Changes in Urban Wages, Jobs, and Workers from 1958–2017*

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Abstract

The urban wage premium in Norway declined from 33% in 1958 to less than 5% in 2017, a period of rapid urbanization. The decline was concentrated among noncollege educated men, for whom the urban wage premium became zero, or even negative. The sharp decline in the urban wage premium coincided with declining demand for noncollege educated male industrial workers in urban areas. In addition, while the earnings distributions in rural and urban areas became more similar over time, the positive selection into urban areas, on observable and unobservable characteristics, decreased at the same time that the urban wage premium declined.

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1 Introduction

The geography of industries, work, and wages changes over time, producing winners and losers. In the aftermath of industrialization, urban wages increased due to higher productivity in manufacturing, and the urban wage premium was sustained for decades through agglomeration effects, such as lower transportation costs or higher quality employer–employee matches (see Glaeser and Gottlieb, 2009, for an overview).[1] However, the urban wage premium has recently declined considerably across several countries, most notably among noncollege educated workers (Baum-Snow, Freedman, and Pavan, 2018; Autor, 2019).

Several mechanisms may explain this observed drop in the urban wage premium. Autor (2019) argues that a decline in demand for middle-skill occupations and sales workers in urban areas, and a corresponding rise in demand for low-skill occupations, is behind the decline in the urban wage premium. While Autor (2019) discusses the importance of the changing tasks for noncollege educated workers for the decline in the urban wage premium, much less is known about potential changes in rural-to-urban migration patterns and the selection of such migrants by gender and skills. That is, the supply side may also play an important role in the declining urban wage premium. Large demographic shifts after World War II, resulting partly from the urbanization process itself, led to compositional changes in the selection of urban workers on observable as well as unobservable characteristics. For instance, changes in industry and occupation structure in rural and urban areas may have led to a differential development in income inequality, altering the selection of workers moving into cities. Moreover, the entry of large numbers of high-skill women into the labor markets after World War II and the reversal of the gender gap in educational attainment may have affected the urban wage premium through changes in the labor supply (Acemoglu, Autor, and Lyle, 2004; Goldin and Olivetti, 2013).

In this paper, we analyze the decline in the urban wage premium over the last 60 years, focusing on differences by gender and skill levels. We assess the importance of

[1] For instance, see Glaeser and Mare (2001) for evidence from the United States (US), Combes, Duranton, and Gobillon (2008) for evidence from France, Tabuchi and Yoshida (2000) for evidence from Japan, and Roca and Puga (2016) for evidence from Spain.

changes in demand for skills—highlighting the importance of shifts in factors such as the skill composition of work—as well as changes in supply-side factors—selection of who lives in and who migrates into urban areas based on observable and unobservable factors—in explaining declines in the urban wage premium. We leverage high quality population-wide panel data on workers over a long time period in Norway, with data on their residence, education, occupation, and demographic characteristics. In addition, we analyze changes in earnings inequality and in the industrial composition in both rural and urban areas.

During our period of analysis, 1958–2017, urbanization in many countries was still ongoing. For instance, in the US, only 65% of the population lived in urban areas in the 1960s, reaching about 80% today. It is expected that this increased urbanization process in itself may lead to a changing urban wage premium over time, including a possible change in selection over time through changes in the patterns of urban and rural inequality, as well as changes in the patterns of work over time. The Norwegian economy urbanized rapidly during this period, the proportion of the population living in urban areas increased from 50% in 1960 to around 80% in 2017, making Norway ideal for analyzing the mechanisms behind a changing urban wage premium and changing mobility patterns over time.

This paper makes three important contributions to the existing literature. First, it exploits population-wide register data to analyze the decline in the urban wage premium by gender and skill level over a long period involving extensive mobility to the cities. Second, it examines whether changes in the urban wage premium among different types of workers corresponded to substantial shifts in inequality, which would lead to changes in selection into urban areas as predicted by a simple Roy model. Finally, the paper presents evidence to understand the underlying reasons behind changes in the urban wage premium. It examines both demand- and supply-side explanations. In particular, focusing on the job opportunities available to workers of different genders and skill levels, the paper reveals how changes in the nature of work in both urban and rural areas corresponded to the observed changes in the urban wage premium. Moreover, following workers over time provides evidence on the importance of the dynamics of the selection—on both observable

and unobservable factors—of workers in urban areas and mobility into urban areas for the changes in the urban wage premium. The ability to study and distinguish between both the shifts in urban worker selection and the changes in the availability of employment opportunities is crucial, as the two mechanisms have different policy implications.

We present four main results. First, we document that the urban wage premium declined considerably over time. In 1958, male workers in urban areas earned 33% more than their rural counterparts; by 2017, this wage premium had declined to below 5%. The drop in the urban wage premium for men can be divided into two different time periods. From 1958–1980, the urban wage premium for men declined by roughly 55%, from 33–15%, and from 2000–2017, the urban wage premium declined by over 65%. These two periods of decline are robust to changes in the definition of urban status and remain in real terms when accounting for differences in local costs of living through housing. In the period in between, 1980–2000, the urban wage premium did not change. Similar to Baum-Snow, Freedman, and Pavan (2018) and Autor (2019), we find that the decline in the urban wage premium in the 2000s is concentrated among noncollege educated men, whereas college educated workers were more insulated from declining urban wages. By 2017, noncollege educated men experienced zero—or even negative—wage differences relative to their rural counterparts. The decline in the urban wage premium among women was much smaller relative to their male counterparts; indeed by 2017, the urban wage premium among women was larger than that among men. For women, the urban wage premium declined among the noncollege educated, but the decline was much less severe compared to men. This reversal of the gender gap in the urban wage premium, is driven by the sharp decrease in the premium among noncollege educated men in the 2000s.

Second, we show that the earnings distribution in rural and urban areas became more similar over time, particularly at the bottom half of the earnings distribution. Given the convergence in the income distributions between rural and urban areas over time, a simple Roy (1951) model predicts changes in selection over time (Borjas, 1987; Borjas, Bronars, and Trejo, 1992). We would expect a positive selection of migrants moving from rural origins with a more equal income distribution to urban destinations with more unequal

income distribution at the start of the analysis period. However, the degree of positive selection into urban areas should decline over time as inequality becomes increasingly similar between rural and urban areas over time, particularly at the bottom half of the earnings distribution.

Third, we analyze whether shifts in the availability of different types of jobs is of importance for the decline in the urban wage premium. We document that the shifting demand and changes in the nature of work coincide with the observed declines in the urban wage premium among men from 1958–1980 and in the 2000s. In particular, the decline in the premium corresponds to industrialization in rural areas and a substantial decline in low-wage agricultural employment. The 1970s and 1980s saw a strong increase in employment in manufacturing in the rural areas, providing high-wage employment for middle- and low-skill workers. At the same time, employment in the local public sector rose considerably, supporting high-wage employment among women both in urban and rural areas. Changes in the nature of work also coincided with the sharp decline in the urban wage premium in the 2000s among noncollege educated men. The existing literature has identified manufacturing decline as a consequence of forces such as import competition and technological change.[2] Norway is no exception to such declines. Employment in manufacturing among prime-aged men declined from a peak of 28% in 1970 to less than 15% by 2017. In the 2000s, deindustrialization in urban areas coincided with declines in the urban wage premium, and the availability of high-wage middle-skill occupations declined in urban areas. Similar findings are observed over time in the US (Autor, 2019) and the United Kingdom (Goos and Manning, 2007). Focusing on gender differences reveals that deindustrialization affected men more than women as middle-skill industrial occupations became increasingly unavailable in urban areas. Noncollege educated workers were particularly impacted by deindustrialization in urban areas, whereas college educated workers were more insulated from such declines. Other factors includ-

[2]For evidence on import competition see Autor, Dorn, and Hanson (2013); Autor, Dorn, Hanson, and Song (2014); Bloom, Draca, and Van Reenen (2015); Balsvik, Jensen, and Salvanes (2015); Acemoglu, Autor, Dorn, Hanson, and Price (2016); Hummels, Jørgensen, Munch, and Xiang (2014), and robotization see Acemoglu and Restrepo (2018); Graetz and Michaels (2018). Likewise, declines in low-skill routine occupations resulting from technological change and computerization are observed (Autor, Levy, and Murnane, 2003; Goos, Manning, and Salomons, 2014; Autor, Dorn, and Hanson, 2015).

ing the discovery of oil, increases in the female labor supply, immigration, and changes in commuting played a smaller role in the decline in the urban wage premium. As such, the findings suggest that the changes in the skill content of work performed in urban and rural areas had a more important role.

Fourth, we analyze the role of shifts in the skill selection into urban areas in the decline of the urban wage premium. The existing literature reveals substantial positive sorting of workers into urban areas (Combes, Duranton, Gobillon, Puga, and Roux, 2012; Roca and Puga, 2016) and highlights the importance of internal migration. Indeed, rural-to-urban migrants were positively selected on education. While some positive selection remained among urban migrants in the 2000s, the decline in selection on observables over the period is substantial. The paper examines selection based on unobservables using two different approaches. First, we include an individual fixed effect in the urban wage premium regressions, consistent with the previous literature (see, e.g., Glaeser and Mare, 2001). Second, we examine brothers and sisters in a sibling fixed effect setting and compare urban to rural wages for siblings where one sibling moved. While some positive selection remains among urban migrants when using the individual fixed effects models, the decline in positive selection on unobservables over the analysis period is substantial. Comparing brothers/sisters where one sibling moves into an urban area and the other remains in the rural area suggests that positive selection was present in earlier periods and negative selection was present after 2000. The declines in positive selection over time were largely similar between women and men. Thus, while selection becoming increasingly less positive might explain some of the decrease in the urban wage premium, the lack of a gender gap in selection cannot explain the substantial divergence in the urban wage premium between men and women after 2000.

The remainder of the paper proceeds as follows. Section 2 describes urbanization in Norway and internationally, the data, and the sample of workers used throughout the paper. Section 3 presents results on the urban wage premium over time for men and women and for workers of different skill levels, and discusses how this development corresponds to shifts in inequality in rural and urban locations. Section 4 documents how changes in

the nature of work among both men and women correspond to the observed changes in the urban wage premium. Section 5 details the role of changes in selection on observable and unobservable factors in the decrease in the urban wage premium over time. Section 6 concludes.

2 Background and Data

In this Section, we first provide background information on the timing of urbanization in Norway relative to other countries. Second, we describe the data sets, variables, and the sample used in the analysis.

2.1 Urbanization in Norway and Around the World

In 18th century European agricultural societies, only a small fraction of the population lived in cities. Today, by contrast, the vast majority of the population is concentrated in urban centers. The 19th century marks the transition phase; urban centers grew during industrialization as more and more people left the rural areas to work in cities (Krugman, 1991). In Great Britain, for example, in 1700, around 12% of people lived in urban areas. By 1800, this had increased to 22%, by 1901 to 77%, and by 1950 to 79% (see, e.g., Malanima and Volckart, 2008). In the US, the large increase in the urban population occurred in the 1950s when urban populations became the majority in the southern states, following urbanization that had already occurred in the northern states.

The urbanization process in Norway started comparably late. In 1960, the urbanization rate remained below 50%, although it increased sharply after 1960. Figure 1 plots the percentage of the population living in urban areas from 1900 to 2010 in Norway, Sweden, Denmark, and the US, and highlights Norway's late urbanization process even compared with other Nordic countries. The fact that the decades when the urbanization process in Norway advanced at a high rate coincide with the time period observable in the Norwegian Registry Data makes Norway a unique and interesting case for exploring the changes in the urban wage premium and the selection into rural-to-urban migration over time.

