Identifying earnings assimilation of immigrants under changing macroeconomic conditions.
The Norwegian experience

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Abstract

Labour market outcomes of immigrants and natives are affected differently by changes in macroeconomic conditions. In particular, we show that earnings of immigrants from outside the OECD area are more sensitive to local labour market conditions than are earnings of natives. Failure to account for this may bias estimates of earnings assimilation of immigrants considerably, particularly when periods of rising or declining unemployment are important to identify assimilation effects on immigrant earnings. We show that this is the case for Norway: An observed drop in relative earnings of non-OECD immigrants after about 10 years in the host country disappears when we allow for differential business cycle effects. Furthermore, the empirical evidence reveals that the earnings assimilation rate of non-OECD immigrants is significantly affected by local labour market conditions. The effect of unemployment on assimilation rates is interpreted in terms of a combined "wage curve effect" and a "learning effect" on the rate at which immigrants acquire country-specific human capital.

1. Introduction

The labour market assimilation of immigrants forms a central topic in the economics of immigration and is of major interest for public policy (Chiswick, 1978; Borjas, 1994; 1999; Bauer et al., 2000). Whether immigrants adapt easily to conditions in the host-country labour market; whether labour market success follows time in the host country; and whether labour market outcomes of immigrants eventually reach parity with those of natives are all critical for the economic impact of immigration policies. It is therefore of disconcert that the empirical literature studying labour market outcomes of immigrants reveals serious methodological challenges that complicate the assessment of immigrant assimilation.

In particular, studies of immigrants both in Europe and North America indicate that the relative labour market performance of immigrants has declined across arrival cohorts (Borjas, 1985; Baker and Benjamin, 1994; Bauer et al., 2000). Any negative correlation between labour market outcomes and date of arrival invalidates cross-sectional analyses of immigrant assimilation as such data fail to discriminate between improvements caused by time in the host country and the positive outcomes merely associated with older arrival cohorts. The standard approach around this challenge is the *synthetic panel methodology*, in which one combines multiple cross-sections and track labour market outcomes of arrival cohorts over time (Borjas, 1995). Unfortunately, even this methodology cannot overcome the problem of untangling aging-, cohort-, and period effects. Researchers therefore typically rely on the assumption that period effects are equal for immigrants and natives in order to identify assimilation effects on immigrant labour market outcomes. In the present paper, we build on the synthetic panel methodology but relax the equal-period effects assumption by allowing macroeconomic conditions to affect immigrant and native labour market outcomes differently.

Surprisingly, although prior studies suggest that immigrants and natives are affected differently by macroeconomic conditions, such linkages are largely ignored in the empirical literature on immigrant labour market assimilation. In the United States, tentative evidence in Chiswick, Cohen, and Zach (1997) shows that employment of immigrants is more adversely affected by macroeconomic downturns than employment of natives. Similarly, McDonald and Worswick (1997) find that the unemployment incidence of immigrant men in Canada

increases more during a recession than that of natives.[1] Further, studies of empirical wage curves, linking earnings of individuals to unemployment in their local labour market, show that earnings of less-established workers tend to be more responsive to local labour market conditions than are earnings of established workers (Blanchflower and Oswald, 1994). A central hypothesis of the present paper is that such differences also characterise the local labour market responsiveness of earnings of immigrants and natives. Indeed, using data from 1980 and 1990, Longva and Raaum (1998) conclude that the annual earnings of immigrant men in Norway are more sensitive to local unemployment than are earnings of native men.

The basic premise behind our empirical strategy is to augment the synthetic panel methodology with wage curve effects. By allowing the linkages between individual earnings and unemployment in the local labour market to differ for immigrant and native workers, we estimate assimilation effects on immigrant earnings accounting for differential responses to macroeconomic conditions. The empirical strategy further permits the rate of immigrant earnings assimilation to depend on macroeconomic conditions. A simple theoretical model is discussed in order to clarify the relationship between the wage curve effect and the human capital growth effect of unemployment.

Recent empirical evidence from the Scandinavian countries indicates significant assimilation effects on immigrant earnings, but also that the assimilation process is tied to arrival cohort, country of origin, and immigrant status. Based on large panels of immigrant and native men in Denmark, and jointly estimating assimilation effects on employment and wages, Husted et al (2000) conclude that immigrant assimilate partially to native, but that the assimilation process depends on immigrant status. In particular, the Danish study shows that labour market outcomes of those initially admitted as refugees fall significantly short of other immigrant groups and natives. Hayfron (1998) and Longva and Raaum (fortcoming) employ the synthetic panel approach and estimate assimilation effects on the earnings of immigrant men in Norway. Although quantitative estimates differ, both studies find significant assimilation effect on earnings. The authors also show that estimates based on cross-sectional data exceed those of the synthetic panel approach and attribute this to declining cohort effects across arrival cohorts. Longva and Raaum estimate assimilation effects separately for immigrants from OECD and non-OECD countries and find that such effects are greater for

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[1] Both the Chiswick, Cohen, and Zack and the McDonald and Worswick studies link employment experiences of immigrant to the national unemployment rate. One problem affecting the statistical evidence of these studies is that of short time series. In fact, the U.S. study is based on only four and the Canadian study on eleven unemployment observations.

the latter group. For OECD immigrants, they conclude that earnings profiles are comparable to those of native workers. Despite their higher assimilation rates, the study finds that earnings of immigrants from non-OECD countries do not reach parity with earnings of natives.

Previewing results below, we find that earnings of non-OECD immigrants show significantly greater responsiveness to local labour market conditions then do earnings of OECD immigrants and natives. We obtain this finding for both male and female immigrants. Next, we show that empirical estimates of assimilation effects are sensitive to whether or not we account for macroeconomic conditions for non-OECD immigrants in Norway. For this group, failure to control for the impact of local labour market unemployment leads to severe underestimates of assimilation effects on earnings. Furthermore, we find that the rate at which non-OECD immigrant men close the earnings gap with native men depends on macroeconomic conditions. For the first ten years after arrivals, earnings growth relative to that of natives is significantly greater during low unemployment regimes than during periods of high unemployment. Finally, we find that estimates of cohort effects—the permanent earnings potential tied to the arrival cohort—are significant. While recent immigrant cohorts from non-OECD countries have a lower earnings capacity than earlier cohorts, the opposite is found for OECD immigrants. The cohort effects are sensitive to whether or not we account for local labour market conditions for non-OECD immigrants but not for OECD immigrants.

2. Earnings assimilation among immigrants - empirical model

The empirical model builds on the formulation in Borjas (1999). Suppose we have n cross sections over the years τ ($\tau = 1,2,....n$) obtained in calendar year T_t. The earnings equation of immigrants is given by[2]

$$(1) \qquad y_{j\tau} = X_{j\tau}\phi_{i\tau} + \delta_i A_{j\tau} + \alpha YSM_{j\tau} + \lambda C_{j\tau} + \sum_{\tau=1}^{\Omega}\gamma_{i\tau}\Pi_{j\tau} + \varepsilon_{j\tau}$$

and the earnings equation of natives by

$$(2) \qquad y_{j\tau} = X_{j\tau}\phi_{n\tau} + \delta_n A_{j\tau} + \sum_{\tau=1}^{\Omega}\gamma_{n\tau}\Pi_{j\tau} + \varepsilon_{j\tau},$$

where y_{jt} is the log earnings of person j in data period t; X is a vector of socio-economic characteristics such as schooling and marital status; A gives the age at the time of

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[2] To simplify notation, higher-order polynomials for age and YSM are ignored in the presentation of the model.

observation; C_{jt} indicates the calendar year in which the immigrant arrived in the host country; YSM_{jt} is the number of years that the immigrant has resided in the host country; and P_{jt} is a dummy variable set to unity if the observation is made in data period t.

The rate of earnings convergence between immigrants and native is given by

$$(3) \qquad \frac{\partial y_j}{\partial t}_{\text{Immigrant}} - \frac{\partial y_j}{\partial t}_{\text{Native}} = (\delta_i + \alpha) - \delta_n = \alpha^*$$

Typically, immigrants earn less than natives at the time of arrival. Thus, immigrants reduce the earnings gap over time if the sum of YSM- and ageing effects exceeds the age effect of natives. The l-vector indicates how immigrant arrival cohorts differ with respect to time-invariant earnings potential and the vectors g_i and g_n measure the period effects, i.e., the impact of changing macroeconomic conditions, for immigrants and natives, respectively.

One key parameter of interest is a^*. However, the YSM-, the period, and the cohort effects for immigrants are not identified because

$$(4) \qquad YSM_{j\pi} = \sum_{\tau=1}^{\Omega} \Pi_\tau (T_\tau - C_{j\pi}),$$

which introduces perfect collinearity among the variables. Hence, estimates of the YSM-parameter, a, are influenced by both cohort- and time effects.

Period effects. The collinearity in (4) implies that some identifying restriction(s) must be imposed on equations (1)-(2). The "equal cohorts" assumption, $\lambda=0$, is unlikely to hold, because immigration policies change, political conflicts generate a mix of potential immigrants that change over time, etc. For example, Boyer et al. (2000) summarise immigrant assimilation in Europe and conclude that nearly all European host countries have experienced a decline in the upon-arrival immigrant-native wage gap. In the Norwegian case, Hayfron (1998) and Longva and Raaum (forthcoming) have shown that recent immigrant cohorts tend to have lower earnings potential than earlier cohorts.

An alternative identifying assumption, commonly used in recent studies following Borjas (1985), is "equal period effects"; $\gamma_{i\tau} = \gamma_{n\tau}$. In other words, trends and transitory changes in aggregate macroeconomic and labour market conditions are assumed to have the same relative impact on native and immigrant earnings. This restriction basically cleans out the immigrant period effect, by using the calculated effect of macro-conditions on earnings of the native-born comparison group. When observations are drawn from years far apart or under highly different macroeconomic conditions, however, the equal period effect assumption is unlikely to hold.

In order to allow for differences in responsiveness to business cycles, we extend the framework and introduce period effects that depend on the labour market conditions, measured by the local unemployment rate (u_{rt});

(5) $\quad \gamma_{gr\tau} = \gamma_{g\tau}^0 + k_g \ln u_{rt}, \quad g = i, n,$

where g denotes nativity and r subscripts the local labour market. It follows from (5) that the period effect is different for immigrants and natives if the distribution of regional unemployment differs, or more importantly, if local labour market conditions have different effects on immigrant and native earnings. Below we outline a theoretical model that predicts that immigrant earnings are more responsive to changes in local unemployment than are native earnings, i.e., $k_i < k_n (< 0)$.

Equation (5) is restrictive in the sense that the impact of local labour market conditions on immigrant earnings is independent of their years of residence in the host country. As discussed in the preceding section, this restriction is not likely to be valid. As immigrants accumulate human capital such as work experience, seniority, union membership, and interpersonal networks in the host country, we expect the influence of local labour market conditions on immigrant earnings to become more similar to that of natives. In other words, k_i is expected to depend on time spent in the host country and, perhaps, eventually approach k_n. Furthermore, the accumulation of human capital may be influenced by the unemployment rate. We therefore extend the empirical specification and let the effect of regional unemployment interact with years since (im)migration. This allows us to discuss the impact of local labour market conditions on both the relative level of earnings as well as on the assimilation rate of immigrants.

3. Unemployment and the labour market performance of immigrants

In this section we develop a simple framework in order to sort out the different mechanisms behind the relationship between local labour market conditions and immigrant earnings. First we discuss the direct effect of local unemployment on annual earnings through individual (un)employment experience. Next we attempt to sort out the combined effects of a wage curve mechanism and assimilation through the acquisition of country-specific human capital.

