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INTERGENERATIONAL TRANSMISSION OF EDUCATION AMONG IMMIGRANT MOTHERS AND THEIR DAUGHTERS IN SWEDEN

by

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Abstract

This study uses extensive Swedish register data to analyze the intergenerational transmission of education between immigrant mothers and their daughters. The results show that the transmission is only slightly lower among daughters of immigrant mothers compared to native daughters. The educational relationship between mothers and daughters is further found to be nonlinear. For both groups, the intergenerational link is weaker among daughters of poorly educated mothers. Moreover, the average transmission differs across immigrant groups but these differences can be explained partly by dissimilar maternal educational backgrounds. In addition, the differences between women with an immigrant background and native women have decreased across the two generations. Finally, the educational attainment of an immigrant group has a positive but weak impact on daughters' educational outcomes.

JEL classification: I20, J15, J62.

Key words: Immigrants, education, intergenerational transmission.

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1. Introduction

As in almost all OECD counties, immigration to Sweden has increased substantially during the past decades. In 2007, almost one quarter of the Swedish population was born abroad or had at least one foreign-born parent. It is well known that immigrants face a socioeconomic disadvantage compared to native-born people and that immigrant women in many cases are more disadvantaged than immigrant men (Arai, Bursell and Nekby, 2009; Åslund, Edin and Lalonde, 2000; Rendall et al, 2008). In addition, there is widespread concern among policymakers that an initial disadvantage may be transmitted from one generation to the next (D'Addio, 2007). The initial disadvantage of immigrant females potentially has important implications for both immigrant-to-native equality and gender equality in the second generation.[1] However, relatively little is known about the intergenerational transmission process within the female immigrant population.

The purpose of this paper is to analyze the intergenerational education transmission between immigrant mothers and their daughters in Sweden. I compare the transmission estimate of daughters of immigrant mothers with that of native daughters. Differences in educational attainments between females with immigrant and native backgrounds are studied across the two generations. The large sample allows for a comprehensive study of possible heterogeneity between immigrant mothers with different educational attainment and/or between immigrant groups. Related to the latter is also the importance of ethnic capital, i.e. the average educational level of an immigrant group, which is analyzed separately. In order to address these issues, I use extensive population data covering a sample of women born in

[1] Sweden is considered as a country with high gender equality. The World Economic Forum has constructed a gender equality index that ranks economies according to their gender equality in economic participation, educational attainment, political empowerment and health. In 2007, Sweden ranked in 3rd place (out of 130) according to the gender equality index (the United States came 27th), see World Economic Forum (2008). There are a number of studies that point to the relationship between gender equality and different welfare state regimes and that emphasize that the very high gender equality in Sweden is a result of a generous welfare system with family friendly policies (Korpi, 2000; Lewis and Åström 1992).

Sweden between 1960 and 1980 with mothers that migrated to Sweden from elsewhere. I will refer to this group as 'daughters with an immigrant background'. The immigrant sample consists of more than 65,000 observations which extends to 780,000 observations when also including a reference group of daughters with native-born parents.

The literature on intergenerational transmission has a long tradition in sociology where the focus, typically, is on social class positions (Erikson and Goldthorpe, 2002; Ganzeboom, Treiman and Ultee, 1991).[2] Most studies within the field of economics instead focus on the transmission of earnings across generations; see Solon (1999) for an overview. In Sweden, the few studies conducted on intergenerational transmission among female immigrants have all focused on earnings and the results are mixed. Hammarstedt (2008) finds a lower transmission among daughters of immigrant mothers compared to native daughters in the second generation (.05; .11) but this relationship is reversed in the third generation (0.07; 0.03). Österberg (2000) instead finds that the transmission among female immigrants and natives is about the same, holding the earnings of the father constant.[3] However, both studies find extremely low levels of transmission. This may partly reflect the fact that a woman's earnings are not always a reliable indicator of her socioeconomic status, since women tend to participate only intermittently in the labor market.[4] Furthermore, immigrant women do not participate in the labor force to the same extent as native women (see Brenner, 2010; SCB, 2009a).

Education has several advantages over earnings when it comes to measuring the intergenerational transmission rate. Most importantly, participation in the labor force does not affect the transmission estimate. Education is an indicator which does not fluctuate between years and a reliable measure is available at a relatively early age. Education has, furthermore,

[2] For sociological studies on education inequality, see for example Breen and Jonsson (2005).
[3] Studies on fathers and sons reveal a higher transmission among sons with an immigrant background; see Hammarstedt (2008), Hammartstedt and Palme (2006) and Österberg (2000).
[4] To avoid this problem, Chadwick and Solon (2002) suggest family income as a measure of initial economic status. For Swedish results, see Hirvonen (2008).

been shown to be a good proxy for general well-being (Lleras-Muney, 2005; Oreopoulos and Salvanes, 2009). Of course, education is also a key determinant for both *access to* and *success in* the labor market and thereby closely related to gender equality.[5] Even though education and earnings are closely related, it is important to bear in mind that the intergenerational transmission estimates of education and of earnings may not necessarily be similar. If, for example, there is discrimination in the labor market, these two measures can go in different directions.

There are few previous studies on the intergenerational transmission of education among female immigrants. Aydemir, Chen and Corak, (2008) however, investigate the educational transmission between immigrant mothers and their daughters in Canada using survey data on about 800 immigrant daughters and 1700 native daughters. The study finds a much lower average transmission among daughters of immigrant mothers than among native daughters.[6] In fact, the transmission estimate constitutes only about one quarter of that of native daughters. Since a low average transmission rate indicates that the relationship between family background and future economic outcomes is loose it is easy to interpret the results as reflecting a desirable situation. However, this reading need not necessarily be true since the average transmission may not be especially informative about the true socioeconomic opportunities for children with a disadvantaged educational background. It is therefore important to study whether the educational relationship between mothers and daughters is nonlinear.

This paper contributes to the current literature by focusing on the intergenerational link between daughters and immigrant mothers. Earlier studies have analyzed almost exclusively the transmission between fathers and sons. My paper also investigates whether socioeconomic

[5] Gustafsson and Jacobsson (1985), for example, find that the increase in wages from the late 1960s to the 1980s, was associated partly with increased female education, and was the most important explanatory factor for the rise in female labor force participation during that period in Sweden.

[6] Studies such as Gang and Zimmerman (2000) and Bauer and Riphahn (2006; 2007) that instead focus on the father-son, the parent-son, or the parent-child relationship, support these findings.

disadvantaged daughters face more or less transmission than daughters who start out with an advantage. As explained above, knowledge of whether the intergenerational link is nonlinear provides important information about the true socioeconomic opportunities for individuals with a disadvantaged background. Furthermore, the population register-based data used allows for large samples to be studied, increases the precision and reduces the risk of measurement errors in daughters' education. Problems associated with measurement errors in mothers' education are addressed separately. To my knowledge, this is an issue which has yet not been discussed in the literature on intergenerational transmission.

The main results show that the correlation among daughters of immigrant mothers is only slightly lower than that of daughters with a native background, .29 compared to .34. For both groups, the average transmission is lower for daughters with less well educated mothers. There are large variations across groups of immigrants, but the correlation is lower among educationally disadvantaged groups. In addition, the differences in educational attainment between women with an immigrant background and native women have decreased across the two generations**.** Finally, tentative estimates indicate that ethnic capital has a positive but weak impact on the educational outcome of daughters.

The structure of the paper is as follows. In the next section, I give a short background of immigration to Sweden.. Section 3 describes the empirical approach and section 4 presents the data used in the study. In section 5, I address some relevant aspects regarding measurement error in the schooling variable. The empirical results are presented in section 6, followed by some concluding remarks in section 7.

2. Immigration to Sweden

The immigrant mothers included in the sample migrated to Sweden prior to 1981. In the 1940s, Sweden became an immigration country with a positive net migration. The ethnical diversity increased during this time as refugees from the Nordic countries, Germany, Poland and the Baltic States, arrived in Sweden as a result of the Second World War. The annual number of net migrants amounted to 20,000 in the 1940s and about one half migrated from the neighboring Nordic countries (two thirds came from Finland).

In the post-war period, in the 1950s and 1960s, the immigration flow changed character. During this period, the Swedish economy was growing fast and the demand for labor was high (Lundh and Ohlsson, 1999). Even though women entered the labor market during this period, the excess labor demand led to labor migration (Essèn, 2002). Although Sweden signed the Geneva Convention in 1951, implying that Sweden undertook the responsibility of helping political refugees, only five percent of the immigration flow during this period was from political refugees migrating from the former communist countries in Eastern Europe. Instead, the dominant source of migration from 1950–1970 was labor force migration and, during the 1950s, labor immigrants mainly consisted of immigrants from the Nordic countries (mainly Finland), Italy, Austria and Germany. The net migration flow was on average 11,000 immigrants per year and, until the late 1950s, about 55 percent of newly arrived immigrants were women, and of them two thirds were unmarried.

In the 1960s, the industrial sector expanded and the demand for male labor increased. As a result, the share of immigrant females decreased to about 40 percent and more than 50 percent of the women who arrived were married. In the 1960s, migration from outside the Nordic countries increased significantly. Labor migration from especially Yugoslavia, Greece and Turkey expanded and immigrants from Yugoslavia now became the second largest immigration group. However, immigrants from Finland still constituted the largest group and

almost 50 percent of the immigrants during this time came from Finland. Also, young people from Iran started to come to Sweden in the 1960s to study, and later could not return to Iran owing to their political involvement. The number of net migrants amounted to about 200,000 during the 1960s.

In the late 1960s, regulated immigration was introduced in Sweden and the immigration policy became more restricted. People wishing to come to Sweden to work were now required to have a written offer of employment and a work permit. Political refugees, relatives of immigrants and people from the Nordic countries were exempted from these new rules. The positive net flow of labor migrants changed character but did not decrease.[7] Labor migration from outside the Nordic countries decreased and migration from the neighboring countries increased again. During 1969–1970, about 80,000 people immigrated to Sweden from Finland.[8] A decrease in labor migration could first be seen when the worldwide economic crisis reached Sweden in the early 1970s. The share of political refugees and family reunion migrants now increased rapidly. Prior to 1970, about 10 percent of the immigrants were of non-European origin. However, in the 1970s the share of non-European immigrants increased by 100 percent and now constituted one fifth of the total immigration flow. Sweden had a significant inflow of political refugees from Chile after the military coup in 1973. Also, refugees from other Latin American countries, Asia and Africa came to Sweden during this period. Even though family-related migration is more common today, it started in the 1970s when family and relatives from Greece, Turkey and Yugoslavia migrated to Sweden (Lundh and Ohlsson, 1999).

[7] Except in 1972−1973 due to a large return migration to Finland.
[8] In 1968, a policy was implemented to register migration within the Nordic countries, which can probably explain a part of the upturn in the registered migration flow from Finland.

3. Empirical Approach

The educational relationship between mothers and daughters can be expressed as follows:[9]

$$s_d^{ij} = \alpha + \beta s_m^{ij} + \lambda_d A_d^{ij} + \gamma_d A_d^{2\ ij} + \lambda_m A_m^{ij} + \gamma_m A_m^{2\ ij} + \varepsilon_d^{ij} \quad (1)$$

where s_d^{ij} represents the educational attainment of daughter *i* in group of origin *j*, s_m^{ij} gives the educational attainment of mother *i* in group of origin *j*. The variables A_d^{ij} and $A_d^{2\ ij}$ and A_m^{ij} and $A_m^{2\ ij}$ control for age, as well as its square of daughters and mothers, respectively. The coefficient β reflects how much of mothers' education, on average, is transmitted to their daughters and thus measures the intergenerational persistence of education. If β is equal to one, the educational differences in the first generation will be transferred as a whole to the next generation. This indicates that daughters with relatively poorly/highly educated mothers will themselves become relatively poorly/highly educated. If, however, the intergenerational persistence of education is equal to zero, the educational level of the mother will have no impact on the educational level of the daughter.

