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

Patrick Bennett Aline Bütikofer Kjell G. Salvanes

Darina Steskal

April 28, 2022

Abstract

We analyze the change in the urban wage premium over the last 60 years. We focus on differences by gender and skill levels, with an emphasis on changes throughout the earnings distribution. We assess the importance of both changing selection into urban areas, as well as the importance of shifts in demand for skills. Both forces explain the dramatic drop in urban premium. Event study analysis reveals that the positive selection into urban mobility declines over time. Among men at the bottom of the distribution, changes in selection are key in accounting for the collapse of the urban wage premium.

*The authors are grateful to the feedback from audiences at the Nordic Summer Institute in Labor Economics, the 2019 FAIR-CELE workshop, the University of York, and Institutt for samfunnsforskning. This work was partially supported by the Research Council of Norway through its Centres of Excellence Scheme, FAIR project No. 262675. Emails: patrick.bennett@liverpool.ac.uk, aline.buetikofer@nhh.no, kjell.salvanes@nhh.no, dste@norceresearch.no. Address Bennett: Department of Economics, University of Liverpool, Chatham Street, Liverpool, L69 7ZH, United Kingdom. Address Bütikofer, Salvanes: Department of Economics, Norwegian School of Economics, Helleveien 30, 5045 Bergen, Norway. Address Steskal: NORCE, Nygårdsgaten 112, 5008 Bergen, Norway.

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 non-college educated workers (Baum-Snow, Freedman, and Pavan, 2018; Autor, 2019).

The composition of workers in urban as well as rural areas has shifted considerably as urbanization has continued to increase over the past century across a number of countries (see Figure A.1). Importantly, selection on both observable and unobservable factors changes as the type of worker migrating into urban areas evolves over time. Such changes in selection are expected to affect the static and dynamic premia to urban mobility: if, for instance, rural to urban migrants become less positively selected over time and the gains to urban mobility are higher among more able workers, then the declining urban wage premium is a result of changing patterns of selection. That is, the positive selection of workers on the supply side plays an important role in the declining urban wage premium and accounting for such changes in selection is crucial to understanding why the urban wage premium declines over time. It is well established that positive selection into cities can explain a large share of the urban wage premium, however, little is known about how changing patterns of rural-to-urban migration and declining positive selection can explain the drop in the urban wage premium.

In this paper, we analyze the change in the urban wage premium over the last 60 years. We focus on differences by gender and worker skill levels, with an emphasis on changes for the average worker but also at different points throughout the earnings distribution. We assess the importance of changes in supply-side factors—changing selection of who lives

[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.

in and who migrates into urban areas based on observable and unobservable factors—as well as changes in the demand for skills—highlighting the importance of shifts in factors such as the skill composition of work—in explaining the declines in the 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 alter 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). At the same time, accounting for changes in the demand side is clearly important: continued declines in the demand for the non-college educated in urban areas are an important factor behind the declining labor market prospects of the lower educated (Autor, 2019). Crucially, we assess the relative importance of both supply and demand factors jointly exploiting the framework in Firpo, Fortin, and Lemieux (2009), leveraging 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.

Norway over the last 60 years, is ideal for analyzing the mechanisms behind a changing urban wage premium and changing mobility patterns 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—and the process and underlying mechanisms are possible to track by population wide panel data for the same period. Although urbanization process in Norway is striking in this period, it is no exception. 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.

In this paper we make three important contributions to the existing literature. First, we exploit a panel of population-wide register data—where we can identify when and

where people are moving—to analyze the decline in the urban wage premium by gender, skill level, and throughout the distribution over a long period involving extensive mobility to the cities. Second, we present evidence to understand the underlying reasons behind changes in the urban wage premium. It examines both supply- and demand-side explanations. Moreover, following workers over time provides evidence on the importance of the dynamics of 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 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. Finally, the paper isolates the relative importance of supply- and demand-side factors in explaining the declining urban wage premium at different points in the distribution through a descriptive decomposition analysis both for the average worker and at different points in the earnings distribution.

We present four main results. First, we document that the average urban wage premium declined considerably over time, from 33% in 1958 to just 5% by 2017 for men, and differentially by gender and skill groups.[2] We show that there is a substantial decline in the urban wage premium in the 2000s, which is concentrated among non-college educated men as in Baum-Snow et al. (2018) and Autor (2019). By 2017, non-college educated men experienced zero—or even negative—wage differences relative to their rural counterparts. In contrast, college educated workers were more insulated from declining urban wages. The decline in the urban wage premium among women was much smaller and much less severe relative to their male counterparts; by 2017, the urban wage premium among women was larger than that among men. The considerable differences by gender and worker skill level reveal the importance of decomposing the urban wage premium throughout the distribution, and not focusing solely on the average worker. Indeed, this reversal of the gender gap in the average urban wage premium is driven by the sharp decrease in the premium among non-college educated men relative to non-college educated women in the 2000s.

[2]The decline in the urban wage premium is 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.

Second, we analyze the role of shifts in the skill selection into urban areas in the decline of the urban wage premium. The results suggest that stark declines in positive selection both on observables and unobservables over the period had an important role in the declining urban wage premium. The existing literature reveals substantial positive sorting of workers into urban areas and highlights the importance of internal migration (Combes, Duranton, Gobillon, Puga, and Roux, 2012; Roca and Puga, 2016). Indeed, we find rural-to-urban migrants are positively selected on education. However, the *decline* in positive selection on observables over the period is substantial. Event study analysis of rural to urban movers reveals that as positive selection into mobility declines over time, so too do the gains to urban mobility. While men see declines in the dynamic gains to urban mobility over time, women see declines in the immediate gains to urban mobility. In addition, there are considerable declines in the ability level of workers who move from rural to urban areas over time. We examine selection based on unobservables using three different approaches. First, we exploit data on cognitive ability of male workers measured at age 18. Second, we include an individual fixed effect in the urban wage premium regressions, consistent with the previous literature (see, e.g., Glaeser and Mare, 2001). In addition, we control for unobservable selection across households, by comparing within family differences among brothers/sisters where one moves from rural to urban areas and one stays in the rural area, finding support for a decline in the positive selection of movers to the city.

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 focus not just on changes in urban areas but also on important shifts in the skill content of work in rural areas. The findings suggest that the changes in the skill content of work performed in both urban and rural areas also had an important role in the declining urban wage premium. In particular, 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 - primary education and primary health services - 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 non-college educated men. The existing literature has identified manufacturing decline as a consequence of forces such as import competition and technological change.[3] Norway is no exception to such decline, as employment in manufacturing among prime-aged men declined substantially from 1970–2017. 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. Non-college educated workers were particularly impacted by deindustrialization in urban areas, whereas college educated workers were more insulated from such declines.

Finally, we decompose the relative importance of supply- and demand-side factors in explaining the declining urban wage premium at different points in the earnings distribution as in Firpo, Fortin, and Lemieux (2018). Changes in the supply of workers plays a critical role in the collapse of the urban wage premium among men at the bottom of the earnings distribution. For such men—where the return to urban work goes from 30% in 1980 to -2% in the 2010s—selection on both observable and unobservable factors is an important explanation behind the declining urban wage premium. Negative selection into urban areas becomes so important that accounting for such negative selection explains the negative return to urban work at the bottom of the distribution. Other factors including

[3]For evidence on import competition see Autor, Dorn, and Hanson (2013); Hummels, Jørgensen, Munch, and Xiang (2014); Bloom, Draca, and Van Reenen (2015), and for Norway Balsvik, Jensen, and Salvanes (2015). For evidence on 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 (Goos, Manning, and Salomons, 2014; Autor, Dorn, and Hanson, 2015).

the discovery of oil, increases in the female labor supply, immigration, and changes in commuting played little role in the decline in the urban wage premium.

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 describes how demand- and supply-side factors have evolved in conjunction with the urban wage premium over time. Section 5 details the role of changes in selection on unobservable factors in the decrease in the urban wage premium over time while Section 6 documents how changes in the nature of work among both men and women correspond to the observed changes in the urban wage premium. Section 7 decomposes the relative importance of supply- and demand-side factors, while Section 8 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 A.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 A.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.[4]

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

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 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.[5] An individual's highest completed level of education is determined using the education register.[6] 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 (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

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

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

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 B.1 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 6 defines a continuous measure of urban status using the initial area population density in 1960. In addition, section 7.1 designs robustness checks to examine how results are robust to other definitions of urban areas.

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.[7] In addition, we only keep individuals with continuous time periods of residence data in the sample.[8] Moreover, we focus on individuals with self-sufficient income.[9] 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 C.1 and C.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 Declining Urban Wage Premium and the Importance of Gender and Education

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 three 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,

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

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

[9] 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.

do we observe different patterns for workers of different skills levels?

