous selection into occupation and sector as in for instance Gould (2007), not controlling for such factors is the correct specification. I like to think of the occupation and sector as a result of the place you work, and will not account for these factors in the main specification. The information about sector is used to remove individuals that are employed in the sectors as described above.

In addition to individuals sorting into regions and agglomeration effects, natural advantages and the selection of more productive firms has been suggested in the literature as explanations of the urban wage premium. The theory behind firm selection in explaining the urban premium is that more competition leads to only the most productive firms to survive, left-truncating the distribution of productive firms. Firms, however, compete against others not only within, but also across regions. Empirically, Combes et al. (2012) find compelling evidence against firm selection in explaining the urban wage premium. Natural advantages can be of importance for specific industries such as those relying on natural resources, but are unlikely to be the most important determinants of agglomeration for most industries (Moretti, 2011).

I cannot rule out that firm selection and natural advantages contribute to the urban earnings premium that is observed here. However, given the findings in the literature on the small role of firm selection and natural advantages in explaining the urban wage premium, it is unlikely that they explain a significant part of the premium found here.

3 Results

3.1 Static Urban Earnings Premium

To reconcile my results with the literature, I first present the static agglomeration effect for the whole sample. Table 3.1, column 1, presents the raw earnings gap between Oslo, the other seven largest cities and the smallest regions in Norway. The results indicate that individuals in Oslo have a raw Oslo premium of 16.9% over individuals in the smallest regions, and a large-city premium of 8.5% compared to the same group.

As discussed in the introduction, this raw premium can be explained by both sorting patterns as well as actual premiums from agglomeration effects. To account for sorting on observable, I rerun the specification with observable characteristics. As seen in column 2, the city premiums are reduced to 13.6% for Oslo and 7.1% for the other largest seven regions, suggesting that sorting on observable characteristics explain only a small part of the raw premium observed. Work experience has a positive, non-linear effect on annual earnings. Calculated at the average combined experience of 15.5 years, one additional year of experience increases annual earnings by about 1.8%. Individuals with a secondary education have a premium of 9% over primary educated individuals, while college educated have on average an annual earning of 35% more than primary educated individuals. Immigrants from LIC earn on average 10.6% less than natives, with individuals from HIC earning on average 2.8% less than natives. Males have an earnings premium of about 19%.

In column 3, I relax the assumption that individuals do not sort into regions of different sizes based on unobserved ability by controlling for worker fixed effects. Accounting for worker fixed effects, the estimated static earnings premium for Oslo drops to 3.8% and 2.6% for the other seven largest economic regions. This suggest that sorting on unobservable time-constant heterogeneity explains a large part of the premium observed in the naive specification. As found in the literature, (e.g., Carlsen et al. (2016), Hybel et al. (2023), and Niebuhr et al. (2022)) accounting for worker fixed effects increases the estimated return to experience. Calculated at the average years of experience of 15.5 years, the return to one additional year of experience is 5%. One interpretation for the increase

Table 3.1: Raw Earnings Gap

Dependent variable	(1) Log annual earnings	(2) Log annual earnings	(3) Log annual earnings
Oslo	0.169***	0.136***	0.038***
	(0.0003)	(0.0003)	(0.0007)
Seven other largest regions	0.085***	0.071***	0.026***
	(0.0003)	(0.0002)	(0.0007)
Experience		0.037***	0.074***
		(0.0001)	(0.0004)
(Experience)^2		-0.0006***	-0.0008***
		(0.0000)	(0.0000)
Secondary		0.090***	
		(0.0003)	
College		0.354***	
		(0.0003)	
Male		0.188***	
		(0.0002)	
LIC		-0.106***	
		(0.0005)	
HIC		-0.028***	
		(0.0008)	
Year dummies	Yes	Yes	Yes
Worker fixed effect	No	No	Yes
Observations	8804798	8804798	8804798
Individuals	1195963	1195963	1195963
R^2	0.044	0.339	0.156

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. All regressions include a constant term. R^2 in column 3 is within individuals.

in the return to experience when worker fixed effects are accounted for is that unobserved ability is more valuable for individuals with less experience; typically young individuals.