The size of the regression coefficient is not only determined by the covariation in education between mothers and daughters, but also by the educational dispersions of the two generations. This means that even if the educational persistence is about the same for females with an immigrant background and females with a native background, the coefficients may differ if the marginal distributions evolve differently across generations. Since the marginal distribution in the first generation is, to some extent, a reflection of the underlying educational system in the country of origin, it is likely to differ across immigrant groups.[10] In Sweden, for example, compulsory education lasted for at least seven years during the time the mothers grew up. Education in Turkey, instead, was mandatory for five years but, in practice, the five-

[9] For more details see Becker and Tomes (1979; 1986).
[10] By plotting the correlation coefficient and the regression coefficient in a given country over a certain time period Hertz et al (2007) show that the marginal distributions have evolved differently in different countries.

year requirement was not enforced and many Turkish individuals did not complete compulsory education (OECD, 2007). In addition to differences in educational systems, the educational composition of immigrants may differ (due to selective immigration), generating differences in the educational distributions. For this reason, I will also use the correlation coefficient that is defined as the regression coefficient multiplied by the ratio of the standard deviations of education in the two generations:[11]

$$\rho = \beta \frac{\sigma_m}{\sigma_d} \tag{2}$$

The correlation coefficient is a standardized measure and so expresses a relative, rather than an absolute, relationship between the years of schooling of the mother and the daughter. Since the variance in education is held constant between the two generations the correlation is not affected by the educational dispersions in the two generations. The correlation tells how many standard deviations the daughter's years of schooling would change in response to a change of one standard deviation in the years of schooling of the mother. A value of one indicates that the daughter's educational position in her generation replicates that of her mother.

As I also estimate deviations from the native mean, the following equation is estimated separately for each generation:

$$s^{ij} = \alpha + \lambda A^{ij} + \lambda A^{2\ ij} + \sum_{j=1}^{N-1} \pi^j C^{ij} + \varepsilon^{ij} \tag{3}$$

where C_{ij} is a dummy variable indicating which group of origin the person belongs to. Note that natives are not included in C_{ij}. The level of education for natives is captured by α. The coefficient π_j therefore gives the educational level of group *j* relative to that of natives. These differences are then used in equation (4) to estimate how deviations from the native mean evolve across the two generations:

[11] This is a well-known approach in the literature on income transmission (see Aaronson and Mazumder, 2008; Björklund and Jäntti, 2009).

$$\bar{\pi}_t^j = \tau + \gamma \bar{\pi}_{t-1}^j + v_t^j \quad (4)$$

where $\bar{\pi}_t^j$ is the age-adjusted difference in the average years of schooling of daughters belonging to group of origin j and $\bar{\pi}_{t-1}^j$ is the age-adjusted difference in the average years of schooling of their mothers. The coefficient γ, tells us how deviations from the native mean evolve from one generation to the next. If the coefficient is equal to one, the differences in the first generation will remain the same in the next generation. If the value is larger than one, differences will increase across generations, i.e. there will be a divergence away from the native mean. If the value, however, is less than one, the differences will decrease, i.e. convergence towards the native mean.

Before turning to the data, a word about causality is warranted. There are several studies that focus on the causal relationship between the educational level of children and their parents (see Behrman and Rosenzweig, 2002; Black, Devereuz and Salvanes, 2005; Holmlund, Lindahl and Plug, 2008; Plug, 2004). The overall finding is that there is either a weak or no casual relationship between the educational levels of the two generations. However, there is some evidence of stronger effects among children to low educated parents (Black, Devereuz and Salvandes, 2005). Nevertheless, none of the studies focus on the immigrant population. The purpose of this paper is not to analyze the causal relationship. Instead, the primary goal is to address the total transmission irrespective of the background drivers. The transmission estimate will thus capture all the effects of maternal characteristics associated with education, whether inheritable, environmental or the two in combination. [12]

[12] Research in other fields has shown that it may not be meaningful to divide between environmental and genetic factors since they may interact, see Lundborg and Stenberg (2009).

4. Data

The data used in this study comes from the database Stativ, administered by Statistics Sweden (SCB). [13] Stativ is a longitudinal database that was created originally on behalf of the Swedish Integration Board. It includes information from population-wide registers collected by the Swedish Migration Board, the Swedish Public Employment Service and Statistics Sweden. It provides information on all individuals aged 16−65 who lived in Sweden at some point during 1997−2007. Parental information is also available in the data. The analysis is based on a sample of daughters of immigrant mothers. The mothers immigrated to Sweden prior to 1981 and the daughters were born in Sweden between 1960 and 1980, and were thus aged 27−47 in 2007. This group of daughters is of particular interest to study since they grew up in Sweden during a time period in which the social welfare system was expanding and different gender equality policies were introduced. The lower age restriction further ensures that most individuals have completed their education by 2007. A reference group of daughters to native-born parents in the same age group will also be used in the analysis. The sample is restricted to only include daughters with biological mothers and only observations with information on the variables of interest are included. Also excluded are daughters who, in 2007, received financial aid from the Swedish Board for Study Support (CSN), since they were enrolled in education.[14] Conditional on these restrictions, I obtained a sample of 68,410 daughters with an immigrant background and 719,753 daughters with a native background, along with their mothers. [15]

The main variable of interest is years of schooling. Information is available both on the field and level of education and I have translated the levels into years of schooling. The levels

[13] For more detailed information about Stativ, see SCB (2009b).
[14] The financial aid consists of grants, loans, extra child allowances and supplementary loans. In Sweden all students are eligible for financial aid for six years.
[15] Mothers who have more than one daughter in the sample are overrepresented since in the analysis I treat the daughter as a unit instead of the mother. Table A1 in the Appendix explains in more detail how the sample changes when the restrictions are imposed on the sample.

and the translation are described in more detail in Table A2 in Appendix. Since my measure of years of schooling is derived from information about attained level of education, the measure does not include individuals' possible extra school years for reaching a certain level. Years of schooling were obtained from 2007 for daughters and from 1998 for mothers.[16]

Mothers who did not attend school in Sweden, i.e. a large share of immigrant mothers, have reported their educational level via a questionnaire. This might induce misclassifications (see section 5.1) and a higher share of non-respondents.[17] There are, however, no large differences in the non-respondent rates between immigrant mothers and native mothers (see Appendix, Table A1). Furthermore, SCB (2000) reports that missing values are almost as common among the native-born population as they are among individuals that migrated to Sweden before 1990. The reason for this is that these immigrants are included in the Swedish Census in 1990 which was mandatory by law, but the Census has not been repeated since then.

Table 1 provides an overview of the sample characteristics for individuals with an immigrant and a native background, respectively. For both immigrants and natives, the average educational level is higher among daughters, and both daughters and mothers within the immigrant group display average years of schooling slightly below natives. For both natives and individuals with an immigrant background, the average age of daughters and mothers is about 37 and 64, respectively. In one part of the analysis mothers will be divided into two subgroups: mothers with less than 12 years of schooling and mothers with at least 12 years of schooling. I will refer to the subgroups as low- versus high-educated mothers. Table 1 shows that the share of poorly educated mothers is higher among women with an immigrant background and that the average years of schooling is higher among natives, both within the poorly and the highly educated groups.

[16] Information on maternal schooling is available from 1998 to 2007.

(Insert Table 1 here)

Table 2 presents sample characteristics across groups with different immigrant backgrounds. I have aggregated countries in which observations are less than 100, resulting in a total of 41 groups of immigrants.[18] This is done to avoid problems caused by small samples even though this will cause some loss of information. The data indicates a substantial improvement in educational attainment across generations for all immigrant groups. Furthermore, the improvement tends to be larger when the average educational level in the first generation is lower. Looking at the average years of education across immigrant groups, sizeable differences are obvious in the first generation as they range from 8.1 (Turkey, row 31) to 12.6 (France, row 6). The highest educational level among mothers is found among those who originate from France and India. Mothers originating from, for example, Turkey (row 31), Greece (row 21) and Bosnia-Herzegovina (row 19) on average, have less than nine years of schooling.

(Insert Table 2 here)

Among daughters, those with mothers from India (row 36) and Japan (row 39) have the highest years of schooling. Daughters that belong to these groups, on average, have about 14 years of schooling, which is equivalent to about two years at university. The lowest years of schooling is found among daughters with mothers from Turkey (row 31). They have about 12 years of schooling on average, which is equivalent to upper secondary school. Also, daughters with mothers from the Scandinavian countries (rows 1−3) have low average educational levels.

[18] See Table A3 in Appendix.

The average age of the daughters differs across groups. The youngest daughters and mothers are found among non-European country groups. This is not surprising since the immigration history of mothers who migrated from Latin America, Africa, Asia and the Middle East is much shorter.

The share of mothers with less than 12 years of schooling differs widely across the groups. Among mothers who originate from Turkey (row 31) 96 percent have less than 12 years of schooling, whereas it is 36 percent for mothers who originate from Japan (row 39). However, only 16 origin groups have a larger share of poorly educated mothers than natives.

5. Measurement Errors in the Mothers' Years of Schooling

The discussion of measurement error has a long tradition in the literature on the intergenerational transmission of earnings, but has, to my knowledge, yet not been discussed in the literature focusing on education. Indeed, there are several potential sources of measurement error in the schooling variable. Therefore, in the following three subsections, I discuss the implications of using survey data and censored variables, as well as the direction and the size of the measurement error.

5.1 The implications of using survey data

Measurement error may occur in both administrative data and in survey data. However, it is likely more frequent in survey data. Furthermore, errors in years of schooling obtained from administrative data do probably not vary substantially across groups of origins. Since only

measurement errors that differs across groups are of relevance for this study, this subsection will discuss the implication of measurement error in survey data.[19]

In the register data used in this study, information on immigrant mothers' educational attainment is drawn both from administrative data and from survey data. Mothers who did not enroll in school in Sweden, i.e. most of the immigrant mothers, have reported their educational level via a questionnaire (see Appendix).[20] This might induce misclassifications in two different ways. The first issue arises if the respondent reports her educational level incorrectly. The second issue is when the reported educational level is interpreted wrongly by Statistics Sweden.

The measurement error that occurs when the respondent's self-reported years of schooling is incorrect can be either classical or mean-reverting. There is, however, little reason to believe that the measurement error in self-reported education is classical, i.e. random. This is because the variable is restricted to an upper and a lower boundary which makes it easier to overreport at low levels (positive values of the error) and to underreport at high levels (negative values of the error). The relationship between reporting error and the true schooling level will then be negative. This type of measurement error goes by the name of 'mean-reverting measurement error' and recent work in the literature on returns to schooling suggests that the measurement error in self-reported schooling in fact is mean-reverting (see Black, Berger and Scott, 2000; Bound and Solon, 1999; Isacsson, 2004; Kane, Rouse and Staiger,1999).

[19] There are several sources of measurement error in administrative data. An individual may not apply for a formal degree after finishing higher education. Furthermore, individuals that attain their highest education abroad may not validate it in Sweden, meaning that their educational level will be downward biased. These types of measurement error do probably only affect daughters schooling, since a larger proportion of individuals within the younger generation attend higher education. However, the errors are not likely to differ much across daughters with different origins and will therefore not affect the findings in this study.

[20] Information on daughters' educational attainment is drawn only from administrative data.

