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

Appendix Tables and Figures

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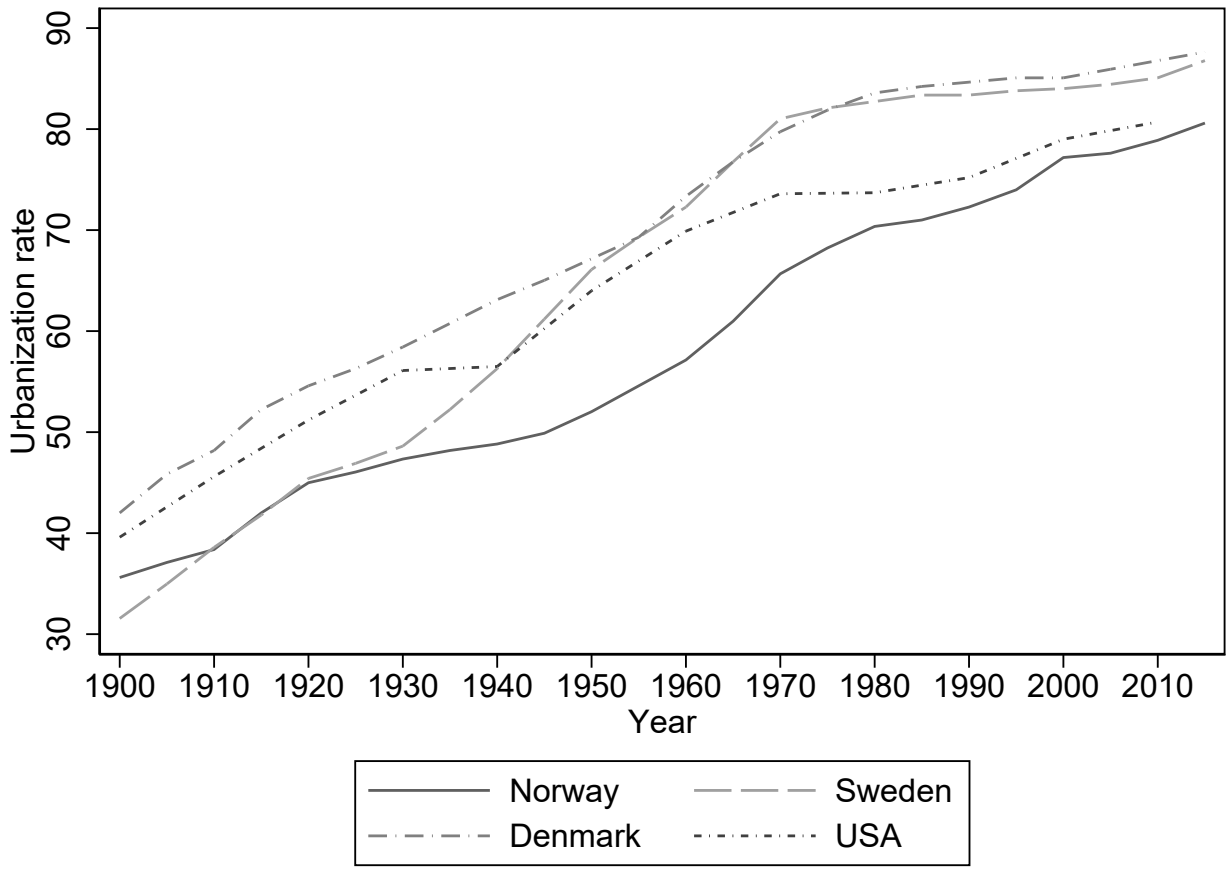
A International Comparison of the Urbanization Process from 1900–2015

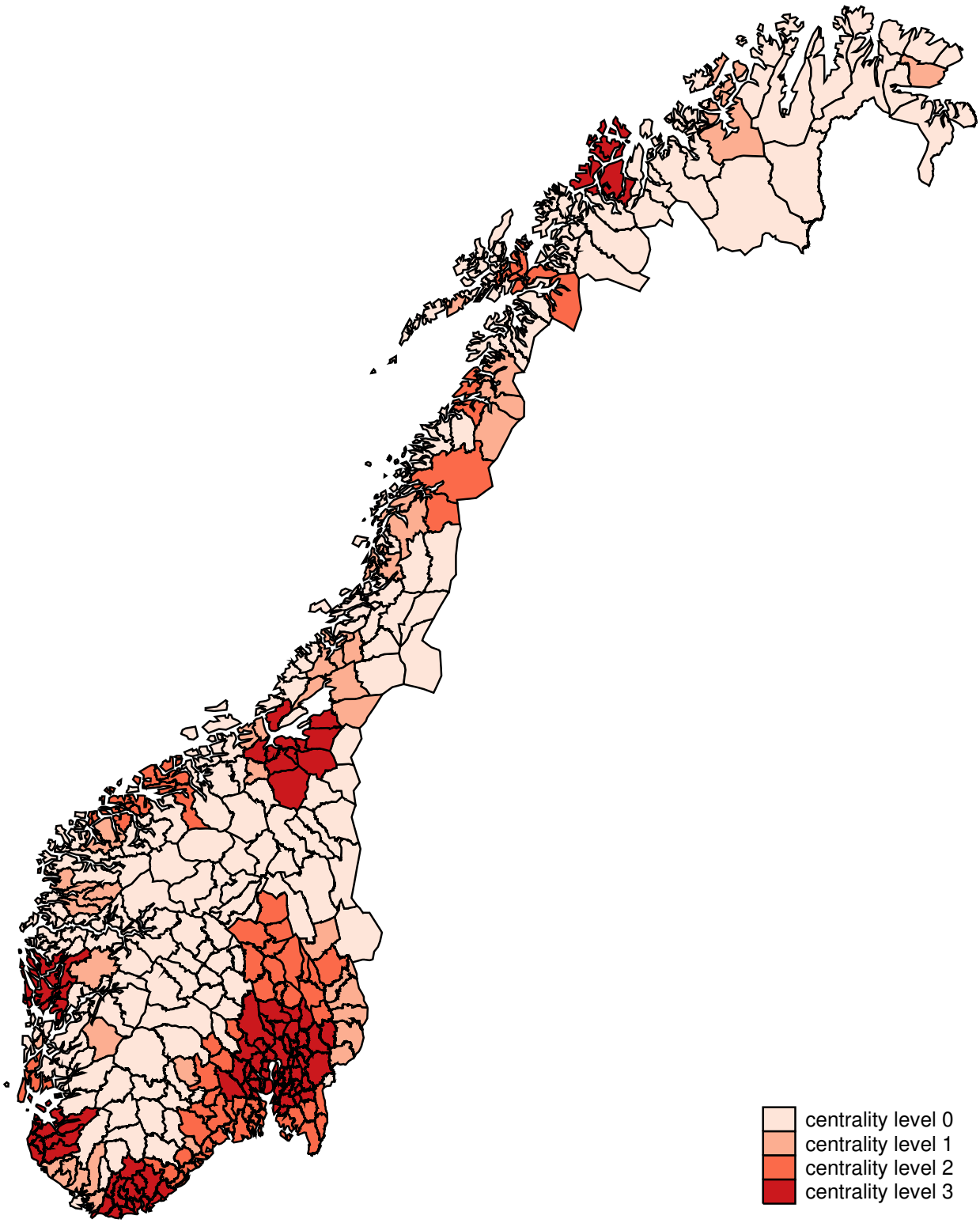
Figure A.1: Percentage of population living in urban areas in Norway, Sweden, Denmark, and the US, 1900-2015



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

B Defining Urban Status in Norway

Figure B.1: 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.

C Describing Estimation Sample

Table C.1: Summary statistics, men 1967–2016

	(1) Entire Sample	(2) Rural Stayers	(3) Urban Stayers	(4) Rural to Urban Movers
log earnings	12.13	11.95	12.20	11.95
	(0.987)	(0.997)	(0.966)	(0.965)
age	39.38	39.40	38.97	32.77
	(8.754)	(8.520)	(8.448)	(7.345)
fraction low educated	0.238	0.281	0.221	0.158
	(0.426)	(0.450)	(0.415)	(0.365)
fraction medium educated	0.446	0.495	0.437	0.328
	(0.497)	(0.500)	(0.496)	(0.469)
fraction high educated	0.317	0.224	0.342	0.514
	(0.465)	(0.417)	(0.474)	(0.500)
Observations	40470376	8009304	30038115	226475

Note: Descriptive statistics for sample of men as defined in Section 2.4. Observation corresponds to an individual in a given year. Sample of columns (1)–(4) correspond to entire sample, rural stayers, urban stayers, and rural to urban movers respectively. Rural (urban) stayers are those who lived in rural (urban) municipality in the current year but moved to a urban (rural) municipality in the next year. Rural to urban movers are those who lived in a rural municipality in the current year but moved to an urban municipality in the next year. Variables are measured prior to urban move.

Table C.2: Summary statistics, women 1967–2016

	(1) Entire Sample	(2) Rural Stayers	(3) Urban Stayers	(4) Rural to Urban Movers
log earnings	11.93	11.87	11.99	11.90
	(0.952)	(0.883)	(0.936)	(0.882)
age	39.56	39.79	39.22	32.73
	(8.712)	(8.338)	(8.421)	(7.771)
fraction low educated	0.208	0.218	0.198	0.116
	(0.406)	(0.413)	(0.398)	(0.320)
fraction medium educated	0.399	0.450	0.388	0.252
	(0.490)	(0.498)	(0.487)	(0.434)
fraction high educated	0.393	0.332	0.414	0.632
	(0.488)	(0.471)	(0.493)	(0.482)
Observations	31081172	5479932	23298082	146654

Note: Descriptive statistics for sample of women as defined in Section 2.4. Observation corresponds to an individual in a given year. Sample of columns (1)–(4) correspond to entire sample, rural stayers, urban stayers, and rural to urban movers respectively. Rural (urban) stayers are those who lived in rural (urban) municipality in the current year but moved to a urban (rural) municipality in the next year. Rural to urban movers are those who lived in a rural municipality in the current year but moved to an urban municipality in the next year. Variables are measured prior to urban move.

D Robustness of Urban Wage Premium Results

D.1 Controlling for differences in education and age composition

As there may be differences in the age and education compositions between rural and urban residents, Figure D.1 plots the urban wage premium over time controlling for age and education by estimating the following equation:

$$ln(W_i^t) = \alpha^t + \gamma U_i^t + \beta age_i^t + \delta education_i^t + \varepsilon_i^t. \quad (1)$$

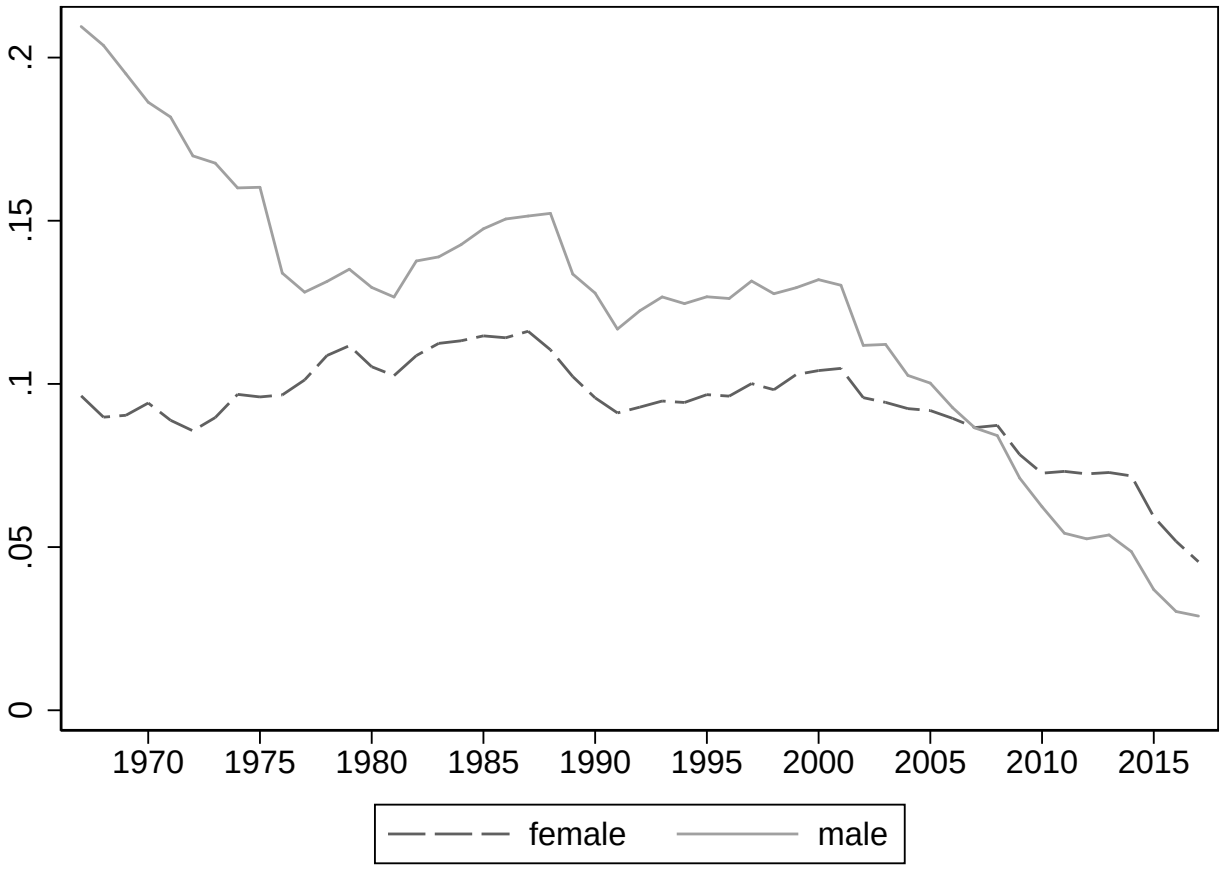
When controlling for education and age differences between workers in urban and rural areas, the estimated urban wage premium is similar, but lower relative to the raw urban wage premium for both men and women. Note that Figure D.1 starts in 1967 as we only observe individual level data on education and age from 1967 onwards.