What are the reasons for the delayed urbanization in Norway? Until 1920, Norway's development was similar to that of Sweden (see Figure 1). After 1920, differences in the urbanization process arose largely due to different of mechanization in the agricultural sector. This mechanization gap was the result of a prolonged downturn following World War I (WWI). In particular, the Norwegian government's efforts to keep the Norwegian currency stable against US dollar led to a severe deflation. Rural areas were particularly severely impacted and many farms went bankrupt in the post-WWI period. Farms' lack of capital to accelerate mechanization resulted in prolonged labor-intensive farming until 1960. In addition, the Norwegian government's fund granting loans for fishing and infrastructure projects in peripheral areas and the implementation of an agricultural subsidy system after World War II were further reasons for the delay in urbanization (see SSB, 2005).

In 2010, the urbanization rate in Norway was 80%, similar to the rate in the US. The rapid growth of Norwegian cities in the 1960s was attributed not only to rural-to-urban migration but also to greater population growth in the urban areas.[3]

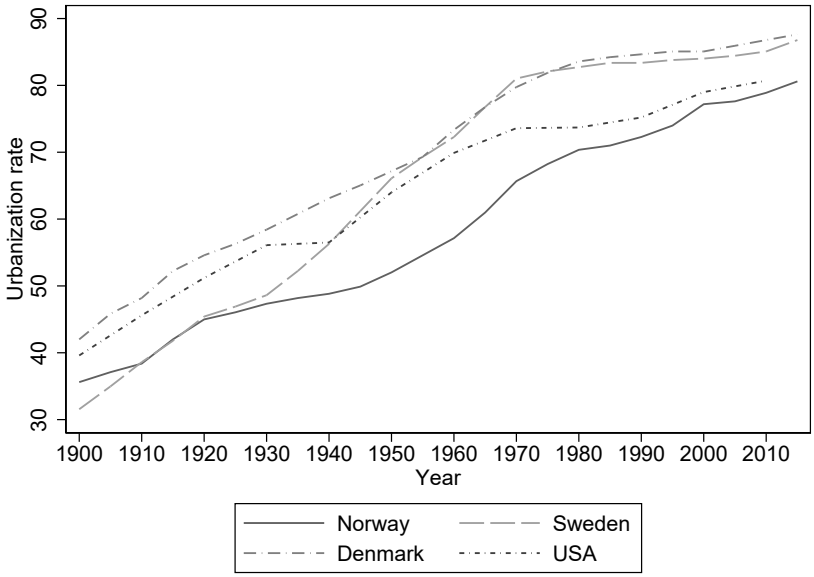
2.2 Data

Our primary data source is the detailed Norwegian Registry Data, a linked administrative data set that contains an education, family, and earnings register. Such data permits the construction of a long individual-level panel with annual information about educational attainments, demographic variables including age and gender, and earnings for the entire Norwegian population for 1967–2017. The availability of a unique personal identifier for all residents in Norway permits the linkage of these data to a central population register, providing the municipality of residence in each year for the period of 1967–2017. The personal identifiers also enable us to identify siblings and parents.

We calculate most of the earnings measures used in the analysis based on before-tax gross earnings from national tax records. Earnings consist of some transfers, such as unemployment benefits and parental leave benefits, i.e., benefits related to labor force

[3]Between 1968 and 2010, the out-migration from rural areas varied between 2.2 and 3.2 percent per year.

Figure 1: Percentage of population living in urban areas in Norway, Sweden, Denmark, and the US, 1900-2015



Data source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, US Census Bureau.

participation. Earnings are adjusted for inflation to the base year 2010 using the consumer price index. While we can rely on annual individual-level data from 1967–2017, we collect income data from 1958 from tax records at the municipality level from NSD's kommunedatabase.[4] An individual's highest completed level of education is determined using the education register.[5] We classify individuals into three education groups: low-educated (basic and lower secondary education), medium-educated (upper secondary education), and high-educated (post-secondary level). In addition, we construct education levels at the regional/local labor market level. The first measure is the share of individuals with mandatory education or less as their highest level of completed education, and the second measure is the average years of education within each region. We supplement this individual-level panel spanning 1967–2017 with data on IQ test scores from Norwegian military records for male cohorts born after 1949 as a proxy for cognitive ability

[4]In particular, we use "Kommunenes regnskaper 1958–1959: Inntekter av overføringer fra skatter og avgifter oppgitt i 1000 kroner".

[5]Any educational institution is legally obligated to report any student who is enrolled or completes a degree to Statistics Norway's education registry.

(see Sundet, Barlaug, and Torjussen, 2004; Thrane, 1977, for details). The military service in Norway is mandatory for men, and each male individual is tested for physical and psychological suitability during an examination around his 18th birthday. The IQ score is constructed as an unweighted mean of three tests–arithmetic, word similarities, and figures–and converted into a single digit number on a zero to nine scale, so that the scores are normally distributed with a mean of five and a standard deviation of two. In addition, we make use of decade-level occupation data from the population censuses from 1960–1990. Individual-level census data provides self-reported occupation information for nearly 100% of the population from 1960–1980, with a representative sample in the 1990 census. For the period of 2007–2017, we use annually available occupation data recorded directly by employers. Occupations are classified according to the Norwegian standard classification of occupations, which is based on the European Union International Standard Classification of Occupations.

2.3 Defining Urban and Rural Areas

Statistics Norway divides municipalities into different levels (on a scale of 0-3) in terms of centrality (see, e.g., SSB, 1994). Centrality is defined as a municipality's geographic location in relation to a center where there are services such as a post office and bank. In accordance with international standards for comparing urbanization levels across countries, Statistics Norway divides urban areas into three levels according to population and available service functions. Municipalities on level 3 are regional centers (municipalities that have a population of at least 50 000 inhabitants) or municipalities that are located within 75 minutes (90 minutes for Oslo) travel time from an urban settlement of level 3. Level 2 includes settlements with a population between 15 000 and 50 000 or municipalities that are located within 60 minutes travel time from an urban settlement of level 2. Following this definition of centrality levels, we define municipalities as urban areas if their level of centrality is 3 or 2. Hence, the definition includes both urban areas as well as surrounding areas within commuting distance. Municipalities with lower levels of centrality have populations of less than 15 000 individuals.

Figure 2 displays the centrality level for each municipality within Norway used throughout this paper. According to this definition, 42.7% of the municipalities are defined as urban locations and 75–80% of workers are urban workers over the period of analysis. While such a definition follows international standards for comparability of urbanization across countries, section 4.4 designs robustness checks to examine how results are sensitive to this definition of an urban area.

2.4 Sample Selection

Our sample contains yearly observations of men and women aged 25–55, who were resident in Norway in at least one of the years from 1967 to 2017 and have non-missing data on education.[6] In addition, we only keep individuals with continuous time periods of residence data in the sample.[7] Moreover, we focus on individuals with self-sufficient income.[8] Our final male (female) sample consists of 41,456,877 (32,031,140) person-year observations and 2,322,192 (2,044,551) unique individuals. Summary statistics for the period of 1967–2017 for the key variables are presented in Tables A.1 and A.2 for men and women, respectively. Earnings of urban area residents are higher than those of rural area residents and individuals living in urban areas have higher levels of education. Moreover, rural-to-urban migrants have higher incomes, are younger, and are higher educated than rural stayers.

3 The Urban Wage Premium and Changes in Inequality

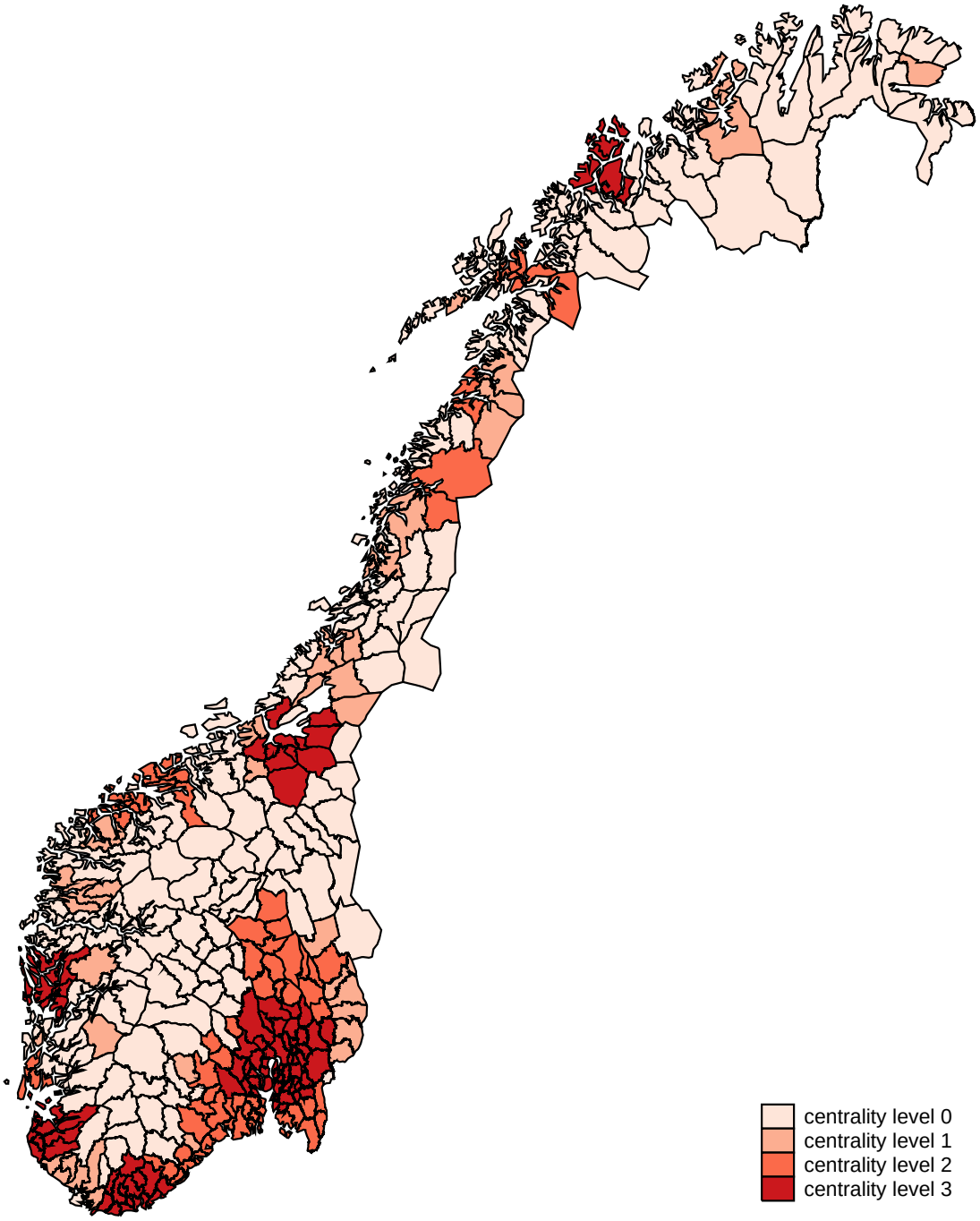
Below, we present some important facts about the evolution of the urban wage premium in Norway over the last 60 years. In particular, we focus on four questions. First, has there been a steady decline in the urban wage premium, or is the trend concentrated in certain time periods? Second, do we observe similar patterns for men and women? Third,

[6]The age restriction ensures that most individuals completed their education when entering the sample and are not in early retirement when observed.

[7]By excluding all individuals with noncontinuous residence data, we exclude less than 4% of the total sample.

[8]That is, we exclude all observations with income lower than the social security base rate. In 2010, for example, the base rate was set to 74,721 Norwegian krone (NOK) or about 11,000 USD.

Figure 2: Centrality level of Norwegian municipalities



Data source: Statistics Norway. Urban areas are defined as centrality levels 2 and 3, while rural areas are defined as centrality levels 0 and 1.

do we observe different patterns for workers of different skills levels? Finally, is there a change in income inequality in urban and rural areas, and are there distinct time patterns for men and women?