To attain an understanding of how measurement error in schooling might affect the transmission estimate, let us assume the following bivariate model for simplicity,:

$$s_d = \alpha + \beta s_m^* + \varepsilon \tag{5}$$

where s_d is the true years of schooling of the daughter, s_m^* is the true years of schooling of the mother and ε is the error term. However, we cannot observe the true years of schooling of the mother since her educational level is self-reported. Instead we observe:

$$s_m = s_m^* + \mu \tag{6}$$

where s_m is the self-reported value and μ is the reporting error. To formalize the effect of the measurement error theoretically, the following universal assumptions are employed. First, the error terms in equations (5) and (6) are assumed to be uncorrelated, i.e. $corr(\varepsilon, \mu) = 0$. Second, since we only are interested in the effect of the measurement error, s_m^* is assumed to be exogenous, i.e. $corr(\varepsilon, s_m^*) = 0$. These assumptions facilitate the analysis and are sufficient to illustrate the main points. They do, however, not need to hold in practice. One can now determine the regression coefficient:[21]

$$\hat{\beta} = \frac{\text{cov}(s_d, s_m)}{v(s_m)} = \frac{\text{cov}(\alpha + \beta s_m^* + \varepsilon, s_m^* + \mu)}{v(s_m^* + \mu)} = \frac{\beta \,\text{cov}(s_m^*, s_m^* + \mu)}{v(s_m^* + \mu)} = \tag{7}$$

$$= \frac{\beta \,\text{cov}(s_m^*, s_m)}{v(s_m)} = \frac{\beta \,\text{cov}(s_m - \mu, s_m)}{v(s_m)} = \frac{\beta v(s_m)}{v(s_m)} - \frac{\beta \,\text{cov}(\mu, s_m)}{v(s_m)} =$$

$$= \beta\left[1 - \frac{\text{cov}(\mu, s_m)}{v(s_m)}\right] = \beta\left[1 - \beta_{\mu, s_m}\right]$$

where the estimated average transmission coefficient $\hat{\beta}$ is equal to its true value β multiplied by one minus $\beta_{\mu s_m}$. When the self-reported error in education, μ, is random so

[21] In order to simplify the expressions, probability limits are not used in the equations.

that the error is uncorrelated with the true years of schooling, s_m*, the estimated regression coefficient $\hat{\beta}$ will be equal to:

$$If\ corr(\mu, s_m^*) = 0 \longrightarrow \hat{\beta} = \beta\left[1 - \beta_{\mu,s_m}\right] = \beta\left[1 - \frac{v(\mu)}{v(\mu) + v(s_m^*)}\right] < \beta \qquad (8)$$

since $v(\mu)/\left(v(\mu) + v(s_m^*)\right)$ lies between zero and one, the estimated transmission coefficient will always be underestimated in the classical case.

However, as already pointed out, it is more plausible that the measurement error is mean-reverting. In this case, the relation between the self-reported error term and the true schooling level will be negative, causing the estimated coefficient to be equal to:

$$If\ corr(\mu, s_m^*) < 0 \longrightarrow \hat{\beta} = \beta\left[1 - \beta_{\mu,s_m}\right] = \beta\left[1 - \frac{v(\mu) + \mathrm{cov}(\mu, s_m^*)}{v(\mu) + v(s_m^*) + 2\,\mathrm{cov}(\mu, s_m^*)}\right] = \qquad (9)$$

$$= \beta\left[1 - \frac{v(\mu) + \rho_{\mu,s_m^*}\sqrt{v(\mu)}\sqrt{v(s_m^*)}}{v(\mu) + v(s_m^*) + 2\rho_{\mu,s_m^*}\sqrt{v(\mu)}\sqrt{v(s_m^*)}}\right]$$

The implication of the bias is more difficult to determine in the mean-reverting case than in the classical case. In general, β_{μ,s_m} will, however, be smaller than in the classical case since $v(\mu)$ is likely to be smaller than $v(s_m^*)$ (Bound, Brown and Mathiowetz, 2001).[22] If one assumes that $v(\mu)$ is smaller than $v(s_m^*)$ and that β is positive, the bias can be of the following kinds:

i) $\hat{\beta}_{classic} < \hat{\beta}_{mean-reverted} < \beta$

ii) $\hat{\beta}_{classic} < \beta < \hat{\beta}_{mean-reverted}$

Case i) will occur when the correlation between the true years of schooling and the error is only weakly negative because then the numerator (as in the classical case) will be larger than the denominator, causing β_{μ,s_m} to lie between zero and one. This happens if there are only a

[22] This, because the value range the true schooling variable is larger than the value range of the error term.

few top and bottom codings so that the relationship is random to a large extent. Case ii) occurs when the correlation between the true years of schooling and the error is stronger than in case i) so that its value exceeds $v(\mu)$, because then the numerator will be negative and the expression within brackets will be larger than one. This will happen when the number of top and bottom codings is large so that, systematically, the measurement error is positive at low educational levels and negative at high educational levels.

The measurement error that arises when the reported educational level is interpreted wrongly by Statistics Sweden is more likely to occur when the educational system in the source country is very different from the one in Sweden. This is because it then will be more difficult to translate the level of education. Since some countries of origin included in this study are more similar to Sweden than others when it comes to education, the magnitude of this misclassification may vary across groups. It is, however, difficult to assess how this type of measurement error affects the estimates. Yet, by taking a closer look at the questionnaire in the Appendix, one gets the impression that this type of error might be more frequent among respondents that have attained more years of schooling than the compulsory level, since the respondent must then state the level herself. If Statistics Sweden underestimates systematically reported educational levels that are above the compulsory level, the estimated regression coefficient may be upward biased. If the opposite occurs, the pattern is likely reversed.

5.2 The implications of using a censored schooling variable

An issue related to measurement error is censoring in the schooling variable. The schooling variable is censored in the sense that individuals with less than seven years of schooling are

assigned seven years. As a result, we observe the following variable:

$$s_m = \begin{cases} s_m^* & if\ s_m^* \geq 7 \\ 7 & if\ s_m^* < 7 \end{cases} \tag{10}$$

where s_m is the observed years of schooling, s_m^* is the true years of schooling, that can only be observed when it is equal to or larger than the threshold value. Schooling is not censored among daughters and native-born mothers since Sweden has a nine-year compulsory schooling system.[23] However, this might affect mothers with an immigrant background. The use of s_m instead of s_m^*, as explanatory variable will then provide an estimate of the transmission that is too high.[24] The intuition is as follows. Years of schooling of mothers will be overestimated systematically at *all* values that are smaller than the threshold value of seven years. The size of the error will decrease as the true years of schooling increase and the error disappears after reaching the censoring value. Therefore, the relationship between the error and true years of schooling will be strongly negatively correlated. Since $v(\mu)$ is smaller than $v(s_m^*)$, this implies that the estimated coefficient is equal to the true coefficient times a value that is larger than one (see equation (10)).

Censoring might affect immigrant groups differently depending on how many individuals within each group that have less than seven years of schooling. Hertz et al (2007) use educational data for a large number of countries. They show that the average years of schooling differ a lot across countries and that individuals that originate from non-Western countries are more likely to have attained only a few years of schooling. This suggests that the upward bias of β, may be larger among groups that originate from outside Europe.

[23] At least seven years before 1962. For more information, see Meghir and Palme (2005).
[24] Austin and Hoch (2004) show this using Monte Carlo simulations.

5.3 The implications of measurement errors for the results

Before turning to the results, I briefly discuss how the measurement error might affect the estimates in this study. Measurement error is not likely to be a problem if education is distributed similar across immigrant groups. In the summary statistics however we saw that the maternal educational distribution differed across groups. In other words, the estimates could very well be biased. As discussed above, the direction of the bias will depend on the share of top and bottom codings within a group and by the share of mothers with censored values. Table A4 in the Appendix gives an indication of both the direction and magnitude of the potential bias. The first column reports the share of mothers with educational levels obtained from administrative data.[25] The next column gives the share of mothers with observed schooling levels in the middle of the distribution, i.e. neither top nor bottom coded.[26] The last column gives the share of mothers that have seven years of schooling.

The size of the measurement error is probably smaller when the share of mothers with education from administrative registers is high. The share of mothers with reported schooling levels obtained from administrative data ranges from .07 (Bosnia-Herzegovina, row 19) to .35 (Chile, row 27 and Latin America, row 28). The magnitude of the measurement error is thus likely to differ across groups.

The direction of the bias is probably affected by the fraction of middle codings, and when this share is small, the transmission estimate may be upward biased. The opposite is true when the fraction instead is large. The share of mothers with observations in the middle of the educational distribution (where the measurement error is more likely to be random) also differs greatly across groups and the range is from .77 (Japan, row 39) to .11 (Turkey, row 31). The direction of the bias is thus likely to differ across immigrant groups. For example, the

[25] This information has been drawn from a variable that states the source of data, e.g. type of survey or specific governmental administrative register.
[26] That is schooling levels above 10 years and under 16 years.

transmission estimate of daughters with a Japanese background is likely to be downward biased whereas this estimate may be upward biased among daughters with a Turkish background.

The transmission estimate will be upward biased if censoring is high and the share of mothers with seven years of education is large. Column 3 shows that this share goes from .04 (Japan, row 39) to .63 (Turkey, row 31) and that countries of origin groups with few middle codings have a higher share of mothers with seven years of schooling. Among mothers from the Scandinavian countries (rows 1−3), almost 30 percent have only seven years of schooling. However, since the educational system in the Scandinavian countries is similar to that of Sweden, these observations are probably not affected.

In general, it seems like immigrant groups with a low share of mothers that have completed their education in Sweden, have few middle codings and also have a larger fraction with seven years of schooling. This indicates that the size of measurement bias may be larger among groups that are more likely to have estimates that are upward biased.

6. Empirical Results

This paper analyzes the intergenerational transmission in education among immigrant mothers and their daughters. In this section I present the results from the analysis. I begin by presenting descriptive results obtained from transition matrices. This is followed by transmission estimates for daughters with and immigrant and a native background, respectively. The next subsection gives the transmission estimates of daughters of poorly versus highly educated mothers. Thereafter, I present results for each country of origin group and analyze if there is a relationship between persistence and maternal educational background at the aggregated level. The next subsection presents results from robustness checks. The final subsections investigate whether ethnic capital influences the educational

outcome of the daughter and how differentials between female immigrants and female natives have evolved across the two generations.

6.2 Transition matrices

This section provides descriptive evidence from educational transition matrices. The matrices are unadjusted but are still useful since they provide a first glance at the raw data. Tables 3 and 4 show the results for daughters and mothers with an immigrant and a native background, respectively. The shaded areas show the educational levels that are most common in the next generation at a given schooling level in the first generation. If the years of schooling of mothers and daughters had been similar, the shaded area would have been on the diagonal. The area above the diagonal shows cases of upward transitions and, by contrast, the area below the diagonal shows cases of downward transitions.

(Insert Tables 3 and 4 here)

In general, the transition matrices show an interesting pattern: the probability of ending up at a certain level of education, conditional on the educational level of the mother, is very similar for daughters of immigrant mothers and native daughters. Moreover, the two groups have identical shaded areas and upward transition is much more frequent at lower educational levels. For example, the share of daughters with educational levels equal to 11 or 12 is larger than .50 for both groups of daughters independently of whether the mother has seven, nine or 10 years of schooling. These results may partly be explained by the features of the Swedish educational system. For example, one of the main goals of the Swedish educational system is to promote equal opportunities. Compulsory school is mandatory for nine years, meaning that daughters will have at least nine years of schooling, irrespective of the educational level of the mother. In addition, education in Sweden is free of charge at all levels and students are

provided with grants and loans by the Swedish Board for Study Support (CSN).[27] The interplay in education between the two generations is probably also affected by access to formal adult education (see Stenberg, 2009).