D.2 Definition of Urban and Rural

There are two potential concerns with defining an urban area based on the international standard developed by Statistics Norway in 1994. Firstly, urban areas may evolve over time, particularly over such a long time horizon. Figure D.2 examines how the estimated urban wage premium changes when defining an urban area contemporaneously. Using data from the 1970 and 1980 census, which contains urban/rural status collected for each individual, Figure D.2 reveals that results are robust to defining urban status contemporaneously. Both the urban wage premium and the observed decline lasting until 1980 are similar and, if anything, slightly larger than when defining urban status according to the original definition.

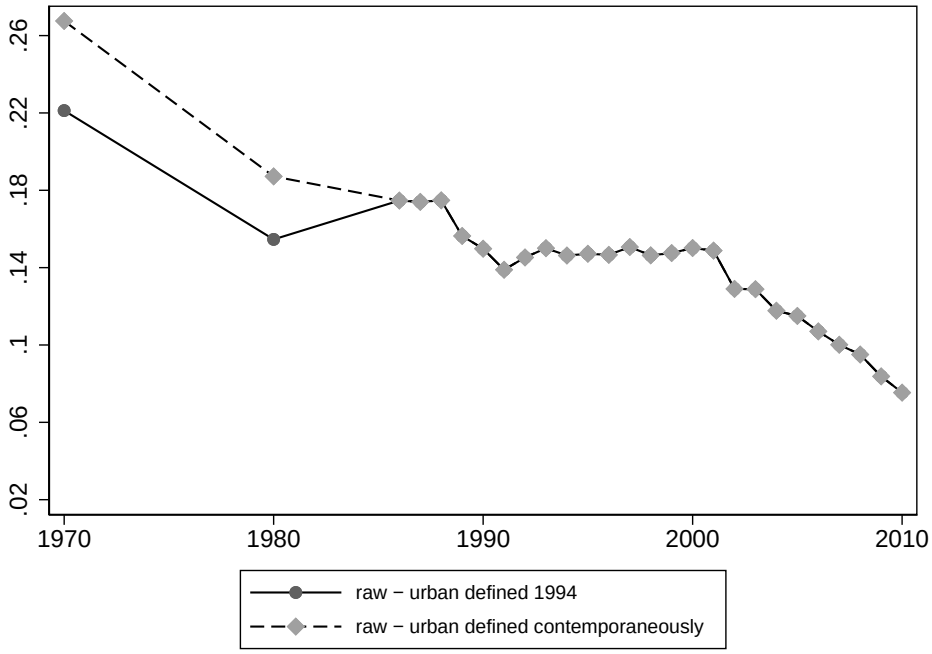
Secondly, many urban areas are more densely populated than others. Using a binary definition of urban status equates large cities and less populated outlying urban areas. Figure D.3 examines the importance of the binary nature in urban status by re-estimating the urban wage premium using population density (measured in 1960) instead of urban or rural status. Reassuringly, the evolution of the urban wage premium in Figure D.3 is similar to what is seen in Figure 1. For men, the urban wage premium declines substantially from 1967–1980 and 2000–2017 as the slope of the relationship between earnings and population density flattens. The urban wage premium also declines for women

Figure D.1: Estimated urban wage premium by year, men and women



Note: Figure plots estimates from equation (1), the urban wage premium controlling for age and education. Urban status defined in Figure B.1. Estimation sample defined in Section 2.4. Figure plots coefficients from separate regressions for each year and gender.

Figure D.2: Defining urban status contemporaneously



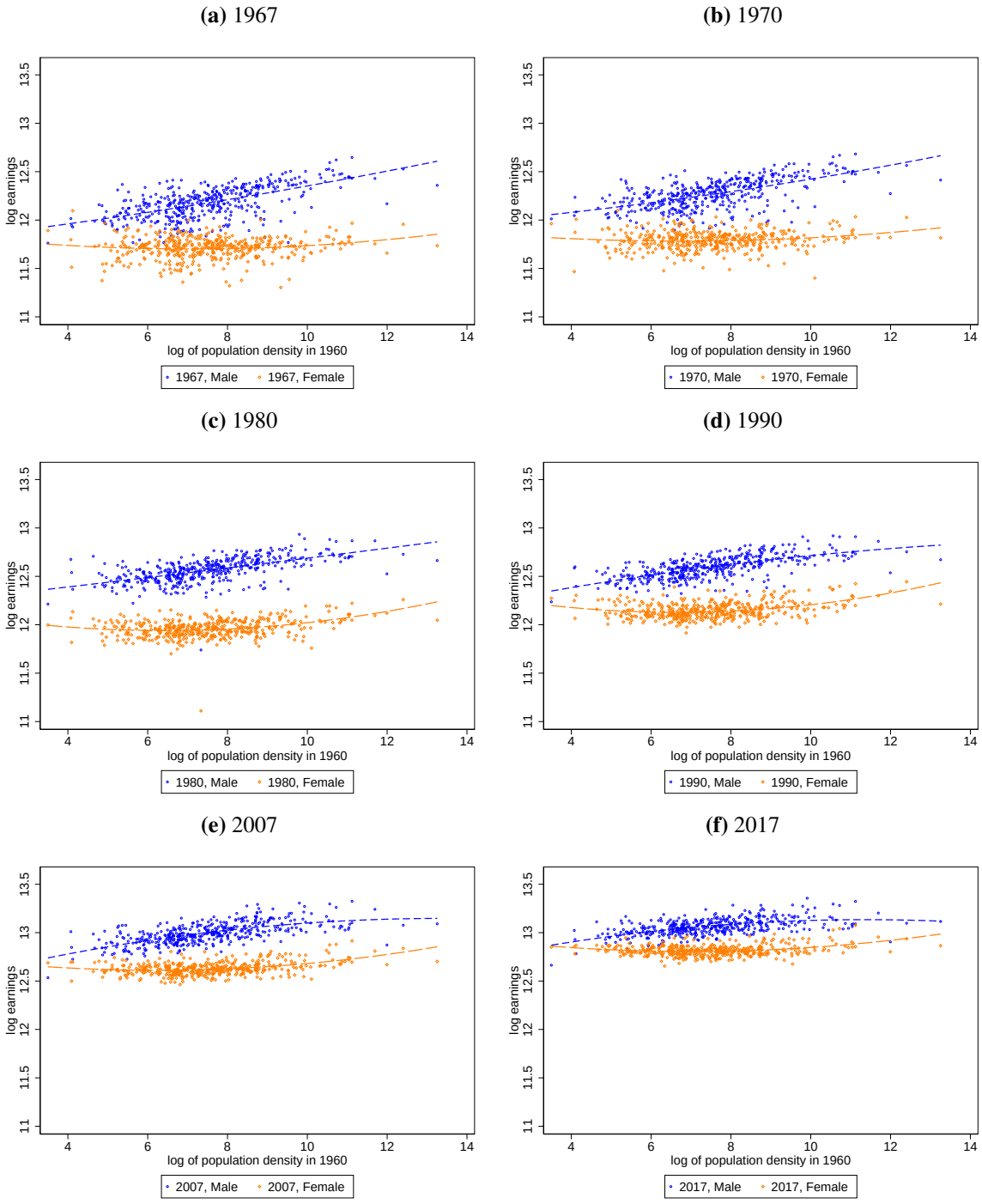
Note: Figure plots coefficients from separate regressions of Equation 1 for each year and gender. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4.

from 2000–2017, but less so compared to men.

D.3 Female Labor Force Participation

Figure D.4a shows female labor force participation, defined as the fraction of women who have income above the social security base rate (1G), increased steadily from 1967–1990. Increases in female labor force participation do not impact urban and rural areas equally (Figure D.4b) and female labor force participation has historically been higher in urban areas. In 1967, female labor force participation in urban areas is nearly double that of rural areas. However, by 1990, female labor force participation is similar between urban and rural areas due to increasing female labor supply in rural areas relative to urban. From 1990 onwards, female labor force participation is roughly similar between urban and rural areas.

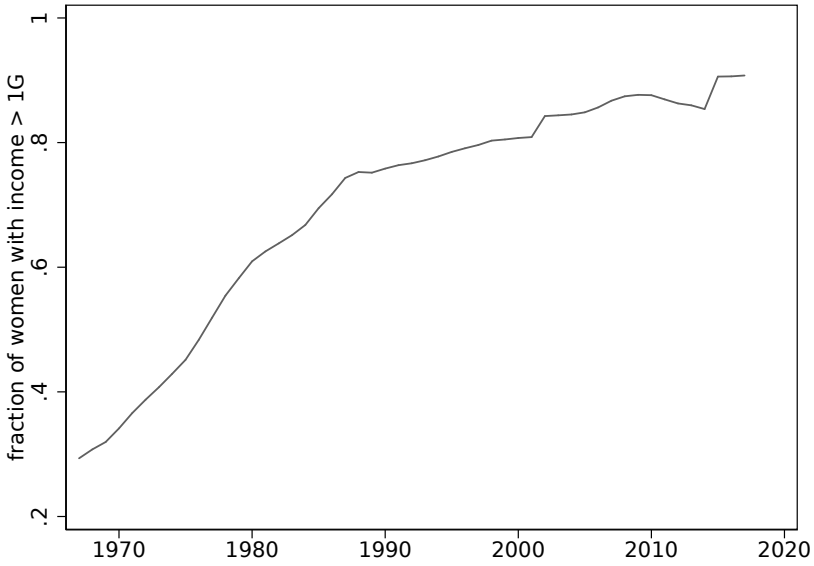
Figure D.3: Real urban wage premium by 1960 population density, by gender



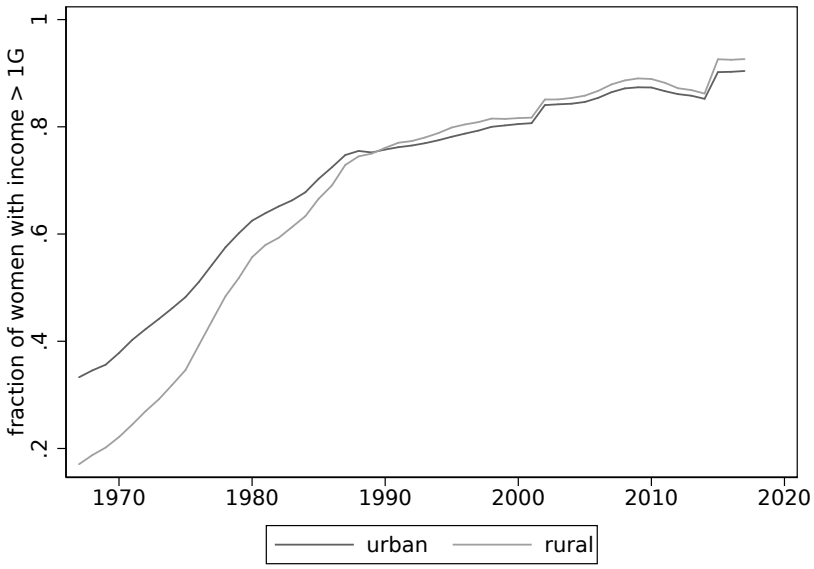
Note: Figure plots the raw urban wage premium for men and women in areas of different population density. Earnings are measured in 2010-NOK. The log of municipality population density (1000 residents per km^2) is measured in 1960. Each point represents the average of log earnings in a given year for workers of different genders.

