The performance of immigrants in the Norwegian labor market

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Abstract. This paper tests the assimilation hypothesis with Norwegian data. Using both cross-section and cohort analyses, the results show that the 1970–1979 immigrant cohort experienced an earnings growth of about 11% between 1980 and 1990, when their earnings profile was compared to that of natives. This is lower than the 19% assimilation rate predicted by the cross-section method. On the contrary, the results reveal a rapid earnings divergence across cohorts, and between the 1960–1969 cohort and natives. It is also shown that the "quality" of successive immigrant waves has declined over time, thus biasing the cross-section estimates of assimilation.

1. Introduction

In recent years, the literature on the economic assimilation of immigrants has been dominated by analysis of two important questions: Do immigrants experience a rapid earnings growth over time and does this rapid growth lead to immigrants overtaking the earnings of native workers within 10–15 years after arrival in the host country? Chiswick (1978) arrived at these

conclusions following his cross-section study on the relative performance of white foreign-born males in the U.S. labor market.

Borjas (1985) was the first to question the empirical validity of Chiswick's findings, arguing that the use of a single cross-section to estimate the immigrants' earnings assimilation over time suffers from two major biases. First, if the quality, or productivity, of recent immigrants is systematically lower than that of earlier immigrant cohorts, the cross-sectional data will overstate the actual earnings growth of immigrants. For example, only if the Norwegian immigration policy selects immigrants from the international "immigration market" with about the same acquired skills (or productivity) each year, is the earnings experience of earlier immigrant cohorts a good predictor of most recent cohorts. Second, if the least successful immigrants return to their country of origin perhaps in response to, for example, changes in aggregate economic conditions in the host country, this incidence of return migration may lead to biased cross-section estimates of earnings assimilation.

In an attempt to address these biases, several empirical studies have re-examined Chiswick's findings using data drawn from two (e.g., Borjas 1985; Beggs and Chapman 1988; Lalonde and Topel 1991, 1992), or more cross-sectional waves (e.g., Baker and Benjamin 1994; Bloom et al. 1994; Aguilar and Gustafsson 1991). The results seem to indicate that, after accounting for the usual factors that determine immigrant earnings, recent cohorts have lower earnings than their native counterparts. Besides, these cohorts assimilate at a much slower pace than that predicted by cross-section studies. However, these studies also differ in their arguments about changing immigrant quality over time. For instance, Lalonde and Topel (1992) found no evidence of declining cohort quality, while the others conclude that the quality of immigrant cohorts have experienced a secular decline. This cohort effect, among others, explains why recent arrival cohorts earn less than earlier cohorts.

In Norway, little is known about how the earnings of immigrants respond to the assimilation process. This paper fills the gap by testing the assimilation hypothesis with Norwegian data. The main objective of this paper is to ascertain whether the cross-section method overstates (or understates) the actual earnings growth of immigrant cohorts in the Norwegian labor market. The results show that the 1970–1979 immigrant cohort experienced an earnings growth of about 11% between 1980 and 1990, when their earnings profile was compared to that of native-born workers. This is lower than the 19% assimilation rate predicted by the cross-section method. On the contrary, the results reveal a rapid earnings divergence across immigrant cohorts, and between the 1960–1969 cohort and natives. It is also shown that the quality (as measured by education and earnings) of successive immigrant waves has declined over time, thus biasing the cross-section estimates of assimilation.

This paper is organized as follows. The next section discusses the model specification. Section 3 describes the data used in this analysis, while the empirical results are presented in Sect. 4. I conclude with a summary of the analysis.

2. Model specification

The model specification draws heavily on that in Baker and Benjamin (1994). (See also Borjas 1985; Lalonde and Topel 1991, 1992). Consider a standard earnings function of the form

$$y_t = X'_t \beta_t + \sum_i c_{i,t} + \varepsilon_t, \tag{1}$$

where y_t is the logarithm of earnings recorded in census year t for immigrants who migrated to Norway in period i. X'_t is a vector of explanatory variables and $c_{i,t}$ are cohort-specific intercepts, β_t is a vector of unknown parameters to be estimated and ε_t, is the disturbance term. The disturbance term in (1), ε_t, is assumed to consist of three components

$$\varepsilon_t = a_{i,t} + \psi_{i,t} + u_i, \tag{2}$$

where $a_{i,t}$ represents the "assimilation" effect, e.g., accumulation of skills specific to Norway. The parameter $\psi_{i,t}$ is the "time" effect such as fluctuations in the level of economic activity, while u_i represents the "cohort" effect.