The main interest of this paper lies in the heterogeneity across groups based on country of birth. Separating between immigrants from LIC, immigrants from HIC and natives reveal significant differences in the urban earnings premium across groups when observables are accounted for. Results are presented in table 3.2. Immigrants from LIC have the lowest static Oslo premium of 4.1%, while immigrants from HIC and natives have a static return of 10% and 14.2%, respectively. When accounting for selection on observables, the return to experience for natives is around 1.8%, 1.7% for HIC immigrants and 1.2% for LIC immigrants calculated at the average years of experience combined (15.5 years).

Table 3.2: Static Urban Earnings Premium

	(1) LIC	(2) HIC	(3) Natives	(4) LIC	(5) HIC	(6) Natives
Oslo	0.041***	0.100***	0.142***	-0.002	0.028***	0.040***
	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)	(0.0008)
Largest seven	0.032***	0.088***	0.072***	-0.001	0.021***	0.027***
	(0.001)	(0.002)	(0.0002)	(0.003)	(0.005)	(0.0007)
Experience	0.043***	0.036***	0.037***	0.065***	0.074***	0.076***
	(0.0003)	(0.0004)	(0.0001)	(0.0013)	(0.0024)	(0.0005)
Experience^2	-0.0010***	-0.0006***	-0.0006***	-0.0011***	-0.001***	-0.0008***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Secondary	0.043***	0.056***	0.095***			
	(0.001)	(0.002)	(0.0003)			
College	0.208***	0.284***	0.363***			
	(0.001)	(0.002)	(0.0003)			
Male	0.132***	0.154***	0.192***			
	(0.001)	(0.005)	(0.0002)			
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country of origin	Yes	Yes	-	-	-	-
Worker fixed effect	No	No	No	Yes	Yes	Yes
Observations	379561	173278	8251956	379561	173278	8251956
Individuals	73258	29307	1093398	73258	29307	1093398
R^2	0.299	0.335	0.332	0.155	0.156	0.157

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported in column 4-6 is within workers. All regressions include a constant term.

Columns 4-6 in table 3.2 present the results from the regressions with worker fixed effects controlled for. The results suggest that sorting on unobservables explain a large part of the raw earnings gap for all three groups studied here. Column 4 shows that immigrants from LIC do not have a level-effect of working in larger economic regions. Consequently, the whole level-effect is accounted for by observable and unobservable characteristics for

immigrants from LIC. In contrast, immigrants from HIC and natives still have a premium of working in Oslo of 2.8% and 4.0%, respectively, as seen from column 5 and 6. The level-effect is somewhat smaller for immigrants from HIC and natives in the other largest seven cities, but the premium is still significant.

3.2 Dynamic Urban Earnings Premium

As argued by De la Roca and Puga (2017), the static premium is biased if the dynamic aspects of labor market activity is not accounted for. To account for this dynamic aspect, I have allowed for an additional return to urban experience over experience acquired elsewhere. As seen from table 3.3, allowing the value of experience to vary with where it is acquired decreases the static urban premium, in line with the arguments of De la Roca and Puga (2017). A possible explanation is that some of the urban earnings premium is gained over time as labor market experience is accumulated.

However, sorting of individuals with more valuable experience into larger economic regions cannot explain the whole static urban earnings premium that is observed for natives and immigrants from HIC. The static premium of working in Oslo is still 3.3% for natives and 2.1% for immigrants from HIC. Immigrants from LIC, however, have a static loss of about 1% in Oslo when urban experience is accounted for. This loss is statistically significant, but not large in economic terms.

For natives, the total Oslo premium increases to 16.2% over time, consisting of the 3.3% static gain and a dynamic gain of 12.9% (calculated at the average experience of 15.5 years). Interestingly, the total effect of 16.2% found here for natives is close to the 17% found by Carlsen et al. (2016).[10] However, their findings suggest that 7% is due to a static wage effect, over twice the size of the static effect found here. The lower static premium found for the time period studied here is consistent with a reduction in the urban premium net of sorting on unobservables over time found by both Bennett et al. (2022) and Butts et al. (2023). This lower estimated static Oslo premium could be due to technological advancements that has benefited firms in the rural areas relative more than firms in the urban areas.

[10]Note that they calculate the dynamic premium using the average years of experience in their sample of 8.1 years.