3.1 Raw Urban Wage Premium Over Time

We follow Glaeser and Mare (2001), and exploit individual-level data to measure the urban wage premium and its development over time. We estimate the regression separately for each year t for the period of 1958–2017, as follows:

$$ln(W_i^t) = \alpha^t + \gamma U_i^t + \varepsilon_i^t, \tag{1}$$

where $ln(W_i^t)$ is the log of gross income for individual i in year t. U_i^t is a dummy variable describing whether the individual lives in an urban location and γ indicates the productivity gain from living in an urban area. As Equation (1) does not control for other individual-specific characteristics that might affect the wage and the location decision, we define γ as the raw urban wage premium. In addition to a binary urban status, we analyzes how log earnings are related to a continuous variable for urban status, measured by the initial log population density of an area. Indeed, changes in the premium over time might differ for the most densely populated municipalities relative to smaller cities.

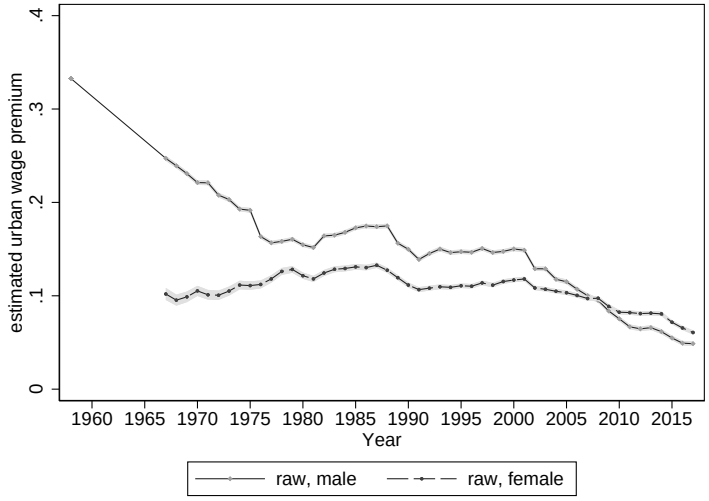
Figure 3 plots the evolution of the estimated unconditional urban wage premium for men from 1958–2017 and for women from 1967–2017.[9,10] Figure 3 reveals two important insights. First, although earnings in urban and rural areas remain significantly different over the entire period for both genders, the plot suggests that the raw premium for men has declined substantially over the past 60 years. In 1958, the raw urban wage premium was 33.3%, whereas by 2017 it was 4.9%. While the urban wage premium for men was

[9]Note that the estimated urban wage premium over time is similar, but lower relative to the raw urban wage premium for both men and women when controlling for age and education (see Figure B.1). Note that Figure B.1 starts in 1967 as we only observe individual-level data on education and age from 1967 onwards.

[10]Figure B.2 shows that the evolution of the estimated urban wage premium over time is largely unchanged when defining urban status contemporaneously rather than at a fixed point in time, as in Figure 3. Moreover, focusing on a continuous measure of population density measured in 1960 does not alter the main findings (Figure B.3).

relatively stable over the 1980s and 1990s, Figure 3 exhibits two distinct and consistent periods of decline for men: (i) 1958–1980, when the raw premium declined by 55% (from 33.3% to 15.2%) and (ii) 2000–2017, when the raw premium declined by over 65% (from 15% to 4.9%), with an accelerated decline corresponding to the Great Recession. Second, there are stark differences in the level and pattern of the urban wage premium over time for men and women. Clearly, different processes affect men and women over time. For women, the urban wage premium did not vary much from 1967–2000. The stable urban wage premium for women is striking because the labor force participation of women rose from less than 30% in the mid 1960s to about 90% in 2017. Similar to men, the premium declined from 2000 onward. However, the magnitude of the decline was 47% (from 11.9%–6.3%), much lower than that experienced by men. Different rates of female labor force participation between urban and rural areas could be a potential factor behind these gender differences 2000 because increases in the female labor supply mainly affect female and, to a lesser extent, male wages (Acemoglu, Autor, and Lyle, 2004). However, Appendix Figure B.4 revealss that the labor force participation among women was relatively similar between rural and urban areas after 1990 in Norway.

Figure 3: Estimated urban wage premium by gender



Note: Figure plots coefficients from separate regressions of Equation 1 for each year and gender. Urban status defined as in Figure 2. The estimation sample is defined in Section 2.4. Earnings measured in 2010-NOK.

Figure 4 reveals that declines in the urban wage premium are concentrated in larger urban areas among men. In particular, the figure plots the change in the relationship between population density, measured as the initial log population density in 1960, and earnings changes relative to 1967 in 1970, 1980, 1990, 2007, and 2017 for men and women. In 1967, there was a strong linear and positive relationship between population density and log earnings (see Figure B.3a). Although log earnings increased considerably over time relative to its 1967 value for men, the increase in earnings in densely populated areas was substantially less than the increase in sparsely populated areas (Figure 4, panel a). In 2000, the relationship became concave for men, as the most densely populated areas exhibited smaller earnings growth relative to more sparsely populated areas.

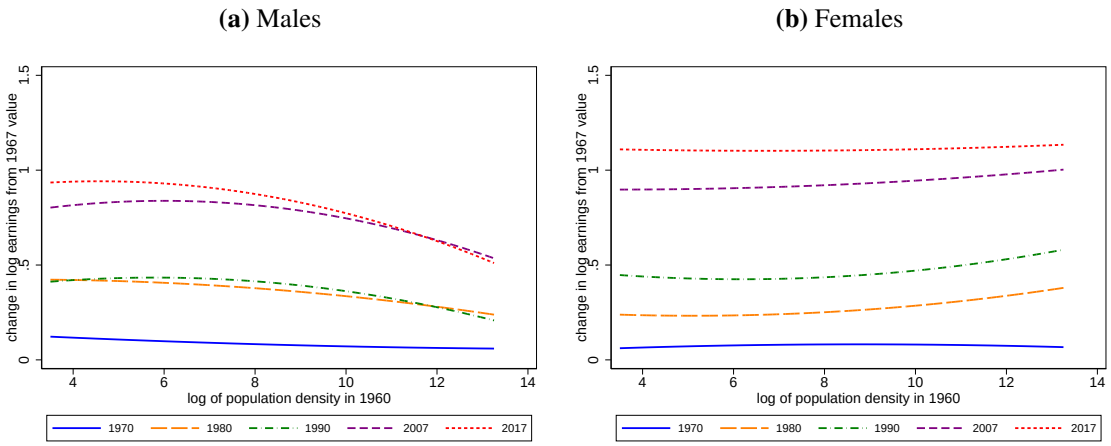
In contrast, the declines in the urban wage premium for women were less substantial in densely populated areas (Figure 4, panel b). Although there was a (slightly convex) positive relationship between log earnings changes and density in 1980, this had gradually flattened out by 2017. Men and women began at different levels of earnings in 1967 (Figure B.3a). However, as Figure B.3 reveals, the substantial gaps in earnings in urban areas between men and women at the start of the period had closed considerably by 2017. Indeed, the relationship between log population density and log earnings became increasingly concave over time for men.

3.2 Urban Wage Premium and Education

The observed declines in the urban wage premium for men relative to women suggest that urban areas increasingly offered fewer earning opportunities for men. A question remains whether such relative declines were equally dispersed among all men, or concentrated among individuals with specific skill or education levels. The answer to this question is central to both the explanation of the changing nature of work and the explanation of the changing selection into the cities over time.

Panels (a) to (c) in Figure 5 plot the urban wage premium controlling for age by gender and by three levels of education: compulsory middle school, high school, and college and beyond. The figure reveals that education insulated men from dramatic declines in the

Figure 4: Relationship between initial population density and earnings



Note: Figure plots the change in log earnings relative to 1967 in five periods: 1970, 1980, 1990, 2007, and 2017 by the log of municipality population density (1000 residents per km^2) measured in 1960. The sample of males in panel (a) and females in panel (b) is defined in Section 2.4. Quadratic fit plotted for each year, where line corresponds to the change in log earnings in a given municipality in a given year relative to the level in 1967. Scatter plot of municipal values for each year omitted because of the complexity of the to visual presentation. Earnings measured in 2010-NOK.

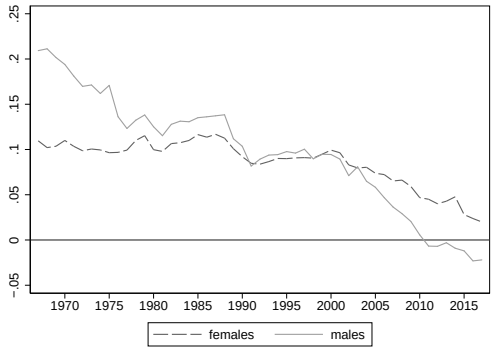
wage premium in urban areas. Although the urban wage premium declined from 2000 onward among all workers, noncollege educated men were the most afflicted. Indeed, the evolution of the urban wage premium for men in Figure 3 is largely driven by changes for the noncollege educated. For the compulsory and high school educated, the male urban wage premium exhibits two distinct periods of decline: prior to 1980 and from 2000–2017.

For men with college education, the urban wage premium increased slightly until 2000 and decreased after. Hence, men with all type of education experienced substantial declines in the urban wage premium after 2000. However, the declines after 2000 are most dramatic among the noncollege educated individuals (panel (a) of Figure 5). Among those at the lowest end of the education distribution, the premium declined by 123% (9.5% to -2.2%) from 2000–2017. Men with high school degrees experienced a similar decline of 100% (11.5% to -0.04%), whereas the premium for college educated men declined by 57%.

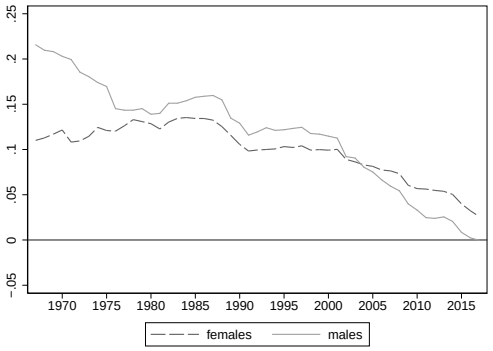
Importantly, the estimated urban wage premium among men without college education was zero by 2017 and was even negative for the group with the lowest education level.

Figure 5: Estimated urban wage premium by year and education levels, men and women

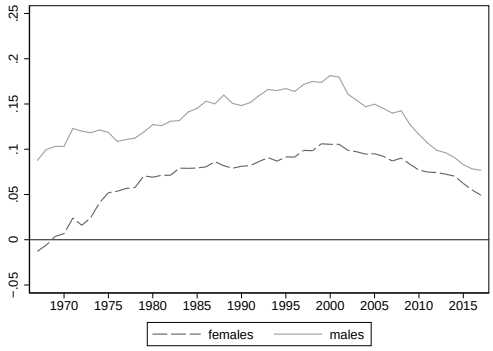
(a) Less than high school educated



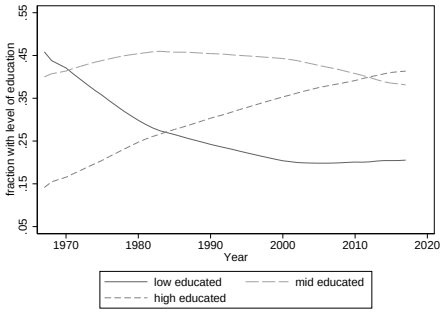
(b) High school educated



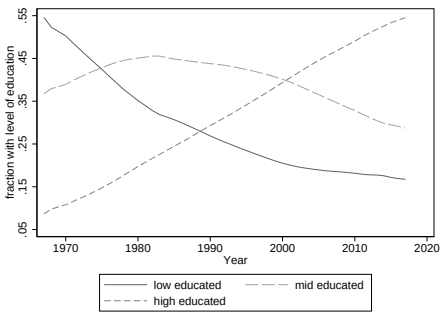
(c) College educated



(d) Education composition of sample, men



(e) Education composition of sample, women



Note: Figure plots estimates from Equation (1), from separate regressions for each year, gender, and education level. Panels (a), (b), and (c) report estimates from the sample of workers with basic or lower secondary education, high school education, and any college education, respectively. Panels (d) and (e) plot the fraction of men and women in the sample with each level of education, respectively.