To examine how cross-section estimates of assimilation may overstate (or understate) the earnings assimilation of a particular cohort, I consider first a single cross-section measure of assimilation. From (2), the return to k years of assimilation can be calculated by comparing the relative earnings of recent and earlier arrival cohorts i.e.,

$$\varepsilon_{i,t} - \varepsilon_{i+k,t} = a_{i,t} - a_{i+k,t} + \psi_{i,t} - \psi_{i+k,t} + u_i - u_{i+k}. \tag{3}$$

The three parameters in (3) are not separately identified in a single cross-section. In this case, (3) will provide an unbiased estimate of assimilation $(a_{i,t} - a_{i+k,t})$, *only* if (i) $E(\psi_{i,t} - \psi_{i+k,t}) = 0$, i.e., there is no "time effect" on the relative earnings of the recent cohorts, and (ii) $E(u_i - u_{i+k}) = 0$, i.e., the successive cohorts have the same average unobserved quality e.g., talent.

Alternatively, a quasi-panel measure of the return to k years of assimilation can be obtained by comparing the earnings growth of a single cohort between two censuses i.e.,

$$\varepsilon_{i,t} - \varepsilon_{i,t-k} = a_{i,t} - a_{i,t-k} + \psi_{i,t} - \psi_{i,t-k}. \tag{4}$$

This estimator is unbiased if $E(\psi_{i,t} - \psi_{i,t-k}) = 0$. To net out the impact of the time effect, the earnings differentials between recent cohorts are decomposed relative to some base group, n. The earnings function for the base group may be expressed as

$$y_{n,t} = X'_{n,t} \lambda_t + c_{n,t} + \varepsilon_{n,t}, \tag{5}$$

where $\varepsilon_{n,t} = \psi_{n,t} + u_n$. By definition, $a_{n,t} = 0$. It follows that $(c_{i,t} - c_{i,t-k}) - (c_{n,t} - c_{n,t-k}) = (a_{i,t} - a_{i,t-k})$ if $E[\psi_{i,t} - \psi_{i,t-k}] - E[\psi_{n,t} - \psi_{n,t-k}] = 0$.

However, the validity of this assumption depends on the choice of a base group against which successive immigrant cohorts can be compared (Baker and Benjamin 1994). For example, if immigrants' earnings are normalized against less successful immigrants between two cross-sections, the estimate of assimilation will be overstated.

To be able to measure earnings assimilation using both cross-section and quasi-panel methods, I define the predicted average earnings of cohort i in time t as

$$\hat{y}_{i,t} = \bar{X}'_{i,t}\hat{\beta}_t + \hat{c}_{i,t}, \tag{6}$$

where $\bar{X}'_{i,t}$ is a vector of mean values of socioeconomic characteristics for immigrant cohort i in time t. The predicted earnings for this same cohort in time $t - k$ is

$$\hat{y}_{i,t-k} = \bar{X}'_{i,t}\hat{\beta}_{t-k} + \hat{c}_{i,t-k}. \tag{7}$$

The year-t predicted earnings, for a cohort that has the same years in Norway as cohort i does in $t - k$, is

$$\hat{y}_{i+k,t} = \bar{X}'_{i,t}\hat{\beta}_t + \hat{c}_{i+k,t}; \tag{8}$$

that is, in t, cohort $i + k$ has the same years since migration as cohort i does in year $t - k$. For example, given that $k = 1o$, immigrants who migrated in 1960–1969 have been in Norway between 10–20 years as of 1980. As of 1990, those who arrived in 1970–1979 have also been in Norway between 10–20 years. Finally, I define the predicted earnings for the base group, n, in year t as

$$\hat{y}_{n,t} = \bar{X}'_{i,t}\hat{\lambda}_{n,t}. \tag{9}$$

Using (6) and (8), the cross-section estimate of assimilation $(\hat{c}_{i,t} - \hat{c}_{i+k,t})$ is equal to $(\hat{y}_{i,t} - \hat{y}_{i+k,t})$. (Note that the c's are the actual dummy variables used in the estimation while the ε's may be the underlying components of the error term.) Note that the vector $\bar{X}'_{i,t}$ is common in all the calculations.