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 pre-tax labor earnings 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 analyze 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 areas relative to smaller cities.

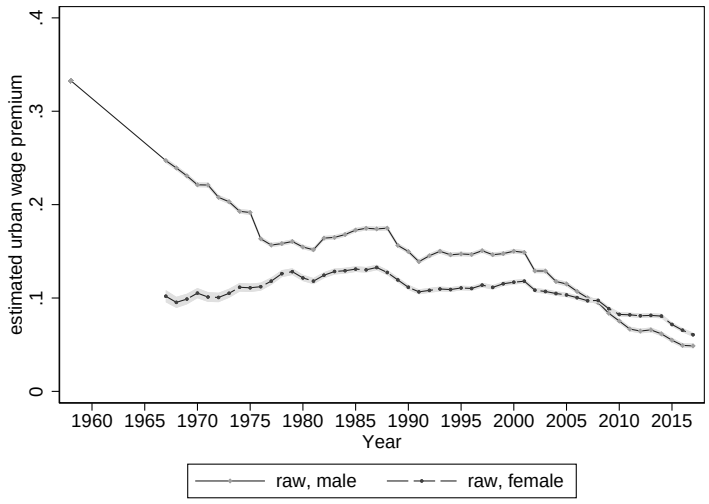
Figure 1 plots the evolution of the estimated unconditional urban wage premium for men from 1958–2017 and for women from 1967–2017.[10,11] Figure 1 reveals two important insights. First, although earnings in urban and rural areas remain significantly different over the entire period for both genders, 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 relatively stable over the 1980s and 1990s, Figure 1 exhibits two distinct and consistent

[10] Few women was in the labor force prior to the mid-60s and we start in 1967 which is also the year when our individual level earnings data start. Moreover, 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 D.1). Note that Figure D.1 starts in 1967 as we only observe individual-level data on education and age from 1967 onwards.

[11] Figure D.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 1. Moreover, focusing on a continuous measure of population density measured in 1960 does not alter the main findings (Figure D.3).

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 et al., 2004). However, Appendix Figure D.4 revealss that the labor force participation among women was relatively similar between rural and urban areas after 1990 in Norway.

Figure 1: 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 Section 2.3 and Figure B.1. The estimation sample is defined in Section 2.4. Earnings measured in 2010-NOK.

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 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 2 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 two important findings. First, education insulated both men and women from dramatic declines in the wage premium in urban areas. Although the urban wage premium declined from 2000 onward among all workers, non-college educated men were the most afflicted. Indeed, the evolution of the urban wage premium for men in Figure 1 is largely driven by changes for the non-college 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 non-college educated individuals (panel (a) of Figure 2). 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. That is, even without adjusting for the higher price levels in urban areas (see Appendix 7.1 for results), low-educated men gained no monetary benefits from living in cities. Moreover, the results in Appendix Figure E.1 reveal that among non-college educated workers,

younger male workers tended to be more affected than older male workers.

Second, non-college educated women in urban areas see dramatic gains in the urban wage premium relative to non-college educated men. 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 non-college 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.

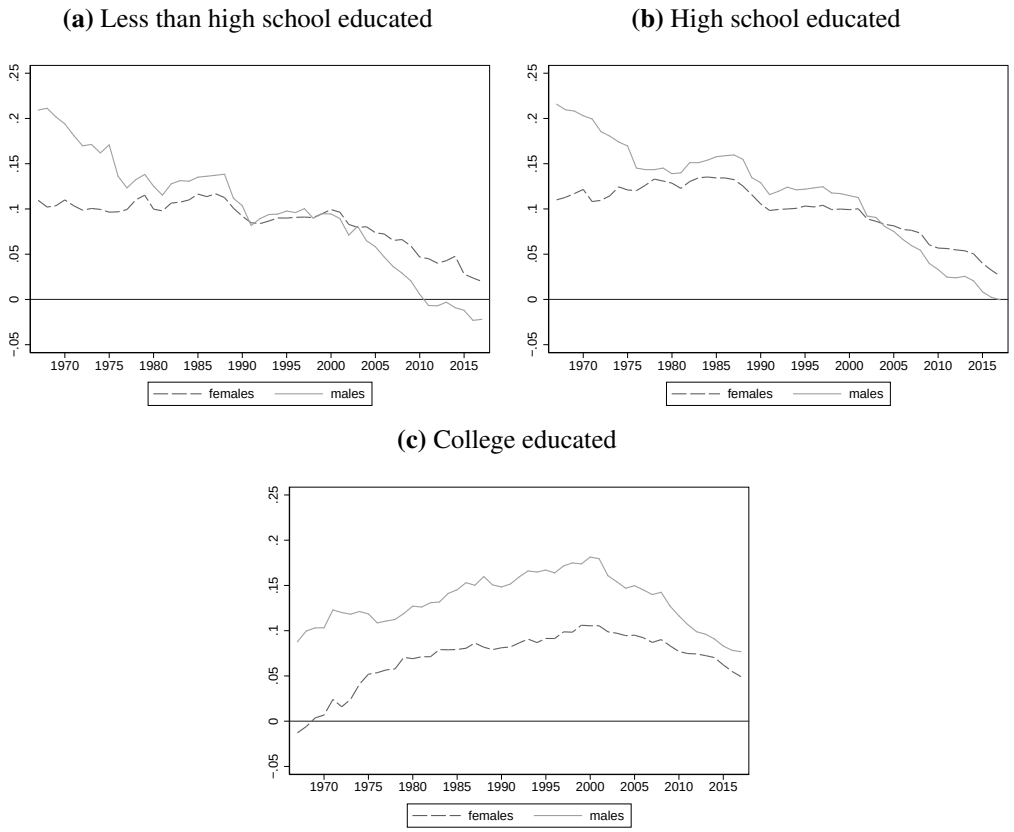
4 Describing Changes in the Demand for and Supply of Workers

In order to better understand why the urban wage premium declined, we start by presenting the descriptive statistics of changes in labor demand between urban and rural areas over the 60 years examined (Section 4.1), and then the details of how selection into rural-to-urban mobility on observable factors has evolved from 1970 (Section 4.2).

4.1 The Demand for Workers: The Decline of the Manufacturing and Agriculture Sectors

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.

Figure 2: Estimated urban wage premium by year and education levels, men and 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.

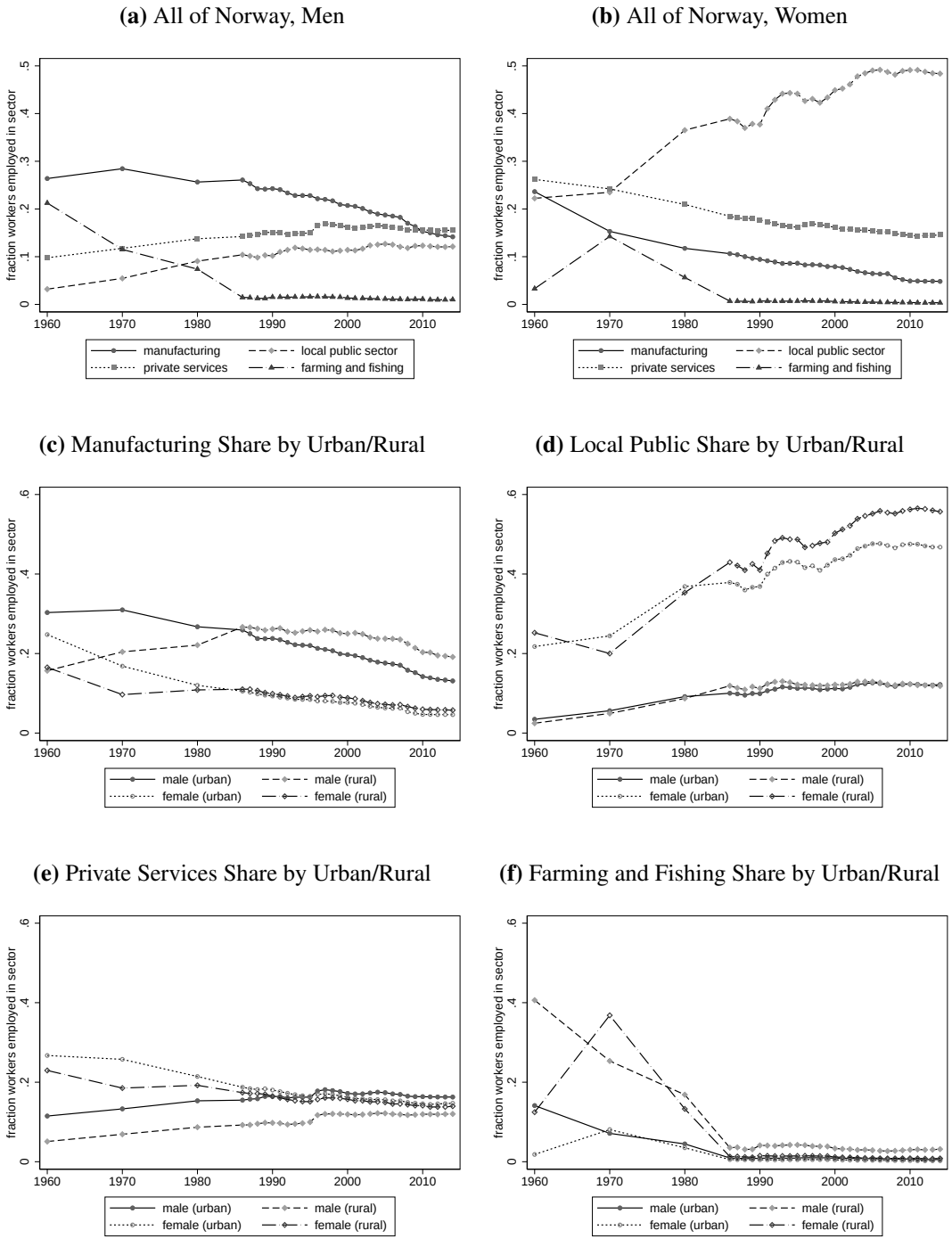
As manufacturing growth tended to be concentrated in urban areas, a decline in manufacturing might have different consequences for urban and rural areas (Krugman, 1991). The existing literature has identified manufacturing declines as a consequence of forces such as import competition and skill-biased technological change.[12] Likewise, declines in low-skill routine occupations as a result of technological change and computerization are observed (Autor, Levy, and Murnane, 2003; Goos et al., 2014; Autor et al., 2015). Norway is no exception to such declines: Figure 3 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 3a) and that such declines were most severe in urban areas (Figure 3c). 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.[13]