6.1 Transmission estimates

Table 5 provides the regression coefficients and the correlation estimates produced by equation (1). Starting with column (2), each additional year of education attained by immigrant mothers is associated with .23 years of further education by their daughters. The correlation coefficient is larger: .29, indicating that the dispersion in the years of schooling has decreased across generations.[28] Turning to daughters with a native background, the regression coefficient and the correlation coefficient are .27 and .34, respectively. The importance of maternal education thus appears to be similar for daughters who do and do not have an immigrant background. The intergenerational transmission is only slightly lower among daughters of immigrant mothers. Indeed, the difference in persistence between the two groups is statistically significant, but is much smaller than what Aydemir, Chen and Corak (2008) found for immigrant daughters in Canada. The estimate for daughters with an immigrant background may, however, be slightly biased upwards since top and bottom codings are more frequent than middle codings among immigrant mothers (see Table A4 in the Appendix). Comparing the results with Hammarstedt (2008), suggests that the educational link between Swedish-born daughters and their immigrant mothers is about six times higher than that of earnings.

(Insert Table 3 here)

[27] The student grant at upper secondary school is USD 146 a month and the weekly grant for higher studies is USD 94 in the current currency.
[28] Including groups of origin fixed effect to account for group specific measurement errors does not affect the results.

In order to examine whether the average effect masks a distributional effect, Figure 1 shows graphically the distribution for the fitted values of equation (1). The darker line shows how the fitted values of daughters of immigrant mothers are distributed. The lighter line instead shows the distribution for native daughters. The two distributions both peak between 12 and 13 years of schooling, but daughters with a native background are more likely to obtain a higher education. The figure also shows that the difference between the groups is bigger for higher educational levels, i.e. the right-hand side of the distribution.

(Insert Figure 1 here)

6.3 Transmission estimates by poorly versus highly educated mothers

Estimates of average persistence presented in the previous subsection have important limitations as they do not tell us whether those who start out poor, in terms of maternal educational background, have more or less persistence than those with highly educated mothers. Descriptive results in subsection 6.1 showed that upward transition is more common among disadvantaged daughters, which draws our attention to whether the intergenerational persistence is weaker for this group.[29] This subsection therefore analyzes if the importance of maternal background differs depending on whether the mother is poorly or highly educated and if the pattern is similar among immigrants and native Swedes.

Table 6 presents the results. Column (1) and row (1) provide the estimate for all daughters with an immigrant background. The second row in column (1), however, shows the results for daughters of highly educated immigrant mothers, i.e. mothers with 12 years of schooling or more, and the third row shows the results for those with poorly educated

[29] Upward transition does not necessarily imply low persistence as it is possible to observe both upward transition and a high transmission.

immigrant mothers, i.e. mothers with less than 12 years of schooling. The estimates for daughters with a native background are given in column (2), rows (1)−(3).

The educational background of the mother is found to be less important among daughters of poorly educated mothers. [30] The results are in line with the goal of the educational system that aims to weaken importance of socioeconomic background, especially among children from poor backgrounds. The patterns are similar for both daughters of immigrant mothers and daughters of native mothers. However, a small difference in the average persistence between the two groups (see row (1)) is still found and significant for both subgroups. This difference may be due to the somewhat higher average educational level that is prevailed among native mothers in both the advantaged and the disadvantaged group. In the presence of measurement error, the estimate of daughters to poorly educated immigrant mothers is presumably overstated because of the censoring mechanism and the mean-reverting structure of the measurement error. Among daughters of highly educated mothers, the estimate may instead be downward biased since the share of middle codings is large, see Table A4 in Appendix.

(Insert Table 6 here)

Comparing my results to the findings in Aydemir, Chen and Corak (2008) for Canada, highlights the importance of looking at different parts of the educational distribution in the first generation. The authors find a much lower average transmission among daughters of immigrant mothers than among native daughters even though immigrant daughters have a more affluent educational background than native daughters. If the transmission rate between the two groups only differs because of dissimilar educational backgrounds, the persistence is

[30] Note that the estimate in row (1) is larger than the estimates in rows (2) and (3) for both immigrant daughters and native daughters. One possible explanation for this may be that there is a level difference in the years of schooling of daughters between the two subgroups.

stronger among those who start out start from poor circumstances, compared to those with advantaged backgrounds.

Figure 2 presents the distribution of the fitted values for each subgroup. The distribution for daughters of poorly educated mothers is very similar for daughters with immigrant and native backgrounds. The distribution for daughters of highly educated mothers does, however, peak at a higher value for daughters with a native mother than for daughters with an immigrant mother. Also, the value range is wider for the native group. This result is consistent with the hypothesis that the educational system in Sweden weakens the link in education between the two generations for low educated mothers. This since, poorly educated immigrant mothers, on average, have lower educational levels than poorly educated native mothers, but the fitted values of their daughters is about the same.

(Insert Figure 2 here)

6.4 Transmission estimates by countries of origin

In the previous sections, all origin groups were pooled into one group of daughters with an immigrant background. This restricts the intergenerational transmission to be equal across groups of origin. It is however plausible that there are variations within the group of daughters with an immigrant background. In order to determine whether this is true, I estimate equation (1) separately for each immigrant group. The results are given in Table 7.

(Insert Table 7 here)

Overall, there is a remarkable variation in the persistence across groups. The correlation estimates range from .05 (West Asia, row 38) to .43 (East Europe, row 18) and the regression coefficient estimates range from .04 (West Asia, row 38) to .35 (East Europe, row 18). For most immigrant groups the correlation coefficient is only somewhat larger than the regression coefficient, implying that the dispersion in the years of schooling has decreased across the two generations. The persistence seems not to be more similar when comparing groups from neighboring countries, with the exception of East European groups (rows 13−18) of origin where the correlation is higher than .30 for all groups.

The importance of the mother's educational level for a daughter's educational outcome is lower among most immigrant groups compared to natives. When ranking the persistence, from the lowest to the highest, native daughters end up in 31st or 33rd place out of 41, depending on whether one uses the correlation coefficient or the regression coefficient. However, many coefficients are imprecisely estimated. For fourteen immigrant groups the regression coefficient estimate is significantly lower than for natives, whereas only one group has an estimate that is significantly higher.[31]

It should be pointed out that the very high transmission in education for some groups does not necessarily imply a low educational level for the daughters of these groups since their mothers, on average, are quite highly educated. There are, however, exceptions. Daughters with mothers from Portugal (row, 25), for example, have a high transmission even though their mothers, on average, are very poorly educated.

For groups of origin with low persistence, the average years of schooling of mothers in general is also low. For example, daughters with mothers that originate from Greece (row 21) and Bosnia-Herzegovina (row 19) both have low transmission rates and low maternal educational backgrounds. A reversed relationship is found for India (row 36) and Chile (row

[31] Lower: Bosnia-Herzegovina, Chile, Croatia, East Asia, Finland, Greece, India, Italy, Macedonia, Norway, Turkey, United Kingdom, West Asia and Yugoslavia. Higher: Denmark.

27), where the transmission is low and the average years of schooling in the mothers' generation is high.

6.5 A closer look at immigrant groups' maternal education distribution

As shown above, the importance of maternal education differs widely across immigrant groups. However, in subsection 6.3 it was revealed that the relationship in education between daughters and mothers is nonlinear and weaker among daughters of poorly educated mothers. A natural next step is, therefore, to explore whether the observed heterogeneity is explained partly by dissimilar distributions in the schooling variable of the mothers, and if daughters belonging to immigrant groups with lower education also have lower transmission estimates. Comparing the transmission estimates in Table 4 with the average educational levels of mothers, shown in Table 2, suggests that there may be a relationship. In order to examine this, I regress the correlation estimates and the regression coefficient estimates, given in Table 7, on the average educational level of each group within the first generation. The results, which are displayed in Figures 3 and 4, show that there is a positive relationship[32] This is an important finding as it tells us that the large differences in persistence across immigrant groups may stem partly from differences in the educational attainment in the first generation, and that the importance of maternal educational background is actually smaller among poorer educational groups than groups from more affluent educational backgrounds.

(Insert Figures 3 and 4 here)

[32] I have also experimented with an alternative explanatory variable by using the share of highly educated mothers instead of the average educational level. The findings remain stable. More detailed results can be obtained upon request.

The regression lines in Figures 3 and 4 are estimated to be .04 and .02. This means that an additional year of average education in the first generation will increase the transmission by .04 or .02, depending on whether one uses the correlation or the regression coefficient. Furthermore, the average educational level explains about one quarter (one seventh) of the variation in the persistence measured by the correlation coefficient (regression coefficient).

So far, I have not taken potential measurement errors into account, which actually may be driving the results. In the following part of the subsection I will, therefore, discuss thoroughly how measurement error can affect this pattern and, as we will see, it is likely to be even stronger in the absence of measurement error. Let us start with immigrant groups on the left-hand side of Figures 3 and 4, where the average educational levels are low in the first generation. Among these groups the measurement error is likely to be larger compared to immigrant groups with higher mean education (on the right-hand side of Figures 3 and 4), as the share with Swedish education is lower among these groups. Also, these groups of immigrants have few middle codings and a large share of the mothers have educational levels equal to seven years, indicating that the intergenerational transmission estimates for groups with poor mean education in the first generation are likely to be upward biased (see Table A4). For example, among Turkish mothers, less than 10 percent of the individuals obtained their education in Sweden and only about 10 percent have observations in the middle of the educational distribution. Furthermore, about 60 percent have observed educational levels equal to seven years which are likely to be censored since Turkish compulsory education, in practice, lasted less than five years during the time the mothers grew up.

Among Greek mothers, however, about 10 percent have completed their education in Sweden, 20 percent have observations that are middle coded and 50 percent have seven years of schooling. The numbers are not that different from Turkey but Figures 3 and 4 suggest that the persistence is much weaker among Greek mothers. However, compulsory school lasted

for six years in Greece, indicating that the censoring bias is less problematic for this group, which may explain the big difference between these two groups that is revealed in the Figures (MoE, 1995).

The intersection point of the dotted lines in Figures 3 and 4 represents the point observation of natives and is assumed to be measured without error. Mothers with, for example, a Portuguese background have a lower mean education but similar transmission estimates as natives. However, since there are fewer observations in the middle of the distribution than at the extremes this estimate may be upward biased.

In fact, all groups of immigrants with an average educational level of around 10 have more top and bottom codings compared to middle codings, indicating that the estimates are more likely to be upward biased than downward biased. However, a smaller share of these mothers attained their education abroad and has seven years of education, compared to groups with less than ten years education. The bias of measurement error may, therefore, be smaller compared to those with less than 10 years.

Turning to the right-hand side of the Figures, Table A4 shows that these groups of origins, in general, have more middle codings than top and bottom codings. This indicates that the estimates of these immigrant groups are more likely to suffer from downward bias than upward bias. For example, among observations of mothers originating from France and Japan more than 70 percent are middle coded. Furthermore, the cross-group variation is larger for higher educated groups compared to low educated group.

The West Asian group is an outlier with a relatively high average educational level in the first generation, but an estimate that is close to zero and that is not significant. The transmission is, however, likely to be downward biased as 60 percent of the observations neither are top-coded nor bottom-coded. Nevertheless, the large deviation cannot fully be explained by measurement error as there are other immigrant groups that, according to Table

A4, have a similar measurement error structure but much higher persistence. Other potential explanations may be few observations and a small age difference between mothers and daughters, as other groups with a small age difference all have low persistence in common (see, for example, Greece and Turkey).