That is, even without adjusting for the higher price levels in urban areas (see Figure E.8), low-educated men gained no monetary benefits from living in cities. Moreover, the results in Appendix Figure C.1 reveal that among noncollege educated workers, younger male workers tended to be more affected than older male workers.

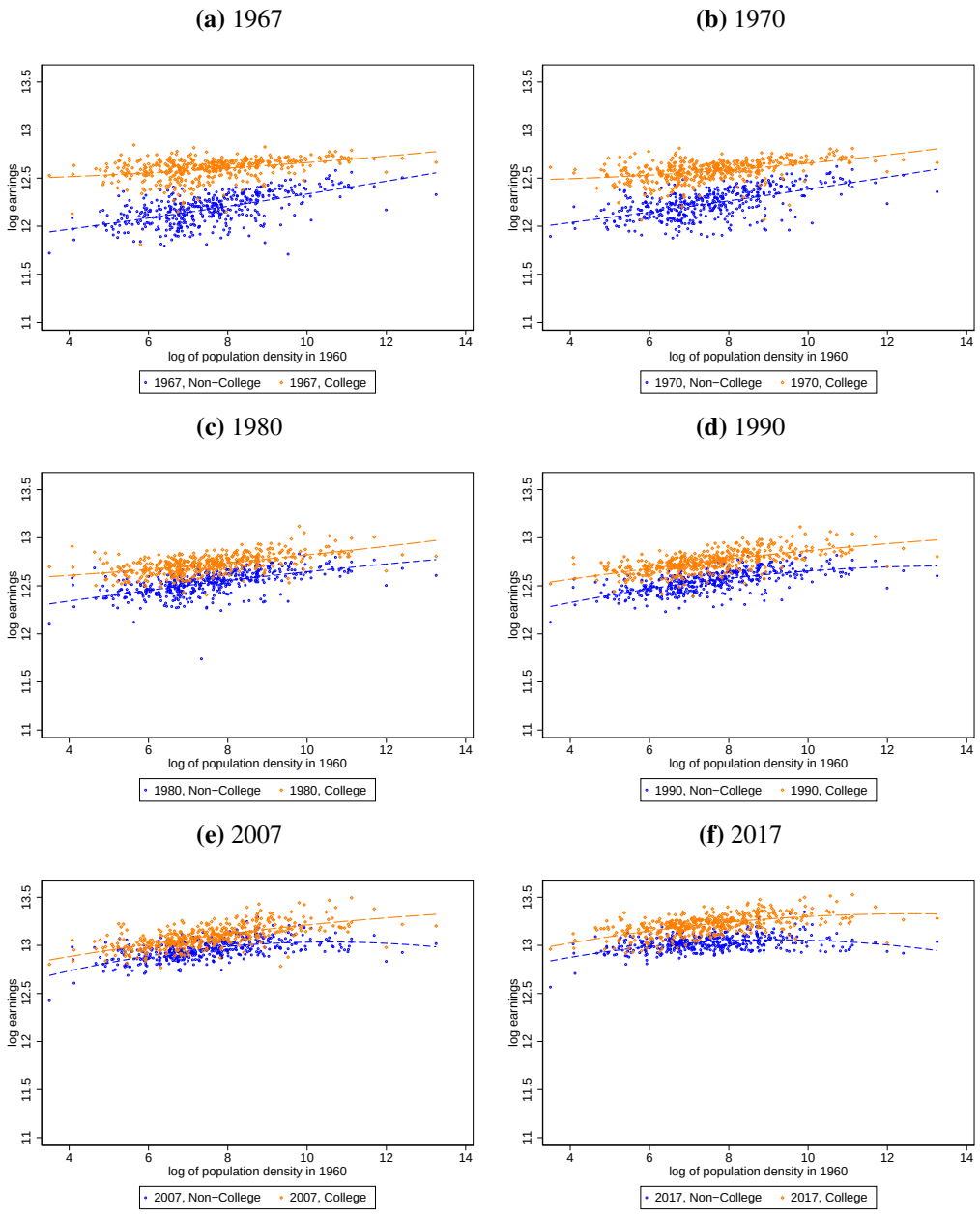
Similar declines in the urban wage premium are seen among noncollege educated women after 2000. As was the case for men, the decline between 2000 and 2017 was largest for the least educated women. However, the declines were smaller among women than among men and by 2017, the urban wage premium among the noncollege educated was higher for women relative to men. For college educated women, we observe an increasing urban wage premium until 2000 and a slight decrease thereafter. Despite this slight decrease, the estimated urban wage premium among women remained positive in 2017 for all education levels. Although the urban wage premium for men in the whole sample was higher than that for women until 2008, the reversal in the estimated premium occurred earlier for certain groups. It had already occurred in the late 1990s for those with compulsory education, and in the early 2000s for those with high school education. For the college educated, the urban wage premium remained larger for men than for women for the whole period from 1967 until 2017.

These findings are also reflected in Figures 6 and 7, where we study the average log earnings of college and noncollege educated men and women by population density in 1967, 1970, 1980, 1990, 2007, and 2017. Although the population density gradient for college educated men increased slightly over time, the gradient for noncollege educated men decreased substantially, particularly between 1967 and 1980. For women, there is almost no population density gradient and little change in the gradient.

3.3 Urban Wage Premium and Inequality

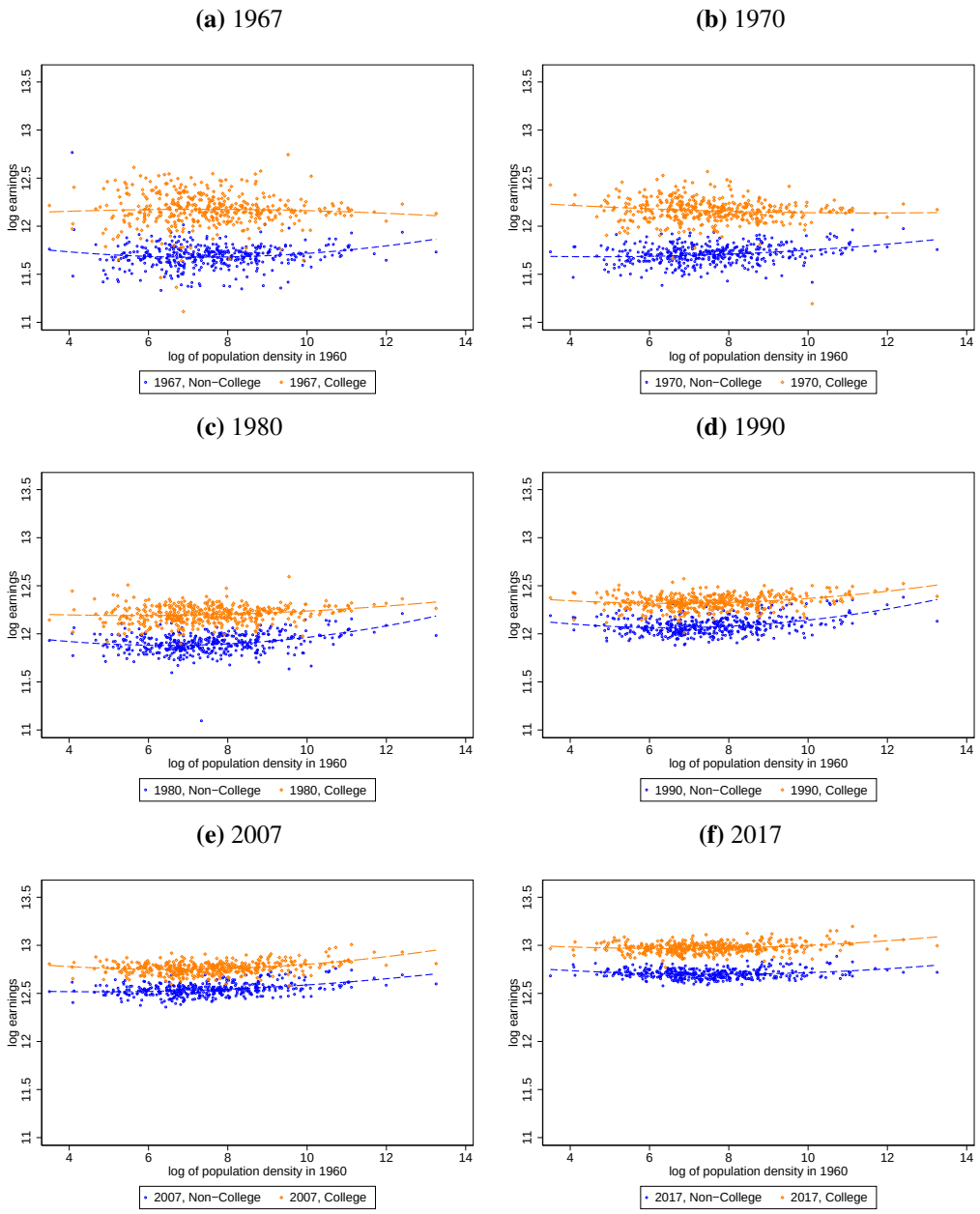
The observed declines in the urban wage premium—especially among men—suggest that urban areas increasingly offered fewer earnings opportunities. A remaining question is whether the drop in the urban wage premium—especially among the noncollege educated—led to increased inequality in urban areas, and whether there has been a change

Figure 6: Real urban wage premium by 1960 population density, by college/noncollege education, men



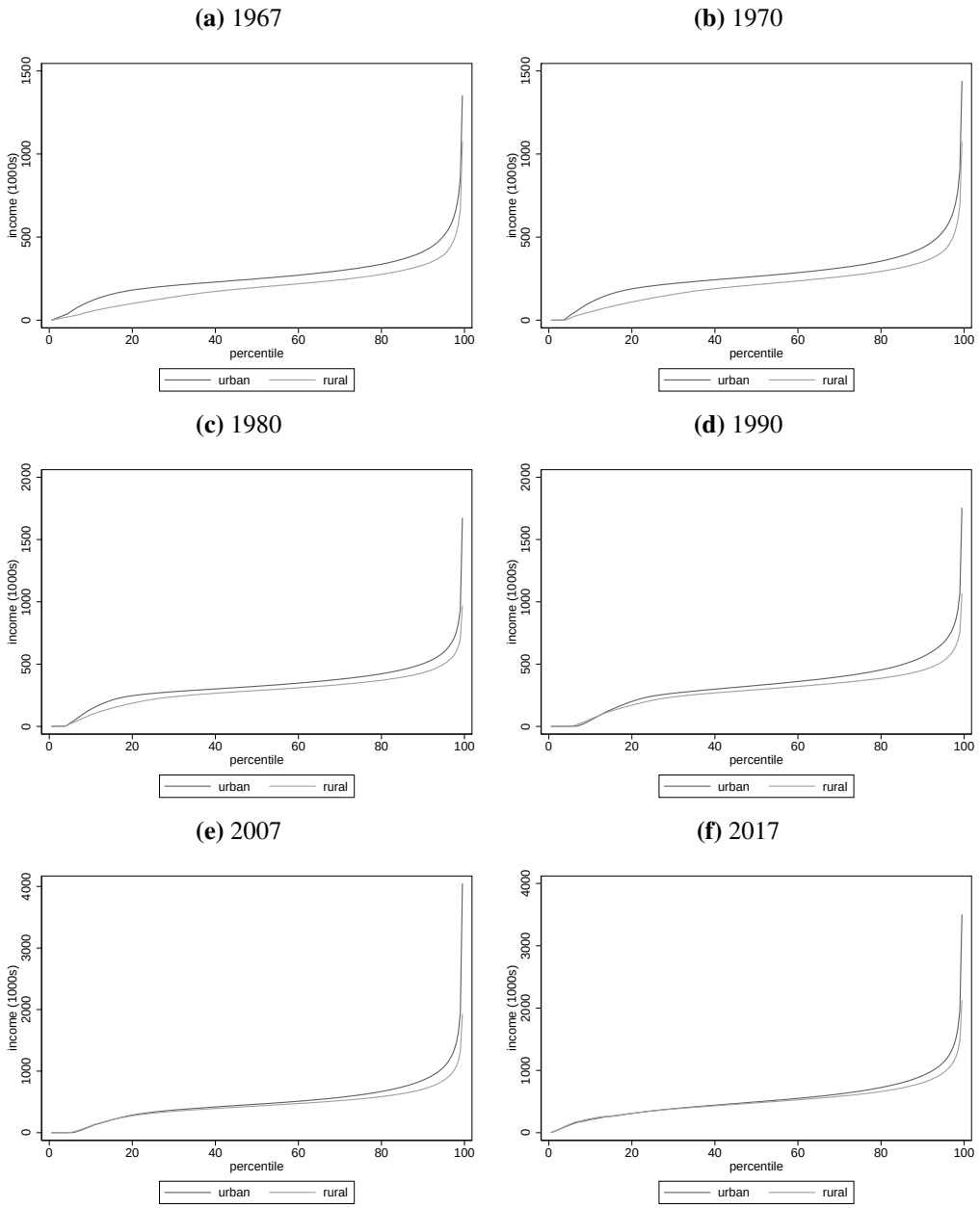
Note: Figure plots the raw urban wage premium for men in areas of different population density by education level. Earnings measured in 2010-NOK. Log of municipality population density (1000 residents per km^2) is measured in 1960. Each point represents the average of log earnings in a given year for workers with certain levels of education.