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. The collapse of the manufacturing sector in urban areas suggests that demand-side factors may be an important determinant of the declining urban wage premium.

[12]For import competition, see Autor et al. (2013); Autor, Dorn, Hanson, and Song (2014); Bloom et al. (2015); Balsvik et al. (2015); Acemoglu, Autor, Dorn, Hanson, and Price (2016)

[13]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 3: Manufacturing, local public, private services, and agriculture employment share from 1960–2014



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 Supply of Workers: Changes in Selection into Urban Areas on Observables

Spatial differences in wages related to selection can be the result of two distinct factors. First, positive selection into urban areas on both observable and unobservable factors such as ability results in a static wage difference between urban and rural residents. Second, to the extent that there are agglomeration economies in densely populated urban areas and the benefits to living in an urban area accrue over time (Combes et al., 2008; Combes, Duranton, Gobillon, and Roux, 2010; Roca and Puga, 2016), there is also a dynamic component to differences in wage growth over time between urban and rural residents. Indeed, Roca and Puga (2016) conclude that dynamic gains to living in urban area are an important factor.

To examine the importance of changes in selection into urban areas and how changes correspond to shifts in the dynamic wage growth in urban areas, we estimate the evolution of wages over time in an event study framework:

$$ln(W_{it}) = \boldsymbol{X}'_{it}\beta + \sum_j \eta_j I^u_{t+j} + \psi_t + \varepsilon_{it}. \tag{2}$$

where I^u_{t+j} is an indicator variable that is equal to one if the individual will move from a rural area into an urban area at time $t+j$, where time is calculated relative to the year an individual moves. The extent to which earnings rise or decline immediately before or after the move is described by the parameter η_j, where η_j represents the difference in wages between urban movers and the comparison group of rural stayers. The evolution in the parameters η_j right after the move will determine whether the wage premium is a wage growth or a wage level effect. η_j when $j \leq 0$ describes the relative wages before the move and provide information about whether movers are positively or negatively selected from the rural population. $\boldsymbol{X}'_{it}$ includes worker's age interacted with event time, accounting for the different trends in earnings for workers of different ages, and ψ_t corresponds to calendar year fixed effects. Movers and rural stayers are followed 5 years before and 7 years after the year they move, and as we are directly concerned with the difference in

the level of earnings, we do not omit a particular reference period in the estimation of equation (2).

Figures 4 and 5 display the estimated difference in earnings between rural to urban movers and rural stayers (indicated by the solid line at zero) and urban stayers (indicated by the dotted line) separately for men and women. The figures plot the evolution of earnings pre- and post-move across four time periods, 1975–1976, 1985–1994, 1995–2004, and 2005–2009, for the sample of non-college educated workers (Figure 4) and college educated workers (Figure 5), where education is measured in the year prior to move.

The figures reveal dramatic changes in the degree of positive selection into urban mobility and the dynamic gains to urban mobility, which differ by both gender and education, suggesting that changes in selection over time may be an important determining factor behind the declining urban wage premium. In particular, four important facts emerge from the figures. First, among workers of all levels of education and gender, there is a substantial decline in the degree of positive selection into urban mobility. At the start of the period, movers tend to be positively selected on earnings and reach earnings levels similar to those of urban stayers over time. Thus, when rural-to-urban movers are positively selected relative to rural stayers, they are able to catch up to urban stayers over time. In contrast, as the degree of positive selection into urban mobility declines towards the end of the period, movers are only able to maintain earnings levels equal to rural stayers. As movers are increasingly less positively selected on earnings, they begin to lag behind the earnings levels of urban stayers.

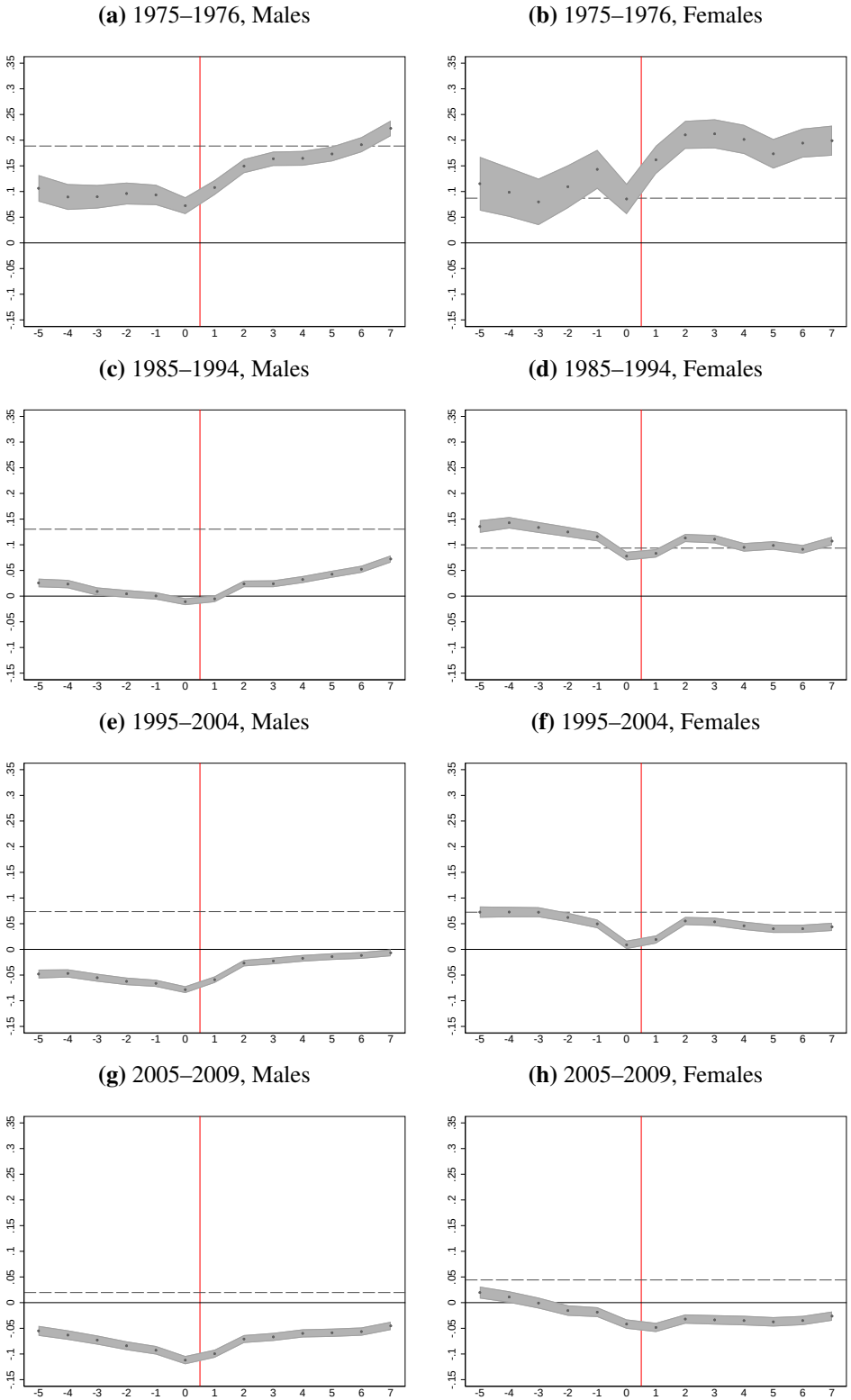
Second, there are stark gender differences in the degree of positive selection pre-move and the dynamic growth of earnings post-move. While female urban movers across all education levels are more positively selected than male urban movers, they experience an immediate earnings level gain post-move which is flat thereafter. In contrast, men experience a smaller immediate earnings gain but steeper earnings trajectories over time. Thus, there are strong gender differences in both the dynamic gains to rural-to-urban mobility and the degree of positive selection into urban mobility.