Let Y denote the annual earnings of an individual. We have:

$Y = T\{(probability\,of\ employment)W + (1 - probability\,of\ employment)Z\}$ (6)

Where T is the (given) number of weeks in a year, W is the weekly wage and Z denotes unemployment benefits. We assume that an immigrant's probability of employment equals $(1-u)j$ (YSM), where $\varphi(YSM) \in (0,1]$, $\varphi' > 0$. The term $1-j(0)$ is a factor representing immigrants' initial disadvantage in obtaining employment at the going wage, arising from a disadvantage in search behaviour or employment- or even wage-discrimination.[3] This disadvantage diminishes as the immigrant spends time in the country. For natives, $j = 1$. Defining r as the earnings replacement ratio of unemployment workers, $r=Z/W$, we have:

$$Y = TWH = TW(r + (1-r)(1-u)j) \tag{7}$$

The effect of local unemployment on annual earnings through employment duration is represented by the effect of unemployment on H (which is the term in brackets in the last equation). For given total number of weeks and weekly wage, this effect can be expressed by the logarithmic derivative of H with respect to unemployment:

$$h'_u = -\frac{(1-r)j}{r + (1-r)(1-u)j} < 0.$$

There is also a direct assimilation effect on employment represented by the logarithmic derivative of H with respect to years since migration:

$$h'_{YSM} = \frac{(1-r)(1-u)j'}{r + (1-r)(1-u)j} > 0.$$

Annual earnings increase with years since migration as the employment probability rises.

We next focus on the weekly wage rate, W. It is useful to express W as the product of two underlying determinants of wages:

$$W = BP, \tag{8}$$

where P denotes the individual's level of productivity and $B \in (0,1]$ is a share factor, determining the fraction of productivity that accrues to the worker. We discuss these two factors separately below. First we present a bargaining model that produces a wage curve

[3] Unemployment is high among immigrants in Norway. Røed and Zhang (2000, p.18) find that "Immigrants from non-OECD countries are known to be much more unemployed than observationally equal natives. The estimates .... indicate that this is attributed to both incidence and duration. For example, ..., male immigrants have roughly a 30 per cent higher transition rate from employment to unemployment, and a 23 per cent lower transition rate from unemployment to employment (cet. par.)."

The high levels of unemployment among immigrants can presumably be explained by a large number of factors; from standard human capital explanations, via information or signaling problems to prejudice. According to this argument, regional unemployment is likely to have a stronger impact on job prospects of immigrants than of natives. First, seniority and LIFO dismissals will generally favor natives and make immigrants more exposed to spells of non-employment. Secondly, when immigrants are less able to signal their productivity accurately, non-immigrant employers will tend to prefer native workers and the hiring probability

type of relationship. The model is a simplified version the bargaining model discussed in Barth et al. (2000) and produces a wage curve effect on the share factor B. Next we discuss the assimilation of human capital, focussing on the accumulation of country-specific capital. The latter relates to the development of P over time in the host country.

3.1. A simple bargaining model of wage determination

Consider first the share factor B. Assume that wages are determined in an asymmetric Nash bargaining solution. We have:

$$W = \beta P + (1 - \beta) A \tag{9}$$

where b is the bargaining power of the worker and A is the alternative wage. Let $A = (1 - u)\varphi \overline{W}$, where $\overline{W}$ is the average wage for workers with productivity P in the economy and $(1 - u)\varphi$ is again the probability of obtaining a job at this wage. (Recall that for natives, $j = 1$.) Assuming homogenous firms, the economy-wide equilibrium is characterised by $W = \overline{W}$. Inserting the expression for A into (9) gives the equilibrium wage $W = BP$, where

$$B(u, YSM, \beta) = \frac{\beta}{1 - (1 - u)\varphi(YSM)(1 - \beta)} \tag{10}$$

We note that B is a positive function of years since migration, i.e., B'$_{YSM}$>0. As j increases, the share-factor rises and pay gets closer to the level of productivity. The wage curve effect is B'$_u$<0 and inspection reveals that B''$_{u,YSM}$ > 0; i.e, *the wage curve effect decreases in absolute value with years since migration.* This is a result of the alternative wage effect of being a newcomer in the labour market.[4] As j approaches unity, the wage curve effect of immigrants approaches that of natives.

3.2. Unemployment and the accumulation of country-specific human capital

P is the productivity level of the individual. Assume for now that the productivity level of an immigrant is given by the following expression:

$$\ln P = p^I = p^N + \kappa(E) \tag{11}$$

where p^N is the log of the productivity level of a native-born worker with identical formal qualifications (e.g., age, gender, and educational attainment) as the immigrant and E is labour

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for immigrant job seekers tends to fall considerably when the number of applicants for a vacancy increases, see Cornell and Welch (1996) and Larsen, Riis and Raaum (2000).

market experience in the host country. $k(E)< 0$ denotes a learning function, measuring the relative difference between the productivity level of immigrants and natives. k thus describes the accumulation of country-specific human capital over time. $\kappa(0)$ can be interpreted as the "cultural distance" between the home and host countries. Because immigrants learn and accumulate skills (language etc.) as they collect experience in the new country, $\kappa'>0$. We interpret κ' as the learning effect of experience on earnings. We assume $\kappa''<0$ and that, eventually, κ approaches zero as immigrants close the culture gap and become equally productive to natives.[5] For simplicity of exposition, assume that the level of unemployment has remained constant over the period since immigration. We then obtain the following relationship for experience in the host country: $E=(1-u)YSM$. Thus, $k=k((1-u)YSM)$. Note that the country-specific capital assimilation rate is given by $\dfrac{\partial \kappa}{\partial YSM} = (1-u)\kappa' > 0$, which is simply the learning effect discounted by the probability of being employed.

How does the marginal learning effect change with different macroeconomic conditions? We have:

$$\frac{\partial^2 \kappa}{\partial YSM\, \partial u} = -\kappa' - (1-u)YSM\kappa'' \tag{12}$$

The first term is negative. The intuition is simple; higher unemployment implies a lower probability of obtaining a job which is necessary for learning. The size of this effect is the learning effect κ'. The second effect is positive, however. The effect arises from the fact that higher unemployment means lower levels of overall experience, which by assumption means that the learning effect, κ', is larger. If an immigrant experiences a higher level of unemployment, each additional year in the host country yields a greater learning effect because the immigrant is at a lower level of experience in the host country.

3.3 The overall effects of unemployment on immigrant annual earnings

The logaritmic derivative of (7) with respect to unemployment gives:

$$\frac{\partial y}{\partial u} = \frac{\partial h}{\partial u} + \frac{\partial b}{\partial u} + \frac{\partial p}{\partial u} = -\frac{(1-\rho)\varphi}{\rho + (1-\rho)(1-u)\varphi} - \frac{(1-\beta)\varphi}{(1-(1-u)\varphi(1-\beta))} - \kappa' YSM < 0 \tag{13}$$

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[4] In addition, β may be smaller for immigrants than for natives if their probability of being unionised is lower. Barth et al. (2000) show that the wage curve effect is lower for unionised workers than for non-union workers in a setting where non-union workers have a wage curve mechanism of the efficiency wage type.

[5] There is a debate over the issue of the level of convergence, see eg. Borjas (1994). In our theoretical model, any discrepancy between the long-run wage level of immigrants and natives must be due to differences in B, or in the definition of comparison group productivity level.

First we have a direct effect on earnings through lower employment. This effect depends on the replacement ratio of unemployed workers, r as well as on potential immigrant disadvantage among the pool of unemployed, j. Next, high levels of unemployment depress the wages of immigrants through a larger wage curve effect. Finally, unemployment reduces learning for every year in the host country.

Failure to account for the unemployment effect in (13) will bias estimates of entry-level wages if unemployment is correlated with entry cohorts in the data. Furthermore, the estimated assimilation rates are biased to the extent that within-cohort correlation exists in the data between years since migration and unemployment rates. Because *YSM* evolves over time, this essentially means that such bias occurs when unemployment, as observed for each cohort, displays a consistent growth- or decline pattern.

But a potential bias introduced by the level-effect of unemployment on earnings is not the whole story. According to the above model, earnings assimilation rates will be affected by unemployment as well. Earnings assimilation is driven by[6]:

$$\frac{\partial y}{\partial YSM} = (1-u)\left[\left(\frac{(1-\rho)}{\rho+(1-\rho)(1-u)\phi}+\frac{(1-\beta)}{1-(1-u)\phi(1-\beta)}\right)\phi'+\kappa'\right] \qquad (14)$$

and arises from better employment opportunities, ϕ', that gives both higher employment probabilities as well as a higher share parameter b. In addition, there is the learning effect, κ', from the employment experience.

Consider next the second-order derivative of equation (14) with respect to unemployment:

$$\frac{\partial^2 y}{\partial YSM\,\partial u} = -\left\{\frac{(1-\rho)}{(\rho+(1-\rho)(1-u)\phi)}+\frac{(1-\beta)}{(1-(1-u)\phi(1-\beta))^2}\right\}\phi'-\kappa'-(1-u)YSM\kappa'' \quad (15)$$

The first two terms associated with ϕ' and κ' are negative. The higher is unemployment, the lower is the assimilation rate. The last term, however, is positive, reflecting that a higher unemployment rate means lower levels of experience and thus a stronger learning effect at the margin. Which of the effects dominates is an empirical issue. Initially, upon entering the host country, both the learning effect, k', and the improved alternative wage effect, ϕ', are expected to be large. At higher levels of *YSM* both effects diminish, and the positive term is likely to dominate. Accordingly, when unemployment is low, we expect to see more rapid earnings assimilation.

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[6] Ignoring differences in aging effects between immigrants and natives as explained in section 2.

Table 3-1: Unemployment elasticities by country of birth and gender.

Country of birth:	Males			Females		
	Estimate (std.err) [# obs]	p-value model I against no wage curve	p-value model II against I	Estimate (std.err) [# obs]	p-value model I against no wage curve	p-value model II against I
Norway (natives)	.0073 (.00934) [490568]	.4352	na	.0161 (.01003) [404653]	0.108	na
Nordic Countries	-.0310 (.015662) [62418]	*0.048*	0.069	.0282 (.01194) [70775]	*0.0163*	0.427
Other OECD	-.0544 (.03361) [63545]	0.106	0.432	.0087 (.01392) [48139]	0.544	*0.000*
Eastern Europe	-.0477 (.02548) [23379]	0.062	0.137	.0037 (.03558) [18176]	0.918	0.172
Asia	-.1754 (.02918) [83068]	0.000	*0.000*	-.1061 (.01944) [44302]	0.000	*0.000*
Africa	-.1021 (.04719) [20578]	0.031	*0.019*	-.0904 (.03833) [6650]	*0.019*	0.095
Latin America	-.2150) (.04670) [12266]	0.000	*0.047*	-.0821 (.03609) [7864]	*0.024*	0.217
Asia+ Africa+ Latin	-.1760 (.02701) [115912]	0.000	*0.000*	-.1000 (.01814) [58816]	0.000	*0.000*

Note: Estimates of the unemployment elasticities are based on separate regression models of the type presented in Table A-3 in the Appendix. Robust standard errors are reported in parentheses using the cluster option by municipality in STATA.

Table 3-1 shows estimated unemployment elasticities for natives and six groups of immigrants by gender. Like Albæk et al (2000), we find no significant effect of local unemployment for natives. For immigrants from the Nordic countries, Eastern Europe and OECD countries we have small unemployment elasticities, significantly less than zero for males from the Nordic countries only. For all three groups of non-OECD immigrants from outside Europe, however, we find strong and highly significant wage curve effects. The last row gives the estimated elasticity of earnings with respect to unemployment for the pooled sample of non-OECD immigrants from outside Europe. The highly significant point estimates are -.176 for males and -.10 for females.