Table 3.3: Dynamic Urban Earnings Premium

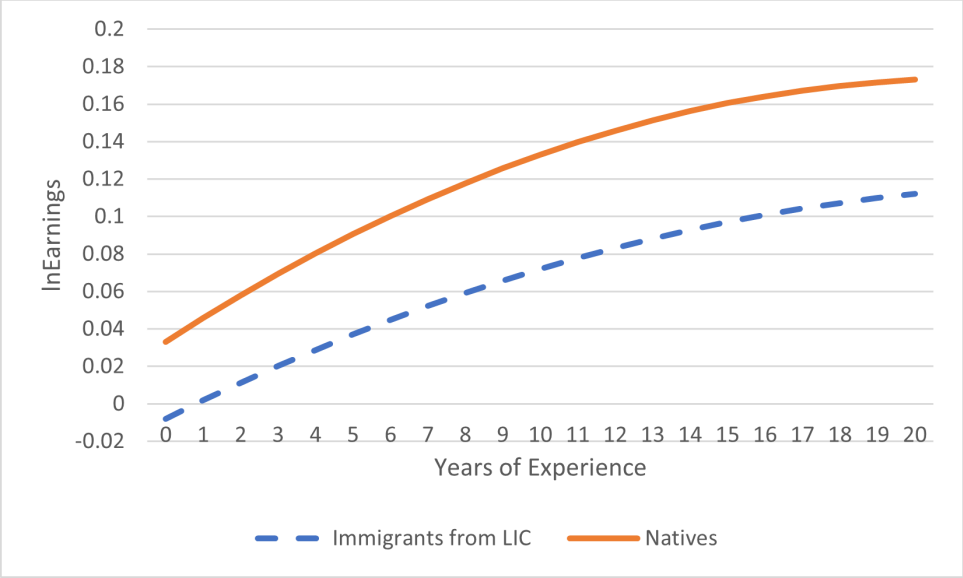
	(1) LIC	(2) HIC	(3) Natives
Oslo	-0.008 ***	0.021***	0.033***
	(0.003)	(0.005)	(0.001)
Largest seven	-0.004	0.018***	0.024***
	(0.003)	(0.006)	(0.001)
Experience	0.061***	0.067***	0.071***
	(0.0014)	(0.0025)	(0.0005)
Experience^2	-0.001***	-0.0008***	-0.0008***
	(0.0000)	(0.0000)	(0.0000)
Exp_Oslo	0.010***	0.013***	0.013***
	(0.0008)	(0.0013)	(0.0002)
Exp_Oslo^2	-0.0002***	-0.0003***	-0.0003***
	(0.0000)	(0.0000)	(0.0000)
Exp_largest seven	0.005***	0.005***	0.005***
	(0.0007)	(0.0012)	(0.0002)
Exp_largest seven^2	-0.0001***	-0.0001***	-0.0001***
	(0.0000)	(0.0000)	(0.0000)
Year dummies	Yes	Yes	Yes
Worker fixed effect	Yes	Yes	Yes
Observations	379561	173278	8251956
Individuals	73258	29307	1093398
R^2	0.157	0.158	0.159

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

The results presented in table 3.3 indicate significant differences in the urban earnings premium between immigrants from HIC and those from LIC. Immigrants from LIC have an urban static earnings loss of -0.8%, with a dynamic earnings effect of 9.9% (calculated at the average experience combined of 15.5 years). Interestingly, when exploiting a natural experiment in Denmark, Eckert et al. (2022) find that initial earnings in cities are zero for refugees. In my data set a large share of the data on reason for immigration is missing. However, almost all of those categorised as refugees are immigrants from LIC. The similarity between my results and the results of Eckert et al. (2022) from a natural experiment is reassuring. Immigrants from HIC have a similar static premium from working in Oslo as natives of 2.1%, increasing to a dynamic earnings effect of 15.0% with 15.5 years of experience.

As we can see from this exercise, immigrants from LIC fall behind both natives and immigrants from HIC in terms of both a lower static effect and a slightly lower dynamic premium from experience in Oslo. Both the static and the dynamic effects are significantly lower for immigrants from LIC than for natives, but not different between immigrants

Figure 3.1: Urban Earnings Premium Trajectories



[1] Urban earnings premium trajectories for immigrants from LIC and natives, n years after working in Oslo.

from HIC and natives, as seen from table A.2. The dynamic effect from work experience in the other seven largest regions is similar for both groups of immigrants and natives.

To illustrate how the return to working in urban regions differs for natives and immigrants from LIC, I graph the trajectories for the first 20 years of Oslo experience in figure 3.1. The difference in the urban earnings premium between natives and immigrants from LIC peak at about 15 year of experience, with a different of about 6 percentage points. After 15 years of labor market experience, the gap is slowly decreasing over time, suggesting that heterogeneous agglomeration effects contribute to early-career inequality between natives and immigrants from LIC.