Third, the gains to urban mobility have declined considerably over time, something which is true for the dynamic gains among men as well as the immediate gains among women. Finally, the decline in the positive selection on observables is more pronounced among the non-college educated. Though they have similar levels of positive selection prior to 1995, non-college educated movers become negatively selected on pre-move earnings. As seen previously, there are stark gender differences, where non-college educated men are the most negatively selected. As such, non-college educated movers increasingly lag behind in the 2000s and fail to ever catch up to rural stayers 7 years after their move.

In line with these differences by education, are there also major changes in the observables of who is migrating into urban areas? Figure 6 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.

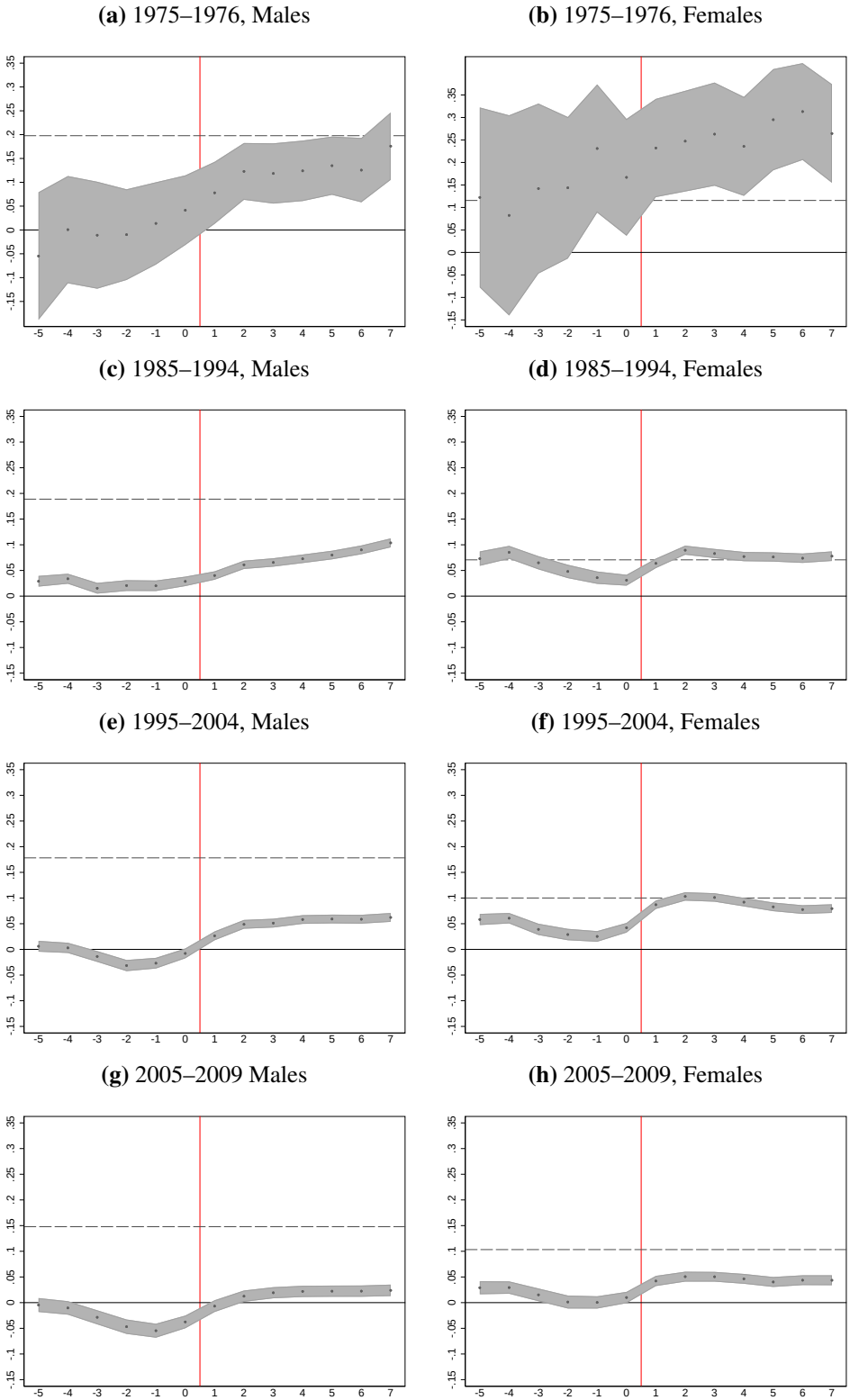
Consistent with the previous results, Figure 6 exhibits clear declines in how positively selected rural-to-urban migrants are on education. This is true for both men and women. At the beginning of the period, rural-to-urban migrants were strongly positively selected on education: they were considerably 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 6a and 6b). At the same time, there is a strong decrease in the fraction of high educated movers (Figures 6e and 6f). However, despite these changes, rural-to-urban migrants continued to have slightly higher levels of education by the end of the period.

Figure 4: Estimated Income Differences Between Rural-to-Urban Movers and Rural Stayers, Non-College Educated



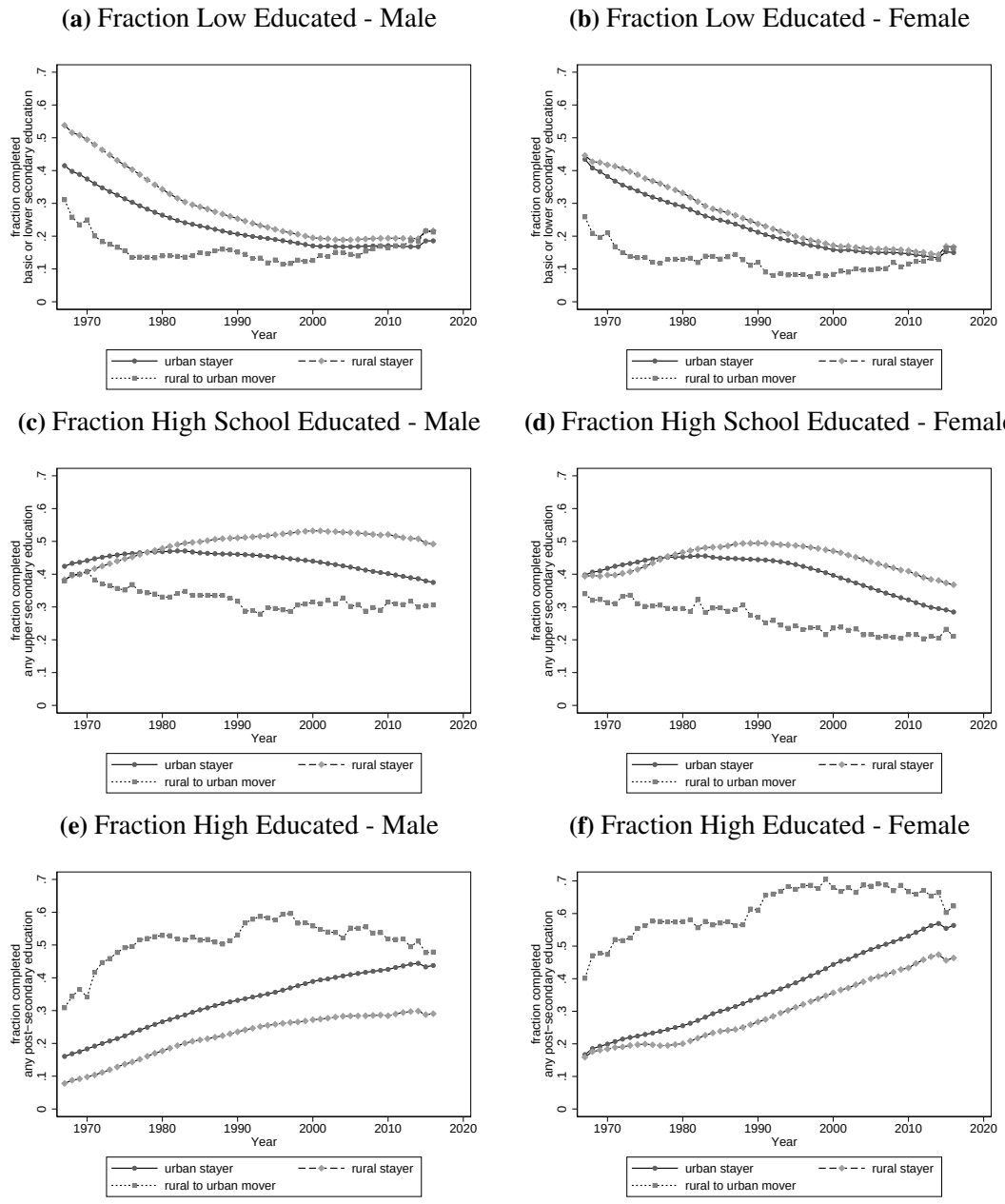
Note: Urban premia are estimated comparing rural-to-urban movers relative to stayers in rural areas, estimating equation (2). Dotted line indicates the difference in income between urban stayers and rural stayers in $+7$. Sample of non-college educated workers who have finished education, defined as those who are not enrolled in any education at -5. Mobility between rural and urban indicated by vertical line, between 0 and $+1$. Each panel corresponds to one of four different periods when mobility occurred—1975–1976, 1984–1994, 1995–2004, 2005–2009—and either male or female workers. 95% confidence interval reported.