Column two displays the p-values for tests of presence of an unemployment elasticity. While no effect is found for immigrants from OECD and Eastern Europe, all of the non-OECD male immigrant groups display a significant and high unemployment elasticity. The same picture applies to females.

The next column reports the p-values of F-tests of inclusion of interaction terms between the quartic polynomial of YSM and the local unemployment rate. We find significant interaction effects for males from all non-OECD regions outside Europe and for women from Asia. With the exception of females from other OECD there seems to be no significant effects of the interaction terms between years since migration and local unemployment for immigrants from Europe or OECD countries.

The next two sections describe the development of unemployment and patterns of immigrations to Norway.

3.4 Unemployment rates over time

Unemployment rates of the last forty years are shown in Figure 3-1. Until 1983-84, unemployment in Norway fluctuated around 1.5 – 2.0 per cent. After a few years of high unemployment in the early 1980'ies, it returned to a historically normal level during 1985-87, before rising rapidly from 1988 and onwards. The unemployment peaked in 1993, fell gradually but remained relatively high throughout the mid 1990'ies. Our Norwegian data are

Figure 3-1. Unemployment rates.
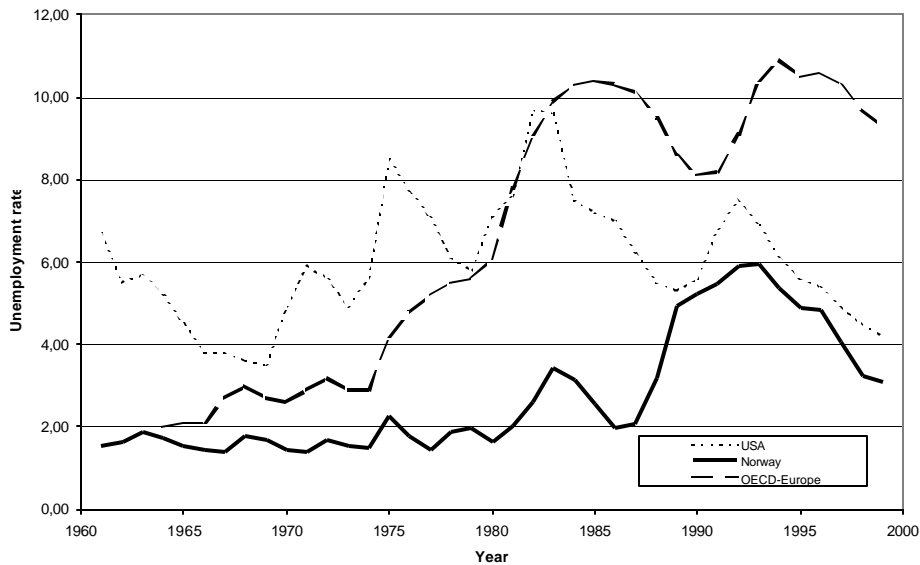
from the years 1980, 1990 and 1992-1996, which basically represents a period of low unemployment and a period of high unemployment.

3.5 Immigration policy and patterns of immigration to Norway.

This section briefly summarizes elements of immigration policy and reviews recent patterns of immigrant arrivals in Norway. Excellent, detailed description of present immigration legislation and characteristics of contemporary immigrants is available at the internet site of the immigration authorities in Norway, UDI (www.udi.no). In Norway, net immigration was negative until the 1960s as emigration of Norwegians (most often to the United States) exceeded arrivals of foreign nationals. In 1970, there were 59 thousand immigrants living in the country, making up only 1.5 percent of the total population (see Table 3-2). Immigration policy was liberal with few restrictions on admissions until 1975, at which time the national parliament imposed a temporary moratorium on immigration (the "innvandringstopp"). Since 1975 new legislation has favoured admissions on the basis of family reunification, skilled workers in specific industries (e.g., the offshore oil industry), and humanitarian grounds (political asylum). To illustrate, in 1999 UDI issued 15,480 residence permits and 19,290 work permits to foreign-borns admitted that year. Of the new permits, 26 percent were granted on the grounds of family reunification, 14 percent were given to individuals from membership countries of the European Economic Area (EEA)—who in principle do not face any restrictions with respect to seeking employment in Norway, and 8,552 (25 percent) were

temporary permits extended to seasonal workers in agriculture, the majority going to Polish nationals engaged in harvesting berry crops (UDI, 2000).

Despite enactment of strict immigration legislation in 1975, Table 3-2 shows that the immigrant population of Norway has grown steadily since 1970. By 1999, the 261 thousand immigrants residing in Norway accounted for almost six percent of the total population. A succinct pattern of Norwegian immigration is the change in mix of source countries over time. Early immigrants predominantly originated in the other Nordic countries or in Western Europe. For example, in 1970 45 percent of immigrants in Norway were born in a neighbouring Nordic country and another 38 percent in a Western European country. By the 1990s the fraction Nordic immigrants had declined to less than twenty percent, being replaced by immigrants from Asia and Africa whose share grew to almost 50 percent. An important observation is that such developments are not the result of declines in Nordic or Western European immigration (in fact, there were twice as many Nordic immigrants in Norway in 1999 as in 1970), but instead the consequence of substantial increases in Asian and African immigration to Norway.

Table 3-2: Immigrant Population of Norway

| | | | | Percent of Foreign-born from: | | |
| | | | | | | |
Year	Foreign born	Percent of Population	Nordic Countries (OECD – countries)	W Europe, Can, US, Aus, NZ	E Europe	Asia, C+S America, Africa (Non-OECD countries)
1970	59,196	1.5	44.8	38.0	9.8	6.0
1980	95,202	2.3	32.8	36.2	7.5	23.5
1990	168,298	4.0	22.6	23.7	8.1	45.6
1995	215,048	4.9	18.9	18.1	14.1	48.9
1999	260,742	5.9	20.1	16.0	14.4	49.6

Source: Statistics Norway (1999)

In summary, Norway as most other European countries has experienced an increase in its immigrant population since 1970. At the same time, we have also seen important changes in

the national origin mix of immigrants away from first-world countries and toward third-world countries.

4. The data

The data source is a database assembled from register data by the Frisch Centre for Economic Research.[7] The data extract used in the present study contains the complete immigrant populations of Norway in 1980, 1990, 1992, 1993, 1994, 1995 and 1996. The immigrant micro data are supplemented with 8.3 percent random samples of the native-born population in each year. Because the analysis requires information on time of residence in Norway and because the register data did not include such information prior to 1992, the immigrant samples from the early years are restricted to those still residing in Norway as of 1992. Immigrant status is defined by country of origin. Foreign-borns with Norwegian parents and Norwegian-borns with immigrant parents are excluded from the samples. We are not able to exclude students or self-employed. Persons in college or university will be included if their earnings exceed the threshold. Our measure of earnings includes taxable income from work, sickness pay, unemployment benefits and income when in labour market programs. Unfortunately, we are unable to study wage earnings only for all years, as the detailed information is only available for 1992-96. Earnings are measured in 1990-unit, deflated by the CPI. Persons with annual earnings below 15 000 NOK and above 2 000 000 NOK are excluded.[8]

The analyses are limited to those aged 25 to 64. The regression samples consist of 755,822 (year individual) observations of males and 600,559 females. Appendix Tables A-1 and A-2 list sample means of key variables separately for each gender by nativity.

4.2 The grouping of immigrants by country of birth

Previous studies show that earnings levels as well as earnings-age profiles differ between immigrants from different regions of origin. We therefore conduct separate analyses for immigrants from six different groups of countries. The first group is the Nordic countries, which are quite similar to Norway with respect to most relevant aspects. The next group is the rest of OECD countries. The third group is immigrants from Eastern Europe. Non-OECD

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[7] All the data are supplied by Statistics Norway.

[8] The lower threshold corresponds to the monthly fulltime wage of the lowest paid public sector employee in 1990. The upper cut-off is motivated by the existence of extremely high self-employment earnings.

countries from outside Europe are split into three groups: Asian countries (including some of Oceania), African countries and Latin American countries.

Separate analyses by region of origin is motivated by an expected difference between immigrants from wealthy western countries and from third-world countries. Immigrants from other European countries and North America are typically labour migrants, while, at least in Norway, refugees constitute a large part of immigrants from countries outside the OECD area. The level as well as the transferability of human capital, and the frequency of return migration differ across immigrant groups.[9] Therefore, earnings at the time of arrival and the growth of earnings with time spent in the host country, is likely to vary across groups. Whether the assimilation process differs across immigrant groups is highly relevant for policy as the expected earnings assimilation of new immigrants is important for evaluating costs and benefits of policy changes. In the case of Norway, the labour market is part of the common European labour market. Consequently, relaxing immigration restrictions would generate an inflow dominated by immigrants from third-world countries. Hence, the average labour market success measured across all immigrant groups of the past will be of limited interest for such policy evaluation.

Research from the United States, for example, indicate that earnings of immigrants can be linked to the level of development of their source country (Jasso and Rosenzweig, 1987; Bratsberg and Ragan, forthcoming). A positive relationship between development of the source country and earnings may result from differences in transferability of human capital (Greenwood and McDowell, 1991) or from differences in quality of educational institutions (Bratsberg and Terrell, 1997).

4.3 Controls and summary statistics

Educational attainment and marital status are the only earnings determinants included as controls in empirical specifications. We deliberately exclude other important wage determinants such as industry affiliation, union membership, occupation, seniority and actual work experience as these are highly affects by the assimilation process itself; see discussion on "over-controlling" in Borjas (1999). Similarly, citizenship of the host country is not included because acquisition of citizenship can be interpreted as a part of the assimilation process and its inclusion may therefore bias estimates of assimilation effects if naturalization

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[9] Tysse and Keilman (1997) find that only 25 percent of OECD immigrants were still living in Norway after a period of 6 to 10 years, compared to more than 80 percent of the immigrants from Asia, Africa and Latin-America.

is correlated with earnings potential. Educational skills are largely obtained at the time of immigration, but it may contain qualifications obtained in the host country. Even marital status can be affected by labour market success. On the other hand, marital status is highly correlated with working hours, particularly for women and we do not want too strong effects of labour supply.

Summary statistics for the control variables are given in Tables A-1 and A-2. In Norway, non-OECD immigrants are on average younger than natives, while OECD immigrants are slightly older. Immigrants are more likely to be married. Non-OECD immigrants tend to live in communities with somewhat higher local unemployment, while no noticeable difference exists between OECD immigrants and natives. The OECD immigrants have on average spent more time in Norway than the non-OECD immigrants. More than half of the non-OECD immigrants in the sample arrived after 1983 and just about 25-30 per cent are included in the low unemployment year of 1980. Information on educational attainment is missing for about 25 per cent of the immigrants, due to incomplete coverage in the education register (recent cohorts in particular).

5. Results

Failure to account for differences in the sensitivity to different macroeconomic conditions may bias estimated relative earnings profiles. In Table 3-1, we uncovered significant differences between the unemployment elasticities of natives and immigrants from non-OECD countries outside Europe. Furthermore, the patterns of immigration and unemployment over time in Norway suggest that years since migration and levels of unemployment will be highly correlated in the data, in particular for the older cohorts of immigrants. For this reason, we first display predicted earnings profiles as well as estimated cohort-effects in our data from two alternative specifications of the empirical model. The first assumes equal period effects, as is standard in the literature. The second includes wage curve effects that are allowed to vary between natives and immigrants as well as over time in the host country. We then proceed by examining the process of earnings assimilation over time under different local labour market conditions in some detail.