The difference in the urban earnings premium-trajectory for immigrants from LIC compared to natives found here is consistent with the expectation that differences in the return to urban experience decreases over time as immigrants integrate more into the labor market. The lack of a difference in the urban earnings premium between natives and immigrants from HIC could reflect that most of these immigrants are either from Scandinavia or English-speaking countries.

As discussed in section 2, whether to control for industry and sector is a temporal question. The main specifications have been without controls for which industry and sector individual

i works in at time t. When worker fixed effects are accounted for, the inclusion of sector and industry does not alter the results as shown in table A.1. This does not necessarily imply that there are no differences in the speed of sorting into more productive industries and occupations across regions of different sizes. The lack of changes can be a result of a combination of sorting and selection bias, as discussed in chapter 2, pulling in opposite directions, or that worker fixed effects capture most of the variation. I investigate sorting into occupation classes over time in the appendix.

3.3 Agglomeration Effects by Country of Birth and Skill Group

Findings in the literature suggest that non-college workers lose out in urban labor markets. Autor (2019) finds that urban non-college workers perform less skilled jobs than in previous decades. Carlsen et al. (2016), De la Roca and Puga (2017), and Niebuhr et al. (2022) find that high-skilled individuals have a higher urban wage premium than low-skilled individuals. To see if the main results presented here are primarily a reflection of differences in skill, I separate the sample into low- and high-skill based on predicted worker fixed effects from the dynamic specification in table 3.2.[11]

The results presented in table 3.4 suggest a somewhat different static premium between low- and high-skilled individuals. High-skilled immigrants from LIC have a negative and significant static loss of more than 1% in Oslo, and close to 1% in the other seven largest regions compared to high-skilled immigrants from LIC in the rural areas. The lower static earnings premium for high-skilled compared to low-skilled is also found for HIC-immigrants. One possible explanation is that a larger pool of high-skilled individuals in the largest regions leads to a weaker initial signaling effect for high-skilled immigrants.

However, high-skilled immigrants quickly catch up the lower static premium over time. The results found here, independent of if they are native or immigrants, suggest a higher return to urban experience for high-skilled individuals than for low-skilled individuals. High-skilled individuals from LIC have a dynamic benefit of Oslo experience of 16%

[11] I have also used predicted worker fixed effects from other, more restrictive specifications. The main conclusions are similar.

Table 3.4: Dynamic Urban Earnings Premium Across Skill Group

	LIC		HIC		Natives	
	(1) Low skilled	(2) High skilled	(3) Low skilled	(4) High skilled	(5) Low skilled	(6) High skilled
Oslo	-0.002	-0.014***	0.027***	0.014**	0.035***	0.032***
	(0.004)	(0.004)	(0.007)	(0.007)	(0.001)	(0.001)
Largest seven	0.002	-0.009**	0.022***	0.014**	0.018***	0.028***
	(0.004)	(0.004)	(0.007)	(0.007)	(0.001)	(0.001)
Experience	0.047***	0.061***	0.054***	0.063***	0.062***	0.065***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.0006)	(0.00007)
Experience^2	-0.0006***	-0.0013***	-0.0005***	-0.0010***	-0.0005***	-0.0007***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Exp_Oslo	0.004***	0.015***	0.004**	0.017***	0.004***	0.016***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.0003)	(0.000)
Exp_Oslo^2	-0.000	-0.0003***	-0.0001	-0.0003***	-0.00006***	-0.0004***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Exp_largest seven	0.003***	0.006***	0.001	0.007***	0.003***	0.006***
	(0.0009)	(0.001)	(0.002)	(0.002)	(0.0002)	(0.0002)
Exp_largest seven^2	-0.0001*	-0.0002***	-0.0001	-0.0001***	-0.0001***	-0.0001***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Worker fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	189800	189756	86639	86639	4126054	4125894
Individual	34004	39254	13663	15644	538919	554479
R^2	0.083	0.219	0.085	0.219	0.094	0.204

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

measured at the average years of experience at 15.5 years. Low-skilled individuals from LIC have a significantly lower dynamic return at 6.2% at 15.5 years of experience. The different dynamic return between high- and low-skilled individuals is also found for immigrants from HIC and for natives. High-skilled individuals also have a higher return from experience acquired in the other seven largest regions than low-skilled individuals, but the additional gain is not as large as that of Oslo experience.