To ascertain a potential bias in the cross-section estimates, the earnings growth is decomposed into within-cohort and across-cohort earnings growth, i.e.,

$$\hat{y}_{i,t} - \hat{y}_{i+k,t} = \{(\hat{y}_{i,t} - \hat{y}_{n,t}) - (\hat{y}_{i,t-k} - \hat{y}_{n,t-k})\}$$
$$+ \{(\hat{y}_{i,t-k} - \hat{y}_{n,t-k}) - (\hat{y}_{i+k,t} - \hat{y}_{n,t})\}. \tag{1o}$$

Using the definitions in (6)–(9), the first component of (10) can be rewritten as

$$\bar{X}'_{i,t}[(\hat{\beta}_t - \hat{\beta}_{t-k}) - (\hat{\lambda}_t - \hat{\lambda}_{t-k})] + (\hat{c}_{i,t} - \hat{c}_{i,t-k}). \tag{11}$$

After netting out the impact of time effect on the earnings of recent cohorts, and given fixed cohort effects, this within-cohort growth captures changes due to net differences in market returns to individual characteristics and changes due to assimilation.

Similarly, the second component (i.e. the across-cohort growth) can be rewritten as

$$\bar{X}'_{i,t}\left[(\hat{\beta}_{t-k} - \hat{\beta}_t) - (\hat{\lambda}_{t-k} - \hat{\lambda}_t)\right] + (\hat{c}_{i,t-k} - \hat{c}_{i+k,t}). \tag{12}$$

Equation (12) measures the potential bias in the cross-section estimates of earnings growth. Estimates of the within- and across-cohort earnings growth of various immigrant cohorts are reported in Table 2.

3. Data and sample selection

The findings in this paper are based on data from the Population Census of Norway Data Bank (FTDB). FTDB is a 8.33% sample of the central register. The central register was created by joining files from the 1960, 1970, 1980 and 1990 population censuses respectively. Overall, the central register contains information on 5.6 million individuals aged 16 years or above. For the purpose of this study, information on all the 9080 immigrants in FTDB was used. In addition, a sample of 9080 natives was randomly drawn to match the immigrant sample.

Individuals included in the analysis are men aged 17–55 in the 1980 sample, and aged 27–65 in the 1990 sample (e.g., Borjas 1985), who worked full time in the two census periods, who earned positive incomes (i.e., labor income including social security benefits) and were neither self-employed nor students.[1] To ensure a meaningful comparison between 1980 and 1990 earnings, the consumer price index (CPI) for 1980 was used to transform the 1990 earnings into 1980 inflation-adjusted Norwegian kroner. This was done by dividing 1990 earnings by 2.312.

The census data do not report the individual's period of immigration. However, the "personal identification" variable in the data provides information on the individual participation in the various population censuses. According to Norwegian law, only individuals who are registered as residents in Norway for at least six months prior to each census can participate in the population census. Using this eligibility condition, I constructed three dummy variables for the 1980 sample, and four dummy variables for 1990 sample respectively. For example, immigrants in the pre-1960 cohort reported participation in the 1960 Census. Similarly, immigrants in the 1960–1969 cohort reported participation in the 1970 Census, while those in the 1970–1979 cohort reported participation in the 1980 Census. Finally, immigrants in the 1980–1989 cohort reported participation in the 1990 Census. Due to the way these cohort-specific dummy variables are constructed, the intervals between the arrival cohorts are fixed at 10 years. Since the primary objective of this study is to test the assimilation hypothesis, the definition of the cohort-specific variables is appropriate.