Figure D.4: Female labor force participation, 1967–2010

(a) National



(b) Separated by Urban Rural

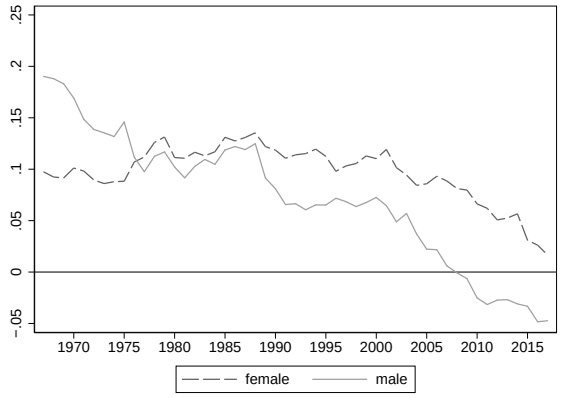


Note: Figure plots female labor force participation over sample period. Panel (a) presents the evolution of national female labor force participation, panel (b) presents separate rates by urban/rural status. Urban status defined in Figure B.1. Labor force participation defined as the fraction of women in a given area who have a level of income greater than the social security base rate.

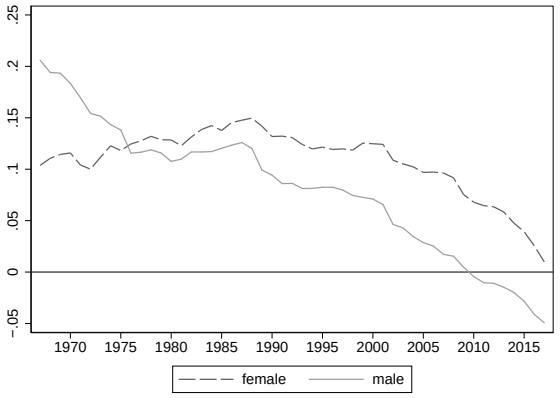
E Estimated Urban Wage Premium by gender, education, and age

Figure E.1: Estimated urban wage premium by year, men and women

(a) Less than High School Educated, 25–34

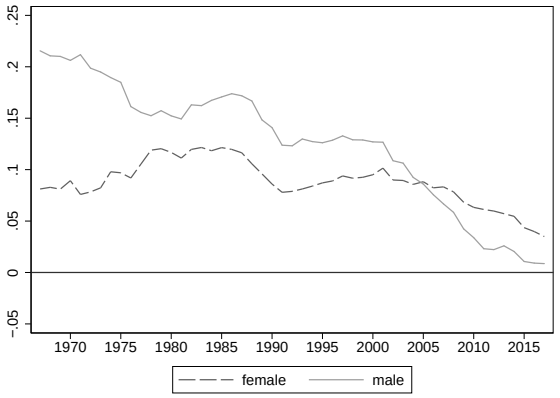


(b) High School Educated, 25–34

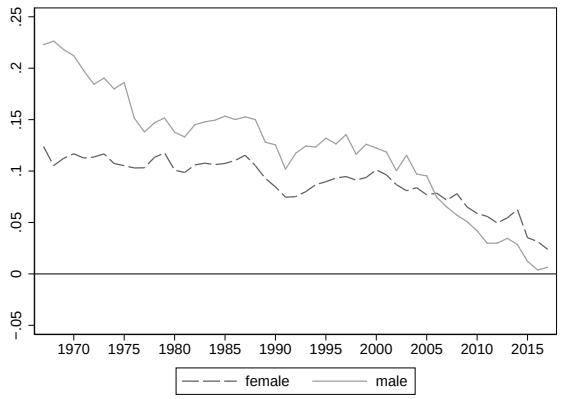


(c) Less than High School Educated, 35–44

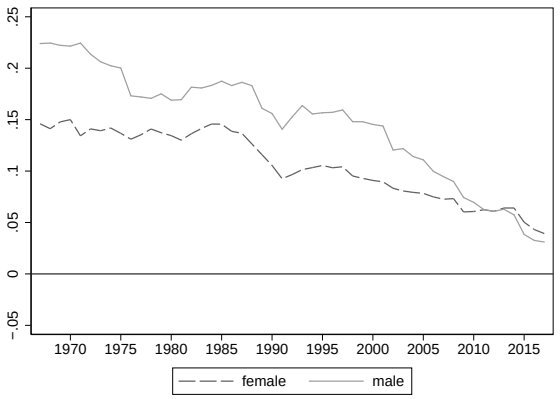
(d) High School Educated, 35–44



(e) Less than High School Educated, 45–55



(f) High School Educated, 45–55

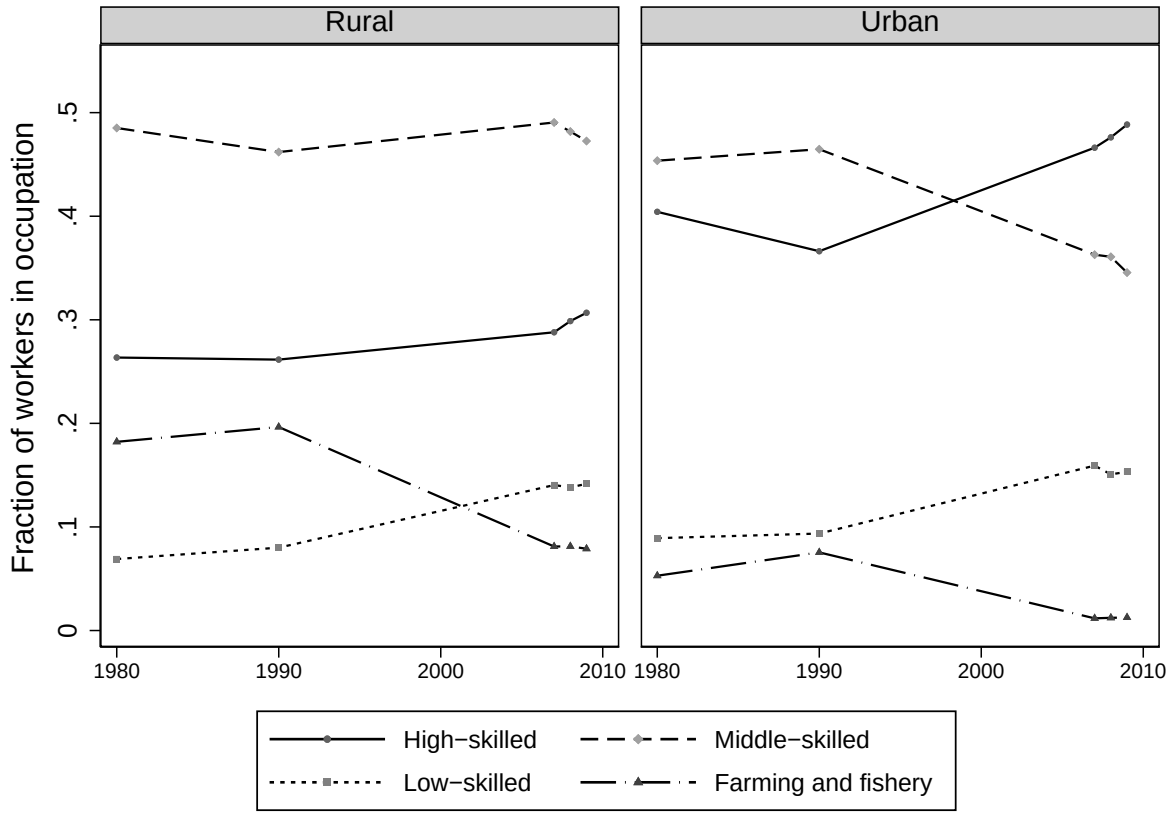


Note: Figure plots estimates from Equation (1), from separate regressions for each year, gender, education level, and age group. Panels (a)–(b), (c)–(d), and (e)–(f) correspond to sample of workers aged 25–34, 35–44, and 45–55 respectively. Panels (a), (c), and (e) plot estimates from sample of workers with less than high school education. Panels (b), (d), and (f) plot estimates from sample of workers with high school education. Urban status defined in Figure B.1.

F Changes in the Nature of Work

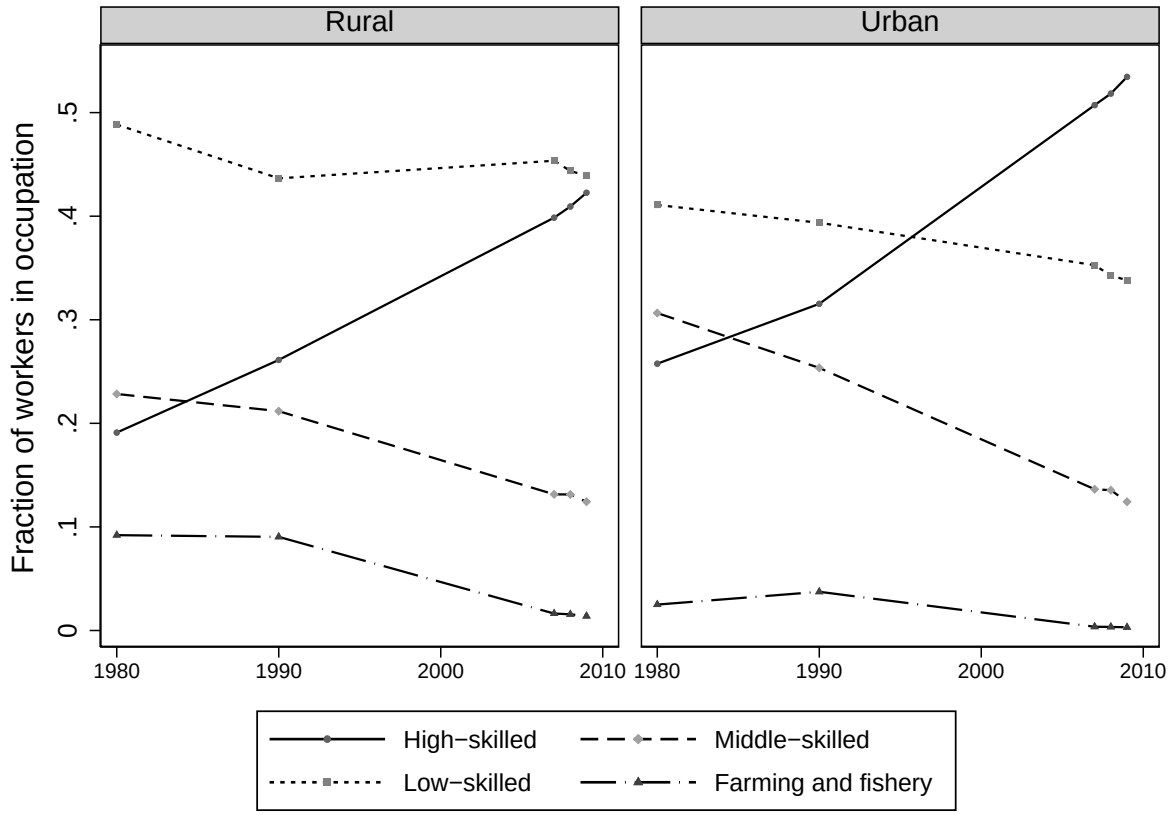
F.1 Binary Urban Status

Figure F.1: Evolution of Male Occupational Share by Urban/Rural Status, 1980–2009



Note: Figure plots the change in occupational share for men by urban status. Sample of men is defined as in Section 2.4. Occupations grouped into four occupations: low-skill, middle-skill, high-skill, and farming/fishery.