The large difference in the return to urban-experience between high- and low-skilled individuals suggests a positive complementary between time-constant abilities and benefits of large-city experience. If we assume that unobserved ability as measured with worker fixed effects is positively correlated with learning potential, this finding is consistent with the learning hypothesis as mentioned in the introduction.

To reconcile my results with the earlier literature that estimate the urban wage premium across skill groups (e.g. Carlsen et al. (2016) and Niebuhr et al. (2022)), I use educational

attainment as a measure of skill. Using educational attainment has the advantage over predicted worker fixed effects as it is observable. The drawback is that it does not necessarily precisely reflect skill level, but works as a proxy. In addition, the data on educational attainment for immigrants might be error prone. The results when using educational attainment as a measure of skill are presented in table 3.5.

Using educational attainment as a measure of skill leads to a somewhat different story compared to the results using predicted worker fixed effects. Primary-educated immigrants from LIC do not have a premium from working in the largest regions that accrues over time. This suggests that the somewhat lower return to urban experience found for immigrants from LIC in table 3.3 is primarily driven by primary educated individuals. College educated immigrants from LIC and HIC have a somewhat higher return to urban experience than that of secondary educated workers from the same country-of-birth-group. For natives however, the results suggest a return to Oslo experience that is similar for workers with different educational attainment.

The different results when using various definition of skills indicates that educational attainment and unobserved ability are not perfectly correlated. Interestingly, the lack of a static effect for immigrants from LIC is found in all specifications, independent of definition of skills.

4 Robustness Checks and Additional Analyses

Defining cities as regions with more than 150.000 inhabitants in 2019 might seem arbitrary. As a robustness check, I have changed the cutoff to those regions with more than 100.000 inhabitants in 2019. The main conclusions still stand. The main difference is, as expected, that the return to experience from the largest regions other than Oslo is lower.

The restrictions put on the immigrant sample might have led to a specific group of individuals. To alleviate this concern, I ease the age-at-arrival restrictions put on the sample. As seen from table A.3, the return to urban experience is higher for the two immigrant-groups when the restrictions are alleviated. The main conclusion that immigrants from LIC do not have a static earnings premium still stand. The return to Oslo

Table 3.5: Urban Earnings Premium by Educational Attainment

	LIC			HIC			Natives		
	(1) Primary	(2) Secondary	(3) College	(4) Primary	(5) Secondary	(6) College	(7) Primary	(8) Secondary	(9) College
Oslo	-0.011**	-0.010*	-0.002	0.018	0.033*	0.008	0.028***	0.037***	0.038***
	(0.006)	(0.005)	(0.006)	(0.011)	(0.007)	(0.008)	(0.002)	(0.001)	(0.001)
Largest seven	-0.007	-0.008	0.006**	0.021*	0.021***	0.0125	0.018***	0.025***	0.031***
	(0.007)	(0.005)	(0.006)	(0.011)	(0.007)	(0.008)	(0.002)	(0.001)	(0.001)
Experience	0.056***	0.049***	0.080***	0.053***	0.059***	0.088***	0.056***	0.063***	0.093***
	(0.002)	(0.002)	(0.003)	(0.005)	(0.004)	(0.005)	(0.001)	(0.001)	(0.001)
Experience^2	-0.001***	-0.0009***	-0.0012***	-0.0007***	-0.0007***	-0.001***	-0.0006***	-0.0006***	-0.00095***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Exp_Oslo	0.003*	0.009***	0.014***	0.012***	0.0097***	0.0125***	0.010***	0.0099***	0.0095***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.0019)	(0.0005)	(0.0003)	(0.0003)
Exp_Oslo^2	-0.0000	-0.0002***	-0.0003***	-0.0003***	-0.0002**	-0.0003***	-0.0003***	-0.0002***	-0.0002***
	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Exp_largest seven	0.0002	0.005***	0.005***	0.004	0.005**	0.004**	0.004***	0.0039***	0.0027***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.0004)	(0.0002)	(0.0003)
Exp_largest seven^2	-0.0000	-0.0002***	-0.0001*	-0.0003***	-0.0001	-0.0001	-0.0001***	-0.0001***	-0.0001***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Worker fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	127821	134850	116894	31627	72273	69375	1453796	4389968	2408187
Individuals	27668	23378	22212	5975	11863	11469	219959	554650	318789
R^2	0.111	0.131	0.236	0.114	0.130	0.210	0.110	0.128	0.231

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

experience for LIC immigrants is now similar to that of natives, while HIC immigrants have a significantly higher return. The somewhat different results can reflect heterogeneity between immigrants that have acquired foreign labor market experience and those that have not.