Figure 5: Estimated Income Differences Between Rural-to-Urban Movers and Rural Stayers, College Educated



Note: Urban premia are estimated comparing rural-to-urban movers relative to stayers in rural areas, estimating equation (2). Dotted line indicates the difference in income between urban stayers and rural stayers in $+7$. Sample of college educated workers who have finished education, defined as those who are not enrolled in any education at -5. Mobility between rural and urban indicated by vertical line, between 0 and $+1$. Each panel corresponds to one of four different periods when mobility occurred—1975–1976, 1984–1994, 1995–2004, 2005–2009—and either male or female workers. 95% confidence interval reported.

Figure 6: Fraction of urban stayers, rural stayers, and rural-to-urban movers by education level



Note: Figure plots the fraction of urban stayers, rural stayers, and rural-to-urban movers across different levels of education and gender. Urban/rural stayers are defined as those who remain in urban/rural area between two years. Rural-to-urban mover defined as those who live in rural areas in the current year and move to urban areas in the next year. 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.

5 The Supply of Workers: Changes in Selection into Urban Areas on Unobservables

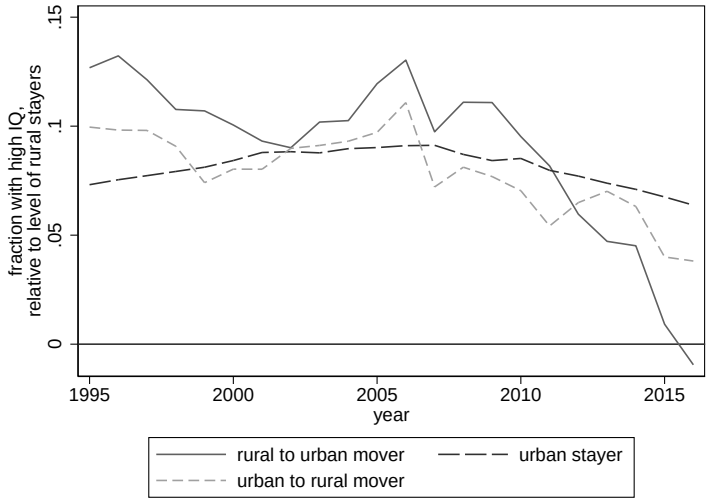
To further examine the importance of changes in selection, which Section 4.2 revealed to be important on *observable* factors, we use two different approaches. First, we examine how the observed differences in cognitive ability explain the decline in the urban wage premium over time. Second, we include an individual fixed effect in the urban wage premium regressions, consistent with the previous literature (see, e.g., Glaeser and Mare, 2001).

Making use of data on cognitive ability for men, measured by an IQ test at age 18, Figure 7 reveals that there is also declining positive selection on unobservable factors. In 1995, where IQ data first becomes available for these birth cohorts, rural to urban movers are strongly positively selected on cognitive ability. This is true relative to rural stayers, where urban movers are 12.7 percentage points more likely to have a high IQ, and also urban stayers, where urban movers are 5.4 percentage points more likely to have a high IQ.

Over time, this positive selection on cognitive ability declines among rural to urban movers. Such declines are so large that the positive selection on cognitive ability among rural to urban movers vanishes relative to urban stayers and eventually rural stayers as well. Urban movers even have lower levels of cognitive ability relative to urban-to-rural movers in the 2010s, while the opposite was true in all years prior. Indeed, urban-to-rural movers remain positively selected on cognitive ability relative to rural stayers. This reversion in the ability levels between rural-to-urban and urban-to-rural movers suggests that those who are leaving cities become more positively selected than urban migrants in the period when the urban wage premium continues to decline.

Differences in cognitive ability also matter for the estimated urban wage premium: Table 1 reveals that adding fixed effects for cognitive ability to the estimation of equation (1) explains 10–20% of the raw urban wage premium. While differences in cognitive ability between urban and rural residents clearly matter, it seems that selection on observable

Figure 7: IQ Differences Between Urban-to-Rural Movers, Rural Stayers, and Urban Stayers



Note: Sample of men, aged 25–45, for whom IQ is measured at age 18. Fraction of rural stayers with high IQ in a given year normalized to zero, indicated by solid line.

factors matters relatively more. Indeed, education fixed effects explain 15–50% of the raw urban wage premium over the same time period. However, differences in cognitive ability do increasingly matter more over time, in particular from 2010–2017.

While cognitive ability measures are unavailable for the sample of women, education also explains a considerable amount of the urban wage premium for women. Selection on observables also explains a considerable component of the raw urban wage premium for women, around 15–35%. Thus, selection may be an important factor in explaining the declining urban wage premium for both men and women, a point which is examined in further detail in Section 7.

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 additional unobserved preferences or skills that are constant over time. However, Section 4.2 and Figure 7 also reveal that there are considerable changes in who is moving from rural to urban areas over time. Thus, the variation in urban status within an individual, which the individual fixed effect results relies on, is also changing considerably as the sample is increasingly less positively selected over the time period.

Bearing this in mind, Table 1 (columns 4 and 7 for men and women respectively) documents that the fixed effects estimates are relatively similar to the estimates controlling

for education in the 2000s, revealing 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 81% from 1967–1979 (19.8% to 3.6%). These reductions are consistent with strong positive selection among the urban population during the whole period. However, the difference between the raw urban wage premium and the fixed effect premium declines considerably over time, explaining roughly 30–40% of the raw urban wage premium from 2000–2017.

Table 1: The Urban Wage Premium over time Controlling for Worker Quality

	Male				Female		
	(1) Raw	(2) Labor Supply (Unobs.)	(3) Labor Supply (Obs.)	(4) Ind. FE	(5) Raw	(6) Labor Supply (Obs.)	(7) Ind. FE
1967–1979	0.198***		0.160***	0.036***	0.112***	0.094***	0.072***
	(0.000)		(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
1980–1994	0.159***		0.132***	0.045***	0.120***	0.101***	0.055***
	(0.000)		(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
1995–1999	0.148***	0.132***	0.125***	0.069***	0.113***	0.095***	0.057***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
2000–2009	0.121***	0.099***	0.092***	0.085***	0.105***	0.081***	0.071***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
2010–2017	0.066***	0.050***	0.029***	0.045***	0.077***	0.044***	0.045***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education FE	No	No	Yes	No	No	Yes	No
IQ FE	No	Yes	No	No	No	No	No
Individual FE	No	No	No	Yes	No	No	Yes
N, 1967–1979	8659868	.	8659868	8619102	3878818	3878818	3793599
N, 1980–1994	11658181	.	11658181	11587025	8851405	8851405	8774691
N, 1995–1999	4416817	4416817	4416817	4344182	3793018	3793018	3713612
N, 2000–2009	9057466	9057466	9057466	8974400	8271994	8271994	8193350
N, 2010–2017	7664545	7664545	7664545	7578900	7235905	7235905	7153365

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. Estimating equation is equation (1) progressively adding fixed effects in each column. Columns (4) and (7) includes an individual fixed effect and columns (1) and (5) exclude individual characteristics. Standard errors in parentheses. Data on IQ in column (2) only available for men, fixed effect includes those with missing data on IQ. Data on IQ unavailable for the vast majority of the sample in earlier periods. *, **, and *** correspond to significant at the 10%, 5%, and 1% levels respectively.