5.1 Predicted earnings profiles with and without allowing for differential wage curve effects.

In Figures 5-1 and 5-2 we display predicted earnings profiles for natives and immigrants from two models. Predicted earnings profiles for natives are drawn as single dotted lines. The first model for immigrants, the thin solid line, is a standard Borjas (1999) specification where the period effects are restricted to be equal for both natives and immigrants (as in columns (1) and (4) of Table A-3). The second specification, which is shown as bold solid lines, allows for different effects of local unemployment for natives and immigrants as well as over time in the host country (as in columns (3) and (6) of Table A-3). In all figures, the predicted earnings profile is computed using the average values of all other variables than age and year since migration for the relevant immigrant group.[10] We consider an immigrant who enters the host country at 25 years of age and draw the figures for the first 25 years in the host country.

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[10] In the models that allow for different unemployment effects, predicted earnings are evaluated at the median unemployment rate over the sample period.

Figure 5-1: Predicted Earnings Profiles of Native and Immigrant Men by Region of Birth

Nordic

Rest-OECD

East Europe

Latin America

Asia

Africa
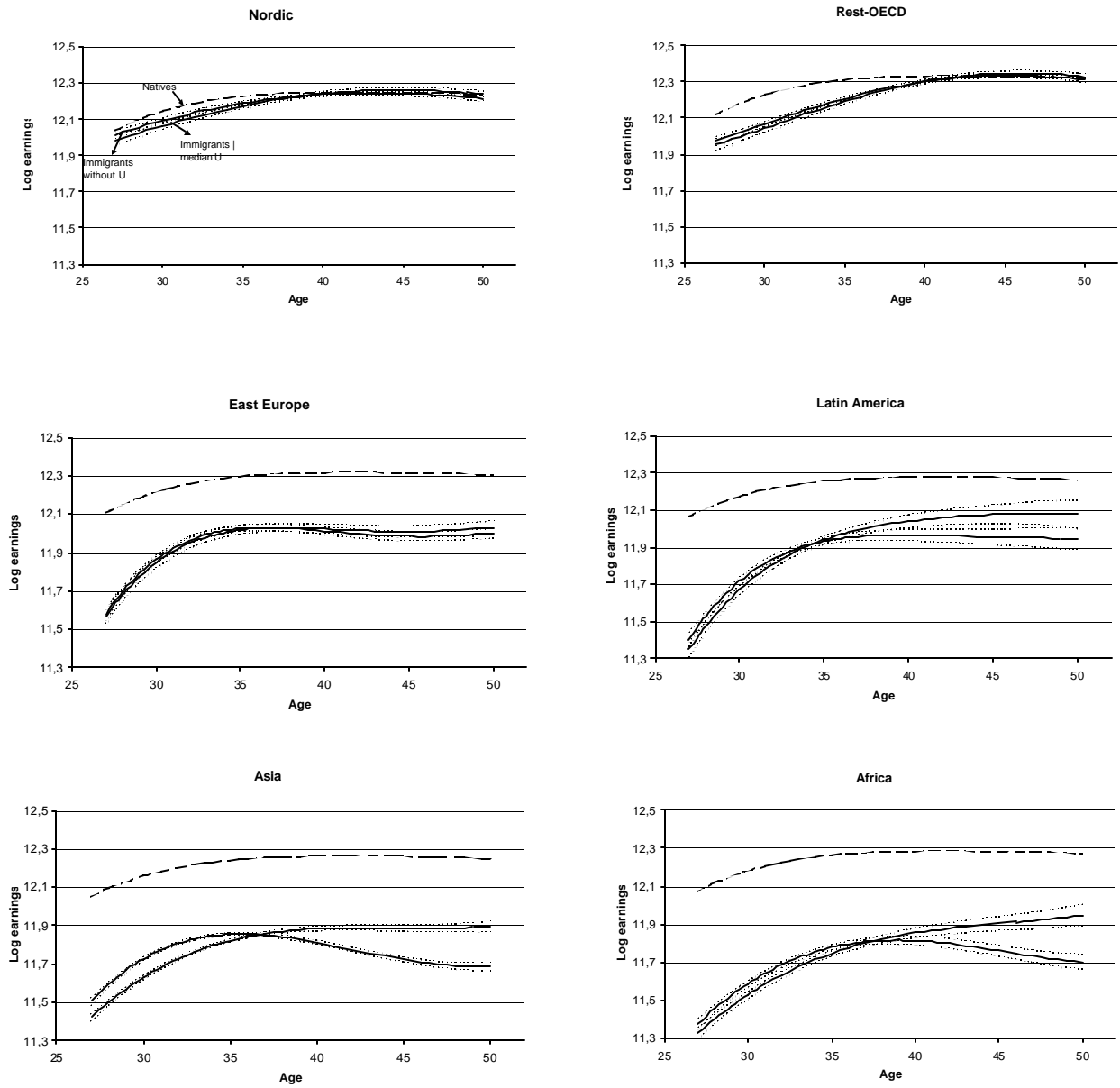
Because immigrants with less than two years of residence are excluded from the regression sample, we limit the reported predictions to the period after 27 years.

We also draw the 95 percent confidence interval (dotted lines) for predicted earnings for the average individual of the given age for immigrants. Few studies of assimilation pay attention to the uncertainty associated with the assimilation estimates. Typically, conclusions are drawn on the basis of predicted wage profiles, using the estimated parameters and evaluated at the means for immigrants under study; see, e.g., Borjas (1995) and Schoeni (1997). With high-order polynomials in age and YSM, the assimilation measure, a^*, or the predicted wage for a given age and YSM, are linear combinations of the regression coefficients. An estimate of the confidence interval around $\widehat{\alpha^*}$ must therefore be based on the (complete) covariance matrix of coefficient estimates.[11] The confidence interval for natives is extremely small, and we have chosen not to draw them into the figure as they would just appear as one single bold line together with the drawn line for predicted earnings.

Consider first the profiles for males (Figure 5-1). The upper left panel gives predicted earnings profiles for immigrants from the Nordic countries compared to the earnings profile of a native with the same characteristics as the average male Nordic immigrant. We find that there is a small earnings differential of less than 10 percent between immigrants and natives during the first 10-15 years since migration. After about 15 years the gap is closed and the earnings of an immigrant is indistinguishable from the earnings of a native. The same picture applies for immigrants from other OECD countries. The earnings gap is larger, about 20 percent after 5 years since migration, but the learning curve is steeper and the gap is closed by about 15 years. Consistent with the observation in the previous section that the wage curve effect is similar to that of natives, the model based on equal period effects performs equally well to a model that includes differential wage curve effects. This latter point applies to Eastern European immigrants as well. The Eastern Europeans do, however, display a larger income gap, and appear not to converge to the natives' level of earnings.

Turn now to the earnings of immigrants from non-OECD countries outside Europe. There is a considerable earnings gap initially. Furthermore, we find that under the equal period effect restriction, there is some earnings assimilation during the first 10 to 12 years after which the profiles of natives and immigrants diverge. This earnings dip of non-OECD immigrants, which imply a negative assimilation rate, is difficult to understand. However,

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[11] A STATA-procedure has been programmed by Tao Zhang.

inspection of the predicted earnings profile from the extended model specification reveals that the dip disappears once we allow for group-specific effects of local unemployment. The adjusted graph demonstrates a continuous process of earnings assimilation during the whole age interval. In other words, *holding unemployment constant*, the predicted earnings of non-OECD immigrants *do not fall* when they reach their late thirties as indicated by the standard specification. This picture is particularly evident for immigrants from Asian and African countries.

The interpretation of this result is as follows. Immigrants with more years since migration are typically observed in the 1990'ies and are consequently observed only during times of high unemployment. This implies a strong, positive correlation between years since migration and unemployment in the Norwegian data. Because immigrants are affected more adversely by high unemployment (or put differently, gain more from lower unemployment) in terms of earnings than natives, imposing equal period effect leads to a downward bias in estimated earnings for immigrants with many years since migration (or an upward bias in the estimated earnings for "young" immigrants). If immigrants of different cohorts had a more even mix of unemployment experiences, what we would observe on average is the profile displayed in the right-hand panel. If we net out the impact of high unemployment in the (early) 1990'ies, we disclose a continuous assimilation process, with an earnings differential between natives and non-OECD immigrant men of 0.7 log points 2 years after migration declining to an earnings differential of 0.3 log points after 25 years in Norway.

Consider next the earnings profiles of non-OECD females in Norway; see Figure 5-2. The same pattern is observed for women as for men; the observed dip in the earnings profile disappears once we allow for group specific effects of local unemployment. However, it turns out that women have a positive assimilation rate only for the first 8 to 10 years, after which the earnings curves diverge even with control for unemployment effects. The difference in earnings between immigrants and natives is smaller for women than for men. After two years in Norway, the native/non-OECD immigrant differential for women is about -0.35 log points and after 25 years it has decreased to slightly below -0.2.

Figure 5-2 : Predicted Earnings Profiles of Native and Immigrant Women by Region of Birth
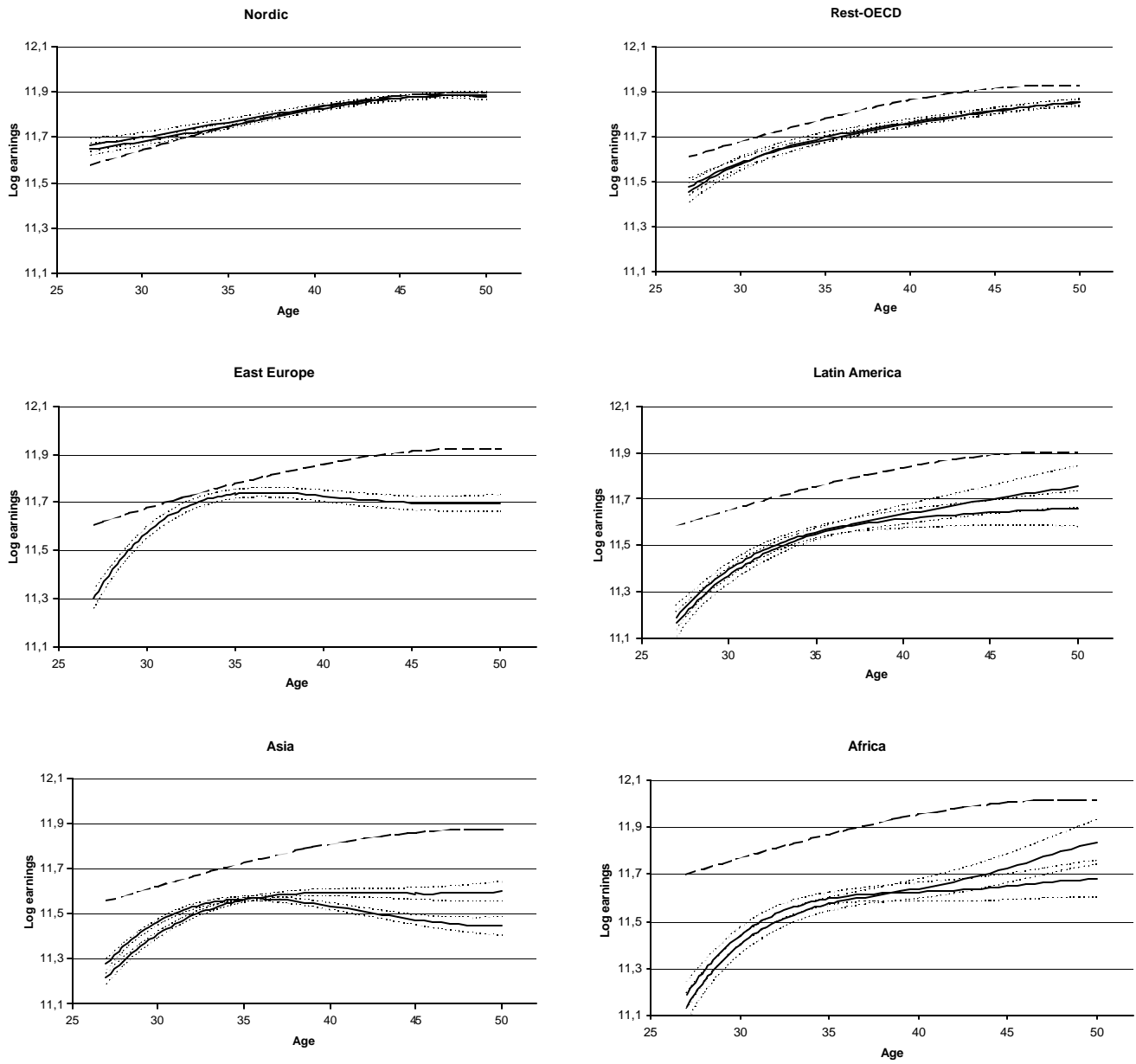
Comparing male and female non-OECD immigrants in Norway, we find that men have a higher earnings differential (in absolute terms) two years after entry but a higher assimilation rate. After about 15 years the two groups have fairly similar earnings differentials compared to their Norwegian counterparts. For both groups, the declining earnings profile observed after 35 years of age (10 years in Norway) is the result of falsely imposing the equal period restriction.