An additional concern is the lower labor participation rate of women which could alter the results. I have therefore rerun table 3.3 with only the male sample. The results presented in table A.4 are similar to those presented in table 3.3 when analysing both men and women. The main difference is that the return to urban experience is even lower for males from LIC compared to males from HIC and natives.

5 Conclusion

Using rich administrative data from Norway in the period 2008-2019, I have analysed the static and dynamic earnings premium of working in large economic regions. The main focus has been on the different return to working in large regions for natives and different groups of immigrants based on birth country. The results suggest the existence of an urban wage premium net of sorting on observables and unobservables in line with the literature. However, the results indicate that there are differences across groups of individuals based on country of birth.

Immigrants from high-income countries have both a static and a dynamic premium of working in larger regions that is similar to the one observed for natives. Immigrants from low-income countries however lack a static earnings premium from working in larger economic regions when observables and unobservables are controlled for. Their return to urban experience is somewhat lower than that of natives. Combined with the lack of a static Oslo city earning premium, the difference between the total urban premium for immigrants from LIC and natives is close to 6% after 15 years of work experience.

To see whether there is a gap in the return to urban experience across skill group, I separated into high- and low-skilled individuals based on predicted worker fixed-effcets. Individuals with higher unobserved abilities gain more from accumulated urban experience, independent of group studied. This suggests a complementary between innate ability

and learning effects. The main difference between high-skilled immigrants from LIC, HIC and natives is that the static Oslo premium is significantly higher for high-skilled natives compared to high-skilled immigrants. Separating the sample based on educational attainment showed a somewhat different story. The results suggest that the return to urban experience is similar for natives and immigrants from HIC independent of education level. However, primary educated immigrants from LIC lack both a static and a dynamic premium of working in larger economic regions. This suggests that the lower return to urban experience for immigrants from LIC compared to natives is primarily driven by the primary educated individuals.

I emphasize that the findings does not address the general equilibrium effects of location choices of immigrants, and that the results only address the static and dynamic return to working in large economic regions.

This paper does not address the underlying mechanisms that drive the urban earnings premium. An interesting extension is to look into specific mechanisms such as those elaborated by Duranton and Puga (2004) and if the effect of such mechanisms vary across immigrants and natives.

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Appendix A

Table A.1: Urban Earnings Premium with Occupation and Sector Dummies

	(1) LIC	(2) HIC	(3) Natives
Oslo	-0.004	0.024***	0.033***
	(0.005)	(0.006)	(0.0008)
Largest seven	-0.004	0.019***	0.024***
	(0.003)	(0.005)	(0.0007)
Experience	0.062***	0.068***	0.074***
	(0.00145)	(0.0029)	(0.0005)
Experience^2	-0.001***	-0.00074***	-0.0007***
	(0.0000)	(0.0000)	(0.0000)
Exp_Oslo	0.010***	0.012***	0.013***
	(0.0008)	(0.0013)	(0.0002)
Exp_Oslo^2	-0.0002***	-0.0002***	-0.0003***
	(0.0000)	(0.0000)	(0.0000)
Exp_largest seven	0.004***	0.005***	0.005***
	(0.0008)	(0.0013)	(0.0002)
Exp_largest seven^2	-0.0002***	-0.0002***	-0.0001***
	(0.0000)	(0.0000)	(0.0000)
Year dummies	Yes	Yes	Yes
Worker fixed effects	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes
Observations	350963	156270	7376771
Individuals	70885	27871	1041938
R^2	0.170	0.170	0.161

[1] *** p<0.01, ** p<0.05, * p<0.10. 2-digit sector indicators and 4-digit occupation dummies. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.
[2] I lose observations as occupation is only available from 2009.