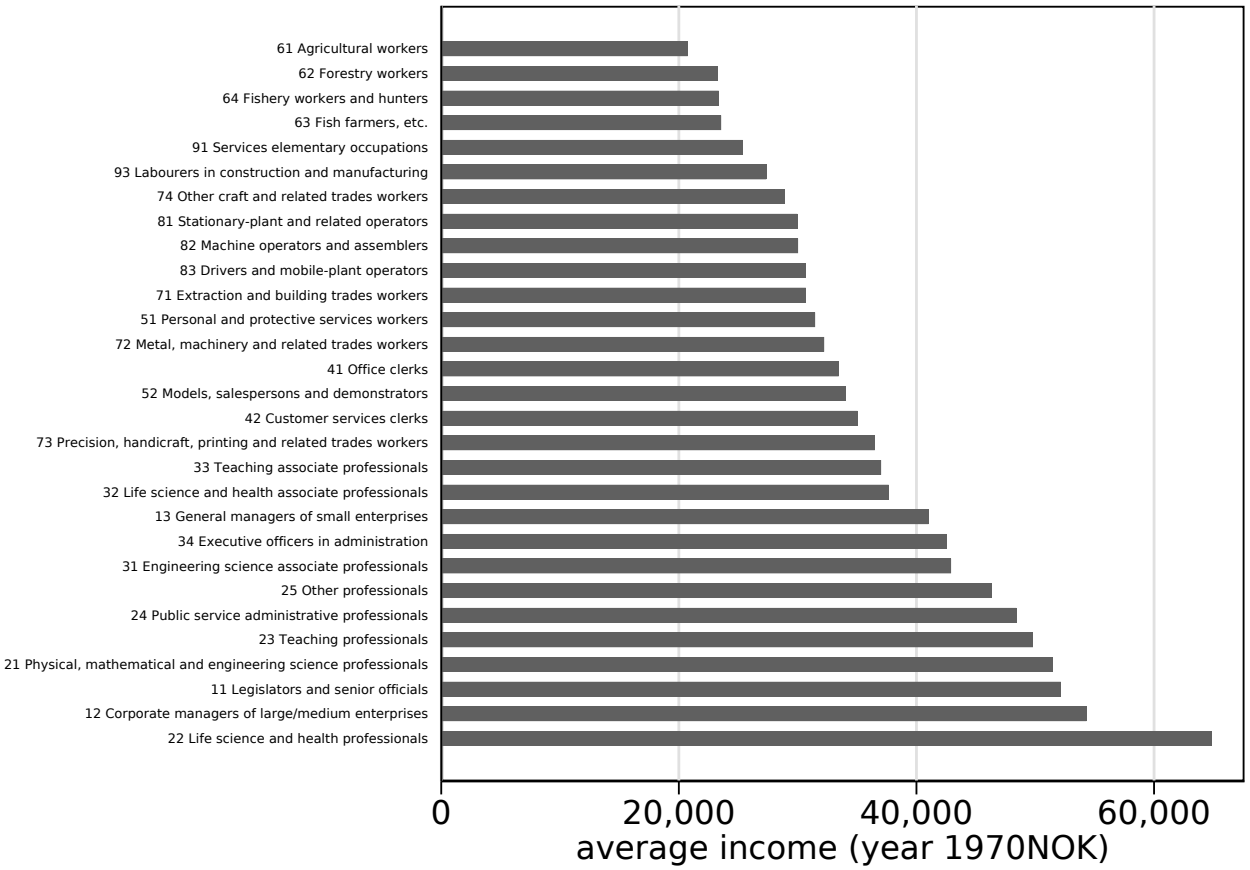
Figure F.2: Evolution of Female Occupational Share by Urban/Rural Status, 1980–2009



Note: Figure plots the change in occupational share for women by urban status. Sample of men is defined as in Section 2.4. Occupations grouped into four occupations: low-skill, middle-skill, high-skill, and farming/fishery.

F.2 Occupational Changes Defined at 2 Digit Level

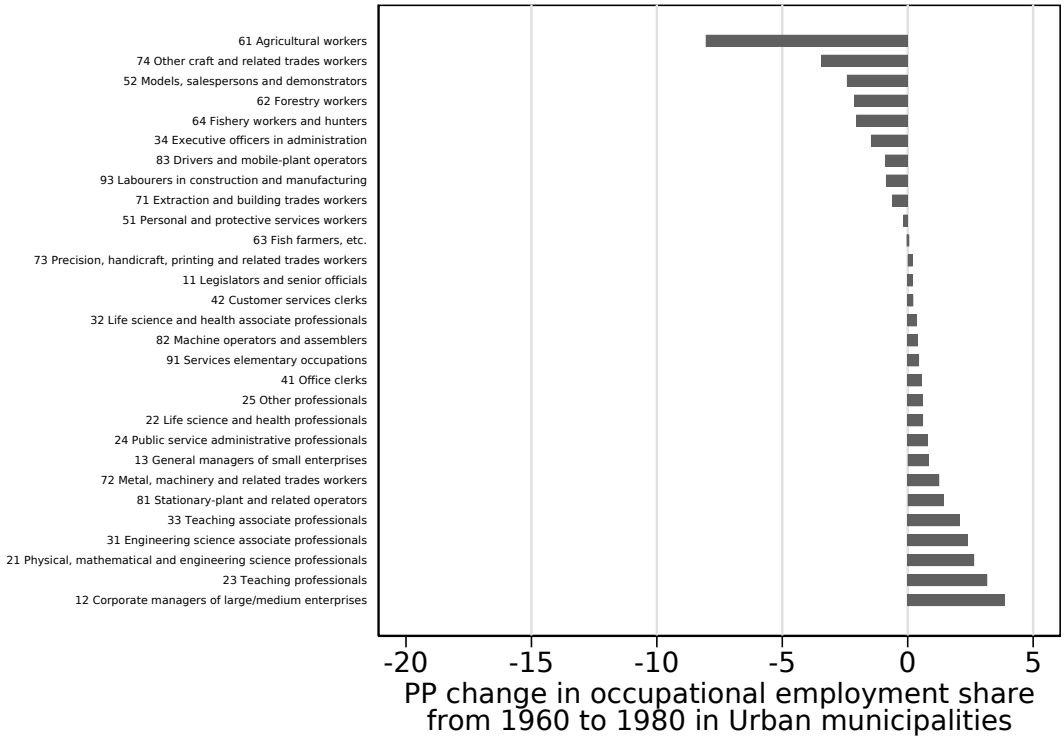
Figure F.3: Occupational income distribution in 1970



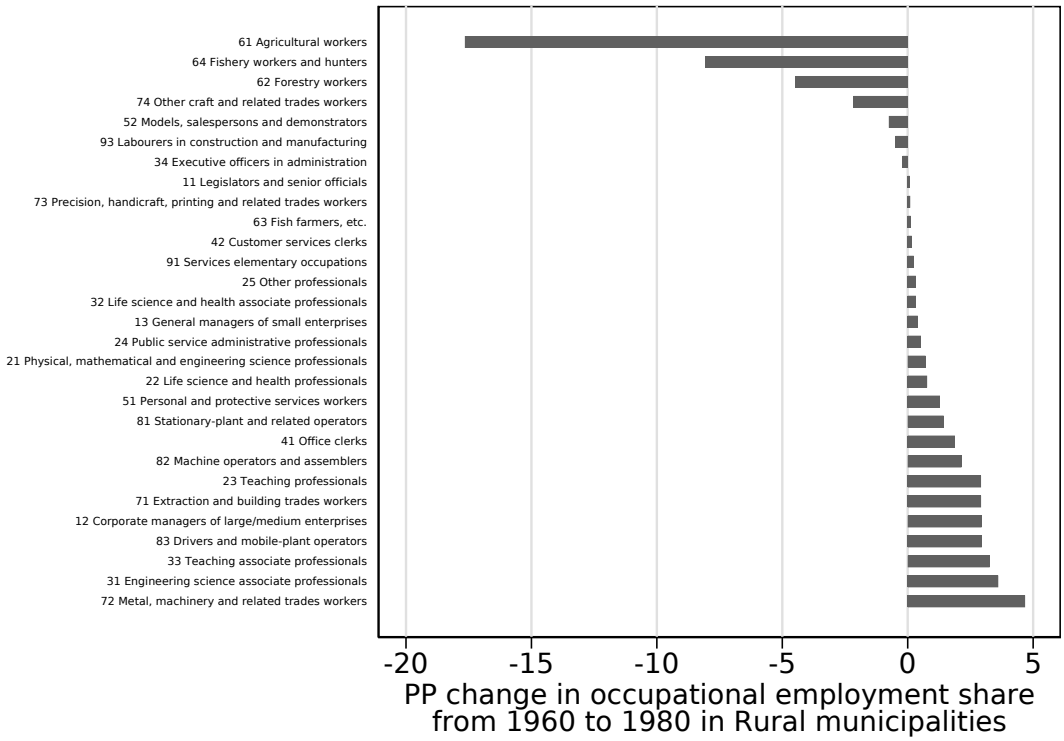
Note: Figure plots the average income by detailed two digit occupations classified according to the Norwegian Occupation Classification System.

Figure F.4: Evolution of occupational shares in urban and rural areas, men 1960–1980

(a) Urban



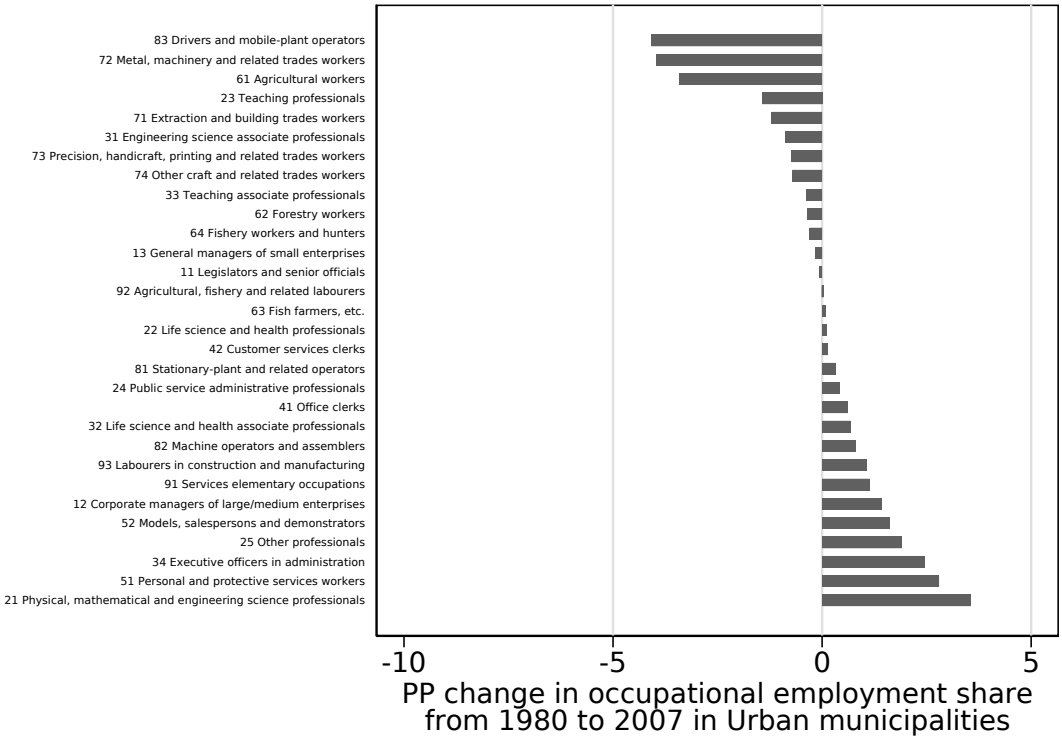
(b) Rural



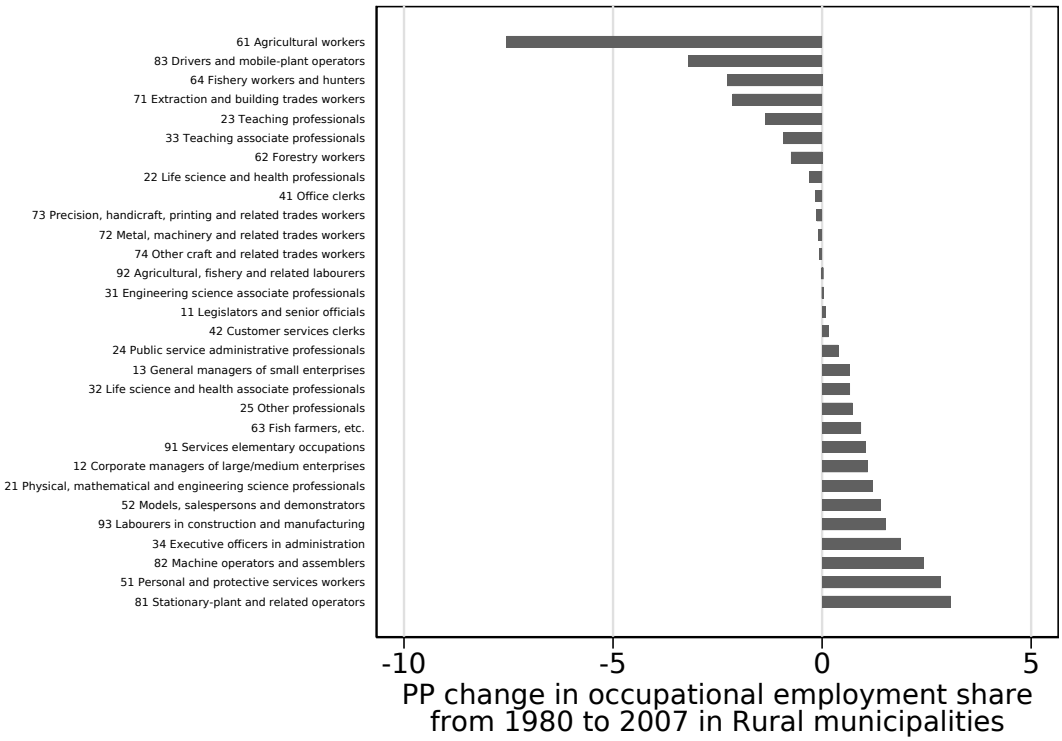
Note: Figure plots the change in the employment share between 1960–1980 of detailed two digit occupations classified according to the Norwegian Occupation Classification System. Sample of male workers. Panel (a) for urban areas, panel (b) for rural areas.