Female OECD immigrants have very similar earnings profiles as their native counterparts and controlling for unemployment effects has only minor impacts on predicted earnings.

Note that the predicted earnings profiles are evaluated for an "average" cohort. As we show in the next section, both model specifications reveal significant immigrant cohort effects on earnings. Predicted earnings for different cohorts would show up as differences in the constant term of the immigrant profiles in the figures of this section. Because cohort effects may also be biased when we ignore differential sensitivity to local labour market conditions, in the next section we discuss estimates of cohort effects from the three alternative specifications.

5.2 Cohort fixed effects

The debate on whether the skills of immigrants have been declining over time has been lively in the U.S. for more than a decade; see e.g., Borjas (1985; 1999), LaLonde and Topel (1992). One specific dimension of the discussion has been whether more recent cohorts have lower earnings capacity than those who arrived prior to 1970. Bauer et al (2000) report that a similar pattern is found in European studies as well. For Norway, Hayfron (1998) and Longva and Raaum (forthcoming) argue that cross-sectional estimates of immigrant assimilation is upwardly biased because the average earnings capacity of pre-1970 cohorts is higher than that of immigrants who arrived during the 1970'ies. Changes in immigration policies and the national origin mix are possible explanations for why this may have happened. In Norway, the gradual change to immigration based on family ties and political asylum could explain why cohorts differ with respect to their ability to succeed in the Norwegian labour market. In this section, we limit the analysis to cohort effects for non-OECD immigrants from outside of Europe. The samples of Asian, African and Latin American immigrants are pooled into one non-OECD sample.

The cohort-effects in Table 5-1, c_j^* $(j = 1,...J)$ are calculated as deviations from the weighted mean;

$$c_j^* = \hat{c}_j - \sum_{j=1}^{J} w_j \hat{c}_j$$

where w_j $(j=1, ...J)$ is the number of observations in cohort j divided by the total number of immigrant group observations and $\hat{c}_j$ $(j = 1,...J)$ is the estimated cohort coefficient. A cohort effect can be interpreted as the (average) time invariant earnings capacity of an immigrant of that cohort, relative to the average immigrant in the group, holding age, educational attainment, marital status, region of residence, country of origin, *and* years since immigration constant.

Consider first male non-OECD immigrants; see Table 5-1. Early cohorts generally have higher earnings than the more recent ones. According to this interpretation, the earnings capacity of Non-OECD immigrants has fallen over time. However, the cohort differentials shrink considerably when we include local labour market conditions as controls. A similar pattern is found for female Non-OECD immigrants. We thus note that *controlling for local labour market conditions reduces the pattern of falling earnings* capacity of Non-OECD immigrants in Norway.

Table 5-1: Cohort effects. Immigrants from Asia, Africa and Latin America (non-OECD)

Males

Cohort	I. Standard earnings profiles	II. With wage curve	III. With interaction unemployment and YSM
Pre-1965	.537 (.01801)	.242 (.0214)	.306 (.0229)
1965-68	.337 (0.0153)	.089 (.0180)	.136 (.0189)
1969-73	.167 (.0070)	-.015 (.0086)	-.008 (.0087)
1974-78	.133 (0.0074)	.029 (.0074)	.010 (.0085)
1979-83	.044 (.0080)	.051 (.0089)	.036 (.0096)
1984-88	-.099 (.0204)	-.025 (.0251)	-.020 (.0257)
1989-93	-.147 (.0078)	-.054 (.0096)	-.046 (.0097)
1994-97	.052 (.0286)	.136 (.0286)	.137 (.0286)

Note: The standard errors in parentheses are calculated as described in DeNew and Schmidt (1997).

Females

Cohort	I. Standard earnings profiles	II. With wage curve	III. With interaction unemployment and YSM
Pre-1965	.353 (.0229)	.130 (.0267)	.211 (.0293)
1965-68	.231 (.0270)	.045 (.0297)	.099 (.0307)
1969-73	.235 (.0147)	.112 (.0164)	.120 (.0167)
1974-78	.144 (.0098)	.077 (.0098)	.050 (.0113)
1979-83	.056 (.0136)	.055 (.0152)	.037 (.0162)
1984-88	-.069 (.0272)	.031(0.0317)	-.026 (.0322)
1989-93	-.161 (.0135)	-.110 (.0161)	-.093 (.0163)
1994-97	-.069 (.0272)	-.130 (.0307)	-.124 (.0307)

The significant cohort effects in Norway imply that the earnings differential between natives and immigrant differ across cohorts. However, even the Non-OECD cohorts with the highest earnings do not completely catch up with natives after 25 years in Norway.

5.3   Earnings assimilation of Non-OECD immigrants at different levels of unemployment
In section 3 we argued that local unemployment affects the level of immigrant earnings as well as the rate at which they converge to the level of natives (assimilation). Assimilation defined as the change in relative immigrant earnings may either rise or decline with local unemployment rates. There are several effects on assimilation: The first is the alternative wage effect working on the share parameter *B*. Assimilation occurs as the alternative wage increase. With high unemployment, however, this assimilation effect is lower since the probability of obtaining the alternative income is reduced. The second effect is the learning effect. Again a lower probability of being employed reduces the assimilation rate through learning. Both of these effects are thus negative in the sense that higher unemployment yields lower earnings assimilation. The third effect is positive. It arises from the assumption that the learning function is concave in experience. Higher unemployment means lower levels of experience, at which the assimilation rate through learning is actually higher. Or, put differently, if an immigrant has experienced low unemployment, a lot of learning is already done, and the potential for new learning diminishes. Finally, higher unemployment has a direct negative impact on immigrant earnings through lower employment probability. In this

section, we report in more detail from the empirical model, by which we are able to study the net of these three effects of unemployment on the rate of earnings assimilation. We limit the analysis in this section to the sample of non-OECD immigrants from outside of Europe, since this is the group for which we have found significant interaction effects between years since migration and local unemployment (Table 3-1).

Columns (3) and (6) of Table A-3 list coefficients of interaction terms between log of the unemployment rate and the years since migration polynomial In other words, the specification allows the assimilation rate to vary with conditions in the local labour market. Figure 5-3 illustrates the predicted earnings assimilation rates of non-OECD immigrants for different levels of unemployment, by displaying the difference between predicted log earnings between an immigrant and a native evaluated at the mean observed characteristics of the immigrants.

Consider first males. After 5 years in Norway, immigrants in the "low unemployment regime" earn about .4 log points less than their native counterparts. In the "high unemployment regime", the difference is .6 log points. Earnings assimilation from 2 to 5 years is clearly faster under low unemployment conditions. In order to avoid out-of-sample predictions in the figures, we start the drawings at two years since migration. However, visual inspection suggests that initial assimilation rates during the first two years upon entry are even more strongly affected by the level of local unemployment. According to the theoretical model in section 3, this faster assimilation rate is due to more learning and reduced wage curve effect from improved alternative income conditions under conditions of low unemployment. However, from about 5 years on, assimilation rates are slower under the low unemployment regime. The faster initial catching up under favourable employment conditions leaves less to be gained per year after 5 years since migration. After about 15 years in Norway, the earnings gap levels off under higher unemployment, while positive assimilation rates persist under better labour market conditions. Note, however, that the precision of the estimated earnings differential is low in the later part of the career. The overall picture is that of faster earnings assimilation early in the new country when labour market conditions are favourable. After about 15 years, however, the effect of different labour market conditions seems to diminish as the earnings growth in the low unemployment regime levels out.

The picture is fairly similar for females. We note that for women the earnings differential is actually lowest after about 6-7 years after which it drops again. The reason

Figure 5-3: Earnings Differentials between Natives and Immigrants from Africa, Asia and Latin America by Gender and Level of Unemployment