Figure 7: Real urban wage premium by 1960 population density, by college/noncollege education, women



Note: Figure plots the raw urban wage premium for women in areas of different population density by education level. Earnings measured in 2010-NOK. Log of municipality population density (1000 residents per km^2) is measured in 1960. Each point represents the average of log earnings in a given year for workers with certain levels of education.

Figure 8: Income distribution between urban and rural areas, 1967–2017



Note: Figure plots the earnings distribution between urban and rural areas in six separate years from 1967–2017. Urban status is defined as in Figure 2. Earnings measured are in thousands of 2010-NOK. Unconditional average earnings are plotted in each year across 100 percentiles. In 1967 and 1970, top of earnings distribution simulated as in Bhuller, Mogstad, and Salvanes (2017). Top coding affects less than 6% of observations in these years.

in inequality in rural areas.

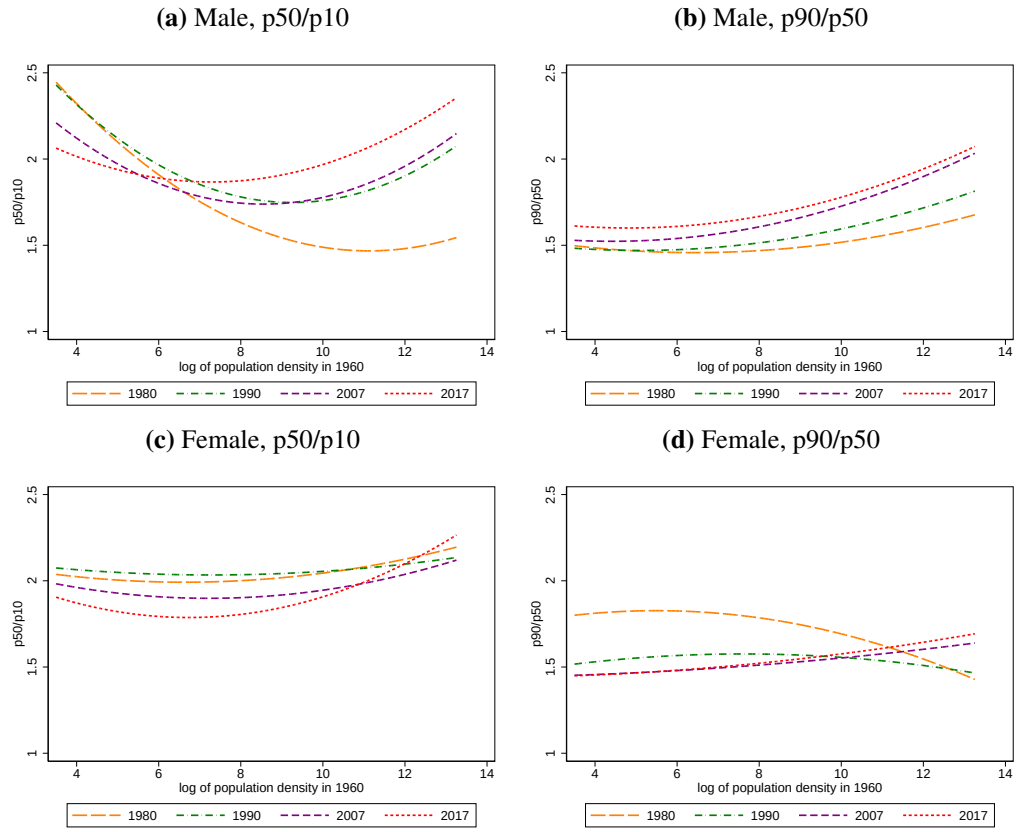
Such considerations are important because a relative change in urban and rural income inequality is expected to lead to a change in the selection of movers into the cities. A simple version of a Roy model (Roy, 1951) (for instance the models of Borjas (1987) and Borjas, Bronars, and Trejo (1992)) indicates that the relative return to skill in the sending and destination areas predicts the selection of movers. If the migration destination—cities in our case—has a higher return to skill than the rural areas, and, therefore, greater levels of income inequality, urban migrants will be drawn disproportionately from the top end of the rural skill distribution, leading to positive selection of workers into the cities. Conversely, if the cities offer lower returns to skill, urban migrants will be drawn disproportionately from the lower tail of the rural areas' skill distribution. Importantly, the change in returns to skills, and, thus, income inequality may vary gender, resulting in different migration patterns over time for men and women.

To better understand the relationship between urban status and the trends in inequality, Figure 8 plots the earnings distribution between urban and rural areas from 1967–2017. At the start of the period in 1967, the distributions of urban and rural earnings are clearly different: urban areas have higher levels of earnings at each percentile in the distribution. Although earnings in rural areas at the bottom half of the distribution are particularly low, the difference in earnings between urban and rural areas is roughly constant throughout the distribution.

Over time, the two distributions gradually converge and the income differences begin to disappear. Such convergence increased dramatically in the 2000s and is particularly visible by 2017. The rural and urban earnings distributions are virtually identical in the bottom half of the distribution. The similarity over time at the bottom of the distribution is consistent with the zero urban wage premium among noncollege educated workers in Figure 5, as the college educated dominate the top of the earnings distribution. In 2017, earnings in urban areas continued to be higher in the upper part of the earnings distribution, with increasingly larger differences in the highest earnings percentiles.

Figure 9 plots the evolution of two measures of inequality—the ratios of 90^{th} and 50^{th}

Figure 9: Relationship between inequality from 1980–2017 and municipal population density in 1960 by gender



Note: Figure plots the level of inequality, measured by p50/p10 and p90/p50, for men (panels a and b) and women (panels c and d) in areas of different population density in 1980, 1990, 2007, and 2017. The sample of males in panel (a) and females in panel (b) are as defined in Section 2.4. The log of municipality population density (1000 residents per km^2) is measured in 1960. Quadratic fit plotted for each year, where line corresponds to the level of either measure of inequality in a given municipality in a given year. Scatter plot of municipal values for each year omitted due to visual presentation. Earnings are measured 2010-NOK.

percentiles and the 50^{th} and 10^{th} percentiles—by population density for men and women, respectively. The figure documents whether inequality is prevalent in the top and/or bottom of the earnings distribution and whether the effects are more prevalent for the largest cities. Overall, the plot supports the findings in Figure 8 and suggests that the development in inequality coincides with the changes in the urban wage premium. First, differences in inequality between rural and urban areas increased at the top of the earnings distribution and decreased at the bottom during the period in which the urban wage premium among noncollege educated individuals was decreasing substantially. Second, the changes in the income distributions are more pronounced among men than women, consistent with the large decrease in the urban wage premium among men.

Consequently, the prediction from a simple Roy model suggests that the increasing similarity of the earnings throughout the distributions over time changed the selection into migration. In particular, the convergence in the earnings distributions is so strong that we would expect that rural-to-urban movers would be increasingly less positively selected over time. Section 5.2 studies the changes in the selection of rural-to-urban migrants.

4 Changes in the Nature of Work and Education

A possible explanation for the changes that we discuss in Section 3 is changes in demand for skills in urban and rural areas. Such changes might arise from transitions in the importance of different industries, the skill content of different occupations, and the nature of work in urban and rural areas over the 60 years examined. We will focus on changes in both rural and urban areas, in various sectors, and across genders. We are specifically interested in whether deskilling for occupations for medium and low-skill male workers was particularly pronounced in urban areas and whether it can explain the observed drop in the urban wage premium for this group.

First, we document the development of employment in the main sectors in urban and rural areas. Second, we examine shifts in employment across low-skill, middle-skill, and high-skill occupations. Finally, we examine the importance of education in employment in different occupations and the robustness of the main results to alternative explanations.

4.1 The Decline of the Manufacturing and Agriculture Sector

At the start and second half of the nineteenth century, industrialization led to the emergence of a decline in the growth of manufacturing and a continued decline in agriculture. As manufacturing growth tended to be concentrated in urban areas, a decline in manufacturing might have different consequences for urban and rural areas (Krugman, 1991). The existing literature has identified manufacturing declines as a consequence of forces such as import competition and skill-biased technological change.[11] Likewise, declines in low-skill routine occupations as a result of technological change and computerization are observed (Autor, Levy, and Murnane, 2003; Goos, Manning, and Salomons, 2014; Autor, Dorn, and Hanson, 2015). Norway is no exception to such declines: Figure 10 reveals that employment in manufacturing among men aged 25–55 declined from a peak of 28% in 1970 to less than 15% by 2015 (Figure 10a) and that such declines were most severe in urban areas (Figure 10c). It is notable that there was a substantial increase in manufacturing in rural areas among men until the mid 1980s and a much slower decline compared with urban areas. In addition, although there was an overall increase in the share of workers in the local public sector—including, for example, local health services, education, and social work—this increase was substantially larger for women. In particular, this change substantially improved female employment opportunities in rural areas. In rural areas, the increase in the share of workers in manufacturing and the local public services until the 1980s was largely offset by a severe decrease in the workforce in farming and fishing.[12]

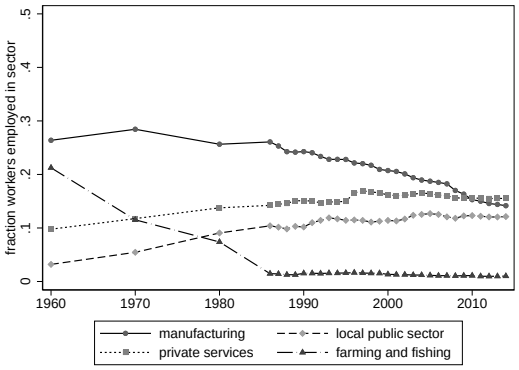
Overall, the decrease in the number of workers in low-income farming and fishing jobs, and the increasing share of workers in the manufacturing and local public service jobs in the urban areas, is in line with the first period of decline in the urban wage premium that we observe in Section 3.