Moreover, in an additional exercise reported in Appendix F, we control for unobservable selection across households, for both men and women separately, by comparing within family differences among brothers/sisters where one moves from rural to urban areas and one stays in the rural area. Again, results are consistent with a decline over time

in the positive selection into urban areas.

6 The Demand for Workers: Changes in the Skill Content of Work in Urban Areas

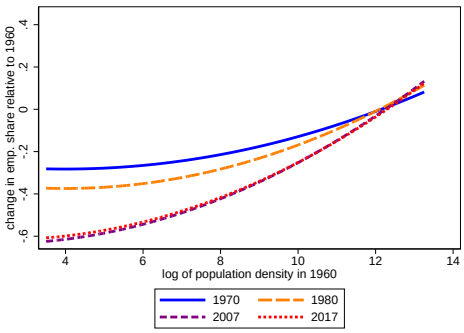
As workers in urban areas become less positively selected on both observable and unobservable factors over time, such changes in selection are an important factor behind the declining urban wage premium. In particular, as movers into urban areas are increasingly workers of lower ability, the dynamic growth of wages in urban areas over time will decline relative to those in rural areas. However, while observable and unobservable characteristics clearly matter, they fail to explain all of the raw urban wage premium in Table 1. Thus, while labor supply factors matter, there is a potentially a role in the demand for workers as well.

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. Indeed, 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. 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. Recent work emphasizes the importance of changes in the nature of skilled work in cities corresponding to declines in the wage level of non-college 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).

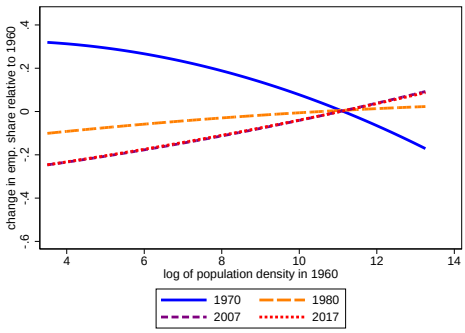
To assess whether changes in the urban wage premium coincide with changes in the

Figure 8: Employment shares of occupations by municipal population density in 1960

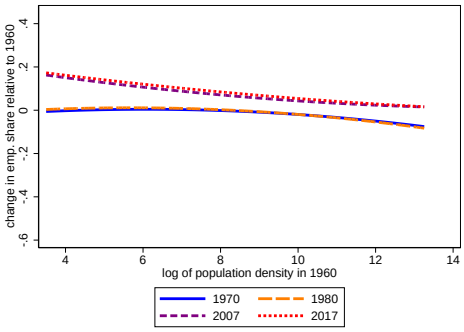
(a) Farming & Fishery, Male



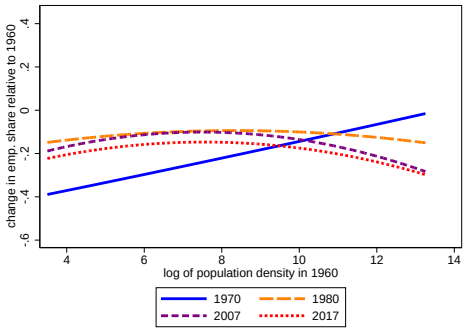
(b) Farming & Fishery, Female



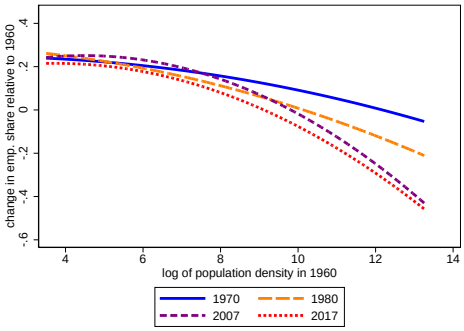
(c) Low-skill, Male



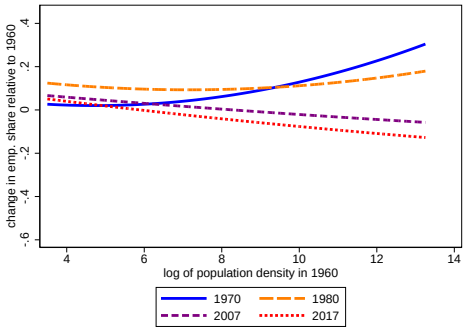
(d) Low-skill, Female



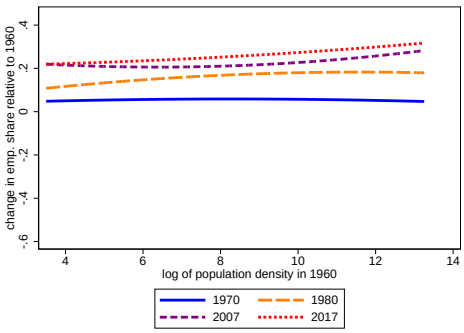
(e) Middle-skill, Male



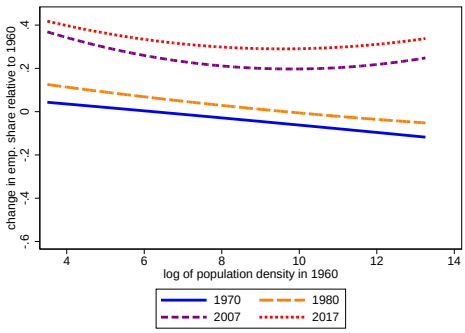
(f) Middle-skill, Female



(g) High-skill, Male



(h) High-skill, 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 (not reported).

skill composition of the workforce, Figure 8 plots 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 three categories: high-skill, middle-skill, and low-skill.[14] 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.[15]

From 1960–1980, Figure 8 reveals considerable declines in the importance of farming and fishing for men in rural areas (panel a). Such declines are met with increases in the importance of middle-skill occupations, whose importance increases drastically between 1960 and 1980 in sparsely populated areas (panel e).[16] Thus, 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. Consistent with the importance of industrialization in explaining the declining urban wage premium from 1958–1980, farming and fishing occupations are roughly as important in 1980 as in 1960 among women (panel b), for whom the urban wage premium was stable over the period.

Figure 8 also reveals important changes in the 2000s in the skill content of work which coincide with the drastic decline in the urban wage premium among men. In particular, 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.[17] Such declines accelerated in the 2000s and, over time, a strong negative relationship between population density and middle-skill employment emerged

[14] The classification of skills follows Autor (2019).

[15] A binary urban/rural status reveals similar patterns in Appendix F.1.

[16] Appendix F.2 examines changes in more detailed 2 digit occupations from 1960–1980. Employment in agricultural workers declines by twice as much in less populated areas. 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.

[17] 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.

for men.[18] This is further confirmed in panel (f), 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 severe. At the same time, the declines in the urban wage premium among non-college educated women were much less pronounced relative to the declines among non-college educated men (see Appendix F.3). 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 non-college educated men in the 2000s.

7 Explaining the Collapse of the Urban Wage Premium: The Relative Importance of Labor Supply and Demand

What is the relative importance of the change in the supply of workers and the change in demand for workers in explaining the declining urban wage premium over time? In particular, what can explain the disappearance of an urban wage premium for men in the 2000s, and the differential effects for high, medium and low skilled workers? To assess the relative contributions of the shift in selection on observable and unobservable factors and the collapse of middle-skilled occupations in urban areas, we use descriptive decomposition exercise to directly test the relative importance of supply and demand factors in explaining the urban wage premium over time. Demand factors correspond to occupations, while supply factors correspond to observable factors, differences in education, and, for men, unobservable factors, differences in cognitive ability.

We test the relative importance of such factors throughout the wage distribution, decomposing the relative importance of demand and supply side factors at different quantiles, exploiting an extension of the Oaxaca-Blinder decomposition method developed in

[18] Figure F.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.

Firpo et al. (2018). Given the stark differences in the evolution of the urban wage premium over time between college and non-college educated workers, the decomposition exercise enables us to focus on the bottom of the earnings distribution where the collapse in the urban wage premium takes place.

Tables 2 and 3 perform the extended Oaxaca-Blinder decomposition using the recentered influence function regression methods developed in Firpo et al. (2009).[19] Similar to the Oaxaca-Blinder decomposition at the mean, the unconditional quantile decomposition exercise developed in Firpo et al. (2018) asks what factors explain the urban/rural earnings gap allowing for the decomposition to be conducted across different points in the distribution. The decomposition has the advantage of constructing a counterfactual for urban workers using the observed outcomes for rural workers without imposing any assumptions regarding specific functional form or distribution.