Males

Females
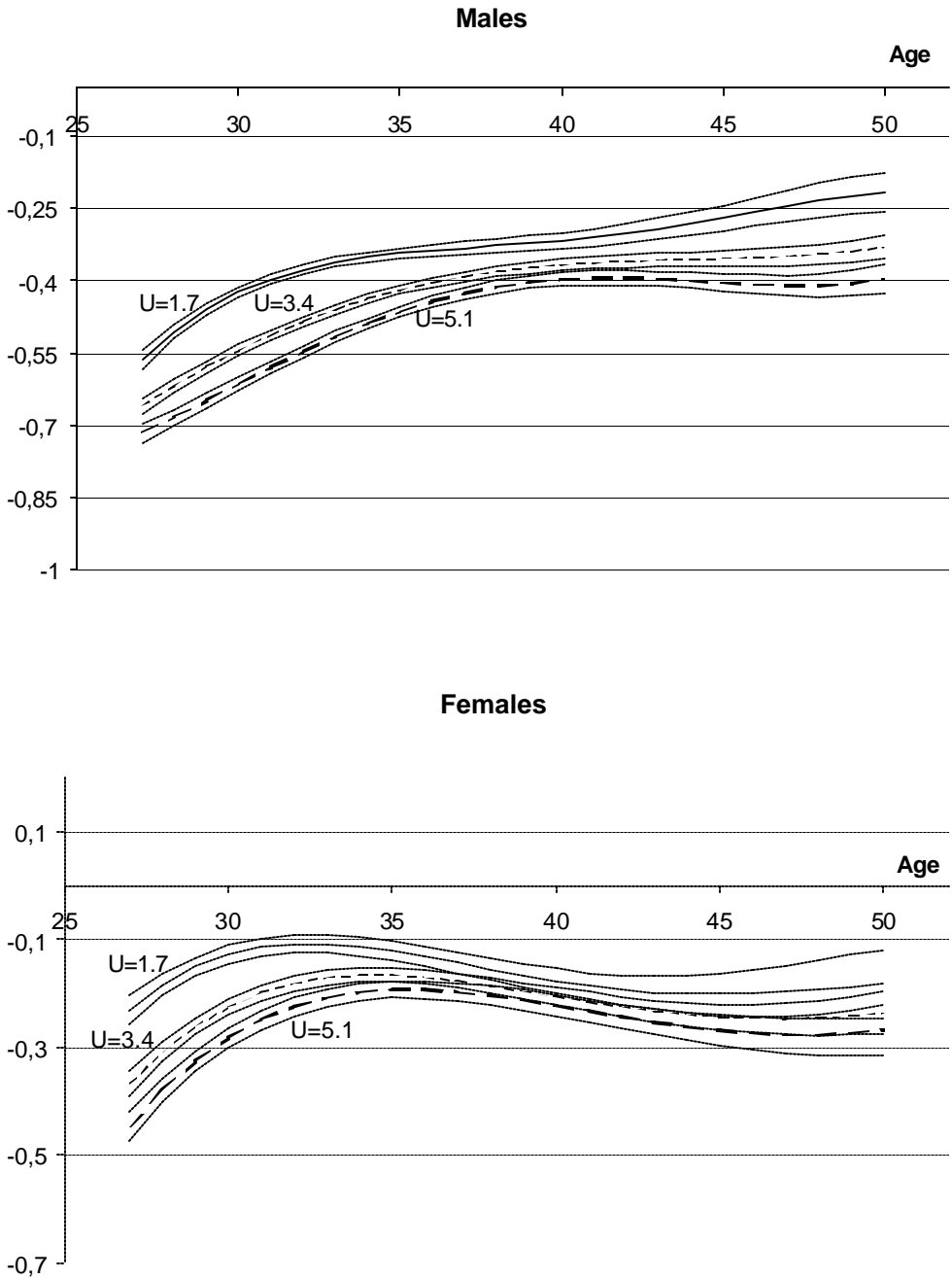
for this is, as we observed in the previous section, is that immigrant women do not keep up with the rather steep earnings path of native women after the age of 35. The predicted earnings path of immigrant women levels off at about 35 (about in the same manner as for native men), while the earnings of native women keep growing. Another difference, which arises from visual inspection of the curves, is that labour market conditions affect the entry level earnings for women more strongly than what we observe for men. Favourable conditions seem to set women on a higher level from the start on, rather than by improving the assimilation rates over the first 5 years that much. One possible interpretation of this finding is that, for female immigrants, the sensitivity of earnings to local labour market conditions works mainly through the share parameter, B, rather than through learning effects on productivity, P. Another interpretation is that, for women, the learning effect of better employment possibilities occurs soon after migration and peaks during the first year upon entry. Clearly, learning effects will also depend on the type of labour market. In the next section, we thus conduct separate analyses of immigrants with different levels of education.

5.4. Unemployment effects on earnings assimilation for different levels of education

In figure 5-4 we display earnings differentials between male immigrants and natives based on separate analyses for three different educational groups. The first figure shows earnings differentials in the labour market for those with lower education (9 years or less). There are no significant effects on earnings of the interaction between unemployment and years since migration. The only effect of unemployment is on the relative level of earnings. After 5 years, the log differential is .25 under low unemployment and .45 with high unemployment. Low skilled immigrants do relatively better under favourable labour market conditions, but they do not display a higher assimilation rate. It seems that cultural differences do not produce that much productivity difference for this group, and possibly the higher wage curve effect mainly arise from the share parameter rather than from the learning effect.

For the two next groups, assimilation is affected by unemployment as well. For the medium education group (10-12 years), income assimilation is much stronger during the first 5-8 years, bringing the immigrant differential to .4 in the low unemployment regime and .65 in the high unemployment regime after 5 years and .3 and .45 respectively after 10 years. Learning effects of unemployment seem to affect

Figure 5-4: Earnings Differentials between Natives and Immigrants from Africa, Asia and Latin America by Education and Level of Unemployment, Males
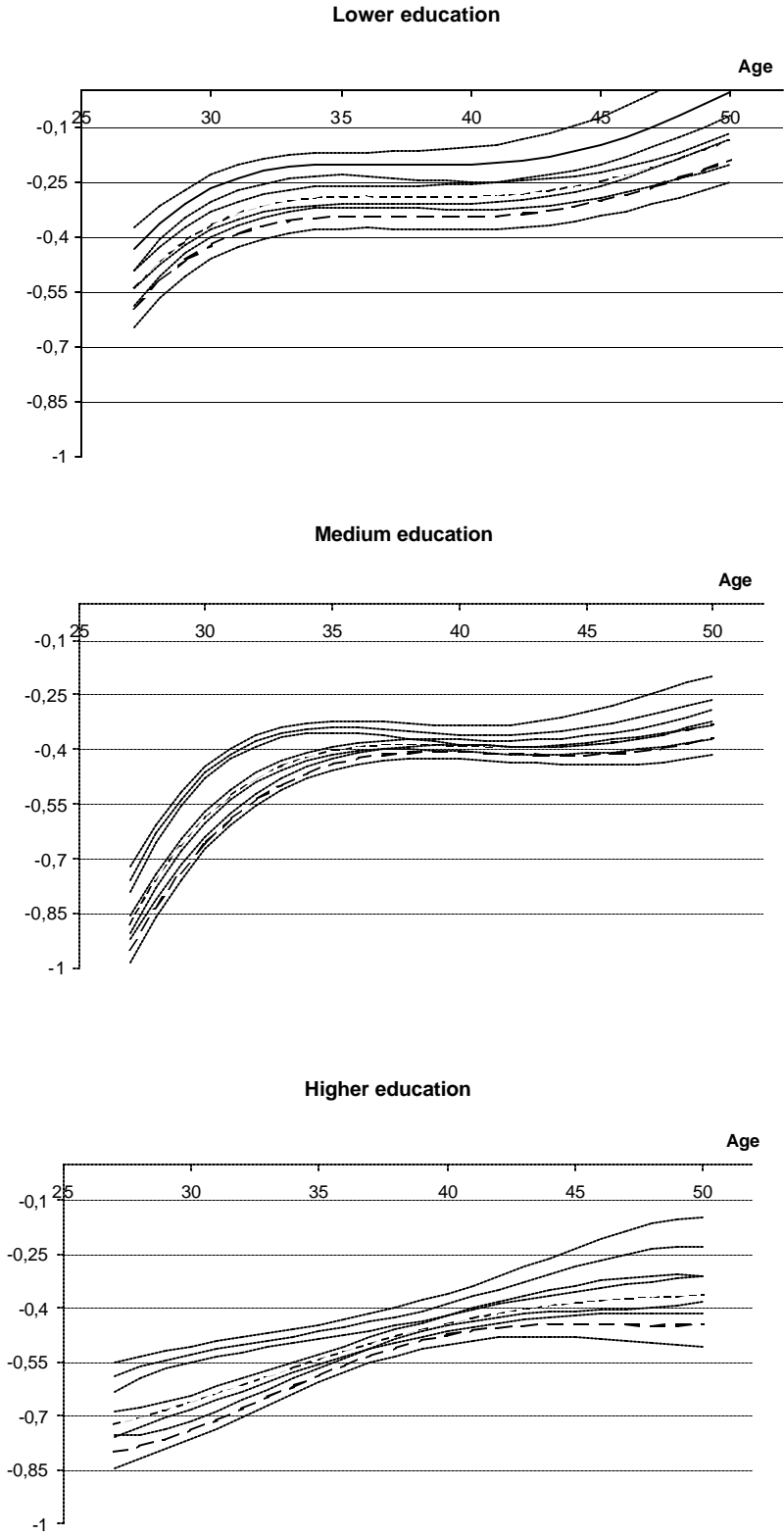
Lower education

Medium education

Higher education

the assimilation of this group strongly. The high skilled group with more than 12 years of schooling (high education), displays a continuous assimilation over the whole span of 25 years. It seems that initial assimilation, or entry level earnings, is most strongly affected by low unemployment. One possible interpretation of this is that newcomers with higher education have a higher probability of obtaining a job matching their educational skills early on in a better labour market. If this is true, a large part of the slow assimilation from about - .80 log points in the high unemployment regime is to a large extent a matter of getting into the right jobs. It takes longer for persons with higher education to bridge the cultural barriers, but these barriers are less important under very good labour market conditions.

The picture looks similar for women, see Figure 5-5.
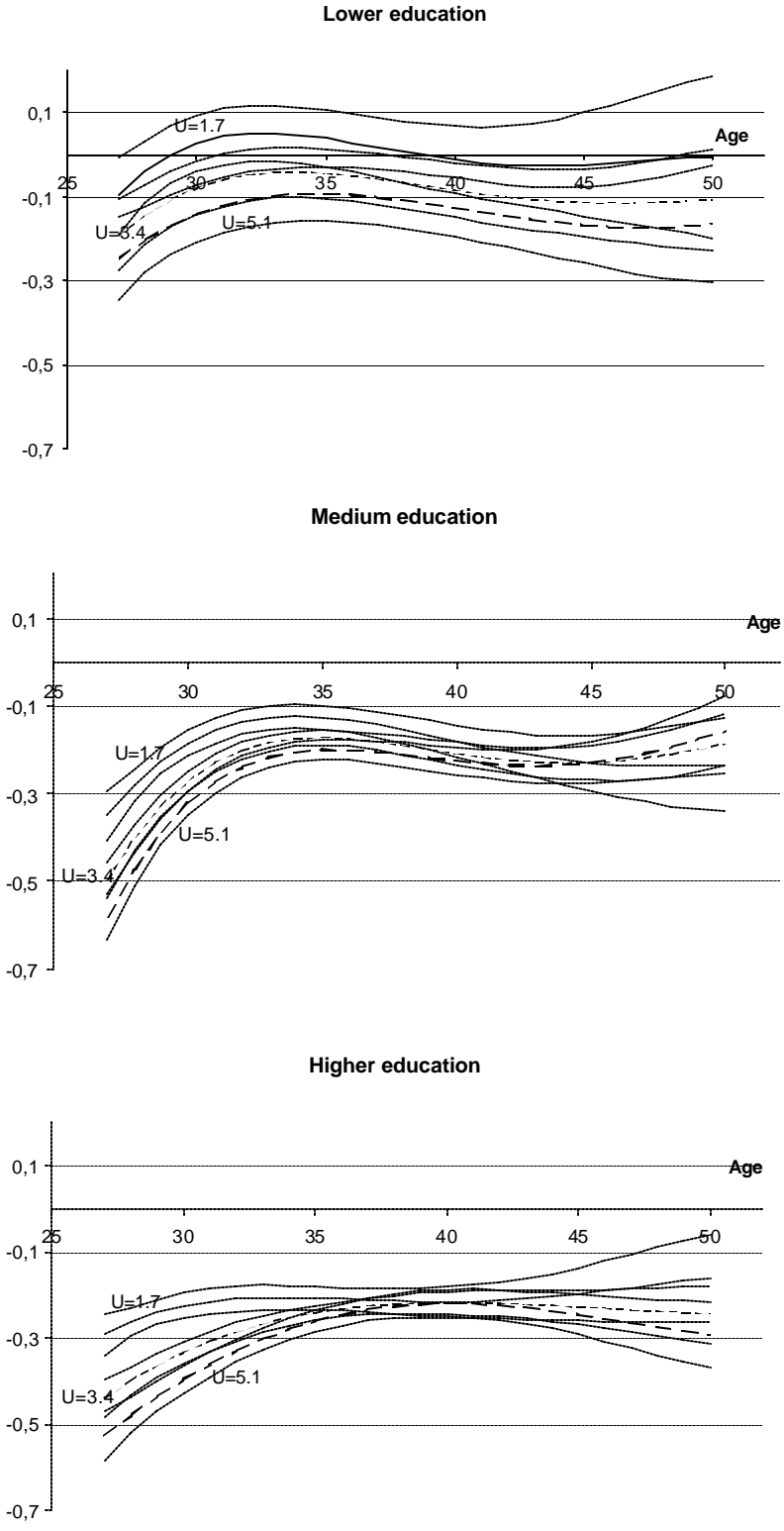
Figure 5-5: Earnings differentials between Natives and Immigrants from Africa, Asia and Latin America by Education and Level of Unemployment, Females

Lower education

Medium education

Higher education

6. Conclusions

Our study extends the standard earnings assimilation model of Borjas (1999), by taking into that account business cycles affect immigrants and natives differently. The standard model of earnings assimilation produces biased assimilation rates and cohort effects if (i) immigrant earnings are more sensitive to local unemployment than is the earnings of natives, and if (ii) years since migration or the observation span for any one cohort is correlated with the level of unemployment. Both of these conditions are met for immigrants to Norway from Asia, Africa and Latin America. The earnings of immigrants from countries outside the OECD area are found to be much more sensitive to local unemployment than is the earnings of natives or OECD immigrants. Furthermore the period of rising unemployment over the observation period induces a correlation between years since migration and the level of unemployment for several cohorts. When controlling properly for differential sensitivity to local unemployment an apparent and significant drop in the assimilation profiles of non-OECD immigrants after 15 years in the country disappears. The tendency of declining cohort levels persists, but is less important than predicted by the standard model.