Figure F.5: Evolution of occupational shares in urban and rural areas, men 1980–2007

(a) Urban



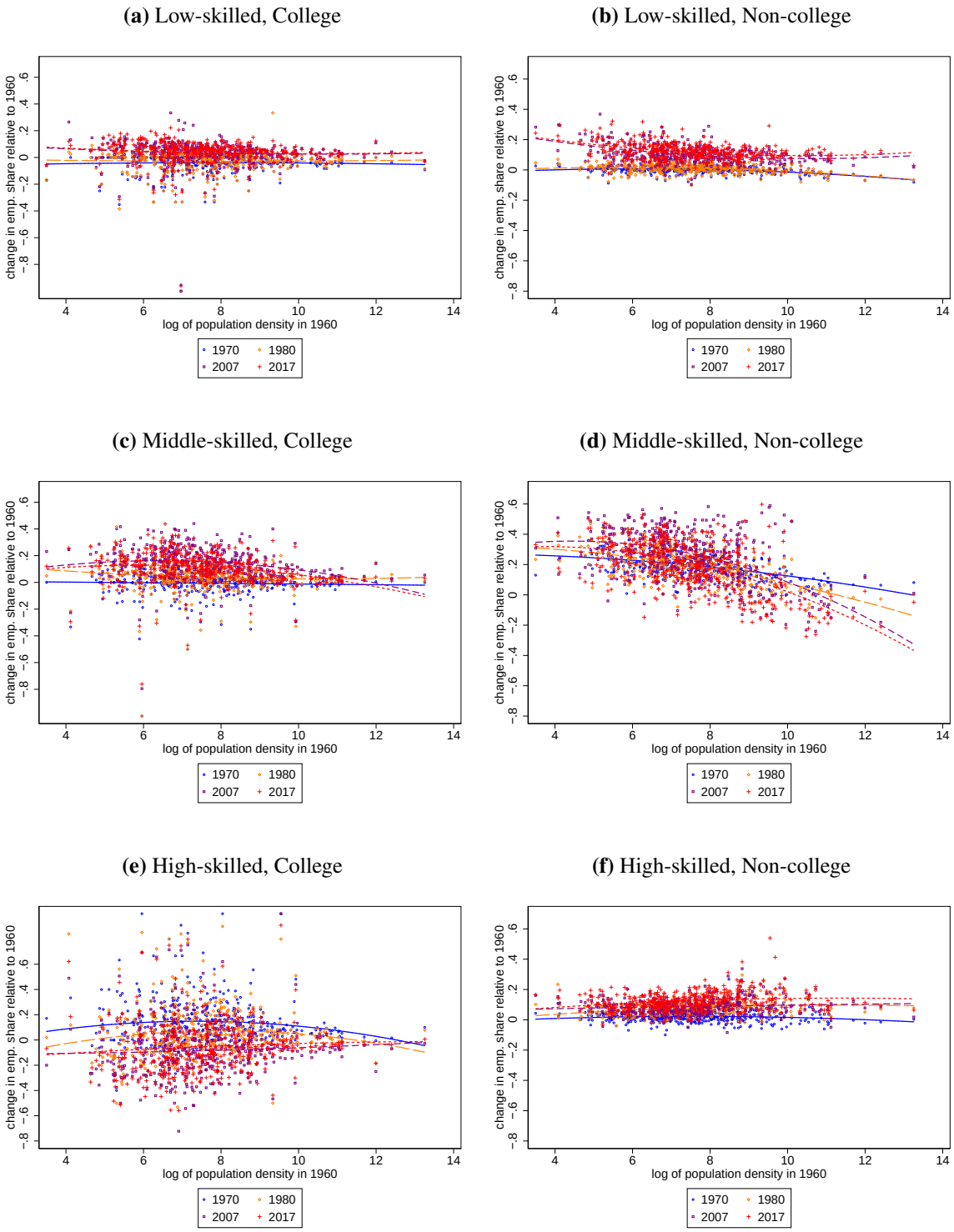
(b) Rural



Note: Figure plots the change in the employment share between 1980–2007 of detailed two digit occupations classified according to the Norwegian Occupation Classification System. Sample of male workers. Panel (a) for urban areas, panel (b) for rural areas.

F.3 Changes in the Nature of Work by Gender and Education Level

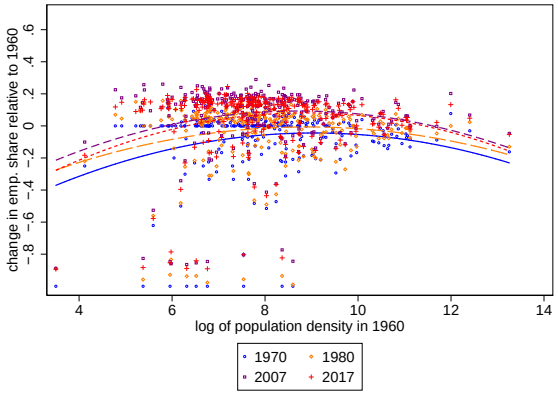
Figure F.6: Employment shares of low-, middle- and high-skill occupations by municipal population density in 1960, men



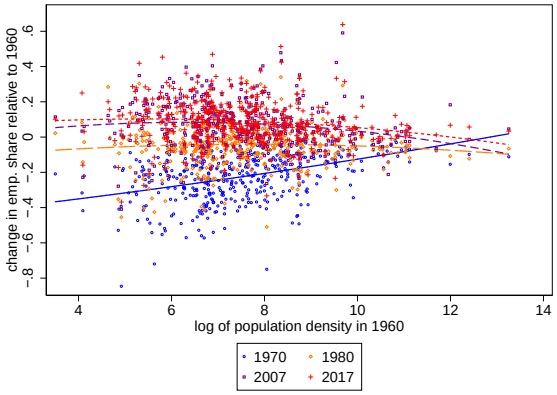
Note: Figure plots the change in occupational share for men in areas of different population density by education level (farming and fishery occupations not reported). Occupational shares calculated separately for college and non-college workers (basic or lower secondary education and upper secondary education). Log of municipality population density (1000 residents per km^2) is measured in 1960. Each point represents the change in municipal employment share in a given year relative to the level in 1960.

Figure F.7: Employment shares of low-, middle- and high-skill occupations by municipal population density in 1960, women

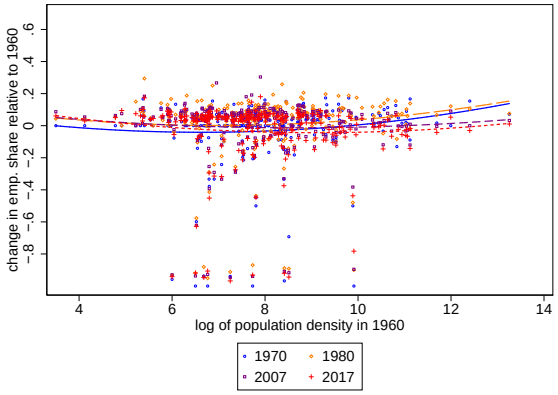
(a) Low-skilled, College



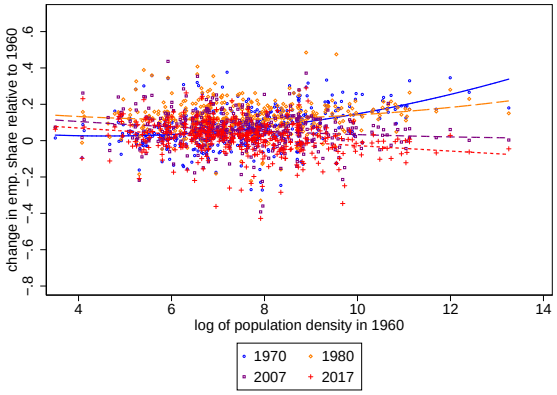
(b) Low-skilled, Non-college



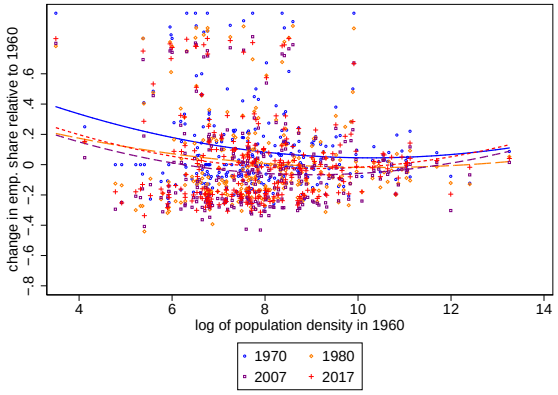
(c) Middle-skilled, College



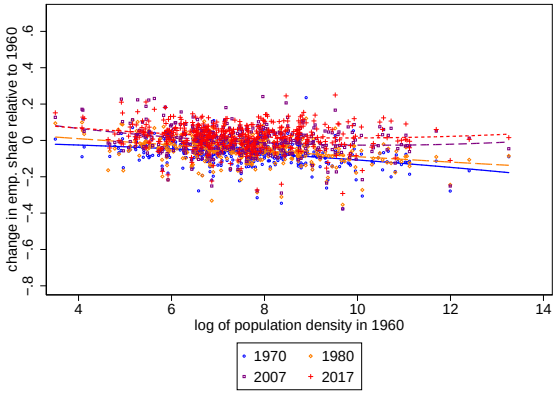
(d) Middle-skilled, Non-college



(e) High-skilled, College



(f) High-skilled, Non-college



Note: Figure plots the change in occupational share for women in areas of different population density by education level (farming and fishery occupations not reported). Occupational shares calculated separately for college and non-college workers (basic or lower secondary education and upper secondary education). Log of municipality population density (1000 residents per km^2) is measured in 1960. Each point represents the change in municipal employment share in a given year relative to the level in 1960.

G Comparing Migrant/Nonmigrant Brothers and Sisters

Comparing siblings of the same gender, we analyze migrants from rural to urban areas within the same families. 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).[1] 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 G.1 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.

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

[1] 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.

and sisters.[2] As such, declines in the positive selection of migrants over time may account for the reduction in the urban wage premium in the 2000s.

Table G.1: Return to migration per decade, analyzing brothers and sisters

Period	(1) 1971-1980	(2) 1981-1990	(3) 1991-2000	(4) 2001-2010	(5) 2011-2017
	Panel (a): Brothers				
OLS	0.1931***	0.1244***	0.1247***	0.0715***	0.0073
brothers sample	(0.0146)	(0.0104)	(0.0095)	(0.0096)	(0.0137)
FE	0.1983***	0.1288***	0.1420***	0.0795***	0.0373***
brothers sample	(0.0153)	(0.0104)	(0.0096)	(0.0095)	(0.0137)
OLS	0.2165***	0.1782***	0.1628***	0.0617***	-0.0332***
general population	(0.0043)	(0.0043)	(0.0044)	(0.0039)	(0.0053)
N brothers sample	6001	18209	23187	19683	10933
N general population	156920	208039	204197	194053	156929
	Panel (b): Sisters				
OLS	0.2209***	0.1476***	0.1197***	0.0589***	0.0406**
sisters sample	(0.0386)	(0.0155)	(0.0108)	(0.0102)	(0.0157)
FE	0.186***	0.1062***	0.0891***	0.0441***	0.0508***
sisters sample	(0.0435)	(0.0169)	(0.0116)	(0.0105)	(0.0159)
OLS	0.2114***	0.1824***	0.1611***	0.0845***	0.0305***
general population	(0.0071)	(0.0051)	(0.0049)	(0.0040)	(0.0054)
N sisters sample	1142	8127	17370	15271	7187
N general population	66854	139031	165210	169653	145705

Note: The brothers/sisters sample contains all siblings aged 25 to 40 who are rural in the beginning of the decade and urban or rural at the end of the decade. General population sample contains all individuals who are in rural at the beginning of the decade and either urban or rural at the end of the decade. Regressions include a full set of education and age dummies. Standard errors in parentheses. OLS results for entire sample (both siblings and non-siblings) seen in Table **??**. Period of panel (a) corresponds to 1971–1980 rather than 1967–1980 to better identify mothers at the start of the data. * p<0.1, ** p<0.05, and *** p<0.01.