Table A.2: Urban Earnings Premium with Interaction Terms

	(1)
Oslo	0.033 ***
	(0.001)
Oslo x HIC	-0.012**
	(0.005)
Oslo x LIC	-0.041 ***
	(0.003)
Largest seven	0.024 ***
	(0.001)
Largest seven x HIC	-0.006
	(0.005)
Largest seven x LIC	-0.028***
	(0.003)
Experience	0.071***
	(0.0005)
Experience x HIC	-0.004
	(0.003)
Experience x LIC	-0.010***
	(0.0014)
Experience^2	-0.0008***
	(0.0000)
Experience^2 x HIC	-0.0001 ***
	(0.0000)
Experience^2 x LIC	-0.0003***
	(0.0000)
Exp_Oslo	0.013***
	(0.0002)
Exp_Oslo x HIC	-0.0003
	(0.001)
Exp_Oslo x LIC	-0.003***
	(0.001)
Exp_Oslo^2	-0.0003***
	(0.0000)
Exp_Oslo^2 x HIC	0.0000
	(0.0000)
Exp_Oslo^2 x LIC	0.0001***
	(0.0000)
Exp_largest seven	0.005 ***
	(0.0002)
Exp_largest seven x HIC	0.0005
	(0.001)
Exp_largest seven x LIC	-0.0001
	(0.0008)
Exp_largest seven^2	-0.0001 ***
	(0.0000)
Exp_largest seven^2 x HIC	-0.0000
	(0.0000)
Exp_largest seven^2 x LIC	-0.0000
	(0.0000)
Year fixed effects	Yes
Worker fixed effect	Yes
Observations	8804798
Individuals	1195963
R^2	0.159

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

Table A.3: Urban Earnings Premium - Relaxing the Sample Restrictions put on Immigrants

	(1) LIC	(2) HIC
Oslo	-0.008***	0.012***
	(0.002)	(0.003)
Largest seven	-0.000	0.013***
	(0.002)	(0.003)
Experience	0.054***	0.068***
	(0.0008)	(0.002)
Experience^2	-0.001***	-0.0009***
	(0.0000)	(0.0000)
Exp_Oslo	0.013***	0.018***
	(0.0005)	(0.001)
Exp_Oslo^2	-0.0003***	-0.0004***
	(0.0000)	(0.0000)
Exp_largest seven	0.006***	0.009***
	(0.0005)	(0.001)
Exp_largest seven^2	-0.0002***	-0.0003***
	(0.0000)	(0.0000)
Year dummies	Yes	Yes
Worker fixed effect	Yes	Yes
Observations	970409	411716
Individuals	196980	72868
R^2	0.172	0.177