[11] For import competition, see Autor, Dorn, and Hanson (2013); Autor, Dorn, Hanson, and Song (2014); Bloom, Draca, and Van Reenen (2015); Balsvik, Jensen, and Salvanes (2015); Acemoglu, Autor, Dorn, Hanson, and Price (2016)

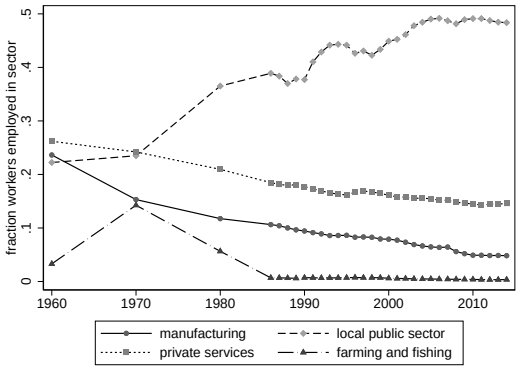
[12] Note that the large increase in the share of women in farming from 1960 to 1970 is a coding issue as most female farm workers were classified as domestic workers in 1960. Moreover, in the 1970s a law change resulted in the first-born child instead of the first-born son inheriting the farm what has also resulted in more female farmers.

Figure 10: Manufacturing, local public, private services, and agriculture employment share from 1960–2014

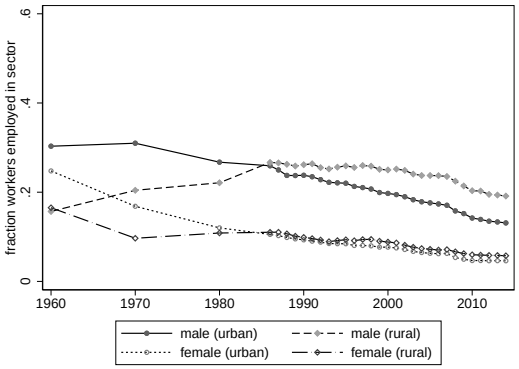
(a) All of Norway, Men



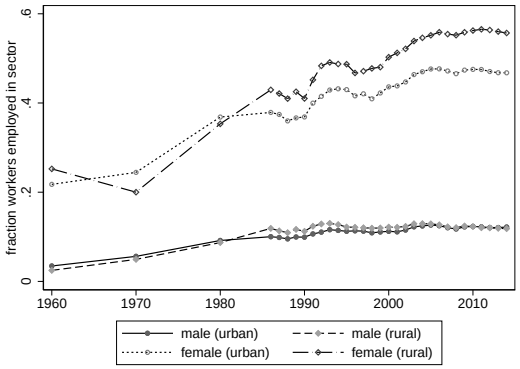
(b) All of Norway, Women



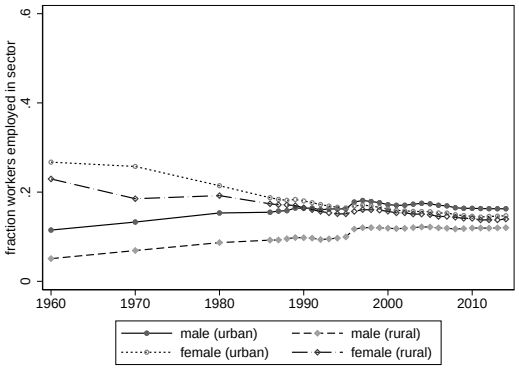
(c) Manufacturing Share by Urban/Rural



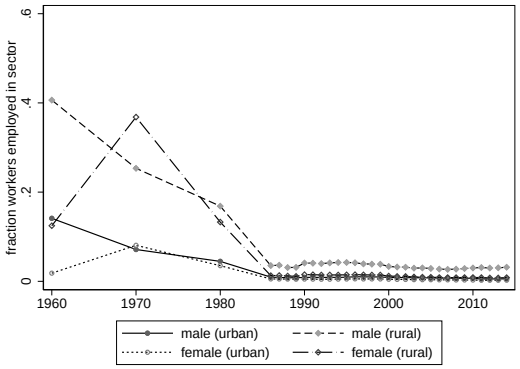
(d) Local Public Share by Urban/Rural



(e) Private Services Share by Urban/Rural



(f) Farming and Fishing Share by Urban/Rural



Note: Sample of workers aged 25–55. Local public sector defined as employment in the following industries: education, health, and social work. Private services defined as employment in the following industries: wholesale and retail trade, accommodation, and food and beverage services. Panels (a) and (b) plot employment in manufacturing, local public sector, private services, and farming/fishing over time for men and women respectively. Panels (c)–(f) plot the change in employment share by gender and urban status for manufacturing, local public sector, private services, and farming/fishing, respectively.

4.2 The Importance of Changes in the Nature of Work

The industrial changes that occurred from the 1960s may have not only altered the importance of different sectors, but also brought about large changes in the demand for different skills in urban and rural areas. Such changes could be another explanation for the declining urban wage premium. Recent work emphasizes the importance of changes in the nature of skilled work in cities corresponding to declines in the wage level of noncollege educated workers (Autor, 2019), and it highlights substantial changes in the underlying tasks workers perform in cities (Michaels, Rauch, and Redding, 2018). Automation is one important driving force behind the decline of routine occupations in areas where industrialization has occurred (Acemoglu and Restrepo, 2018; Graetz and Michaels, 2018).

To assess whether changes in the urban wage premium coincide with changes in the skill composition of the workforce, Figures 11 and 12 plot the changes in employment in occupations with different skill levels by population density in 1970, 1980, 2007, and 2017 for men and women, respectively. Changes in occupations are calculated relative to the 1960 employment share and occupations are grouped into four categories: high-skill, middle-skill, low-skill, and farming/fisheries.[13] High-skill occupations are those requiring a college education such as managerial work, politicians, professionals, and technicians. Middle-skill occupations comprise clerical workers as well as blue collar craft, trade, and machinery occupations. Low-skill occupations comprise elementary jobs. Farming and fishery occupations comprise low-skill jobs in agriculture.[14]

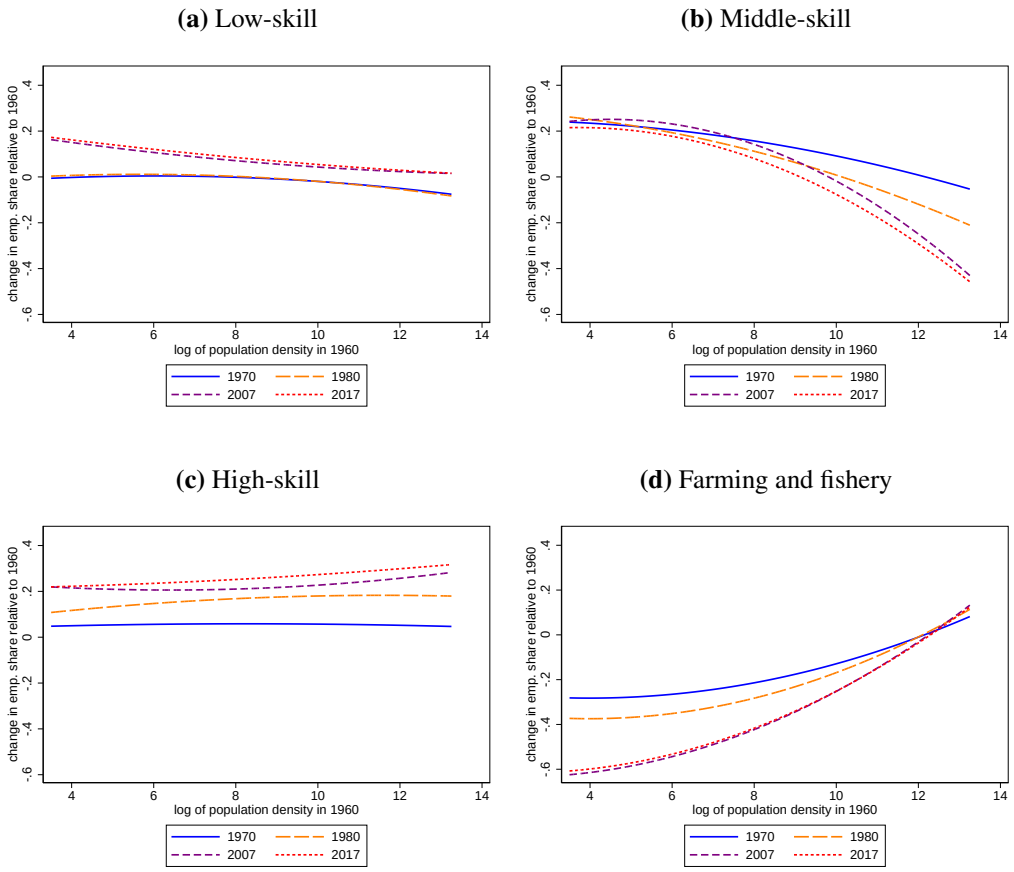
Figures 11 shows that during the first period of decline in the urban wage premium for men (1958–1980), men in sparsely populated areas moved out of low-skill agricultural jobs that were poorly paid and that an increasing number of men in rural areas worked in middle-skill occupations.[15] Consistent with the importance of industrialization in explaining the declining urban wage premium from 1958–1980, the farming and fishing

[13]The classification of skills largely follows Autor (2019). Due to importance of the agricultural sector in 1960 in Norway, we classify farming/fisheries as a separate skill level.

[14]A binary urban/rural status reveals similar patterns in Appendix D.1.

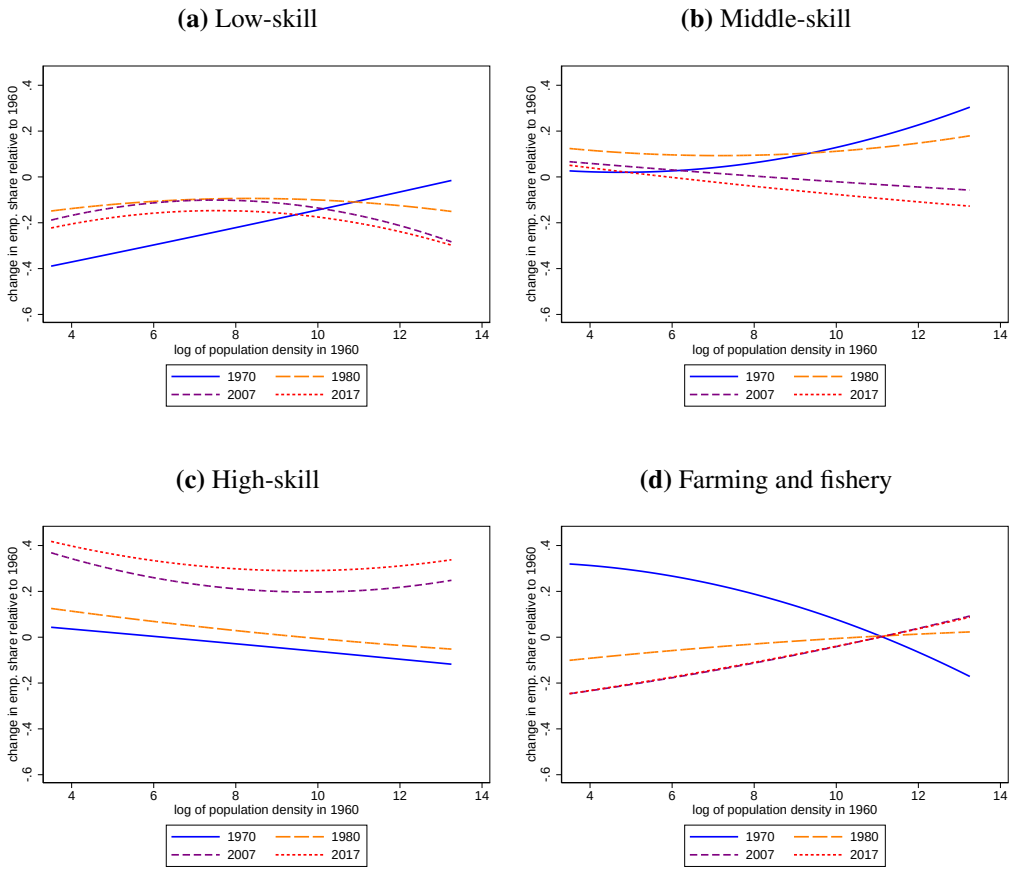
[15]Figure D.2 examines changes in more detailed 2 digit occupations from 1960–1980. Employment in agricultural workers declines by twice as much in rural areas compared to urban. Middle-skill occupations which dominate the manufacturing industries comprise two of the top five occupations which increase in rural areas while high-skill occupations dominate occupations which increase in urban areas.