Putting it all together, the results show that the large variations across groups are explained partly by different average educational levels across groups in the first generation. The analysis further suggests that this relationship would have been even stronger in the absence of measurement error as the estimates of groups to the left in Figures 3 and 4 are likely to be upward biased and the estimates of groups to the right are likely to be downward biased.

6.6 Sensitivity Analysis

To examine the robustness of the results, I have conducted a number of sensitivity checks. The first concern is that the results may be sensitive to the definition of educational background. Therefore, I experimented with the following alternative definitions of the educational background: paternal schooling, parental schooling, average parental schooling and the parent with the highest years of schooling. The results, given in Table 8, indicate a stable relation between estimates obtained for immigrants and natives, being somewhat lower for daughters with an immigrant background.[33] Furthermore, for both daughters with an immigrant background and a native background, the education of the mother is significantly more important than the education of the father.

(Insert Table 8 here)

[33] All estimates with exception of paternal schooling in panel (3) are significantly different from each other.

Years of schooling tend to increase over time so that younger age cohorts are more educated than older age cohorts, often referred to as 'educational inflation'. In order to take this into account, I reestimate the model in Table 5 by including birth-cohort dummies and interaction terms between the cohorts and the transmission variable. The results are shown in Table 9. For both daughters with an immigrant background and native daughters, the estimate of the transmission tends to decrease with age. The reduction is, furthermore, somewhat larger among daughters to native mothers. However, the differences between the two groups remain as the transmission estimate is still somewhat larger among native daughters.

(Insert Table 9 here)

The descriptive analysis revealed that the age distribution of the daughters differs across groups. This could be a concern since it is more likely that younger people are in education. De Haan and Plug (2008) use different correction methods in order to examine how this type of error may affect the intergenerational persistence estimate of education. The measurement error is, however, found to be nearly negligible. In order to explore whether this type of error may be a problem for this study, I reestimated the models in section 6.4 by using a restricted sample where I imposed the same sample restrictions as in Table A1 but for the year of 2003 (instead of 2007). Also, only observations of daughters with information on years of schooling in both 2003 and 2007 are included, and daughters are restricted to be born between 1960 and 1976. I reestimated the baseline model for each group of origin by using two alternative outcome variables: the educational level in 2003 and 2007, respectively. This enabled me to follow up daughters aged 27−43 in 2003, when they are four years older and are thus more likely to have completed their education. Descriptive statistics for the restricted sample are given in Table 10. Tables 11 and 12 present the results from regressions, based on

the education of the daughter in 2003 and in 2007, respectively. Countries with less than 100 observations are excluded from the analysis.[34]

(Insert Table 10 here)

As expected, the average years of schooling have increased for all groups during these four years. When comparing the estimates in Table 11 with the ones in Table 12 there is no general pattern and the estimates have not changed dramatically. One may have expected the estimates to be larger in 2007 compared to 2003, for daughters of highly educated mothers, since they are more likely to attend higher education. But instead the findings reveal that the estimate increases for some origins and decreases for others. The estimates in Table 12 do, however, not differ significantly from the ones in Table 11 and for many groups the transmission estimate is estimated imprecisely. Additionally, for most groups the rank position remains stable.

(Insert Tables 11 and 12 here)

6.7 Convergence towards the native mean

To get a more detailed picture of the educational transmission in Sweden, this section examines how differences in educational attainment between females with an immigrant background and those with a native background are transmitted across the two generations.

[34] Bosnia-Herzegovina, Chile, Iceland, India, Japan, Lebanon, Morocco, North Africa, Portugal, Syria and West Asia.

The results from equation (4) are given in Figure 4. The weighted least squares regression line has a slope of .35 and is statistically significant at the one percent level.[35] The findings indicate that there is a convergence towards the native mean and that the educational gap between immigrant and native women in the first generation has decreased in the next generation. For example, a one year difference in schooling in the mother's generation, decreases by about two thirds in the daughter's generation.

Figure 4 also offers scatter plots of each immigrant group's educational position in comparison to natives in the two generations. These are further described in Table 13, which shows the results from estimating equation (3) for each generation. For a majority of immigrant groups mothers have more than the average education of native mothers and this advantage is, for most groups, passed on to the next generation. The advantage in the first generation has, however, decreased in the second generation. French women (row 6), for example, have about two more years of schooling compared to native women in the first generation, but in the next generation this advantage has decreased to less than one year. Correspondingly, for educationally disadvantaged groups, the difference is smaller in the second generation. For example, immigrants from Turkey (row 31) are more likely to be poorly educated, but the disadvantage is smaller in the second generation than in the first generation.

(Insert Table 13 here)

Table 13 further shows that daughters with mothers from Turkey (row 31) and Chile (row 27) are furthest behind daughters from a native background. In addition, there has been a relative downward education transition among Chilean women: mothers are above native

[35] Since aggregated data is used here, each group is weighted by the number of persons included in that group (see e.g. Lewis, 1983).

average (.59) but daughters are below native average (-.89). The Chilean group already showed deviating results in the previous subsections, with a low intergenerational transmission rate although a high average level of education in the first generation. A potential explanation for the deviating results of the Chilean immigrant group may be attributed to their overall socioeconomic status. For a long period after having migrated to Sweden, there was high optimism among Chilean political refugees of returning to Chile. Therefore, many did not make any investments in Swedish society and most of the Chilean refugees stayed in the socially disadvantaged neighborhoods where they first arrived in Sweden. Furthermore, many highly educated Chileans took temporary blue-collar jobs (especially cleaning jobs) in order to not get too attached to their work (Lindqvist, 1991; Mella, 1990). As a consequence, daughters with a Chilean background, to a large extent, grew up in disadvantaged environments.

Table 7 revealed that the Portuguese and the West Asian groups had transmission estimates that deviated negatively. Table 13, however, shows that these daughters are doing better than their mothers since the gap between these groups and natives has decreased across the two generations. For West Asia (row 38), there has even been an upward education transmission with mothers that have below native average education but daughters having above the native average.

Finally, the pattern in Figure 4 suggests that differences decrease faster across the two generations when a group is either substantially disadvantaged or advantaged in the first generation. In contrast, the difference decreases more slowly if a group only has a small disadvantage or advantage in the first generation. For example, Turkish women are further behind natives compared to Finnish women in the first generation, but Turkish women are also catching up faster than Finnish women in the next generation.

6.8 Intergenerational transmission and the role of ethnic capital

A closely related issue in the intergenerational transmission context among immigrants is the concept of ethnic capital (Borjas, 1992). The idea is that the economic outcomes of children from an immigrant background are not only transmitted via parental skills, but also through the average skill level of the immigrant group, i.e. ethnic capital. If ethnic capital is positively correlated with daughters' and mothers' years of schooling, the persistence estimate of daughters with an immigrant background may further be biased upwards. The results in the very few studies conducted on the topics are, however, ambiguous. While, Borjas (1992; 1995) finds evidence of an effect of ethnic capital in the United States, Nielsen et al (2003) for Denmark, Bauer and Riphahn (2007) for Switzerland, as well as Aydemir, Chen and Corak (2008) for Canada, find no or only weak support for the existence of ethnic capital.

Table 14 gives the results. Ethnic capital is constructed in the same way as in Borjas (1992), as the average educational level of mothers in each immigrant group. Column (1) shows the estimate of the intergenerational education transmission, column (2) gives the estimate of ethnic capital and in the last column both these variables are included in the same model. The first row shows the results for all daughters while rows (2)−(3) give the results for daughters of highly and poorly educated mothers. This is mainly done to answer if ethnic capital is more important among daughters to poorly educated mothers. The results show that the educational performance of the immigrant group has a positive impact on the educational attainment of the daughter but its importance is, however, smaller than that of the mother, as its magnitude constitutes only about one third of the transmission estimate. [36] Furthermore, the estimate of maternal schooling does not change when ethnic capital is included in the model, implying that these two are not correlated. Immigrant groups' educational capital is more important among daughters of highly educated mothers. Although the findings support the

[36] The pattern is, however, weaker than that found by Borjas (1992) for the United States.

existence of ethnic capital it may be difficult to assess its implication. If, for example, a group of origin is small and spread over the country there may be no interaction within the group.[37] It is then unreasonable to assume that the average skill level within that group will affect the future economic outcome of a child belonging to the group. Ideally, one would like to construct a variable that measures the educational performance of those individuals within an ethnic group that a child actually interacts with.[38] In this data there is no information on the childhood neighborhood, so I am therefore not able to address this question any further.

(Insert Table 14 here)

7. Concluding Remarks

This study uses extensive register data on more than 65,000 daughters of immigrant mothers to examine the intergenerational transmission of education among the female immigrant population.

The intergenerational education transmission appears to be similar for daughters with an immigrant background and with a native background. The correlation is only slightly lower among daughters of immigrant mothers (.29 compared to .34). I further find that the intergenerational correlation is weaker among disadvantaged daughters (in terms of maternal educational background), and this pattern is similar for immigrant daughters (.12 compared to .20) and native daughters (.15 compared to .21). The pooled results do, however, mask large variations across immigrant groups with correlation estimates that range from .05 to .43.

[37] The interaction between quantity and quality may also matter, i.e. ethnic capital may be more important in larger groups. When interaction and size are added into the specification, the estimate on the interaction, however, is zero.

[38] Åslund et al (2009) measure ethnic capital by the local educational performance of an ethnic group. They find a positive effect between the local ethnic community and the school performance of a child in Sweden.

Nevertheless, regressing the transmission estimates on immigrant groups' average maternal educational levels, suggests that the differences in persistence across groups partly may bee explained by dissimilar educational levels in the first generation. This pattern is not likely to be driven by measurement errors. If anything, a careful analysis indicates that this pattern would probably have been even stronger in the absence of measurement error. The results also show that there is a convergence towards the native mean across the two generations, implying that differences in educational attainment between immigrant females and native females in the first generation have decreased in the next generation. Finally, tentative estimates from the last part of the analysis indicate that ethnic capital matters and that the influence is stronger among daughters of highly educated mothers.

The results clearly show that the influence of maternal education is weaker among daughters of poorly educated mothers. The findings thus reflect a highly desirable condition as family background is less important among disadvantaged daughters. This may partly be explained by the features of the Swedish educational system. For example, children are required to stay in school for at least nine years, independently of their socioeconomic background. The results are similar for daughters with a native and an immigrant background and observed differences across immigrant groups seem simply be due to the nonlinear feature of the transmission. This is since poorly educated groups have a low transmission and highly educated groups a high transmission. This suggests that there are no country specific, or "cultural", role-model effects that affect the transmission estimate. Another interpretation may be that inheritable factors are of greater importance than environmental factors.

The results open up for interesting tasks of future research. Naturally, since this study is on women, it would be interesting to incorporate men as well. Furthermore, since some immigrant groups showed deviating results, e.g. the Chilean group, it would be interesting to study immigrant groups more closely and disentangle the mechanisms that lie behind the

intergenerational education persistence. Future research may also go a step further and consider the intergenerational correlation in field of education, since it is strongly correlated with earnings and with socioeconomic wellbeing.