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

Table A.4: Urban Earnings Premium - Male Sample

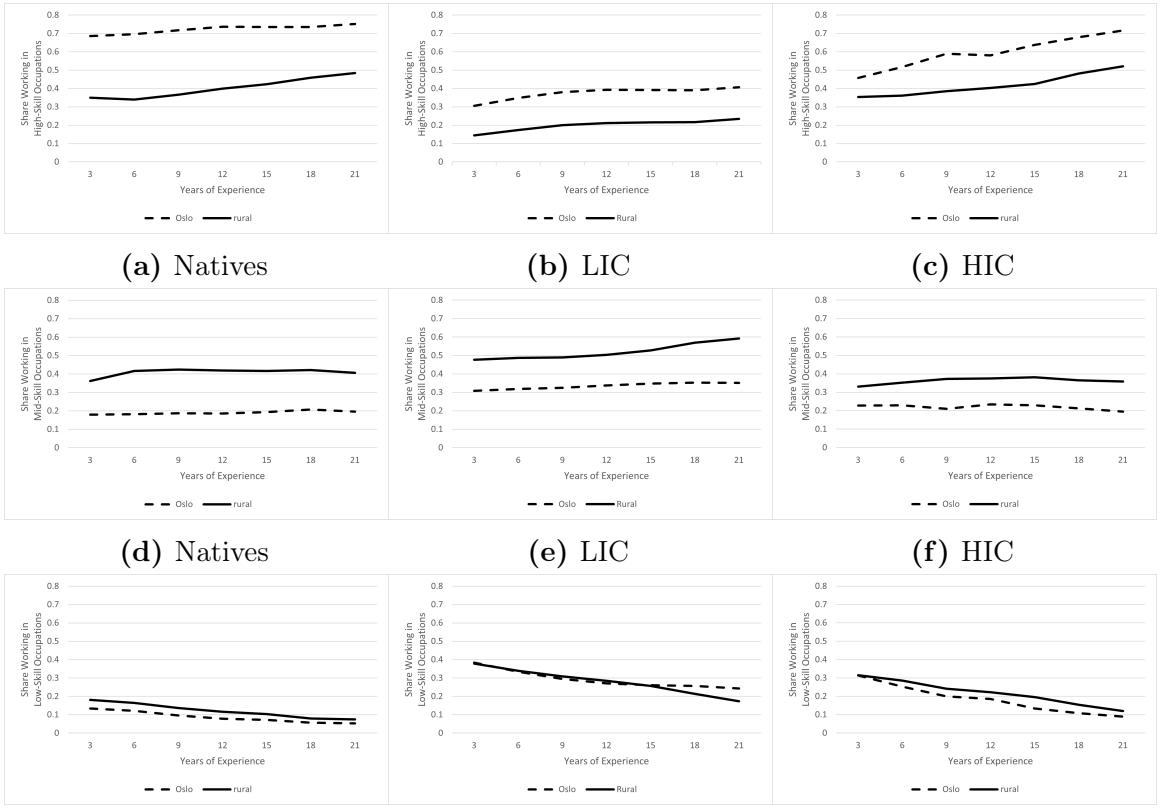
	(1) LIC	(2) HIC	(3) Natives
Oslo	-0.010 ***	0.021***	0.034***
	(0.004)	(0.006)	(0.001)
Largest seven	-0.004	0.018***	0.026***
	(0.004)	(0.006)	(0.001)
Experience	0.066***	0.069***	0.073***
	(0.0017)	(0.0032)	(0.0006)
Experience^2	-0.001***	-0.0009***	-0.0008***
	(0.0000)	(0.0000)	(0.0000)
Exp_Oslo	0.009***	0.013***	0.014***
	(0.0010)	(0.0017)	(0.0003)
Exp_Oslo^2	-0.0001***	-0.0003***	-0.0004***
	(0.0000)	(0.0001)	(0.0000)
Exp_largest seven	0.0034***	0.004**	0.0044***
	(0.0009)	(0.0012)	(0.0002)
Exp_largest seven^2	-0.0001***	-0.0001**	-0.0001***
	(0.0000)	(0.0000)	(0.0000)
Year dummies	Yes	Yes	Yes
Worker fixed effect	Yes	Yes	Yes
Observations	250051	113438	5831453
Individuals	45705	18357	735443
R^2	0.145	0.142	0.144

[1] *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors clustered at the individual level in parenthesis. The R^2 reported is within workers. All regressions include a constant term.

Appendix B

Figure B.1 shows for each group studied, the share of workers in Oslo or rural areas working in three occupation groups at 3-21 years of experience with 3 year intervals. Occupations are ranked into low-, mid- and high-skilled based on average monthly earnings. Sudden changes in the share when years of experience is high should be interpreted with care as the number of observations quickly decrease with years of experience, especially among the two immigrant groups.

The top row of figure B.1 shows that in Oslo, the share of workers in high-skill occupations is consistently higher than outside of Oslo. However, the figure shows significantly differences across the three groups studied. Firstly, the share of workers in Oslo in a high-skill occupation is significantly lower for both groups of immigrants compared to natives at three years of experience. After 21 years of experience however, among immigrants from HIC, the share of workers in Oslo working in a high-skill occupation is similar to the share for natives.



(a) Natives **(b)** LIC **(c)** HIC

(d) Natives **(e)** LIC **(f)** HIC

(g) Natives **(h)** LIC **(i)** HIC

Figure B.1: Share of Workers in Different Occupation Groups

For immigrants from LIC, the share has increased, but more gradually than for immigrants from HIC. This is partly due to a stagnation after approximately 9 years of experience. Interestingly, the difference in the share of workers in high-skilled occupations in urban and rural areas is approximately constant for LIC-immigrants, while it increases over years of experience for immigrants from HIC. The difference is decreasing for natives, but note that the share is significantly higher at the beginning.

Among all groups studied, the share of workers in low-skill occupations is decreasing with years of experience. However for immigrants from LIC, the reduction in the share of low-skilled workers in Oslo seems to stagnate after 12 years of experience. This is not the case for immigrants from HIC. One explanation is that immigrants from LIC are more likely to continue to work in low-paying jobs over time.

The findings here reveal somewhat distinct sorting patterns into more productive industries among immigrants from LIC and those from HIC. While immigrants from HIC seem to have a more intense sorting into high-productive industries in Oslo compared to rural regions, immigrants from LIC have a similar trend in the two regions.[12]

[12]Note that these are just raw numbers, and the individuals used for calculating the shares are not the same across years of experience.