Figure 11: Employment shares of low-, middle- and high-skill occupations by municipal population density in 1960, male



Note: Figure plots the change in occupational share for men in areas of different population density. The log of municipality population density (1000 residents per km^2) is measured in 1960. Quadratic fit plotted for each year, where line corresponds to the change in municipal employment share in a given year relative to the level in 1960. Scatter plot of municipal values for each year omitted due to visual presentation. Sample of men is defined as in Section 2.4. Occupations grouped into four categories: low-skill, middle-skill, high-skill, and farming/fishery.

Figure 12: Employment shares of low-, middle- and high-skill occupations by municipal population density in 1960, female



Note: Figure plots the change in occupational share for women in areas of different population density. The log of municipality population density (1000 residents per km^2) is measured in 1960. Quadratic fit plotted for each year, where line corresponds to the change in municipal employment share in a given year relative to the level in 1960. Scatter plot of municipal values for each year omitted due to visual presentation. Sample of women is defined as in Section 2.4. Occupations grouped into four categories: low-skill, middle-skill, high-skill, and farming/fishery.

occupations are roughly as important in 1980 as in 1960 among women, for whom the urban wage premium was stable over the period (Figure 12d).

Moreover, the urban wage premium declined from 2000 onwards for both men and women. Figures 11 and 12 document that, whereas middle-skill employment remained more important compared with its employment share in 1960 in sparsely populated places, its importance drastically decreased in densely populated areas.[16] Such declines accelerated in the 2000s and, over time, a strong negative relationship between population density and middle-skill employment emerged for men.[17] While the importance of low-skill occupations is roughly equal to its 1960 level in densely populated areas, high-skill occupations became increasingly important over time for men and women. Overall, the substantial decline in middle-skill occupations among men between 1980 and 2017 in densely populated areas is a key factor that coincides with the collapse of the urban wage premium among the noncollege educated men in the 2000s. This is further confirmed in Figure 12b, which shows that the importance of middle-skill occupations among women declined in both sparsely and densely populated areas. Thus, while men in more densely populated areas were disproportionately impacted by declines in middle-skill occupations over time, the decline experienced by women in urban areas over the period 1980–2017 was much less. At the same time, the declines in the urban wage premium among noncollege educated women were much less pronounced relative to the declines among noncollege educated men.

4.3 Changes in the Nature of Work and Education

The strong decline in middle-skill occupations may correspond to a shift in the composition of education levels among middle-skill occupations. For instance, noncollege educated workers comprised 95% of the workers employed in middle-skill occupations in 1980. Figures D.6 and D.7 present the reallocation of labor across occupations for dif-

[16] This is also true in absolute terms, as the employment share in middle-skill occupations in the least populated areas was 45% and 27% in 2017.

[17] Figure D.5 presents more detailed 2 digit occupational changes from 1980–2007 for men in urban and rural areas. Relative to rural areas, the importance of middle-skill occupations concentrated in manufacturing such as stationary plant and related operators; machine operators and assemblers; and metal, machinery, and related trade workers decline considerably in urban areas.

ferent education groups across time and regions; the upper and lower panels show college and noncollege workers respectively. For men, Figure D.6 documents a strong decline in the share of noncollege workers in the middle-skill occupations in the most urban areas and an increase in most rural areas. It is noticeable that the largest decline occurred in the 2000s. There was no decline in middle-skill occupations among the college educated. This pattern of polarization is in line with the findings of Autor (2019) for the US. In particular, this observed shift in Norway is so substantial that the density gradient in employment for noncollege middle-skill jobs that existed up to disappeared in the 2000s. In contrast to Autor (2019), we do not observe any noticeable increase in low-skill employment for noncollege workers in urban areas. However, we do see a strong increase in employment for this group in rural areas. Whether the reallocation of noncollege educated individuals is related to net out-migration from the cities, is discussed in Section 5.

The changes observed for women are similar to those for men. First, there was a reduction in the proportion of noncollege workers in middle-skill occupations in urban areas, although it was smaller than that for men. Second, although there was no increase in low-skill occupations for noncollege workers in urban areas, there was an increase in rural areas for women as for men.

4.4 The Role of the Oil Discovery, Female Labor Force Participation, Immigration and Commuting

In Appendix E, we report robustness checks for the importance of changes in factors other than occupational composition. First, the discovery of oil in 1969 may have disproportionately impacted urban or rural areas. Appendix E.1 suggests that rural and urban areas were similarly impacted by the Norwegian oil boom. Second, urban–rural differences in rising female labor force participation could result in a different development of the urban wage premium when considering joint household earnings. Figure B.4b suggests that female labor force participation increased most in rural areas from 1967–1990. Hence, the decrease in the estimated urban wage premium for men is slightly stepper when us-

ing household earnings rather than individual earnings (Figure E.2). Third, immigration increased substantially from 1967, particularly in urban areas (Figure E.3) which could have impacted the development of the urban wage premium. Figure E.4 plots the urban wage premium separately for Norwegian born males. The estimated urban wage premium for native born workers was slightly higher from the late 1980s, and the declines in the urban wage premium in the 2000s were somewhat less severe than when considering both Norwegian and foreign born workers. Fourth, the results are similar when controlling for differences in hours worked (Figure E.5). Fifth, the fraction of rural–urban commuters was relatively constant over time (Figure E.6), suggesting that increases in commuting were unlikely to be an important factor behind the changes in the urban wage premium. Finally, the evolution of the urban wage premium over time exhibits similar declines when accounting for differences in local prices (Figure E.8).

5 Selection into Urban Areas

Substantial changes in the nature of work and the skill content of occupations in urban and rural areas coincide with the observed declines in the male urban wage premium. In particular, the drop in the premium was not monotonous across education groups, but largely concentrated among noncollege educated men, whereas women and college educated men experienced lesser declines, and this pattern is reflected in changes in the nature of work. These findings indicate that the changes in the demand for skills are an important explanation behind the declining urban wage premium. Nevertheless, the reduction in the urban premium could also be driven by changes in the selection of people living in urban or rural areas or moving from the countryside to the cities. For example, decreasing differences between urban and rural earnings for noncollege workers reduced the incentives for these groups to move to the cities or, potentially, it could have increased the probability of moving out of the cities. Such a finding would imply that it is not only the demand side that has driven the change in the urban premium but also, potentially, changes in the composition of observable and unobservable characteristics.

As shown in Section 3.3, the drop in the urban wage premium coincided with a con-

vergence in the earnings distributions between urban and rural areas, as well as with an increase in inequality in the top of the earnings distribution. Such changes may have affected selection into mobility. Thus, it is important to understand how selection into urban areas and into rural-to-urban migration changes over time across skill groups, and across men and women, and whether such changes are related to the decline in the urban wage premium. First, we analyze both the development of selection by education levels into urban migration changes over time (Section 5.1). Second, we study how controlling for education and age change the urban wage premium over time and document how the unobservable factors influence the urban wage premium over time (Section 5.2).

5.1 Selection on Education

Are there major changes in who is migrating into urban areas that coincided with the observed declines in the urban wage premium? Figure 13 describes the rural–urban migration patterns for different skill groups over time. In particular, the figure summarizes the education levels of urban stayers, rural stayers, and rural-to-urban movers over the sample period for men and women. Each panel compares, separately by gender, the fraction of rural-to-urban migrants with less than high school education, high school education, or higher education, with urban and rural stayers.

Figure 13 exhibits clear declines in how positively selected rural-to-urban migrants are on education. This is true for both men and women. At the beginning of the period, rural-to-urban migrants were strongly positively selected on education: they were considerably more educated than both urban and rural stayers, who had lower levels of education. Over time, the degree of this positive selection declined. Education levels strongly increased among rural and urban stayers, whereas the education levels of migrants remained relatively constant, but eventually declined over time. Thus, the education gap between migrants and stayers was decreasing over time. This was particularly true in the 2000s, where there was a strong increase in the fraction of low-educated movers (Figures 13a and 13b). At the same time, there is a strong decrease in the fraction of high educated movers (Figures 13e and 13f). However, despite these changes, rural-to-urban migrants

continued to have slightly higher levels of education by the end of the period.

Figure 13 reveals strong declines in positive selection into migration, while Figure F.1 details how the levels of migration changed over time. Despite sharply declining urban wage premiums for both men and women, net migration remained positive in the 2000s when the urban wage premium began declining. Men and women tended to follow the same migration patterns, although the levels are slightly higher for men.

Confirming the results of Figure 13, Figures F.1c and F.1d show that the migration patterns were similar for different education groups until 1990. After 1990, the vast majority of rural-to-urban movers were highly educated. The 1990s was a period when the urban wage premium was still increasing for highly educated individuals, which suggests that the demand for this group remained high. However, from 2005, the net migration of highly educated workers decreased, particularly among men. This reduction coincided with a period of decline in the urban wage premium for this group.

5.2 Controls and Individual and Family Fixed Effects

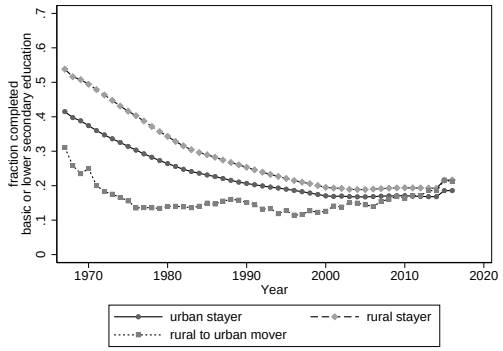
How did changes in selection over time impact the estimated urban wage premium? Although migration to urban areas remained largely constant from the 1980s, the supply of workers of different skill levels in cities changed. This section examines how the urban wage premium changes when controlling for differences in observables, such as education and age, and for differences in unobservables, by including an individual fixed effect as well as controlling for the IQ of men. Finally, we introduce an individual-level instrument for mobility, comparing brothers/sisters to net out common family-specific factors.

5.2.1 Education, Age, and Individual Fixed Effects

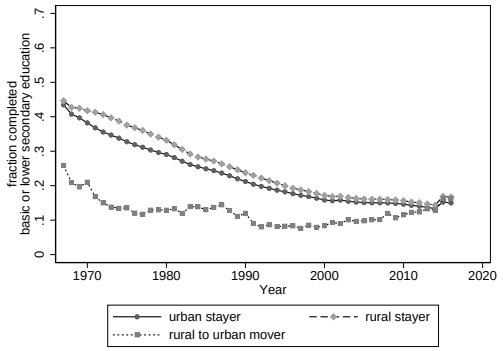
As documented above, the changes in the urban wage premium differed by education level, and the education levels of rural-to-urban movers also declined between 1967 and 2015 relative to urban and rural stayers. To understand the role of education and age, Table 1 includes control variables for education and age controls (see columns 2 and 5 for men and women, respectively) across five subperiods from 1967–2017. By comparing

Figure 13: Fraction of urban stayers, rural stayers, and rural-to-urban movers by education level