Table 1. Differences in average earnings and education for recent immigrants and natives

	1980	1990
A: Immigrants' relative log earnings[a]		
All immigrants	0.076	–0.174
Cohort:		
1980–1989 Arrivals		–0.246
1970–1979 Arrivals	0.099	–0.056
1960–1969 Arrivals	0.043	–0.144
<1960 Arrivals	0.045	–0.054
B: Immigrants' years of completed schooling[b]		
All immigrants	11.8	9.5
1980–1989 Arrivals		9.3
1970–1979 Arrivals	12.3	8.8
1960–1969 Arrivals	11.4	11.4
<1960 Arrivals	10.6	10.8
Natives	11.0	11.8

Note: The statistics are calculated in the subsample of men aged 17–27 (27–55) in 1980 (1990) Censuses respectively.
[a] The percentage earnings differential between immigrants and comparable natives equals $100(e^X–1)$, where X is the average differences between log earnings of immigrants and natives.
[b] Average years of completed schooling among immigrants and natives in both samples.

The results presented in Table 1 show a downward trend in earnings and education of immigrants relative to natives over the decade. In 1980 the average immigrant had 11.8 years of education and earned about 7.6% more than natives. In 1990, the average education of immigrants has dropped to 9.5 years. Similarly, immigrants earned about 17.4% less than natives. The mean earnings and education of successive cohorts of immigrants have also declined relative to natives. For example, the 1970–1979 cohort had 12.3 years of education and earned about 10% more than natives in 1980. Between 1980 and 1990, both the earnings and education of this particular cohort declined relative to natives. For both the pre-1960 and the 1960–1969 immigrant cohorts, relative earnings have declined even though their educational levels have remained unchanged over the 10-year period. Finally, the earnings disadvantage tends to be higher for the 1980–1989 cohort (about 24.6%), than the earlier cohorts.

4. Assimilation of immigrants

The analysis in the previous section suggests that the quality (as measured by education and earnings) of successive immigrant waves is declining over time, thus supporting the hypothesis that there may exist cohort effect in the immigrant population. To examine the cohort effect on immigrants' relative earnings, a decomposition of the cross-section estimates of assimilation in (10), is carried out for the 1970–1979 and 1960–1969 arrival cohorts. The earnings of the pre-1960 immigrant cohort and that of natives are used to normalize immigrant earnings.

Table 2. Decomposition of cross-section growth in immigrant earnings

| Arrival cohort | Cross section | Control (base) group | | | | | |
| | | None | | Prior to 1960 | | Natives | |
		Within cohort	Across cohort	Within cohort	Across cohort	Within cohort	Across cohort
1960–1969	–0.2241	–0.1794	–0.0447	–0.1643	–0.0598	–0.1167	–0.1074
1970–1979	–0.1204	–0.1520	0.2724	–0.0453	0.1657	0.0390	0.0815

Source: Tables A 2 and A 3 of the Appendix.

In the first column of Table 2, I present the cross-section estimates of assimilation $(\hat{c}_{i,t} - \hat{c}_{i+k,t})$. The second, third and fourth columns report the decomposition estimates under the different normalizing groups. The estimates in column two are obtained by comparing the relative position of a particular cohort across the 1980 and 1990 censuses. As the results show, the cross-sectional analysis predicts that, between 1980 and 1990, the 1970–1979 immigrant cohort experienced an earnings growth of about 12%. However, the negative within-cohort growth indicates that this cohort actually experienced a decline in earnings by about 15.2% between 1980 and 1990. The negative within-cohort term suggests that the earnings profiles of earlier and most recent cohorts are diverging over time. Furthermore, the positive across-cohort growth indicates that the 1970–1979 cohort earned about 27.2% more than most recent cohort in 1990. Since the across-cohort growth exceeds the cross-section estimate, the positive return to assimilation in the cross-sectional data suggests that the "quality" of recent immigrants is declining across immigrant cohorts. A similar result is obtained if the pre-1960 immigrant cohort is used as the base (i.e., fixed-cohort approach). The negative within-cohort growth implies that the earnings profile of the 1970–1979 cohort and that of the pre-1960 cohort are diverging over time. The positive across-cohort growth indicates that the bias in the cross-section estimates is also large for the 1970–1979 cohort.