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Table 1: Descriptive Overview

	Immigrant Background		Native Background	
Variable	Mean	St Dev.	Mean	St Dev.
Education Daughter	12.57	2.17	12.87	2.16
Education Mother	10.22	2.67	10.67	2.72
Age Daughter in 2007	36.74	5.91	37.11	5.79
Age Mother in 2007	63.58	7.92	63.51	7.30
Share of Mothers with Edu<12	.75		.71	
Education Mother < 12	9.01	1.68	9.27	1.64
Education Mother ≥ 12	13.85	1.58	14.14	1.46
Sample Size	68,410		719,753	

Table 2: Descriptive Overview by Country of Origin

	Education		Age in 2007		Share of Mothers	
Country of Origin	Daughter	Mother	Daughter	Mother	with Edu<12	N
1 Denmark	12.29	10.12	37.79	64.85	.77	4,086
	(2.14)	*(2.63)*	*(6.00)*	*(8.07)*		
2 Finland	12.44	10.04	37.06	63.51	.79	34,974
	(2.13)	*(2.55)*	*(5.70)*	*(7.49)*		
3 Norway	12.35	10.02	38.09	65.24	.81	4,734
	(2.11)	*(2.49)*	*(5.86)*	*(8.35)*		
4 Iceland	13.07	11.59	33.54	59.84	.58	121
	(2.06)	*(2.63)*	*(5.49)*	*(8.12)*		
5 Austria	12.76	10.70	38.35	65.25	.67	722
	(2.13)	*(2.49)*	*(5.79)*	*(7.28)*		
6 France	13.56	12.57	37.04	65.98	.36	211
	(2.11)	*(2.57)*	*(6.39)*	*(8.14)*		
7 Germany	12.78	10.81	39.92	68.62	.67	5,645
	(2.24)	*(2.56)*	*(5.41)*	*(6.98)*		
8 Netherlands	13.27	11.51	38.63	67.82	.57	313
	(2.29)	*(2.52)*	*(5.38)*	*(6.68)*		
9 Switzerland	13.16	11.65	38.71	68.47	.50	147
	(2.06)	*(2.35)*	*(5.95)*	*(7.43)*		
10 United Kingdom	13.40	12.14	35.60	64.00	.45	638
	(2.27)	*(2.92)*	*(5.90)*	*(7.77)*		
11 United States	13.26	12.14	38.35	68.67	.45	494
	(2.15)	*(3.14)*	*(6.49)*	*(9.39)*		
12 Western Countries	13.18	11.53	36.54	65.41	.56	213
	(2.04)	*(2.69)*	*(6.48)*	*(9.04)*		
13 Czechoslovakia	13.42	12.01	35.67	63.81	.43	659
	(2.28)	*(2.78)*	*(5.65)*	*(6.56)*		
14 Estonia	13.30	11.25	40.35	69.82	.58	1,186
	(2.19)	*(3.21)*	*(4.78)*	*(5.02)*		
15 Hungary	12.92	11.33	36.85	64.26	.56	1,106
	(2.28)	*(2.84)*	*(6.13)*	*(7.29)*		
16 Latvia	13.30	12.45	40.55	69.13	.39	181
	(2.24)	*(2.85)*	*(4.76)*	*(4.79)*		
17 Poland	13.16	11.75	32.17	59.62	.52	1,854
	(2.33)	*(2.76)*	*(4.74)*	*(6.73)*		
18 East Europe	13.55	12.22	34.18	62.34	.43	163
	(2.37)	*(2.90)*	*(5.34)*	*(7.17)*		
19 Bosnia-Herzegovina	12.83	8.83	33.01	58.72	.81	109
	(1.68)	*(2.39)*	*(4.00)*	*(5.44)*		
20 Croatia	12.87	9.38	34.60	60.00	.82	462
	(1.96)	*(2.45)*	*(4.30)*	*(5.81)*		
21 Greece	12.79	8.71	33.45	58.72	.90	929
	(2.29)	*(2.23)*	*(4.41)*	*(7.02)*		

Note: Standard errors are reported in parenthesis.

Table 2 *(continued)* : Descriptive Overview by Country of Origin

	Education		Age in 2007		Share of Mothers	
Country of Origin	Daughter	Mother	Daughter	Mother	with Edu<12	N
22 Italy	12.64	10.05	37.37	65.45	.76	368
	(2.13)	*(2.80)*	*(5.36)*	*(7.72)*		
23 Yugoslavia	12.47	9.31	34.00	59.15	.83	4,308
	(2.05)	*(2.35)*	*(4.38)*	*(6.31)*		
24 Macedonia	12.74	9.04	32.98	56.77	.88	163
	(1.99)	*(2.17)*	*(3.47)*	*(4.24)*		
25 Portugal	12.54	9.86	33.08	61.77	.77	142
	(2.11)	*(2.82)*	*(4.84)*	*(8.46)*		
26 Spain	13.02	10.07	36.05	64.55	.74	364
	(2.33)	*(2.68)*	*(5.48)*	*(7.41)*		
27 Chile	12.41	11.55	29.52	56.70	.56	242
	(2.19)	*(2.41)*	*(2.78)*	*(5.85)*		
28 Latin America	13.15	11.71	32.78	61.17	.56	362
	(2.33)	*(2.71)*	*(5.20)*	*(7.20)*		
29 Lebanon	12.55	9.18	30.98	56.64	.88	120
	(2.03)	*(2.42)*	*(4.17)*	*(6.52)*		
30 Syria	12.55	8.99	29.08	53.82	.90	157
	(2.06)	*(2.11)*	*(2.17)*	*(5.86)*		
31 Turkey	12.04	8.13	30.13	54.68	.96	1,433
	(2.07)	*(1.75)*	*(3.09)*	*(6.6)*		
32 Middle East	13.27	11.69	31.36	57.62	.51	232
	(2.27)	*(2.71)*	*(4.17)*	*(6.23)*		
33 Morocco	13.04	8.72	31.53	56.83	.92	133
	(2.35)	*(2.09)*	*(3.65)*	*(5.88)*		
34 North Africa	13.10	11.53	33.44	60.05	.50	104
	(2.13)	*(3.08)*	*(5.46)*	*(7.35)*		
35 Africa	13.61	12.09	32.86	60.63	.50	222
	(2.23)	*(2.81)*	*(5.64)*	*(8.08)*		
36 India	14.09	12.46	33.69	61.21	.44	145
	(2.06)	*(3.14)*	*(6.10)*	*(8.73)*		
37 Soviet Union	12.91	10.71	39.24	68.58	.68	398
	(2.25)	*(3.13)*	*(6.03)*	*(7.02)*		
38 West Asia	13.33	10.88	29.37	55.46	.68	105
	(2.02)	*(2.58)*	*(2.75)*	*(5.47)*		
39 Japan	14.07	12.36	34.53	63.91	.35	140
	(2.00)	*(2.49)*	*(5.13)*	*(6.12)*		
40 East Asia	13.60	11.29	31.97	60.48	.57	325
	(2.18)	*(3.02)*	*(5.23)*	*(7.20)*		

Note: Standard errors are reported in parenthesis.

Table 3: Unadjusted Transmission Matrices for Daughters with an Immigrant Background (in column share)

	Education Daughter												
Education Mother	7	9	10	11	12	13	14	15	16	17	18	20	Total
7	.00	.12	.06	.27	.28	.04	.07	.11	.04	.00	.00	.00	1
9	.00	.11	.05	.21	.31	.05	.06	.14	.06	.01	.00	.00	1
10	.00	.08	.05	.22	.28	.05	.09	.15	.06	.01	.00	.00	1
11	.00	.08	.04	.21	.28	.06	.08	.15	.08	.01	.00	.00	1
12	.00	.06	.03	.14	.28	.07	.08	.19	.12	.02	.00	.01	1
13	.00	.05	.02	.08	.21	.10	.09	.25	.16	.03	.00	.01	1
14	.00	.04	.02	.12	.22	.08	.11	.24	.14	.02	.00	.01	1
15	.00	.03	.02	.08	.18	.08	.11	.28	.19	.03	.00	.01	1
16	.00	.03	.01	.05	.13	.08	.09	.29	.25	.05	.01	.02	1
17	.00	.03	.01	.04	.09	.07	.07	.28	.28	.09	.00	.03	1
18	.00	.01	.01	.03	.13	.03	.03	.33	.30	.07	.01	.04	1
20	.00	.04	.02	.02	.04	.07	.08	.25	.31	.12	.02	.05	1

Table 4: Unadjusted Transmission Matrices for Daughters with a Native Background (in column share)

	Education Daughter												
Education Mother	7	9	10	11	12	13	14	15	16	17	18	20	Total
7	.00	.10	.05	.33	.23	.04	.08	.11	.04	.00	.00	.00	1
9	.00	.09	.04	.21	.32	.05	.08	.15	.06	.00	.00	.00	1
10	.00	.06	.04	.23	.28	.04	.09	.17	.07	.00	.00	.00	1
11	.00	.06	.03	.20	.28	.05	.09	.19	.08	.01	.00	.00	1
12	.00	.04	.02	.13	.26	.07	.09	.24	.13	.01	.00	.01	1
13	.00	.03	.02	.09	.20	.08	.10	.28	.17	.02	.00	.01	1
14	.00	.03	.01	.10	.20	.06	.11	.29	.16	.02	.00	.01	1
15	.00	.02	.01	.06	.14	.07	.11	.33	.22	.03	.00	.02	1
16	.00	.01	.01	.04	.10	.07	.10	.31	.27	.05	.01	.03	1
17	.00	.01	.01	.03	.08	.06	.07	.30	.28	.12	.01	.04	1
18	.00	.01	.00	.04	.08	.06	.07	.29	.28	.09	.00	.07	1
20	.00	.01	.00	.02	.06	.06	.07	.26	.30	.11	.01	.09	1

Table 5: Estimations of Intergenerational Transmission

	Immigrant Background		Native Background	
	(1)	(2)	(3)	(4)
	Corr.Coef.	Reg.Coef.	Corr.Coef.	Reg.Coef.
Education Mother	0.288***	.234***	0.337***	.267***
	(.004)	*(.003)*	*(.001)*	*(.000)*
Adj. R-Squared	.107	.107	.158	.158
Sample Size	68,410	68,410	719,753	719,753

Note: Regressions include controls for age, age-squared of mothers & daughters. Robust standard errors are reported in parentheses. */**/*** denote significance at the 10/5/1 percent level.

Table 6: Estimations of Intergenerational Transmission by Educational Background

	Immigrant Background		Native Background	
	(1)	(2)	(3)	(4)
	Corr.Coef.	Reg.Coef.	Corr.Coef.	Reg.Coef.
(1) ***All:***				
Education Mother	0.288***	.234***	0.337***	.267***
	(.004)	*(.003)*	*(.001)*	*(.000)*
Adj. R2	.107	.107	.158	.158
Sample Size	68,410	68,410	719,753	719,753
(2) ***Edu Mother ≥ 12***				
Education Mother	0.199***	.275***	.208***	.296***
	(.008)	*(.010)*	*(.002)*	*(.003)*
Adj. R2	.063	.063	.077	.077
Sample Size	17,122	17,122	207,316	207,316
(3) ***Edu Mother < 12***				
Education Mother	0.119***	.145***	.152***	.187***
	(.004)	*(.005)*	*(.001)*	*(.002)*
Adj. R2	.029	.029	.053	.053
Sample Size	51,288	51,288	512,437	512,437

Note: Regressions include controls for age, age-squared of mothers & daughters. Robust standard errors are reported in parentheses. */**/*** denote significance at the 10/5/1 percent level.