It turns out that OECD immigrants have earnings profiles that are much more similar to those of natives. And for both OECD and other European immigrants, there is no added sensitivity of earnings with respect to local labour market conditions to that of natives.

We also find that assimilation rates for non-OECD immigrants are sensitive to local unemployment. For low skilled workers, the effect of unemployment on earnings is mainly on the relative level of earnings. For workers with more than 10 years of education, however, lower unemployment means faster assimilation rates during the first 5 years in the host country. After that assimilation rates are slower. We interpret this finding in terms of a model of earnings assimilation that incorporates both a standard wage curve effect arising from poorer alternatives for immigrants as well as a learning effect arising as the immigrants accumulate country specific human capital.

In a companion paper, Barth et al (2001), we explore the relationship between immigrant assimilation and unemployment in the United States. We find differences in the sensitivity of unemployment between immigrants and natives, but omitting differential unemployment effects does not bias the estimated earnings profiles. Unlike Norway, the US have experienced a much more cyclical pattern of unemployment, as shown in Figure 3-1, implying a weaker - if any - correlation between unemployment, cohorts or observed years since migration within cohorts. Also, the US is a traditional immigrant country without a

clear structure in the data between years since migration and particular periods of high or low unemployment.

Given the increase in European unemployment from the 70-ies to the 90-ies, together with a pattern of increasing immigrant population, our conjecture is that controlling for differential unemployment effects is important to obtain unbiased estimates of assimilation rates in most other European countries.

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Appendix

Table A-1: Summary Statistics, Male Samples

Variable	Asia		Africa		Latin America	
	Mean	StdDev	Mean	StdDev	Mean	StdDev
ln(Annual Earnings)	11.755	0.667	11.674	0.692	11.818	0.610
ln(Unempl Rate)	1.237	0.550	1.231	0.563	1.251	0.518
Years Since Migr	10.903	6.336	10.051	6.768	9.699	6.477
Pre-1964 Cohort	0.011	0.104	0.026	0.159	0.031	0.172
1964-68 Cohort	0.010	0.098	0.032	0.177	0.028	0.166
1969-73 Cohort	0.110	0.313	0.099	0.299	0.041	0.198
1974-78 Cohort	0.179	0.383	0.110	0.313	0.141	0.348
1979-83 Cohort	0.183	0.387	0.128	0.335	0.111	0.314
1984-88 Cohort	0.376	0.484	0.400	0.490	0.569	0.495
1989-93 Cohort	0.128	0.334	0.200	0.400	0.077	0.266
1994-97 Cohort	0.003	0.055	0.004	0.062	0.003	0.050
Age	36.484	8.308	36.244	7.984	38.371	8.544
Educ1	0.052	0.221	0.043	0.203	0.034	0.182
Educ2	0.083	0.276	0.081	0.272	0.064	0.245
Educ4	0.210	0.407	0.223	0.416	0.277	0.447
Educ5	0.141	0.348	0.184	0.387	0.191	0.393
Educ6	0.055	0.228	0.068	0.252	0.072	0.258
Educ Missing	0.284	0.451	0.252	0.434	0.201	0.401
Married	0.699	0.459	0.581	0.493	0.574	0.494
Divorced/Separated	0.070	0.256	0.207	0.405	0.195	0.396
1980 Observation	0.046	0.210	0.051	0.220	0.040	0.197
1990	0.131	0.338	0.131	0.337	0.141	0.348
1992	0.154	0.361	0.157	0.364	0.164	0.370
1993	0.163	0.370	0.167	0.373	0.166	0.372
1994	0.158	0.365	0.149	0.356	0.156	0.363
1995	0.168	0.374	0.165	0.372	0.163	0.369
1996	0.179	0.383	0.180	0.384	0.170	0.376
Region 1	0.597	0.490	0.676	0.468	0.412	0.492
Region 2	0.135	0.342	0.090	0.287	0.123	0.329
Region 3	0.032	0.175	0.027	0.162	0.038	0.191
Region 4	0.094	0.292	0.091	0.288	0.158	0.365
Region 5	0.081	0.273	0.068	0.252	0.220	0.414
Region 6	0.060	0.238	0.047	0.212	0.048	0.215
Region 7	0.048	0.213	0.044	0.205	0.027	0.161
Observations	83080		20580		12277	

Table A-1, Continued

Variable	Eastern Europe		Nordic Countries		Other OECD		Natives	
	Mean	StdDev	Mean	StdDev	Mean	StdDev	Mean	StdDev
ln(Annual Earnings)	11.915	0.681	12.160	0.597	12.234	0.662	12.164	0.551
ln(Unempl Rate)	1.108	0.700	1.087	0.706	1.051	0.747	1.061	0.727
Years Since Migr	13.083	9.300	15.208	9.043	15.764	8.679		
Pre-1964 Cohort	0.172	0.378	0.239	0.426	0.192	0.394		
1964-68 Cohort	0.049	0.215	0.062	0.242	0.087	0.282		
1969-73 Cohort	0.137	0.344	0.094	0.291	0.149	0.356		
1974-78 Cohort	0.077	0.267	0.139	0.346	0.163	0.370		
1979-83 Cohort	0.100	0.299	0.147	0.354	0.146	0.353		
1984-88 Cohort	0.223	0.416	0.201	0.401	0.165	0.371		
1989-93 Cohort	0.220	0.414	0.109	0.312	0.090	0.286		
1994-97 Cohort	0.022	0.146	0.009	0.097	0.007	0.086		
Age	41.468	9.898	43.629	9.952	43.675	9.342	41.945	10.776
Educ1	0.011	0.105	0.019	0.138	0.014	0.117	0.001	0.025
Educ2	0.096	0.294	0.149	0.356	0.086	0.280	0.200	0.400
Educ4	0.224	0.417	0.244	0.429	0.222	0.416	0.333	0.471
Educ5	0.147	0.354	0.146	0.354	0.210	0.407	0.173	0.379
Educ6	0.126	0.331	0.076	0.264	0.141	0.348	0.073	0.259
Educ Missing	0.293	0.455	0.261	0.439	0.237	0.425	0.007	0.082
Married	0.723	0.447	0.607	0.488	0.721	0.449	0.638	0.481
Divorced/Separated	0.146	0.354	0.150	0.357	0.156	0.363	0.096	0.295
1980 Observation	0.092	0.290	0.108	0.311	0.116	0.320	0.137	0.344
1990	0.118	0.322	0.151	0.358	0.158	0.365	0.146	0.354
1992	0.132	0.339	0.147	0.354	0.145	0.352	0.144	0.351
1993	0.137	0.343	0.146	0.353	0.144	0.351	0.145	0.352
1994	0.138	0.345	0.145	0.352	0.142	0.349	0.141	0.348
1995	0.172	0.378	0.148	0.355	0.146	0.353	0.143	0.350
1996	0.211	0.408	0.154	0.361	0.150	0.357	0.144	0.351
Region 1	0.512	0.500	0.452	0.498	0.421	0.494	0.346	0.476
Region 2	0.208	0.406	0.233	0.423	0.170	0.375	0.189	0.392
Region 3	0.050	0.218	0.061	0.239	0.040	0.195	0.087	0.282
Region 4	0.114	0.317	0.136	0.343	0.198	0.398	0.133	0.340
Region 5	0.059	0.235	0.066	0.248	0.111	0.314	0.125	0.331
Region 6	0.057	0.232	0.052	0.221	0.061	0.239	0.119	0.324
Region 7	0.048	0.213	0.094	0.292	0.055	0.228	0.142	0.349
Observations	23382		62437		63556		490596	

Table A-2: Summary Statistics, Female Samples

Variable	Asia		Africa		Latin America	
	Mean	StdDev	Mean	StdDev	Mean	StdDev
ln(Annual Earnings)	11.494	0.665	11.519	0.661	11.516	0.638
ln(Unempl Rate)	1.258	0.460	1.260	0.495	1.248	0.494
Years Since Migr	10.053	5.831	11.060	7.261	10.219	6.668
Pre-1964 Cohort	0.016	0.127	0.069	0.253	0.038	0.192
1964-68 Cohort	0.008	0.089	0.022	0.148	0.016	0.124
1969-73 Cohort	0.038	0.190	0.061	0.240	0.057	0.233
1974-78 Cohort	0.161	0.367	0.135	0.341	0.162	0.369
1979-83 Cohort	0.227	0.419	0.173	0.378	0.119	0.324
1984-88 Cohort	0.358	0.479	0.331	0.471	0.468	0.499
1989-93 Cohort	0.187	0.390	0.202	0.402	0.134	0.341
1994-97 Cohort	0.006	0.077	0.007	0.085	0.005	0.071
Age	36.610	7.926	36.115	8.838	38.643	8.508
Educ1	0.079	0.270	0.060	0.237	0.038	0.191
Educ2	0.088	0.283	0.080	0.271	0.072	0.259
Educ4	0.173	0.378	0.226	0.418	0.255	0.436
Educ5	0.201	0.401	0.180	0.384	0.198	0.398
Educ6	0.055	0.227	0.037	0.189	0.079	0.270
Educ Missing	0.272	0.445	0.262	0.440	0.214	0.410
Married	0.799	0.401	0.669	0.470	0.642	0.479
Divorced/Separated	0.113	0.317	0.181	0.385	0.232	0.422
1980 Observation	0.028	0.166	0.035	0.185	0.037	0.189
1990	0.119	0.324	0.121	0.326	0.127	0.333
1992	0.148	0.355	0.157	0.364	0.157	0.364
1993	0.160	0.367	0.162	0.369	0.167	0.373
1994	0.163	0.369	0.156	0.363	0.161	0.367
1995	0.181	0.385	0.172	0.377	0.170	0.376
1996	0.201	0.401	0.196	0.397	0.182	0.386
Region 1	0.551	0.497	0.666	0.472	0.414	0.493
Region 2	0.154	0.361	0.115	0.319	0.159	0.365
Region 3	0.039	0.193	0.021	0.144	0.039	0.193
Region 4	0.107	0.309	0.101	0.302	0.134	0.341
Region 5	0.085	0.279	0.067	0.250	0.202	0.401
Region 6	0.064	0.245	0.030	0.170	0.053	0.223
Region 7	0.058	0.234	0.032	0.176	0.035	0.185
Observations	44306		6652		7867	