Similar to the Oaxaca-Blinder decomposition, the exercise decomposes the raw urban wage premium into what is explained by: (a) differences in the composition across urban and rural areas, that is, the differential availability of jobs and supply of workers, and (b) differences in the coefficients, the differential effects of jobs and workers across urban and rural areas (differences in the wage structure). Equation (3) details the standard Oaxaca-Blinder decomposition of the urban wage premium:

$$\overline{lnW_u} - \overline{lnW_r} = \underbrace{\hat{\delta}_u(\overline{X_u} - \overline{X_r})}_{\text{differences in demand \& supply}} + \underbrace{\overline{X_r}(\hat{\delta}_u - \hat{\delta}_r)}_{\text{differences in wage structure}}, \tag{3}$$

where $\overline{X_g}$ is a vector of average demand and supply factors in urban and rural areas ($g = u, r$) and $\hat{\delta}_g$ is a vector of estimated coefficients for area g. As before, demand factors correspond to occupations, while supply factors correspond to observable factors, differences in education, and, for men, unobservable factors, differences in cognitive ability.

Compared to the decomposition depicted in equation (3), Firpo et al. (2018) perform this decomposition at different quantiles in the distribution. As such, we are able to assess the relative importance of labor supply and demand factors not just at the mean but, im-

[19] Specifically, the exercise is performed using the `oaxaca_rif` command developed in Rios-Avila (2020).

portantly, at the bottom of the distribution where declines in the urban wage premium are concentrated. Indeed, given the differences in the evolution of the urban wage premium across different skill levels seen previously, we would expect that different factors account for the declining urban wage premium at different points throughout the distribution.

Tables 2 and 3 report the results of this decomposition exercise over time, from 1980–2017, and across the distribution for men and women respectively. The table reports the raw urban wage premium for 5 points in the distribution, the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles for each time period. The table then decomposes the amount of the raw urban wage premium in row (a) which is explained by differences in the composition of jobs and workers and the amount of the premium explained by total differences in the coefficients (rows (b) and (c) respectively).

Three key findings emerge.[20] First, for both men and women, supply and demand account for a considerable portion of the unconditional urban wage premium throughout the distribution, and these factor matter increasingly more over time as the unexplained component of the urban wage premium declines considerably from 1980–2017. Indeed, in the bottom half of the distribution, the majority of the return to urban work was previously explained by differences in the wage structure while in the 2000s, the majority of the urban wage premium is explained by supply and demand factors.

Second, the disappearance of the urban wage premium in the 2000s among men is nearly entirely accounted for by both supply and demand factors. As seen previously, there is a collapse of the urban wage premium at the lower end of the distribution, while the top of the distribution remains more insulated from such declines. This is particularly true for the 10^{th} percentile: in 1980, the urban wage premium was 30%; by the late 2000s, this has declined to 5%; and by the 2010s there is actually a negative return to urban work and rural workers fare better than their urban counterparts. At the same time, differences in the composition of workers, supply and demand factors, are increasingly important over time in explaining the urban wage premium.

[20]Results for the median worker in the distribution are similar to the average effects (Appendix H). Additionally, findings are similar when abstracting from any sequencing issues as in Gelbach (2016) (Appendix I).

Table 2: Decomposing the Relative Importance of Demand- and Supply-Side Factors Across the Distribution, Male Sample

	Percentile:				
	(1)	(2)	(3)	(4)	(5)
	10	25	50	75	90
	Panel A: 1980				
(a) Raw UWP	0.300***	0.146***	0.109***	0.123***	0.151***
(b) UWP Explained by Composition Diffs.	0.113***	0.063***	0.041***	0.049***	0.055***
Amount of UWP Explained by:					
Labor Demand	0.116***	0.059***	0.032***	0.032***	0.030***
Selection on Observables	-0.004***	0.005***	0.009***	0.017***	0.025***
(c) UWP Explained by Coefficient Diffs.	0.187***	0.082***	0.067***	0.074***	0.096***
	Panel B: 2007–2009				
(a) Raw UWP	0.053***	0.061***	0.071***	0.121***	0.189***
(b) UWP Explained by Composition Diffs.	0.022***	0.026***	0.030***	0.038***	0.057***
Amount of UWP Explained by:					
Labor Demand	0.036***	0.023***	0.022***	0.025***	0.031***
Selection on Observables	-0.015***	0.002***	0.005***	0.007***	0.018***
Selection on Unobservables	0.001	0.002***	0.003***	0.005***	0.009***
(c) UWP Explained by Coefficient Diffs.	0.030***	0.035***	0.040***	0.083***	0.132***
	Panel C: 2010–2017				
(a) Raw UWP	-0.019***	0.032***	0.053***	0.100***	0.150***
(b) UWP Explained by Composition Diffs.	0.009***	0.024***	0.034***	0.046***	0.066***
Amount of UWP Explained by:					
Labor Demand	0.030***	0.025***	0.029***	0.036***	0.043***
Selection on Observables	-0.013***	0.003***	0.007***	0.008***	0.019***
Selection on Unobservables	-0.008***	-0.005***	-0.002***	0.001***	0.004***
(c) UWP Explained by Coefficient Diffs.	-0.028***	0.008***	0.018***	0.054***	0.084***

Note: Table decomposes the relative importance of demand and supply factors in explaining the raw urban wage premium (row a) at five different points in the distribution: the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles. Extended version of Oaxaca-Blinder decomposition as in Firpo et al. (2018) explains the relative importance of differences in the composition of jobs and workers between rural/urban areas (row b) and differences in the coefficients between rural/urban areas (row c). Panels A–C present the decomposition exercise for 1980, 2007–2009, and 2010–2017 respectively. Labor demand, selection on observables, and selection on unobservables correspond to fixed effects for occupation, education, and IQ (where available). Sample of male workers, where IQ data (selection on unobservables) unavailable for panel A. Standard errors computed by the delta method are omitted due to visual presentation. *, **, and *** correspond to significant at the 10%, 5%, and 1% levels respectively.

Table 3: Decomposing the Relative Importance of Demand- and Supply-Side Factors Across the Distribution, Female Sample

	Percentile:				
	(1)	(2)	(3)	(4)	(5)
	10	25	50	75	90
	Panel A: 1980				
(a) Raw UWP	0.116***	0.128***	0.160***	0.108***	0.076***
(b) UWP Explained by Composition Diffs.	0.039***	0.053***	0.057***	0.042***	0.029***
Amount of UWP Explained by:					
Labor Demand	0.038***	0.050***	0.051***	0.034***	0.019***
Selection on Observables	0.002**	0.003***	0.006***	0.008***	0.010***
(c) UWP Explained by Coefficient Diffs.	0.077***	0.075***	0.103***	0.065***	0.047***
	Panel B: 2007–2009				
(a) Raw UWP	0.037***	0.080***	0.087***	0.099***	0.150***
(b) UWP Explained by Composition Diffs.	0.004***	0.021***	0.031***	0.038***	0.040***
Amount of UWP Explained by:					
Labor Demand	0.001	0.011***	0.019***	0.019***	0.015***
Selection on Observables	0.003***	0.010***	0.012***	0.019***	0.026***
(c) UWP Explained by Coefficient Diffs.	0.034***	0.060***	0.056***	0.061***	0.109***
	Panel C: 2010–2017				
(a) Raw UWP	0.004***	0.053***	0.073***	0.088***	0.144***
(b) UWP Explained by Composition Diffs.	0.004***	0.020***	0.035***	0.043***	0.051***
Amount of UWP Explained by:					
Labor Demand	0.010***	0.015***	0.023***	0.021***	0.017***
Selection on Observables	-0.006***	0.005***	0.013***	0.022***	0.033***
(c) UWP Explained by Coefficient Diffs.	-0.000	0.033***	0.037***	0.045***	0.094***

Note: Table decomposes the relative importance of demand and supply factors in explaining the raw urban wage premium (row a) at five different points in the distribution: the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles. Extended version of Oaxaca-Blinder decomposition as in Firpo et al. (2018) explains the relative importance of differences in the composition of jobs and workers between rural/urban areas (row b) and differences in the coefficients between rural/urban areas (row c). Panels A–C present the decomposition exercise for 1980, 2007–2009, and 2010–2017 respectively. Labor demand, selection on observables, and selection on unobservables correspond to fixed effects for occupation, education, and IQ (where available). Sample of female workers, for whom IQ data (selection on unobservables) unavailable in all periods. Standard errors computed by the delta method are omitted due to visual presentation. *, **, and *** correspond to significant at the 10%, 5%, and 1% levels respectively.