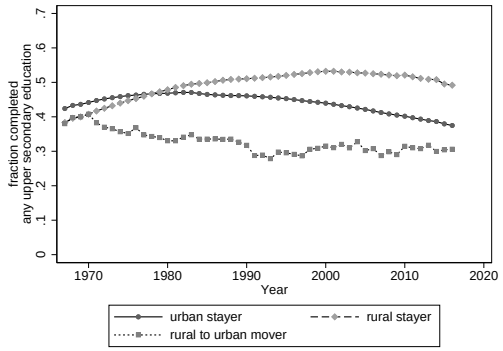
(a) Fraction Low Educated - Male



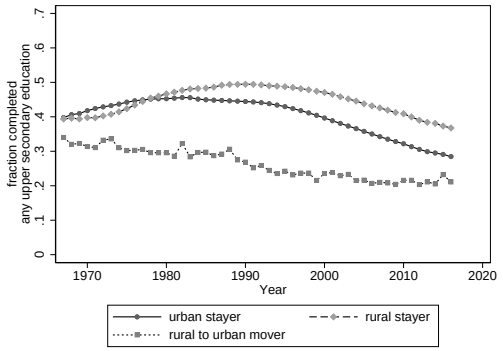
(b) Fraction Low Educated - Female



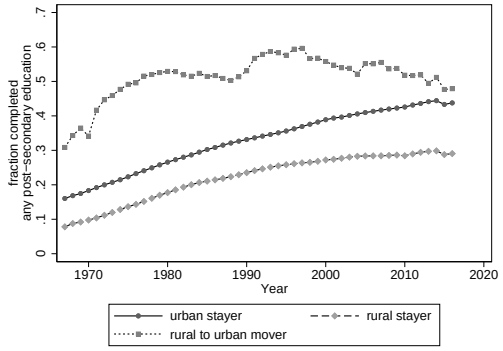
(c) Fraction High School Educated - Male



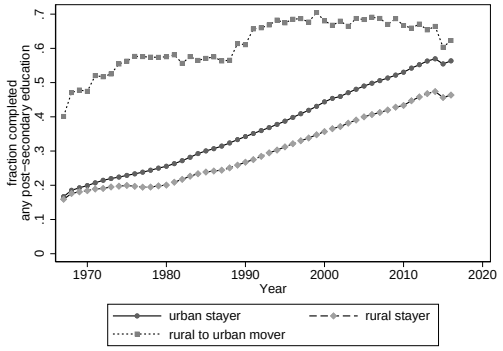
(d) Fraction High School Educated - Female



(e) Fraction High Educated - Male



(f) Fraction High Educated - Female



Note: Figure plots the fraction of urban stayers, rural stayers, and rural-to-urban movers across different levels of education and gender. Male sample corresponds to panels (a), (c), and (e) while female sample corresponds to panels (b), (d), and (f). Panels (a)–(b) plot the fraction of workers in one of the three groups with less than high school education, panels (c)–(d) plot the fraction of workers with high school education, and panels (e)–(f) plot the fraction of workers with higher education.

the estimated raw premium and the premium when controlling for education and age, we can infer the direction and magnitude of selection of persons into cities. The inclusion of education and age controls reduces the urban wage premium compared with the raw premium, indicating a positive selection of individuals living in urban areas. We see similar patterns for women when comparing columns 4 and 5. For both genders, the difference between the raw and controlled premiums is relatively stable over the whole time period, with a slight tendency toward a reduction in sorting on education and age.

Next, we include an individual fixed effect to control for unobserved time-constant factors. That is, by studying individuals who move between rural and urban areas, we are able to control, for example, for unobserved preferences or skills that are constant over time. Table 1 (see columns 3 and 6 for men and women respectively) documents that the fixed effects estimates are substantially lower than the estimates controlling for age and education and thereby reveals a strong positive selection on unobservables into urban areas, which declines considerably over time. For men, accounting for unobserved time-constant factors reduces the estimated urban wage premium by 73% from 1967–1980 (14% to 4%) and by 74% from 1981–1990. These reductions are consistent with strong positive selection among the urban population during the whole period. However, the difference between the controlled premium and the fixed effect premium declines considerably over time: from 42% accounting for selection (10% to 6%) between 1991–2000, to 25% from 2001–2010, and 30% from 2011–2017.

This decline in positive selection after the 1990s corresponds to the changes in inequality observed in Figures 8 and 9. The higher variance of earnings in urban areas in the 1970s suggests that a positive selection of individuals, where mobility occurs from origins with less unequal income distribution (rural areas) to destinations with more unequal income distribution (urban areas). Over time, the earnings distributions between urban and rural areas converged, particularly in the bottom half of the distribution, although some differences remained in the top of the earnings distribution between rural and urban areas by 2017. Hence, the considerable decline in the degree of positive selection into cities over time in Table 1 is consistent with changes in the earnings distribution.

Importantly, Table 1 does not reveal negative selection, only a strong reduction in positive selection. In addition, declines in selection are generally similar for women and men, suggesting that differences in selection by gender are not an important factor behind the decline in the urban wage premium of men relative to women. Overall, the results suggest that selection of migrants cannot explain the collapse of the urban wage premium among noncollege educated male workers and that demand forces are likely to be a more important factor, as in Autor (2019).[18]

Table 1: Urban wage premium in five subperiods

	Male			Female		
	(1) Raw	(2) Control	(3) FE	(4) Raw	(5) Control	(6) FE
1967–1980	0.1944***	0.1372***	0.0367***	0.1129***	0.0822***	0.0705***
	(0.0003)	(0.0003)	(0.0010)	(0.0006)	(0.0006)	(0.0019)
1981–1990	0.1649***	0.1103***	0.0283***	0.1251***	0.0881***	0.0510***
	(0.0004)	(0.0004)	(0.0012)	(0.0005)	(0.0005)	(0.0017)
1991–2000	0.1477***	0.1001***	0.0577***	0.1116***	0.0739***	0.0566***
	(0.0004)	(0.0004)	(0.0012)	(0.0004)	(0.0004)	(0.0014)
2001–2010	0.1137***	0.0803***	0.0606***	0.1014***	0.0667***	0.0588***
	(0.0004)	(0.0004)	(0.0011)	(0.0004)	(0.0004)	(0.0012)
2011–2017	0.0634***	0.0452***	0.0316***	0.0755***	0.0472***	0.0357***
	(0.0005)	(0.0004)	(0.0016)	(0.0004)	(0.0004)	(0.0017)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Education FE	No	Yes	No	No	Yes	No
Individual FE	No	No	Yes	No	No	Yes
N, 1967–1980		9386083			4337225	
N, 1981–1990		7635141			5639798	
N, 1991–2000		8616037			7335421	
N, 2001–2010		9081803			8353474	
N, 2011–2017		6737551			6364940	

Note: Each parameter is from a separate regression of the log yearly income on a vector of individual characteristics and a dummy variable describing whether the individual lives in an urban location. Columns (3) and (6) includes an individual fixed effect and columns (1) and (4) exclude individual characteristics. Standard errors in parentheses.

[18]Table F.1 controls for cognitive ability as a measure of unobserved skills. If selection into cities was based solely on ability and IQ scores are a good measure of workers' ability, controlling for IQ test scores controls for static selection in the urban wage premium. We use all men with non-missing IQ score data and estimate the urban wage premium in the 1990s and 2000s including controls for education and age as well as IQ. Rural-to-urban movers become increasingly less positively selected on IQ over period (Figure F.2). The results confirm the positive sorting of urban residents, and the estimated urban wage premium declines by 6% from 1991–2000 and by 8% from 2001–2010 when including IQ scores. However, the decline in the urban wage premium when controlling for IQ scores is not as substantial as when estimating individual fixed effects, particularly in the 2000s. To the extent the decline in the urban wage premium were the same when including individual fixed effects and IQ measures, then workers' mobility would be selected purely on time-constant cognitive factors.

5.2.2 Family Fixed Effects

As an individual fixed effect may not be able to capture all important unobserved skills, we turn to a within family fixed effect estimator that compares siblings of the same gender. This allows us to analyze from which families the migrant flows from rural to urban areas are selected. We apply a method similar to Abramitzky, Boustan, and Eriksson (2012) and compare two siblings in cases where one moves from a rural to an urban area and one remains in the rural area. We apply this approach separately for both sisters and brothers. The sample is limited to households with at least two brothers/sisters who are in the sample at the beginning (e.g., 1971, 1981, 1991, 2001) and the end of the decade (e.g., 1980, 1990, 2000, 2010).[19] By comparing earnings of migrants and their nonmigrant brothers/sisters, we eliminate selection across households using the following regression including family fixed effects:

$$ln(W_{ij}) = X'_{ij}b + M'_{ij}d + \rho_j + \nu_{ij}, \tag{2}$$

where the first component of the error term ρ_j is shared between brothers/sisters in the same household j and ν_{ij} is the component that is idiosyncratic to each individual i. Estimating a model with household-specific fixed effects will eliminate ρ_j and thereby the potential bias emerges due to aspects of family background that are correlated with both with earnings and the probability of migration.

Table F.2 shows the return to migrating to an urban area for the sample of brothers and sisters. The return to migration, δ, is identified using all rural-to-urban migrants who moved to a city during the decade of interest. The first row in panel (a) displays the OLS estimate for the return in the sample of brothers, and the second row displays the results of the within-household estimation. Here, the return to migration δ is identified only by brothers where one sibling is moving from a rural to an urban area and one sibling stays in the rural area. Panel (b) presents the same results for women.

[19] Since the family identifiers only allow us to identify parents for cohorts born in 1950 or later, the sample of men/women is restricted to ages 40 or less. Moreover, we restrict our sample to individuals aged 25 or older at the beginning of a decade.

From the comparison of the OLS and the family fixed effects results, we can infer the direction and magnitude of selection across households. In the 1970s and 1980s, the differences are rather small. In the subsequent decades, the estimated return to migration increases when adding family fixed effects. Hence, the OLS estimate is biased downward by negative selection of migrant households. Particularly from 2011–2017, the selection among households becomes negative for both brothers and sisters.[20] As such, the reduction in the premium in the 2000s may be partly explained by the negative selection of movers into the cities over time. However, the changes in selection over time are similar among brothers and sisters, suggesting that differences in selection are incapable of explaining the large decline in the urban wage premium among men relative to women.

6 Conclusion

This paper analyzes the substantial decline in the urban wage premium over the period 1958–2017. While urban areas continued to provide greater labor market opportunities than rural areas, specific types of workers were increasingly less able to realize such opportunities. Men, particularly noncollege educated men, faced steeper declines in the urban wage premium than women did. We document two periods of decline in the urban wage premium in Norway for men: 1958–1980, when the urban wage premium for men declined by roughly 55%, from 33–15%, and 2000–2017, when the urban wage premium declined by over 65%. The decline among noncollege educated men was sufficiently severe that by 2017, there were zero, or even negative, wage differences between urban and rural workers. Moreover, we document a convergence in the earnings distributions between urban and rural areas over time, particularly in the bottom half of the distribution.

Major shifts in the skill content of work correspond with periods of decline in the urban wage premium. From 1958–1980, the fall in the urban wage premium corresponded with industrialization in rural areas and a growth of middle-skill occupations in rural relative to urban areas. In the 2000s, middle-skill manufacturing occupations declined

[20]Note that the third row in Panels (a) and (b) in Table F.2 shows the return to migration in each decade for the whole sample of men or women. The estimated returns to migration are generally similar to those using the sibling sample, with the estimates being slightly higher in the first and the third decades.

in importance in urban areas relative to those in rural areas. The disappearance of such occupations was more prevalent among men than women and dominated by noncollege workers.

As expected from the convergence of the rural and urban earnings inequality, there were shifts in selection into urban areas. In particular, we find a decline in the degree of positive selection into urban areas over time. While some positive selection into mobility remained in the 2000s, the decline in the degree of positive selection on both observable and unobservable factors was substantial. The change in selection was similar among men and women, suggesting that the decline in the urban wage premium among men is attributed to demand factors rather than differences between genders in changes in selection.

As the fraction of individuals residing in urban areas continues to grow in most countries, understanding the urban–rural wage dynamics between high- and low-skill workers is of crucial importance for policy makers. While the availability of high-paying industrial jobs in urban areas declines, a trend also observed by Autor (2019) in the US, a key question is how noncollege educated workers can remain competitive in the urban labor force. Michaels, Rauch, and Redding (2018) point to an increase in the communicative nature of tasks in urban areas over time. To the extent that new task creation will counteract declines in routine tasks over time, as in Acemoglu and Restrepo (2019), such declines will be of less concern over a long time horizon. However, whether all workers equally benefit from such task creation remains unclear and widening inequality observed from 2000–2017 in urban areas suggests that noncollege educated men have the most to lose.

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