[2]Note that the third row in Panels (a) and (b) in Table G.1 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.

H The Importance of Supply and Demand Factors for the Average Worker

First, we examine changes in the urban wage premium when accounting for selection on observables, selection on unobservables, and the demand for workers by comparing rural and urban workers within the same education, ability, and occupational skill groups.

In Table H.1, we present the estimated raw urban wage premium changes when accounting for differences in the supply of workers between urban and rural areas, accounting for selection on observable and unobservable factors, and differences in the demand for workers between urban and rural areas, accounting for the availability of jobs of different skill levels. Column (1) presents the unconditional raw urban wage premium. Columns (2) and (3) ask how much changes in the supply of workers can account for the urban wage premium, on observable factors (differences in education) and unobservable factors (difference in cognitive ability). Column (4) asks how much changes in labor demand accounts for the raw urban wage premium, accounting for differences in the composition of occupations between rural and urban areas. Finally, column (5) presents a fully saturated regression accounting for both labor supply and demand factors.

Table H.1: Explaining the Urban Wage Premium from 1980–2017

	Estimated Urban Wage Premium Accounting For:				
	(1) Raw	(2) Labor Supply (Obs.)	(3) Labor Supply (Unobs.)	(4) Labor Demand	(5) Labor Supply & Demand
	Panel A: Male				
1980	0.154***	0.127***		0.100***	0.094***
	(0.001)	(0.001)		(0.001)	(0.001)
2007–2009	0.098***	0.068***	0.078***	0.050***	0.041***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
2010–2017	0.066***	0.029***	0.050***	0.012***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year FE	Yes	Yes	Yes	Yes	Yes
Education FE	No	Yes	No	No	Yes
Ability FE	No	No	Yes	No	Yes
Occupation FE	No	No	No	Yes	Yes
Observations 1980	726288	726288	726288	726288	726288
Explained Component of Raw UWP (%)		-17.0		-35.0	-38.8
Observations 2007–2009	2745459	2745459	2745459	2745459	2745459
Explained Component of Raw UWP (%)		-30.6	-20.6	-48.7	-57.7
Observations 2010–2017	7664545	7664545	7664545	7664545	7664545
Explained Component of Raw UWP (%)		-55.1	-23.9	-82.1	-83.8
	Panel B: Female				
1980	0.121***	0.104***		0.077***	0.073***
	(0.002)	(0.002)		(0.002)	(0.002)
2007–2009	0.095***	0.069***		0.069***	0.058***
	(0.001)	(0.001)		(0.001)	(0.001)
2010–2017	0.077***	0.044***		0.047***	0.035***
	(0.000)	(0.000)		(0.000)	(0.000)
Year FE	Yes	Yes		Yes	Yes
Education FE	No	Yes		No	Yes
Occupation FE	No	No		Yes	Yes
Observations 1980	458494	458494		458494	458494
Explained Component of Raw UWP (%)		-14.7		-36.3	-39.5
Observations 2007–2009	2569615	2569615		2569615	2569615
Explained Component of Raw UWP (%)		-27.6		-27.0	-38.8
Observations 2010–2017	7235905	7235905		7235905	7235905
Explained Component of Raw UWP (%)		-42.2		-38.0	-53.8

Note: Each parameter corresponds to estimation from separate of the log of earnings on a dummy variable for urban residence and, in columns 2–5, additional controls for supply- and demand-side factors. Estimating equation is equation (1) progressively adding fixed effects stated in each column. Column (2) includes education fixed effects. Column (3) includes ability fixed effects (where available). Column (4) includes occupation fixed effects. Column (5) includes education, ability, and occupation fixed effects. Ability measure only available for men, years 2007–2017. Annual occupation measure available from 2007–2017, while 1980 occupation is measured in census data. Standard errors reported in parentheses. *, **, and *** correspond to significant at the 10%, 5%, and 1% levels respectively.

I Gelbach (2016) Method: Abstracting from Sequencing Issues

Table I.1 decomposes the relative importance of each factor as in Gelbach (2016). Similar to the Oaxaca-Blinder decomposition, the Gelbach (2016) decomposition exercise asks how much of the total explained component of the urban wage premium, column 1 minus 5 in Table H.1, can be attributed to each of the included fixed effects in columns 2–4. The primary advantage of such a decomposition is that is abstracts from any sequencing issues, the order in which additional fixed effects are added, which arise due to how intercorrelated each of the additional fixed effects are.

From 2010–2017, labor demand factors account for 73% of the total explained premium for men. However, despite the strong importance of demand factors in explaining the raw urban wage premium for men, selection still matters. Selection on observables matters more, explaining 22% of the urban wage premium compared to just 5% for selection on unobservables. In contrast to men, selection matters considerably more for women over time. While selection on observables explained just 15% of the total explained premium in 1980, it explains 41% by 2010–2017. Thus, while demand side factors are clearly the dominant channel in explaining the decline of the urban wage premium for men in the 2000s, changes in selection are also an important factor in the declining urban wage premium.

Table I.1: Decomposing the Relative Importance of Demand- and Supply-Side Factors

	1980		2007–2009		2010–2017	
	(1) Male	(2) Female	(3) Male	(4) Female	(5) Male	(6) Female
Amount of UWP Explained by:						
Selection on Observables	0.012***	0.007***	0.011***	0.017***	0.012***	0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Selection on Unobservables			0.008***		0.003***	
			(0.000)		(0.000)	
Labor Demand	0.047***	0.041***	0.038***	0.020***	0.040***	0.024***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Total Explained Premium	0.060***	0.048***	0.057***	0.037***	0.055***	0.041***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	726288	458494	2745459	2569615	7664545	7235905
% of TEP Explained By:						
Selection, Observables	20.4	14.8	19.4	45.9	21.8	40.9
Selection, Unobservables			14.2		4.8	
Labor Demand	79.6	85.2	66.4	54.1	73.4	59.1

Note: Table decomposes the relative importance of each factor in Table H.1 in explaining the difference between the fully saturated regression of column (5) and the raw urban wage premium in column (1). Decomposition exercise of Gelbach (2016) explains the relative importance of covariates irrespective of the order in which they are included in the regression and the extent to which each covariate is intercorrelated. Columns (1)–(2), (3)–(4), and (5)–(6) present decomposition exercise for 1980, 2007–2009, and 2010–2017 respectively. Sample of male workers presented in odd columns, sample of female workers presented in even columns. The percentage of the Total Explained Premium (TEP) explained by each factor is stated for each factor at the bottom of the Table. *, **, and *** correspond to significant at the 10%, 5%, and 1% levels respectively.

J Importance of Other Factors

J.1 The Discovery of Oil

At the end of 1969, oil is discovered off the southwest coast of Norway, and many subsequent discoveries led to the extensive development of the Norwegian oil industry.[3] Though the majority of the agricultural decline in rural areas occurred between 1960–1970, the discovery of oil corresponds with the continued decline of agricultural jobs in rural areas from 1970–1980. While the discovery of oil might be an important driving force behind the continued occupational change in rural areas, 13.5% of all jobs in rural areas are in oil by 1980 while 11.5% of all jobs in urban areas are in oil.[4] Figure J.1 plots the geographic distribution of employment in the oil industry, defined as in Bütikofer, Dalla-Zuanna, and Salvanes (2018), in 1980 into 3 quantiles. Rural areas, particularly those in the south, experience high levels of employment in the oil industry. However, urban areas are also impacted by the oil boom, particularly those on the coast. Indeed, in 1972, the state-owned company Statoil is founded by the Norwegian government in the city of Stavanger.[5] Given that rural and urban areas were similarly impacted by the discovery of oil, oil appears to play a small role in explaining changes in the urban wage premium.

J.2 Household Labor Supply

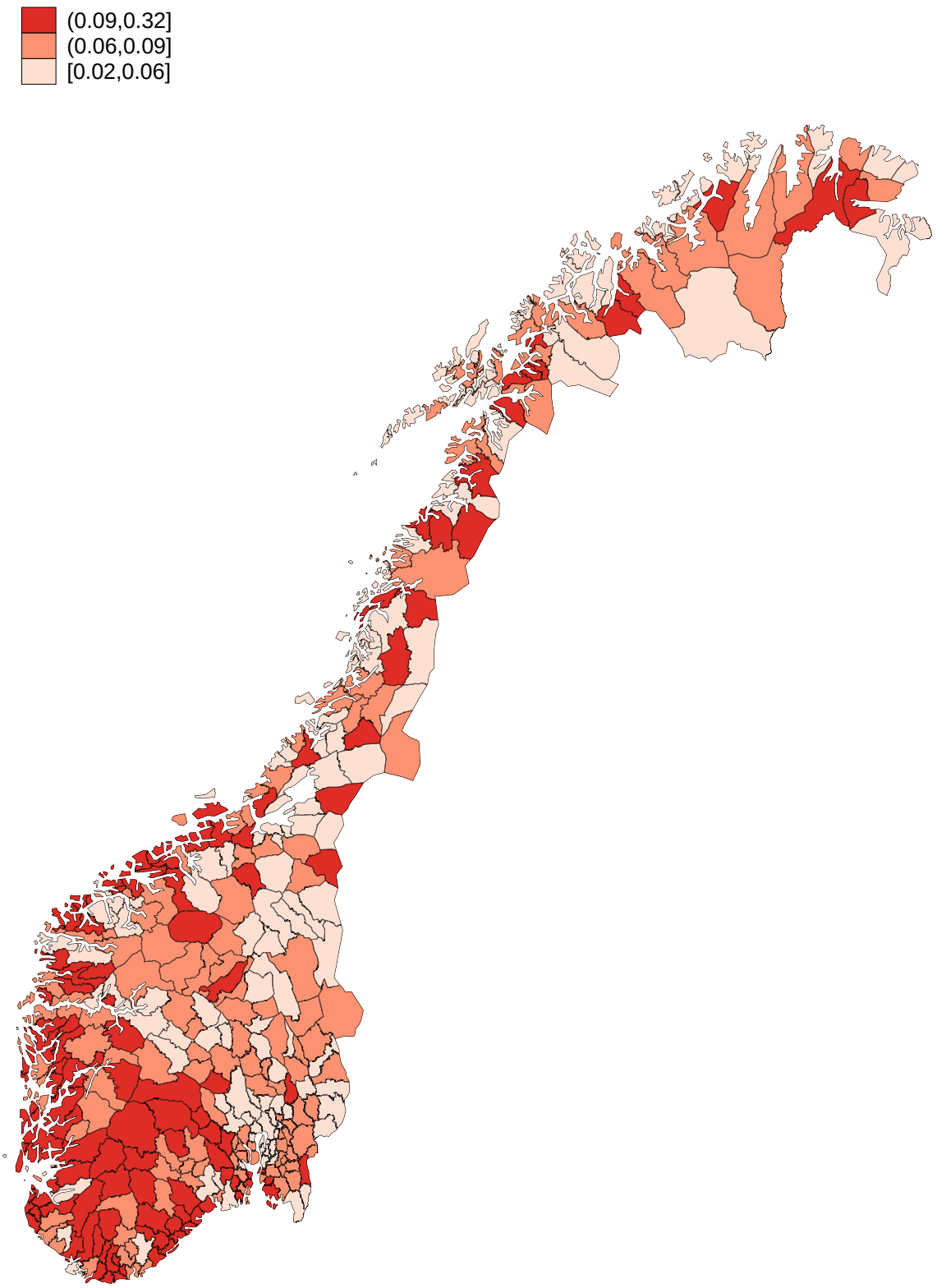
One important reason behind why couples may move to urban areas is the presence of thicker labor markets is beneficial for dual career couples with co-location considerations (Costa and Kahn, 2000). Additionally, thicker labor markets in urban areas may produce better matches and decrease risk following idiosyncratic employment shocks (Moretti, 2011). To understand the importance of both female and household labor supply, Figure J.2 calculates the urban wage premium using household income rather than individual income. If joint labor supply differed substantially between urban and rural areas, the estimated urban wage premium using household income would differ from that using individual income. Differences in household labor supply between urban and rural areas do not appear to explain the observed declines in the urban wage premium as the two different measures of the urban

[3] For a more detailed background on the Norwegian oil discovery, see Bütikofer, Dalla-Zuanna, and Salvanes (2018)

[4] An oil industry is defined as petroleum production and refinery as well as secondary industries such as manufacturing in machinery and transportation and construction of oil related equipment. See for further details on what constitutes an oil industry.