Finally, changes in patterns of selection of workers are a crucial explanation behind the declining urban wage premium at the bottom of the distribution. In particular, labor demand factors contribute to a higher urban wage premium while the negative return to urban work at the bottom of the distribution is in large part explained by shifting labor supply. Indeed, ignoring differences in the composition of labor supply would understate the urban wage premium at the bottom of the distribution, as both observable and unobservable factors serve to further reduce the estimated urban wage premium. The changes in the patterns of selection are so important that accounting for such differences in the supply of workers would eliminate the negative return to urban work at the bottom of the distribution in Table 2. This is consistent with negative selection into urban work at the bottom of the earnings distribution, and while labor demand factors also remain an important reason behind the decline in the urban wage premium, changes in selection increasingly matter at the bottom of the distribution.

The importance of changes in patterns of selection also differs by gender, where selection matters slightly more in explaining the urban wage premium for women throughout the wage distribution. While women at the bottom of the wage distribution also see a decline in the urban wage premium in the 2010s, this is less severe compared to men. In contrast to men, labor supply factors are considerably more important in explaining the urban wage premium throughout the distribution.

7.1 The Importance of Alternative Explanations: the Roles of the Oil Discovery, Female Labor Force Participation, Immigration and Commuting

In Appendix J, we report robustness checks for the importance of changes in factors other than demand or supply-side factors. First, the discovery of oil in 1969 may have disproportionately impacted urban or rural areas. Appendix J.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 D.4b sug-

gests 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 using household earnings rather than individual earnings (Figure J.2). Third, immigration increased substantially from 1967, particularly in urban areas (Figure J.3) which could have impacted the development of the urban wage premium. Figure J.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 J.5). Fifth, the fraction of rural–urban commuters was relatively constant over time (Figure J.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 J.8).

8 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 non-college educated men, faced a collapse in the urban wage premium relative to women. 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% and 2000–2017, when the urban wage premium declined by over 65%. The decline among non-college educated men was sufficiently severe that by 2017, there were zero, or even negative, wage differences between urban and rural workers.

The paper finds that shifts in the skill selection into urban areas are an important explanation behind the declining urban wage premium over time. Changes in the supply of labor correspond to declines in the positive selection into urban work as workers became increasingly less positively selected on observable and unobservable factors such

as education and cognitive ability. As the degree of positive selection into rural-to-urban mobility declines over time, so too does the labor market return to urban mobility. Decomposing the relative importance of both supply- and demand-side factors reveals that changes in the composition of workers, again on both observable and unobservable factors, explain the negative return to urban work among men in the lower end of the earnings distribution. Indeed, changes in selection and the supply of labor are a major explanation behind the collapse of the urban wage premium at the bottom of the distribution.

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. Indeed, a key policy question is how non-college educated workers can remain competitive in the urban labor force. While the availability of high-paying industrial jobs in urban areas declines, a trend also observed by Autor (2019) in the US, our findings point to the importance of the supply-side. Indeed, understanding how changes in the selection of workers into urban areas evolves over time is key for understanding the dynamics of declining labor market conditions in urban areas among the non-college educated.

References

Acemoglu, D., D. Autor, D. Dorn, G. H. Hanson, and B. Price (2016). Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics 34*(S1), S141–S198.

Acemoglu, D., D. H. Autor, and D. Lyle (2004). Women, war, and wages: The effect of female labor supply on the wage structure at midcentury. *Journal of Political Economy 112*(3), 497–551.

Acemoglu, D. and P. Restrepo (2018, July). Robots and jobs: Evidence from us labor markets. Technical report.

Autor, D. H. (2019, May). Work of the past, work of the future. *AEA Papers and Proceedings 109*, 1–32.

Autor, D. H., D. Dorn, and G. H. Hanson (2013, October). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review 103*(6), 2121–68.

Autor, D. H., D. Dorn, and G. H. Hanson (2015). Untangling trade and technology: Evidence from local labour markets. *The Economic Journal 125*(584), 621–646.

Autor, D. H., D. Dorn, G. H. Hanson, and J. Song (2014, 09). Trade adjustment: Worker-level evidence. *The Quarterly Journal of Economics 129*(4), 1799–1860.

Autor, D. H., F. Levy, and R. J. Murnane (2003, 11). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics 118*(4), 1279–1333.

Balsvik, R., S. Jensen, and K. G. Salvanes (2015). Made in china, sold in norway: Local labor market effects of an import shock. *Journal of Public Economics 127*, 137–144.

Baum-Snow, N., M. Freedman, and R. Pavan (2018, October). Why has urban inequality increased? *American Economic Journal: Applied Economics 10*(4), 1–42.

Bloom, N., M. Draca, and J. Van Reenen (2015, 09). Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity. *The Review of Economic Studies 83*(1), 87–117.

Combes, P.-P., G. Duranton, and L. Gobillon (2008). Spatial wage disparities: Sorting matters! *Journal of Urban Economics 63*(2), 723–742.

Combes, P.-P., G. Duranton, L. Gobillon, D. Puga, and S. Roux (2012). The productivity advantages of large cities: Distinguishing agglomeration from firm selection. *Econometrica 80*(6), 2543–2594.

Combes, P.-P., G. Duranton, L. Gobillon, and S. Roux (2010). Estimating Agglomeration Economies with History, Geology, and Worker Effects. In *Agglomeration Economics*, NBER Chapters, pp. 15–66. National Bureau of Economic Research, Inc.

Firpo, S., N. M. Fortin, and T. Lemieux (2009). Unconditional quantile regressions. *Econometrica 77*(3), 953–973.

Firpo, S. P., N. M. Fortin, and T. Lemieux (2018). Decomposing wage distributions using recentered influence function regressions. *Econometrics 6*(2).

Gelbach, J. B. (2016). When do covariates matter? and which ones, and how much? *Journal of Labor Economics 34*(2), 509–543.

Glaeser, E. L. and J. D. Gottlieb (2009). The wealth of cities: Agglomeration economies and spatial equilibrium in the united states. *Journal of Economic Literature 47*(4), 983–1028.

Glaeser, E. L. and D. C. Mare (2001). Cities and skills. *Journal of Labor Economics 19*(2), 316–42.

Goldin, C. and C. Olivetti (2013, May). Shocking labor supply: A reassessment of the role of world war ii on women's labor supply. *American Economic Review 103*(3), 257–62.

Goos, M. and A. Manning (2007). Lousy and lovely jobs: The rising polarization of work in britain. *The Review of Economics and Statistics 89*(1), 118–133.

Goos, M., A. Manning, and A. Salomons (2014, August). Explaining job polarization: Routine-biased technological change and offshoring. *American Economic Review 104*(8), 2509–26.

Graetz, G. and G. Michaels (2018). Robots at work. *The Review of Economics and Statistics 100*(5), 753–768.

Hummels, D., R. Jørgensen, J. Munch, and C. Xiang (2014, June). The wage effects of offshoring: Evidence from danish matched worker-firm data. *American Economic Review 104*(6), 1597–1629.

Krugman, P. (1991). History and industry location: The case of the manufacturing belt. *The American Economic Review 81*(2), 80–83.

Malanima, P. and O. Volckart (2008). Urbanisation 1700-1870. In S. Broadberry and K. O'Rourke (Eds.), *Unifying the European Experience: An Economic History of Modern Europe, Volume 1: 1700-1870*.

Michaels, G., F. Rauch, and S. J. Redding (2018, 03). Task specialization in u.s. cities from 1880 to 2000.

Rios-Avila, F. (2020). Recentered influence functions (rifs) in stata: Rif regression and rif decomposition. *The Stata Journal 20*(1), 51–94.

Roca, J. D. L. and D. Puga (2016, 07). Learning by Working in Big Cities. *The Review of Economic Studies 84*(1), 106–142.

SSB (1994). Standard for kommuneklassifisering 1994 (standard classification of municipalities 1994). *Norges offisielle statistikk (Official Statistics of Norway): Oslo-Kongsvinger*.

SSB (2005). *Hundre års ensomhet? Norge og Sverige 1905-2005*. Statistics Norway.

Sundet, J., D. Barlaug, and T. Torjussen (2004). The end of the flynn effect? a study of secular trends in mean intelligence test scores of norwegian conscripts during half a century. *Intelligence XXXII*, 349–362.

Tabuchi, T. and A. Yoshida (2000). Separating urban agglomeration economies in consumption and production. *Journal of Urban Economics 48*(1), 70–84.

Thrane, V. (1977). Evneprøving av utskrivingspliktige i norge 1950-53. Technical Report nr. 26, INAS.