Table 7: Estimations of Intergenerational Education Transmission by Country of Origin

		Education Mother					
		(1)		(2)			
	Country of Origin	Corr. Coef.	Robust SE	Reg. Coef.	Robust SE	Adj. R-Squared	N
1	Denmark	.362***	*(.015)*	.295***	*(.012)*	.154	4,086
2	Finland	.264***	*(.005)*	.220***	*(.004)*	.092	34,974
3	Norway	.280***	*(.015)*	.237***	*(.012)*	.098	4,734
4	Iceland	.309***	*(.078)*	.243***	*(.061)*	.066	121
5	Austria	.280***	*(.034)*	.239***	*(.029)*	.094	722
6	France	.315***	*(.066)*	.259***	*(.054)*	.116	211
7	Germany	.302***	*(.013)*	.264***	*(.011)*	.120	5,645
8	Netherlands	.238***	*(.052)*	.216***	*(.047)*	.081	313
9	Switzerland	.222**	*(.086)*	.195**	*(.076)*	.109	147
10	United Kingdom	.245***	*(.038)*	.190***	*(.030)*	.090	638
11	United States	.416***	*(.044)*	.285***	*(.030)*	.138	494
12	Western Countries	.318***	*(.065)*	.241***	*(.049)*	.128	213
13	Czechoslovakia	.333***	*(.038)*	.272***	*(.031)*	.160	659
14	Estonia	.387***	*(.028)*	.265***	*(.019)*	.163	1,186
15	Hungary	.343***	*(.028)*	.276***	*(.023)*	.153	1,106
16	Latvia	.363***	*(.060)*	.286***	*(.047)*	.152	181
17	Poland	.348***	*(.023)*	.294***	*(.020)*	.136	1,854
18	East Europe	.425***	*(.078)*	.348***	*(.063)*	.181	163
19	Bosnia-Herzegovina	.168*	*(.099)*	.118*	*(.070)*	.027	109
20	Croatia	.209***	*(.044)*	.167***	*(.035)*	.043	462
21	Greece	.113***	*(.031)*	.116***	*(.032)*	.027	929
22	Italy	.256***	*(.055)*	.195***	*(.042)*	.080	368
23	Yugoslavia	.181***	*(.015)*	.157***	*(.013)*	.043	4,308
24	Macedonia	.147*	*(.085)*	.135*	*(.078)*	.020	163
25	Portugal	.351***	*(.075)*	.262***	*(.056)*	.153	142
26	Spain	.231***	*(.052)*	.201***	*(.046)*	.059	364
27	Chile	.175**	*(.069)*	.159**	*(.062)*	.066	242
28	Latin America	.240***	*(.055)*	.207***	*(.047)*	.051	362
29	Lebanon	.276***	*(.082)*	.231***	*(.069)*	.092	120
30	Syria	.128	*(.091)*	.124	*(.089)*	.019	157
31	Turkey	.176***	*(.026)*	.209***	*(.031)*	.044	1,433
32	Middle East	.257***	*(.057)*	.216***	*(.048)*	.119	232
33	Morocco	.237***	*(.089)*	.266***	*(.100)*	.028	133
34	North Africa	.409***	*(.093)*	.283***	*(.064)*	.121	104
35	Africa	.301***	*(.667)*	.240***	*(.053)*	.080	222
36	India	.199**	*(.093)*	.131**	*(.061)*	.034	145
37	Soviet Union	.358***	*(.052)*	.257***	*(.037)*	.147	398
38	West Asia	.049	*(.108)*	.038	*(.084)*	-.010	105
39	Japan	.296***	*(.088)*	.238***	*(.071)*	.086	140
40	East Asia	.231***	*(.057)*	.167***	*(.041)*	.050	325

Note: Regressions include controls for age, age-squared of mothers & daughters. */**/*** denote significance at the 10/5/1 percent level.

Table 8: Estimations of the Transmission: Alternative Definitions of the Eductional Background

		Immigrant Background		Native Background	
		(1)	(2)	(3)	(4)
		Corr.Coef.	Reg.Coef.	Corr.Coef.	Reg.Coef.
(1)	Maternal Schooling	.290***	.233***	.333***	.266***
		(.004)	*(.003)*	*(.001)*	*(.001)*
	Adj. R-Squared	.112	.112	.160	.160
(2)	Paternal Schooling	.287***	.209***	.318***	.225***
		(.004)	*(.003)*	*(.001)*	*(.001)*
	Adj. R-Squared	.103	.103	.140	.140
(3)	Parental Schooling				
	Mother	.203***	.163***	.241***	.192***
		(.005)	*(.004)*	*(.001)*	*(.001)*
	Father	.181	.132***	.193	.137***
		(.005)	*(.004)*	*(.001)*	*(.001)*
	Adj. R-Squared	.137	.137	.187	.187
(4)	Average Parental Schooling	.331***	.293***	.374***	.325***
		(.004)	*(.004)*	*(.001)*	*(.001)*
	Adj. R-Squared	.136	.136	.186	.186
(5)	Parent with Highest Education	.312***	.243***	.349***	.274***
		(.004)	*(.003)*	*(.001)*	*(.001)*
	Adj. R-Squared	.121	.121	.168	.168
	Sample Size	48,704	48,704	576,445	576,445

Note: Regressions include controls for age, age-squared of daughters & concerned parent/parents.
Robust standard errors are reported in parentheses. */**/*** denote significance at the 10/5/1 percent level.

Table 9: Estimations of the Transmission: Interacted Model with Birth Cohorts

	Immigrant Background		Native Background	
	(1)	(2)	(3)	(4)
Education mother	.240 ***	.248 ***	.282 ***	.316 ***
	(.003)	*(.006)*	*(.001)*	*(.002)*
Interaction-terms:				
age 27−30		*ref*		*ref*
age 31−34		.008		-.026 ***
		(.009)		*(.003)*
age 35−38		-.001		-.033 ***
		(.009)		*(.003)*
age 39−42		-.032 ***		-.068 ***
		(.009)		*(.003)*
age 43−47		-.025 **		-.061 ***
		(.011)		*(.003)*
Adj. R-Squared	.100	.101	.144	.145
Sample size		68,410		719,753

Note: Regressions include controls for age-cohorts of daughters and age & age-squared of mothers.
Robust standard errors are reported in parentheses. */**/*** denote significance at the 10/5/1 percent level.

Table 10: Descriptive Overview by Country of Origin, Restricted Sample

	Country of Origin	Education daughter Year 2003	Education daughter Year 2007	Education Mother	Share of Mothers with Edu<12	N
1	Denmark	11.99	12.11	9.94	.79	3,287
		(2.03)	*(2.09)*	*(2.60)*		
2	Finland	12.13	12.25	9.89	.81	27,945
		(2.00)	*(2.05)*	*(2.53)*		
3	Norway	12.04	12.14	10.63	.82	3,883
		(1.99)	*(2.03)*	*(2.47)*		
4	Austria	12.44	12.57	12.48	.68	581
		(2.07)	*(2.10)*	*(2.48)*		
5	France	13.34	13.46	10.75	.38	159
		(2.05)	*(2.13)*	*(2.61)*		
6	Germany	12.54	12.65	11.30	.68	5,018
		(2.14)	*(2.21)*	*(2.56)*		
7	Netherlands	12.89	13.06	11.70	.59	275
		(2.17)	*(2.30)*	*(2.49)*		
8	Switzerland	12.96	13.05	12.19	.50	124
		(1.99)	*(2.00)*	*(2.29)*		
9	United Kingdom	13.05	13.17	11.75	.46	443
		(2.28)	*(2.36)*	*(2.93)*		
10	United States	13.05	13.16	11.58	.51	386
		(2.10)	*(2.13)*	*(3.23)*		
11	Western Countries	12.97	13.05	11.72	.57	151
		(2.00)	*(2.00)*	*(2.82)*		
12	Czechoslovakia	13.05	13.18	11.72	.47	502
		(2.22)	*(2.26)*	*(2.73)*		
13	Estonia	13.11	13.2	11.20	.59	1,098
		(2.18)	*(2.19)*	*(3.19)*		
14	Hungary	12.57	12.69	11.10	.58	831
		(2.24)	*(2.29)*	*(2.94)*		
15	Latvia	13.06	13.24	12.36	.40	173
		(2.04)	*(2.24)*	*(2.85)*		
16	Poland	12.78	12.96	11.56	.55	942
		(2.26)	*(2.32)*	*(2.95)*		
17	East Europe	13.18	13.34	12.00	.46	105
		(2.21)	*(2.47)*	*(3.00)*		
18	Croatia	12.66	12.79	9.34	.82	373
		(1.81)	*(1.91)*	*(2.40)*		

Note: Standard errors are reported in parenthesis.

Table 10 *(continued)* : Descriptive Overview by Country of Origin, Restricted Sample

	Country of Origin	Education daughter Year 2003	Education daughter Year 2007	Education Mother	Share of Mothers with Edu<12	N
19	Greece	12.61	12.72	8.52	.91	600
		(2.20)	*(2.29)*	*(2.09)*		
20	Italy	12.37	12.44	9.87	.78	299
		(1.97)	*(2.02)*	*(2.76)*		
21	Yugoslavia	12.16	12.28	9.25	.84	3,061
		(1.91)	*(1.98)*	*(2.35)*		
22	Macedonia	12.26	12.40	8.92	.90	110
		(1.77)	*(1.92)*	*(2.06)*		
23	Spain	12.62	12.75	9.89	.78	273
		(2.18)	*(2.30)*	*(2.65)*		
24	Latin America	12.84	13.03	11.67	.55	187
		(2.13)	*(2.27)*	*(2.68)*		
25	Turkey	11.59	11.66	8.06	.96	471
		(1.84)	*(1.84)*	*(1.64)*		
26	Middle East	13.36	13.59	11.75	.50	101
		(2.13)	*(2.20)*	*(2.78)*		
27	Africa	13.41	13.56	12.62	.41	108
		(2.22)	*(2.37)*	*(2.75)*		
28	Soviet Union	12.50	12.62	10.16	.75	330
		(2.10)	*(2.17)*	*(2.92)*		
29	East Asia	13.58	13.69	12.36	.36	139
		(2.22)	*(2.26)*	*(2.81)*		

Note: Standard errors are reported in parenthesis.

Table 11: Estimations of Intergenerational Transmission by Country of Origin, Restricted Sample 2003

		Education Mother							
		(1)			(2)				
		Corr.	Robust	Rank	Reg.	Robust	Rank	Adj. R-	
	Country of Origin	Coef.	SE		Coef.	SE		Squared	N
1	Denmark	.361 ***	*(.017)*	22	.281 ***	*(.013)*	24	.157	3,287
2	Finland	.265 ***	*(.006)*	10	.209 ***	*(.005)*	9	.087	27,945
3	Norway	.295 ***	*(.017)*	15	.237 ***	*(.014)*	14	.099	3,883
4	Austria	.293 ***	*(.038)*	14	.245 ***	*(.031)*	17	.102	581
5	France	.307 ***	*(.307)*	18	.241 ***	*(.063)*	16	.078	159
6	Germany	.314 ***	*(.013)*	19	.263 ***	*(.011)*	21	.128	5,018
7	Netherlands	.281 ***	*(.056)*	13	.246 ***	*(.049)*	18	.085	275
8	Switzerland	.220 **	*(.092)*	7	.191 **	*(.080)*	8	.099	124
9	United Kingdom	.350 ***	*(.042)*	20	.273 ***	*(.033)*	23	.159	443
10	United States	.404 ***	*(.049)*	27	.263 ***	*(.032)*	20	.140	386
11	Western Countries	.366 ***	*(.079)*	23	.260 ***	*(.056)*	19	.182	151
12	Czechoslovakia	.264 ***	*(.044)*	9	.215 ***	*(.036)*	10	.121	502
13	Estonia	.398 ***	*(.029)*	26	.272 ***	*(.020)*	22	.167	1,098
14	Hungary	.373 ***	*(.033)*	24	.285 ***	*(.025)*	26	.172	831
15	Latvia	.406 ***	*(.066)*	28	.291 ***	*(.047)*	28	.181	173
16	Poland	.373 ***	*(.032)*	25	.286 ***	*(.025)*	27	.167	942
17	East Europe	.497 ***	*(.089)*	29	.366 ***	*(.065)*	29	.266	105
18	Croatia	.205 ***	*(.052)*	5	.155 ***	*(.039)*	4	.041	373
19	Greece	.103 ***	*(.103)*	1	.108 ***	*(.042)*	1	.014	600
20	Italy	.267 ***	*(.060)*	11	.191 ***	*(.043)*	6	.111	299
21	Yugoslavia	.192 ***	*(.018)*	4	.156 ***	*(.015)*	5	.040	3,061
22	Macedonia	.280 ***	*(.091)*	12	.240 ***	*(.078)*	15	.119	110
23	Spain	.182 ***	*(.064)*	3	.149 ***	*(.053)*	3	.026	273
24	Latin America	.241 ***	*(.074)*	8	.191 ***	*(.059)*	7	.048	187
25	Turkey	.207 ***	*(.048)*	6	.232 ***	*(.054)*	13	.066	471
26	Middle East	.299 ***	*(.081)*	16	.230 ***	*(.062)*	12	.165	101
27	Africa	.351 ***	*(.096)*	21	.283 ***	*(.077)*	25	.120	108
28	Soviet Union	.307 ***	*(.055)*	17	.221 ***	*(.040)*	11	.092	330
29	East Asia	.168 *	*(.093)*	2	.133 *	*(.073)*	2	.023	139

Note: Regressions include controls for age, age-squared of mothers & daughters. */**/*** denote significance at the 10/5/1 percent level.