Table A-2, Continued

Variable	Eastern Europe Mean	Eastern Europe StdDev	Nordic Countries Mean	Nordic Countries StdDev	Other OECD Mean	Other OECD StdDev	Natives Mean	Natives StdDev
ln(Annual Earnings)	11.638	0.677	11.792	0.590	11.742	0.665	11.687	0.583
ln(Unempl Rate)	1.155	0.624	1.079	0.711	1.030	0.763	1.104	0.684
Years Since Migr	12.237	8.679	17.236	9.322	18.116	8.854		
Pre-1964 Cohort	0.108	0.310	0.289	0.453	0.304	0.460		
1964-68 Cohort	0.051	0.220	0.089	0.284	0.095	0.293		
1969-73 Cohort	0.117	0.321	0.123	0.329	0.152	0.359		
1974-78 Cohort	0.112	0.316	0.123	0.329	0.141	0.348		
1979-83 Cohort	0.131	0.338	0.115	0.319	0.112	0.316		
1984-88 Cohort	0.223	0.417	0.162	0.369	0.124	0.329		
1989-93 Cohort	0.233	0.423	0.090	0.286	0.068	0.252		
1994-97 Cohort	0.024	0.155	0.008	0.088	0.005	0.071		
Age	40.316	9.027	43.367	10.346	44.628	9.847	41.657	10.480
Educ1	0.013	0.113	0.010	0.101	0.007	0.084	0.000	0.021
Educ2	0.094	0.292	0.123	0.328	0.081	0.273	0.196	0.397
Educ4	0.185	0.388	0.173	0.378	0.160	0.366	0.207	0.405
Educ5	0.216	0.411	0.285	0.451	0.333	0.471	0.227	0.419
Educ6	0.130	0.337	0.059	0.235	0.123	0.328	0.026	0.159
Educ Missing	0.260	0.438	0.174	0.379	0.149	0.356	0.006	0.078
Married	0.751	0.432	0.647	0.478	0.731	0.444	0.664	0.472
Divorced/Separated	0.184	0.388	0.158	0.365	0.175	0.380	0.138	0.345
1980 Observation	0.066	0.248	0.100	0.300	0.120	0.325	0.109	0.312
1990	0.114	0.318	0.148	0.355	0.161	0.368	0.145	0.352
1992	0.132	0.338	0.149	0.356	0.148	0.355	0.149	0.356
1993	0.140	0.347	0.150	0.357	0.147	0.354	0.151	0.358
1994	0.144	0.351	0.147	0.354	0.139	0.346	0.146	0.353
1995	0.180	0.384	0.150	0.358	0.141	0.348	0.149	0.356
1996	0.224	0.417	0.156	0.363	0.144	0.351	0.151	0.358
Region 1	0.538	0.499	0.523	0.499	0.450	0.498	0.362	0.481
Region 2	0.187	0.390	0.202	0.401	0.175	0.380	0.183	0.387
Region 3	0.043	0.203	0.071	0.258	0.049	0.215	0.087	0.282
Region 4	0.103	0.304	0.097	0.295	0.158	0.365	0.129	0.335
Region 5	0.064	0.244	0.055	0.227	0.104	0.305	0.122	0.328
Region 6	0.065	0.247	0.052	0.223	0.063	0.243	0.117	0.321
Region 7	0.064	0.244	0.111	0.314	0.064	0.245	0.139	0.346
Observations	18176		70800		48150		404673	

Table A-3: Log Earnings Regressions (Synthetic Panel Method), African, Asian, and Latin American Immigrants in Norway

	Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Unempl Rate)		-.0026	-.0026		.0133	.0127
		(.0020)	(.0020)		(.0024)	(.0024)
Imm*ln(UR)		-.1367	-.0417		-.1111	-.2285
		(.0044)	(.0259)		(.0062)	(.0364)
YSM	.1177	.1034	.1781	.1179	.1176	.0925
	(.0060)	(.0060)	(.0142)	(.0086)	(.0086)	(.0206)
$YSM^2/10$	-.0835	-.0609	-.1836	-.1089	-.1048	-.1065
	(.0078)	(.0078)	(.0196)	(.0111)	(.0111)	(.0286)
$YSM^3/100$	.0197	.0138	.0814	.0380	.0383	.0483
	(.0038)	(.0039)	(.0104)	(.0054)	(.0054)	(.0151)
$YSM^4/1000$	-.0011	-.0007	-.0125	-.0045	-.0047	-.0073
	(.0006)	(.0006)	(.0018)	(.0009)	(.0009)	(.0026)
ln(UR)*YSM			-.0677			.0138
			(.0110)			(.0161)
$ln(UR)*YSM^2/10$			.1105			.0137
			(.0154)			(.0225)
$ln(UR)*YSM^3/100$			-.0600			-.0142
			(.0082)			(.0120)
$ln(UR)*YSM^4/1000$			.0104			.0030
			(.0014)			(.0021)
Immigrant	4.0752	4.4153	4.3581	-.3290	-.1121	-.0228
	(.5380)	(.5377)	(.5382)	(.7600)	(.7598)	(.7607)
Pre-1964 Cohort	.6356	.2671	.3258	.4222	.1601	.2367
	(.0186)	(.0219)	(.0236)	(.0241)	(.0283)	(.0309)
1964-68 Cohort	.4362	.1142	.1564	.2997	.0756	.1253
	(.0157)	(.0187)	(.0196)	(.0276)	(.0304)	(.0314)
1969-73 Cohort	.2662	.0100	.0118	.3040	.1423	.1458
	(.0086)	(.0118)	(.0123)	(.0166)	(.0189)	(.0193)
1974-78 Cohort	.2319	.0536	.0303	.2126	.1072	.0757
	(.0074)	(.0093)	(.0097)	(.0109)	(.0125)	(.0130)
1979-83 Cohort	.1432	.0761	.0563	.1250	.0857	.0633
	(.0062)	(.0065)	(.0068)	(.0084)	(.0087)	(.0091)
1984-93 Cohort	-.0483	-.0287	-.0258	-.0915	-.0793	-.0669
	(.0056)	(.0056)	(.0057)	(.0077)	(.0077)	(.0079)
1994-97 Cohort	.1510	.1605	.1574	-.1064	-.0996	-.0982
	(.0287)	(.0287)	(.0287)	(.0309)	(.0309)	(.0309)
Africa	-.0580	-.0558	-.0549	.0071	.0100	.0105
	(.0042)	(.0042)	(.0042)	(.0073)	(.0073)	(.0073)
Latin America	.0948	.0979	.0990	.0115	.0138	.0143
	(.0052)	(.0052)	(.0052)	(.0068)	(.0068)	(.0068)
Age	.6937	.6983	.6982	.0105	.0138	.0141
	(.0206)	(.0206)	(.0206)	(.0239)	(.0239)	(.0239)
Age^2	-.2319	-.2336	-.2336	.0046	.0034	.0033
	(.0074)	(.0074)	(.0074)	(.0086)	(.0086)	(.0086)
Age^3	.3467	.3493	.3493	-.0032	-.0012	-.0011
	(.0115)	(.0115)	(.0115)	(.0134)	(.0134)	(.0134)
Age^4	-.1957	-.1972	-.1972	-.0071	-.0082	-.0083
	(.0065)	(.0065)	(.0065)	(.0077)	(.0077)	(.0077)
Imm*Age	-.4372	-.4517	-.4562	-.0218	-.0320	-.0262
	(.0545)	(.0544)	(.0544)	(.0771)	(.0771)	(.0771)

Imm*Age^2	.1404	.1455	.1471	.0063	.0105	.0083
	(.0201)	(.0201)	(.0201)	(.0286)	(.0286)	(.0286)
Imm*Age^3	-.1995	-.2074	-.2100	-.0156	-.0232	-.0195
	(.0323)	(.0322)	(.0322)	(.0459)	(.0459)	(.0459)
Imm*Age^4	.1060	.1106	.1121	.0146	.0194	.0172
	(.0189)	(.0189)	(.0189)	(.0270)	(.0270)	(.0270)
Educ1	-.2938	-.2951	-.2951	-.1166	-.1176	-.1177
	(.0298)	(.0298)	(.0298)	(.0401)	(.0401)	(.0401)
Educ2	-.0680	-.0677	-.0676	-.1170	-.1173	-.1173
	(.0024)	(.0024)	(.0024)	(.0024)	(.0024)	(.0024)
Educ4	.1127	.1125	.1125	.1326	.1326	.1326
	(.0021)	(.0021)	(.0021)	(.0025)	(.0025)	(.0025)
Educ5	.2573	.2574	.2573	.3312	.3312	.3311
	(.0024)	(.0024)	(.0024)	(.0024)	(.0024)	(.0024)
Educ6	.4750	.4754	.4753	.5992	.5992	.5991
	(.0032)	(.0032)	(.0032)	(.0056)	(.0055)	(.0055)
Educ Missing	.0144	.0168	.0168	.0313	.0347	.0346
	(.0093)	(.0094)	(.0093)	(.0110)	(.0111)	(.0111)
Imm*Educ1	.3302	.3349	.3357	.1650	.1663	.1671
	(.0309)	(.0308)	(.0308)	(.0414)	(.0414)	(.0414)
Imm*Educ2	.1258	.1223	.1248	.1380	.1399	.1403
	(.0070)	(.0070)	(.0070)	(.0101)	(.0101)	(.0101)
Imm*Educ4	-.0231	-.0231	-.0227	.0080	.0087	.0102
	(.0054)	(.0054)	(.0054)	(.0084)	(.0084)	(.0084)
Imm*Educ5	-.1337	-.1320	-.1313	-.0580	-.0563	-.0553
	(.0060)	(.0060)	(.0060)	(.0083)	(.0083)	(.0083)
Imm*Educ6	-.0814	-.0798	-.0790	-.1012	-.1016	-.0998
	(.0082)	(.0082)	(.0082)	(.0126)	(.0126)	(.0126)
Imm*Educ Missing	.0665	.0645	.0643	.0302	.0272	.0272
	(.0105)	(.0106)	(.0106)	(.0134)	(.0134)	(.0134)
Married	.2050	.2050	.2050	-.1749	-.1747	-.1747
	(.0021)	(.0021)	(.0021)	(.0025)	(.0025)	(.0025)
Prev Married	.0868	.0868	.0868	-.0583	-.0584	-.0584
	(.0031)	(.0030)	(.0030)	(.0033)	(.0033)	(.0033)
Imm*Married	-.0519	-.0533	-.0536	.1271	.1233	.1229
	(.0046)	(.0046)	(.0046)	(.0082)	(.0082)	(.0082)
Imm*Prev Married	-.0644	-.0606	-.0610	.0171	.0145	.0143
	(.0067)	(.0067)	(.0067)	(.0102)	(.0102)	(.0102)
Constant	4.2302	4.188	4.1889	11.1006	11.055	11.0542
	(.2095)	(.2093)	(.2093)	(.2419)	(.2418)	(.2418)
R^2	.2280	.2293	.2294	.1762	.1768	.1769
Root MSE	.5253	.5248	.5247	.5418	.5416	.5416
Observations		606,533			463,498	

Note: Standard errors are reported in parentheses. Dependent variable is ln(annual earnings, 1990 NOK). Regressions also include six regional indicator variables and a complete set of year indicators. Omitted immigrant group is Asia and omitted arrival cohort is 1984-88.