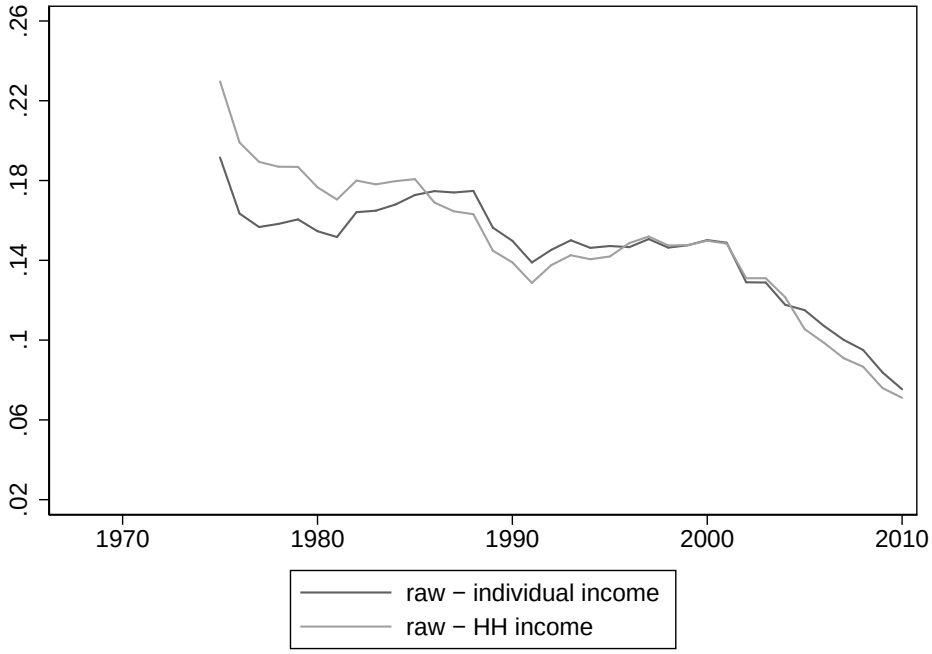
[5] In 2018, Statoil was renamed to Equinor.

Figure J.1: Distribution of oil industry across urban/rural in 1980



Note: Figure plots the distribution of oil jobs in 1980 across municipalities. Oil industry defined as in Bütikofer, Dalla-Zuanna, and Salvanes (2018), using data from 1980 on occupations classified as oil occupations.

Figure J.2: Urban wage premium from 1975–2010 using individual and household income for male sample



Note: Figure plots coefficients from separate regressions of Equation 1 for each year. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4, male sample. Income defined as individual income as well as household income. Household income is defined as the sum of individual income and spousal income for those with a spouse, and individual income for those without a spouse.

wage premium evolve similarly over time.

J.3 Immigration

Shifting immigration patterns may also be an important factor in the declining urban wage premium. Figure J.3a reveals that immigration into Norway, defined as the fraction of the population who are foreign born, has increased drastically over this period. In 1967, less than 3% of the population are foreign born while by 2010, this is nearly 15%. Immigration has increased substantially in the 2000s, in part due to the expansion of the European Union in 2004 (Bratsberg and Raaum, 2012). Figure J.3b reveals that immigrants disproportionately settle in urban areas, a gap which has steadily increased over time since 1967.

Given the strong increases in immigration combined with the fact that immigrants are overly represented in urban areas, Figure J.4 examines the evolution of the urban wage premium for a sample of those born in Norway. The estimated urban wage premium considering only Norwegian born males aged 25–55 is slightly higher from 1990–2010, but the evolution over time remains unchanged. In

2010, the urban wage premium for the sample of Norwegian born males is 9.7% while this is 7.5% when including both native and foreign born. The urban wage premium also declines substantially from 2000–2010 for Norwegian born males. However, such decline is somewhat less severe, 40% compared to 50%, than when considering both Norwegian and foreign born. While we cannot exclude that increases in immigration impact wages in equilibrium, differences between foreign and native borns suggests that immigration might have some role in the extent of the decline in the urban wage premium from 2000–2010.

J.4 Controlling for Hours Worked in the Urban Wage Premium

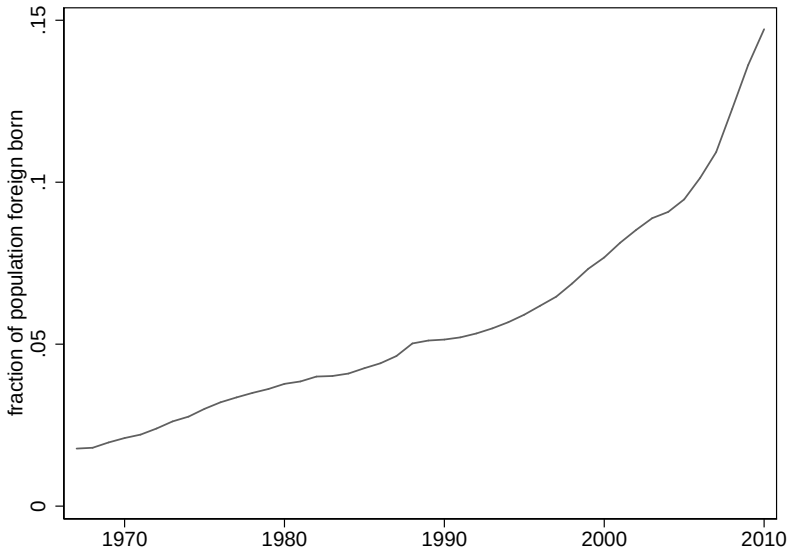
An ideal measure of labor income is hourly wages, as clearly differences in hours worked may be important. Using hours worked measures are available from the 1970 and 1980 census and annually from 1986–2010, Figure J.5 examines how the urban wage premium changes when including controls for hours worked. Accounting for differences in hours worked reveals similar patterns in the estimated urban wage premium over time, suggesting that differences in hours worked between urban and rural areas are not of major concern.

J.5 Changes in Commuting Patterns

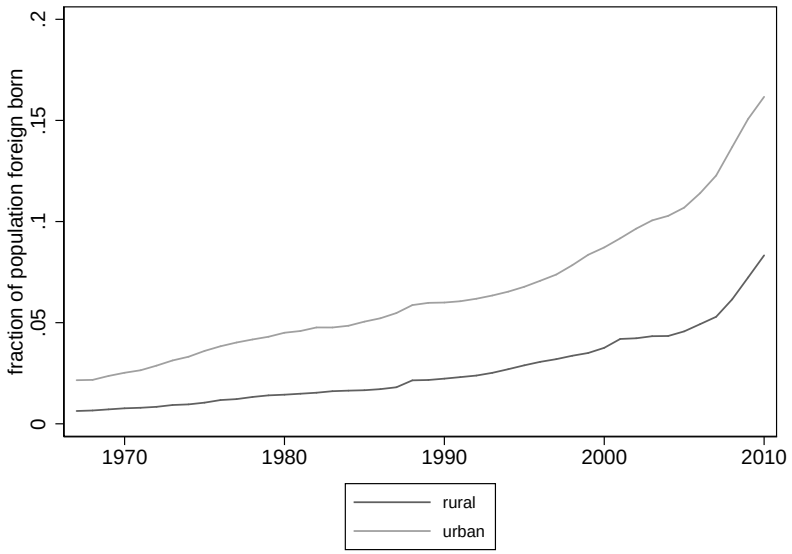
One additional factor which may change over time is commuting. Not only is transportation better connected in 2010 than in earlier years, but it is also less costly in terms of time. Despite this, commuting from rural to urban is roughly similar in 1986, where 3% of workers are rural-urban commuters, as it is in 2010, where 3.5% of workers commute. Making use of data available from 1986, Figure J.6 examines how the urban wage premium changes if urban status is defined using a worker's municipality of employment rather than municipality of residence. Using municipality of employment produces a similar pattern in the estimated urban wage premium though, in levels, the estimated urban wage premium is consistently lower when using municipality of employment. Defining urban status using municipality of employment suggests changes in commuting patterns over time explain little of the observed patterns in the urban wage premium.

Figure J.3: Fraction of population foreign born, 1967–2010

(a) National

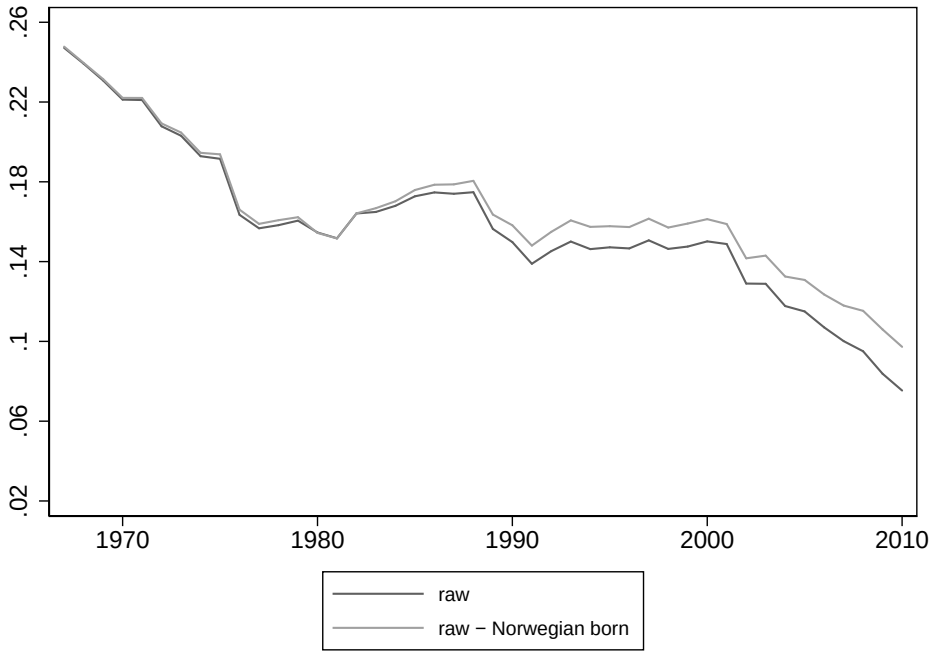


(b) Separated by Rural/Urban



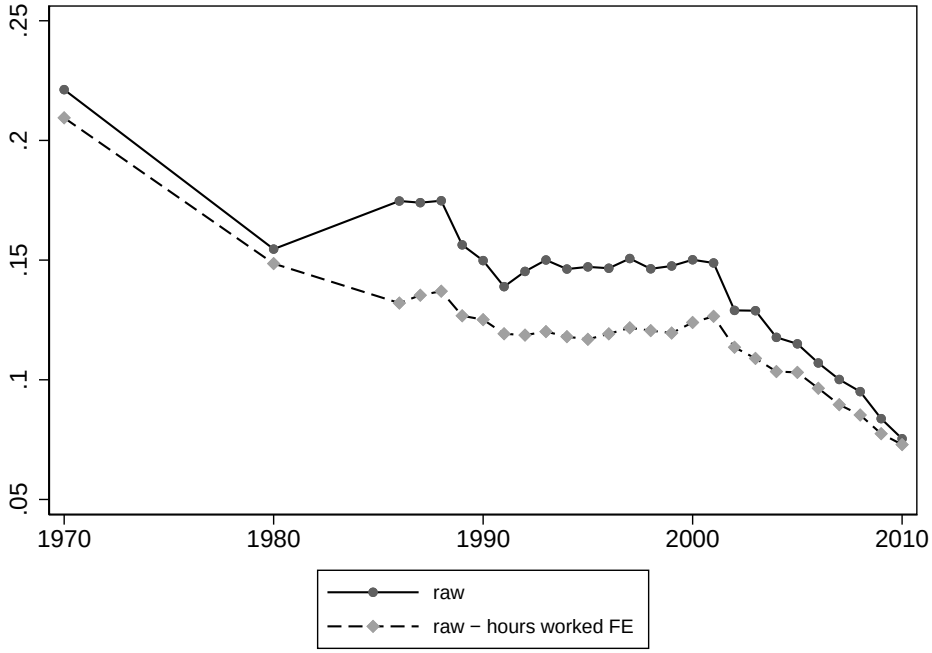
Note: Figure plots the fraction of the population foreign born over sample period. Panel (a) presents the evolution of the foreign born rate at the national level, panel (b) presents separate rates by urban/rural status. Urban status defined in Figure B.1.