The within-cohort growth changes if the earnings of natives are used to normalize the earnings of immigrants. For example, the positive within-cohort growth implies that the 1970–1979 cohort experienced an earnings growth of about 3.9% during the first 10 years in Norway. Moreover, the positive across-cohort growth indicates that the 1970–1979 immigrant cohort in 1980 earned about 8.2% (relative to natives) more than most recent immigrants in 1990. Finally, both the within-cohort and across-cohort estimates for the 1960–1969 cohort are uniformly negative under the different normalizing groups. This implies that there is a divergence between the earnings profile of the 1960–1969 cohort and that of natives over time.

Aging and cohort effects

The previous section presented estimates of within-cohort and across-cohort earnings growths net of aging. The change in relative earnings of immigrants between 1980 and 1990 may be due solely to the fact that immigrant men are

Table 3. Pure aging plus within-cohort growth

	Pure aging	Cross-section	Control (base) group		
			None	Prior to 1960	Natives
1960–1969	0.0270	–0.1971	–0.1524	–0.1373	–0.0897
1970–1979	0.0697	0.1901	–0.0823	0.0244	0.1087

Note: The aging effect is calculated as $\Delta_i - \Delta_n = 1\text{o}\,(\hat{\rho}_i - \hat{\rho}_n) + (\hat{\gamma}_i - \hat{\gamma}_n)(2\text{o}\,\bar{X} - 1\text{oo})$, where $\hat{\rho}$ is estimated coefficient of the age variable, and $\hat{\gamma}$ the estimated coefficient of the age-squared variable obtained from the immigrant and native regressions respectively (see, e.g., Borjas 1985). $\bar{X}$ is mean age of immigrants in a particular cohort.

10 years older in 1990 than in 1980. In this case, the predicted aging effect should be added to the within-cohort growth rate to give a more complete picture of immigrants' assimilation process in Norway. This implies calculating the impact of aging on the relative earnings growth of immigrants over time. A necessary condition for the calculation of pure aging effect is that the estimated coefficients on the age variable should differ for immigrants and natives. Table A 3 shows that this is the case. Immigrants tend to have a steeper age profile than natives, at least in the 1990 sample.[2]

Table 3 presents the estimates of pure aging (first column), and the sum of predicted aging and within-cohort growth rates evaluated under the different normalizing groups. To facilitate comparison, the predicted aging effect is added to the cross-section estimates of assimilation, since these estimates are also net of aging effect. The predicted aging effect indicates that an additional 10 years aging increases the earnings of the 1960–1969 immigrant cohort (relative to the earnings of natives) by about 2.7%, while, for the 1970–1979 cohort, the relative earnings increase by about 7% respectively.

This finding is, however, contrary to the findings in the American literature (e.g., Borjas 1985), which suggests that the pure impact of aging seldom works in favor of the immigrants. Two probable reasons may explain the differences in the conclusion. First, this may be due to the differences in the age composition of immigrant cohorts across immigrant-receiving countries. Second, this may also be due to the differences in the wage-setting mechanisms that operate in the Norwegian and U.S. labor markets respectively. For example, while the wage-setting mechanism is more institutionalized in Norway i.e., workers are paid more as they grow old, that of the United States is more market oriented.

Adding pure aging to within-cohort growth rate, the relative earnings of the 1970–1979 immigrant cohort grow at a rate of about 2% when the pre-1960 cohort is used as the base group, and at about 11%, when natives are used as the normalizing group. Comparing these figures to the cross-section estimate of about 19%, indicates that the cross-section method clearly overstates the earnings assimilation of the 1970–1979 immigrant cohort.

5. Conclusions

This paper uses two cross-sections drawn from the 1980 and 1990 population censuses to analyze earnings assimilation of immigrants in Norway. The results show that different immigration cohorts show different rates of earnings assimilation. These differences are as a result of changing quality of successive immigrant waves over time. For example, the 1970–1979 cohort experienced earnings growth of about 11% over the 1980–1990 period. This is lower than the 19% earnings growth predicted by the cross-section method. In contrast, the earnings profile of the 1960–1969 cohort tend to diverge from the native earnings profile over time. However, these results must be interpreted with care due to the limitations of this study. First, a potential sample selection problem due to the exclusion of part-time workers from this analysis may bias (downwards) the estimates. Finally, the small sample size makes it impossible to estimate earnings assimilation by ethnicity. It is likely that immigrants from the developed economies will experience different earnings growth than Third world immigrants due to a drop in cohort quality.