Figure J.4: Urban wage premium for sample of Norwegian borns, male sample



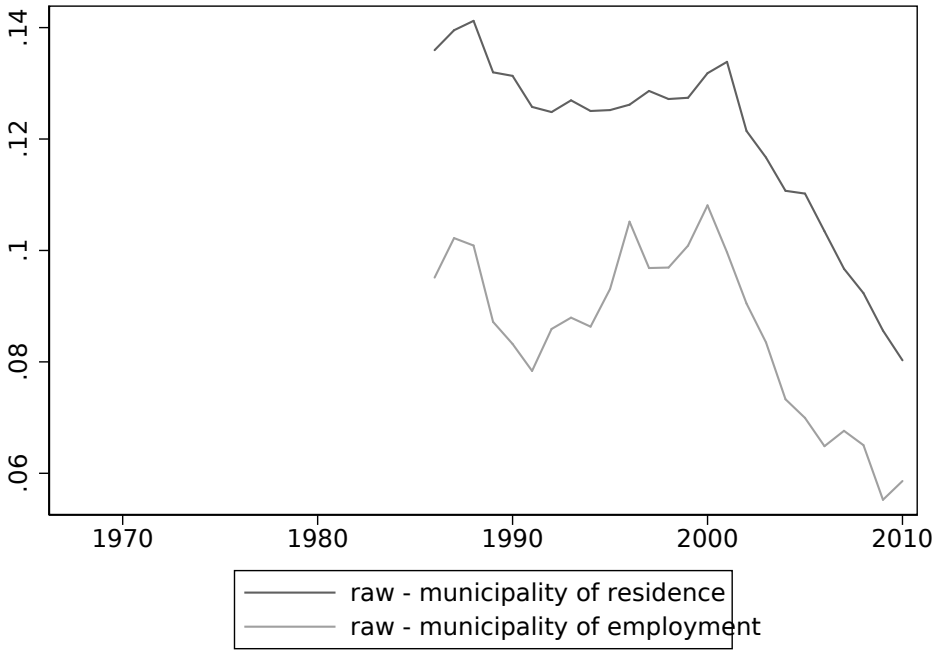
Note: Figure plots coefficients from separate regressions of Equation 1 for each year and foreign born status. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4.

Figure J.5: Urban wage premium for controlling for hours worked, male sample



Note: Figure plots coefficients from separate regressions of Equation 1 for each year. Dashed line includes hours worked fixed effects while solid line presents raw urban wage premium. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4. Hours worked are categorized into bins, corresponding to full-time employment, part-time employment, some employment, and no employment.

Figure J.6: Urban wage premium from 1986–2010 using municipality of residence and municipality of employment, male sample



Note: Figure plots coefficients from separate regressions of Equation 1 for each year. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4. Urban status defined differently depending on municipality of residence or municipality of employment from 1986 when data becomes available.

J.6 The Real Urban Wage Premium

In a simple standard theoretical framework (see for example Moretti, 2011), a worker's decision between two locations is a function of nominal wages, the cost of housing, local amenities, and some unobserved preference for a given location.[6] In equilibrium, nominal wages may differ across space. However, locations with higher nominal wages are typically accompanied by higher costs of living.

Spatial differences in real wages, nominal wages minus the cost of housing, will also exist when workers are not perfectly mobile—that is, they have some idiosyncratic preference for a given location—or when the supply of housing is not fixed. If workers are perfectly mobile, real wages will equalize across space in equilibrium as workers will always migrate to take advantage of the smallest differences in real wages. Glaeser and Gottlieb (2009) summarize the literature documenting the imperfect response of mobility. Likewise, if the supply of housing is fixed, then migration is impossible as housing cannot expand and any nominal wage change is perfectly compensated by an increase in the cost

[6]This abstracts from differences in other costs of living, assuming that differences in local prices are completely reflected in differences in house prices. Housing is a major component of local prices differences and Norwegian households spend a quarter of their household income on housing between 1999–2009.

of housing. Glaeser and Gyourko (2005) emphasize the importance of asymmetries in urban growth and decline; as the durable nature of housing implies housing cannot immediately decline, declining urban areas have a fixed housing supply in the short run.

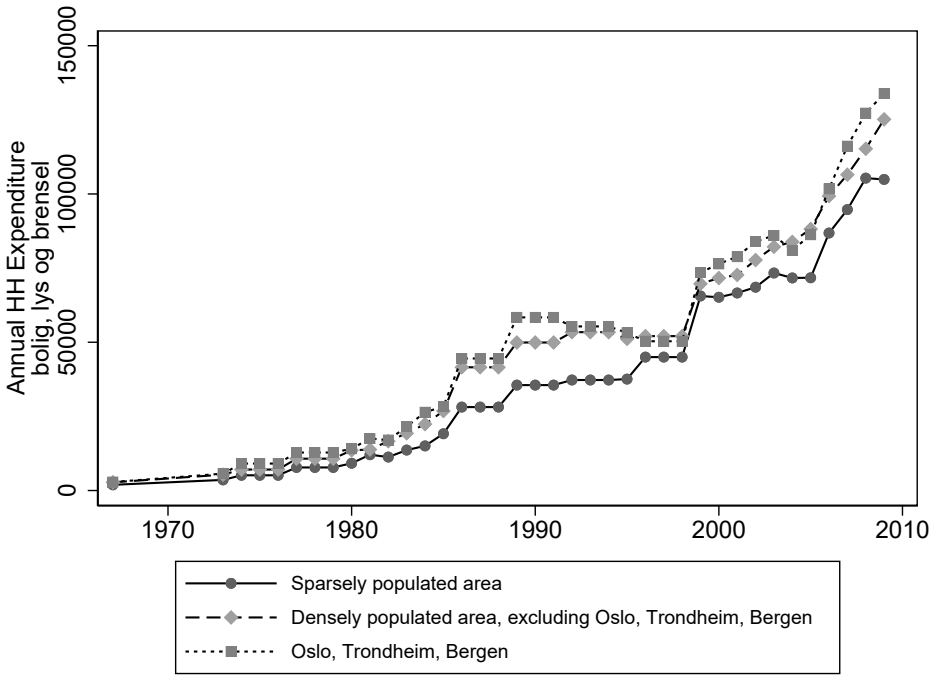
Comparing the evolution of the real urban wage premium to the nominal urban wage premium is informative for two reasons. Firstly, it informs how changes in the urban wage premium changes accounting for differences in local prices. Specifically, changes in the nominal urban wage premium between 1967–1980 and 2000–2010 may disappear when accounting for local price differences. Secondly, the presence of spatial differences in real wages informs the importance of factors such as amenities or unobserved preference for residing in a specific location. If, for instance, the real urban wage premium is negative but workers continue to migrate into urban areas, then either workers have a strong preference for such places or amenities must be different in urban areas.

J.6.1 Creating a local price index

The consumer survey historically has housing prices for the 3 largest cities, Oslo, Bergen, Trondheim. These values are assigned to these three municipalities. We map the 30 largest municipalities to the index for densely populated areas. All other municipalities are assigned the value of housing equivalent to sparsely populated areas; that is, apart from Oslo, Bergen, Trondheim and the 30 largest municipalities, housing prices are assumed equal across all other areas. The figure below plots the annual expenditure of households on housing in the three different areas over time.

Using this developed measure of local prices from information from consumer expenditure surveys (forbruksundersøkelsen) conducted by Statistics Norway going back to 1967, we estimate the real urban wage premium in Figure J.7. Each edition of the consumer expenditure survey asks households detailed questions on spending on separate consumption categories such as food, housing, clothing, transportation, and restaurants. Importantly, Statistics Norway has historically separated households based on three categories: (1) those in Oslo, Trondheim, or Bergen; (2) those in densely populated areas excluding Oslo, Trondheim, and Bergen; and (3) sparsely populated areas. To account for local price differences, we use information on total household spending on housing across different areas.

Figure J.7: Differences in local housing prices across urban and rural areas

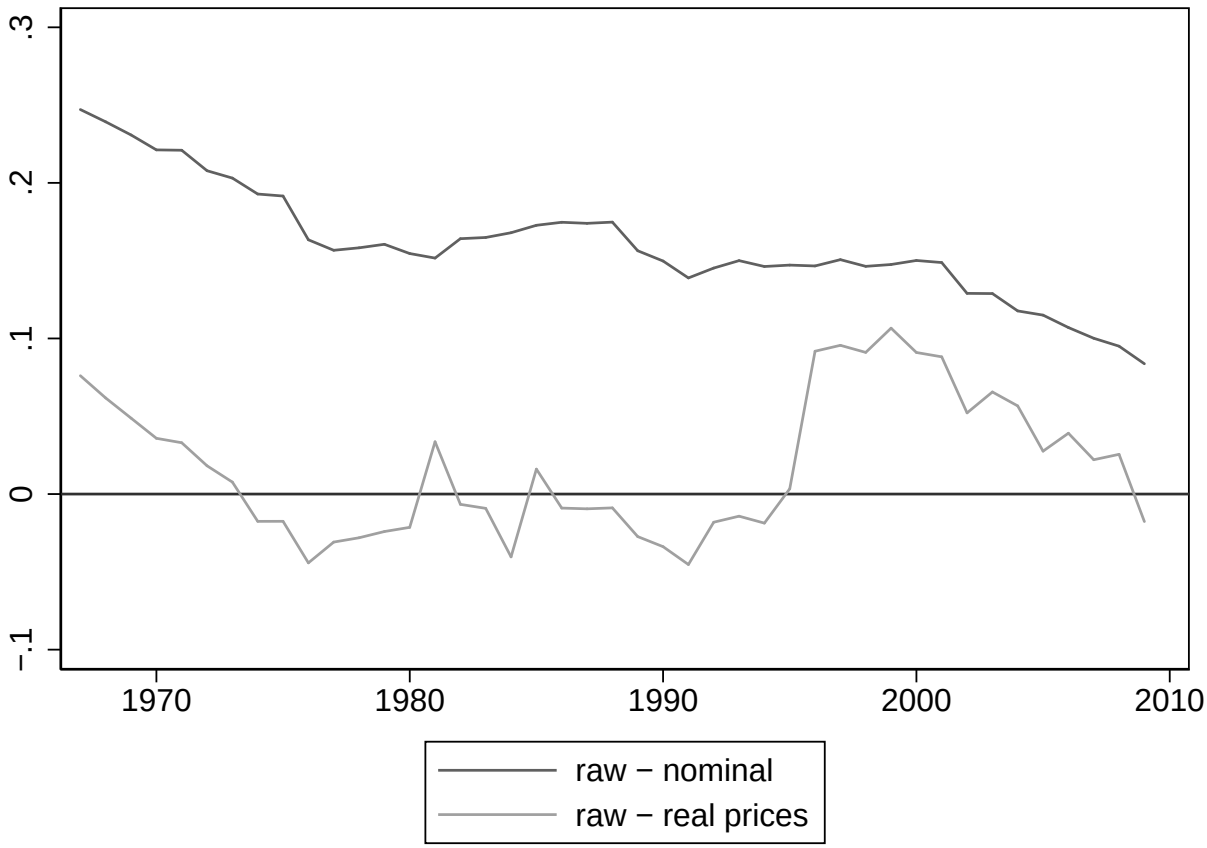


Note: Housing prices extracted from consumer expenditure surveys as described in Section J.6.1. Linear growth assumed between 1968 and 1972.

J.6.2 The Real Urban Wage Premium

Mapping different areas to the three different categories from the consumer expenditure survey as described above, Figure J.8 compares changes in the nominal and real urban wage premia from 1967–2009. From 1967–1980, the real urban wage premium declines substantially from 8% to -2%, a similar decline seen in the nominal wage premium. Throughout the 1980s and mid-1990s, the real urban wage premium remains close to zero or negative. From 1995, the real urban wage premium increases to 10% corresponding to declines in the cost of housing in urban areas and increases in rural areas. From 2000–2010, the real urban wage premium declines similarly as the nominal wage premium, becoming slightly negative by 2009.

Figure J.8: Real urban wage premium adjusted for local differences in cost of living, male sample



Note: Figure plots coefficients from separate regressions of Equation 1 for each year. Dark line corresponds to nominal urban wage premium while light line corresponds to real urban wage premium adjusting for local price differences. Urban status defined contemporaneously in each year as in Section D.2. The estimation sample is defined in Section 2.4. adjusted for local prices making use of housing index available from consumer survey data described in Appendix J.6.1.

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