Endnotes

[1] Self-employed workers were eliminated from the analysis because their income includes both property income and labor income. Similarly, students may choose lower-paying jobs, perhaps in return for more flexible working hours. Part-time workers were also dropped from the analysis for similar reason and because of the very large variation in their weekly hours of work compared to full time workers. In this case, the hours of work of part-time workers may not be good indicators of their labor income.

[2] I also did a quasi-panel or cohort analysis based on age. That is, I defined dummy variables for 10-year groupings and used the coefficients on these dummies to examine how, for example, the earnings of individuals aged 17–27 increased over the 1980–1990 period. The results tend to be different for immigrants and natives thus providing a consistent basis for estimating age effect. Thanks to David Green for suggesting this point.

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Appendix

Table A1. Definition of explanatory variables in regression

Education	Years of completed schooling
Age	Census year *minus* year of birth
Married	One if married; zero otherwise
Visible-minority	One if originated in the Third World; zero otherwise
West	One if resides in Western Norway; zero otherwise
North	One if resides in Northern Norway; zero otherwise
$C_{1980-1989}$	One if immigrated in 1980–1989; zero otherwise
$C_{1970-1979}$	One if immigrated in 1970–1979; zero otherwise
$C_{1960-1969}$	One if immigrated in 1960–1969; zero otherwise
C_{1960}	One if immigrated prior to 1960; zero otherwise

Table A2. Means of explanatory variables in 1990 cross-section

	Year of immigration					
	Prior 1960	1960–1969	1970–1979	1980–1989	All	Natives
Education	10.8	11.4	8.8	9.3	9.5	11.8
Age	46.9	45.5	41.8	35.7	39.2	43.2
Age squared	2331.0	2166.8	1799.4	1319.8	1613.5	1965.1
Married	0.66	0.71	0.75	0.64	0.68	0.73
Visible minority	00	0.04	0.27	0.37	0.28	–
West	0.21	0.19	0.20	0.26	0.23	0.26
North	0.06	0.03	0.04	0.05	0.04	0.11
No. of observation	119	195	485	965	1764	2482

Table A 3. Estimates of earnings functions (Dependent variable: log earnings)

	1980		1990	
	Immigrants	Natives	Immigrants	Natives
Intercept		8.7343 (63.643)		9.544 (47.887)
Education	0.0237 (4.077)	0.0383 (9.433)	0.0194 (6.414)	0.0689 (17.708)
Age	0.0881 (5.471)	0.1066 (13.524)	0.0901 (4.942)	0.0413 (4.570)
Age-squared	–0.0010 (–4.550)	–0.0012 (–11.963)	–0.0010 (–4.748)	–0.0004 (–4.418)
Married	0.1295 (2.684)	0.1531 (5.853)	0.1077 (2.578)	0.1716 (7.090)
Visible-minority	–0.0676 (–1.297)		–0.4854 (–10.772)	
West	0.3310 (6.690)	–0.0347 (–1.440)	0.1561 (3.476)	–0.0217 (–0.911)
North	–0.2350 (–2.484)	–0.1050 (–3.123)	–0.2301 (–2.463)	–0.1127 (–3.311)
C_{1960}	9.1921 (34.204)		9.1510 (24.340)	
$C_{1960-1969}$	9.1312 (32.710)		9.0111 (23.639)	
$C_{1970-1979}$	9.2363 (33.144)		9.2352 (23.863)	
$C_{1980-1989}$			9.1148 (24.222)	
R-squared	0.21	0.27	0.14	0.15
Adjusted R-squared	0.21	0.26	0.13	0.15
$F(k, N - k)$	27.2	126.5	28.1	73.22
No. of observations	963	2102	1764	2482

Note: The t-ratios are given in parentheses.