Table 12: Estimations of Intergenerational Transmission by Country of Origin, Restricted Sample 2007

		Education Mother								
		(1)				(2)				
		Corr.		Robust	Rank	Reg.		Robust	Rank	Adj. R-	
	Country of Origin	Coef.		SE		Coef.		SE		Squared	N
1	Denmark	.358	***	*(.017)*	22	.287	***	*(.014)*	24	.156	3,287
2	Finland	.264	***	*(.006)*	12	.214	***	*(.005)*	11	.087	27,945
3	Norway	.283	***	*(.017)*	15	.233	***	*(.014)*	16	.094	3,883
4	Austria	.270	***	*(.038)*	13	.229	***	*(.032)*	15	.087	581
5	France	.312	***	*(.078)*	18	.254	***	*(.064)*	18	.092	159
6	Germany	.307	***	*(.013)*	17	.265	***	*(.012)*	20	.125	5,018
7	Netherlands	.247	***	*(.055)*	10	.228	***	*(.051)*	14	.075	275
8	Switzerland	.229	**	*(.094)*	8	.200	**	*(.082)*	8	.090	124
9	United Kingdom	.346	***	*(.042)*	20	.280	***	*(.034)*	23	.162	443
10	United States	.422	***	*(.049)*	28	.279	***	*(.032)*	21	.153	386
11	Western Countries	.361	***	*(.077)*	23	.255	***	*(.054)*	19	.186	151
12	Czechoslovakia	.258	***	*(.043)*	11	.214	***	*(.036)*	10	.115	502
13	Estonia	.406	***	*(.029)*	27	.279	***	*(.020)*	22	.175	1,098
14	Hungary	.372	***	*(.032)*	24	.289	***	*(.025)*	25	.172	831
15	Latvia	.380	***	*(.061)*	25	.298	***	*(.048)*	26	.180	173
16	Poland	.392	***	*(.033)*	26	.308	***	*(.026)*	28	.187	942
17	East Europe	.524	***	*(.096)*	29	.431	***	*(.079)*	29	.259	105
18	Croatia	.193	***	*(.050)*	2	.154	***	*(.040)*	2	.035	373
19	Greece	.115	***	*(.039)*	1	.126	***	*(.043)*	1	.017	600
20	Italy	.275	***	*(.062)*	14	.201	***	*(.046)*	9	.112	299
21	Yugoslavia	.195	***	*(.018)*	4	.164	***	*(.016)*	4	.042	3,061
22	Macedonia	.209	**	*(.096)*	7	.195	**	*(.089)*	6	.076	110
23	Spain	.209	***	*(.064)*	6	.182	***	*(.055)*	5	.037	273
24	Latin America	.235	***	*(.235)*	9	.198	***	*(.062)*	7	.054	187
25	Turkey	.195	***	*(.048)*	3	.218	***	*(.054)*	12	.056	471
26	Middle East	.313	***	*(.081)*	19	.248	***	*(.064)*	17	.161	101
27	Africa	.347	***	*(.093)*	21	.299	***	*(.080)*	27	.109	108
28	Soviet Union	.304	***	*(.057)*	16	.226	***	*(.042)*	13	.091	330
29	East Asia	.198	**	*(.096)*	5	.160	**	*(.077)*	3	.025	139

Note: Regressions include controls for age, age-squared of mothers & daughters. */**/*** denote significance at the 10/5/1 percent level.

Table 13: Age-adjusted Educational Differences Between Females with an Immigrant Background and a Native Backgound

		First Generation		Second Generation	
	Country of Origin	Reg. Coef.	Robust SE	Reg. Coef.	Robust SE
1	Denmark	-.439 ***	*(.041)*	-.539 ***	*(.033)*
2	Finland	-.629 ***	*(.014)*	-.436 ***	*(.012)*
3	Norway	-.511 ***	*(.036)*	-.455 ***	*(.031)*
4	Iceland	.794 ***	*(.240)*	-.009	*(.189)*
5	Austria	.123	*(.092)*	-.031	*(.079)*
6	France	2.079 ***	*(.178)*	.696 ***	*(.146)*
7	Germany	.468 ***	*(.034)*	.078 ***	*(.030)*
8	Netherlands	1.093 ***	*(.144)*	.490 ***	*(.128)*
9	Switzerland	1.309 ***	*(.202)*	.386 **	*(.167)*
10	United Kingdom	1.511 ***	*(.117)*	.446 ***	*(.089)*
11	United States	1.919 ***	*(.133)*	.466 ***	*(.097)*
12	Western Countries	1.044 ***	*(.181)*	.281 **	*(.139)*
13	Czechoslovakia	1.326 ***	*(.108)*	.464 ***	*(.087)*
14	Estonia	.946 ***	*(.092)*	.621 ***	*(.063)*
15	Hungary	.695 ***	*(.085)*	.041	*(.068)*
16	Latvia	2.074 ***	*(.216)*	.636 ***	*(.165)*
17	Poland	.895 ***	*(.064)*	.002	*(.054)*
18	East Europe	1.483 ***	*(.222)*	.512 ***	*(.184)*
19	Bosnia-Herzegovina	-2.103 ***	*(.227)*	-.276 *	*(.159)*
20	Croatia	-1.503 ***	*(.114)*	-.148	*(.091)*
21	Greece	-2.164 ***	*(.073)*	-.297 ***	*(.076)*
22	Italy	-.488 ***	*(.143)*	-.210 *	*(.111)*
23	Yugoslavia	-1.573 ***	*(.036)*	-.580 ***	*(.031)*
24	Macedonia	-1.957 ***	*(.170)*	-.379 ***	*(.155)*
25	Portugal	-.846 ***	*(.236)*	-.569 ***	*(.181)*
26	Spain	-.546 ***	*(.140)*	.085	*(.122)*
27	Chile	.591 ***	*(.154)*	-.894 ***	*(.142)*
28	Latin America	.921 ***	*(.143)*	.036	*(.123)*
29	Lebanon	-1.756 ***	*(.219)*	-.671 ***	*(.190)*
30	Syria	-1.975 ***	*(.168)*	-.773 ***	*(.164)*
31	Turkey	-2.814 ***	*(.047)*	-1.231 ***	*(.055)*
32	Middle East	.763 ***	*(.180)*	.066	*(.152)*
33	Morocco	-2.230 ***	*(.185)*	-.156	*(.205)*
34	North Africa	.708 **	*(.310)*	.015	*(.208)*
35	Africa	1.318 ***	*(.191)*	.496 ***	*(.150)*
36	India	1.740 ***	*(.274)*	1.026 ***	*(.168)*
37	Soviet Union	.365 **	*(.148)*	.175	*(.111)*
38	West Asia	-.103	*(.250)*	.023	*(.197)*
39	Japan	1.658 ***	*(.210)*	1.050 ***	*(.167)*
40	East Asia	.481 ***	*(.176)*	.434 ***	*(.123)*
	No Obs.	788,163		788,163	

Note: Regressions include controls for age and age-squared. */**/*** denote significance at the 10/5/1 percent level.

Table 14: Ethnic Capital

	Immigrant Background		
	(1)	(2)	(3)
(1)		***All:***	
Education Mother	.234***		.230***
	(.003)		*(.008)*
Ethnic Capital		.305***	.070*
		(.035)	*(.035)*
Adj. R-Squared	.107	.037	.108
Sample Size	68,410		
(2)		***Edu Mother ≥ 12***	
Education Mother	.275***		.270***
	(.010)		*(.011)*
Ethnic Capital		.163***	.122***
		(.026)	*(.027)*
Adj. R-Squared	.063	.028	.065
Sample Size	17,122		
(3)		***Edu Mother <12***	
Education Mother	.145***		.141***
	(.005)		*(.009)*
Ethnic Capital		.117***	.045
		(.040)	*(.041)*
Adj. R-Squared	.029	.016	.029
Sample Size	51,288		

Note: Regressions include controls for age, age-squared of mothers & daughters. Standard errors are reported in parentheses. Robust standard erros for column 1 & clustered standard errors by origin in columns 2 and 3. */**/*** denote significance at the 10/5/1 percent level.

Figure 1: Distribution of Fitted Values, Immigrants and Natives

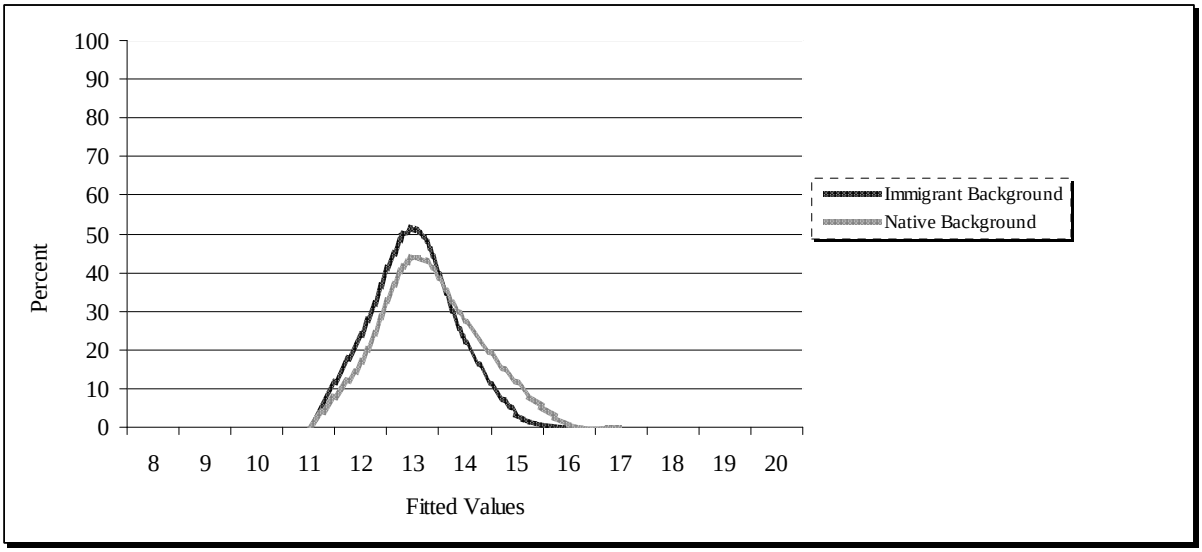


Figure 2: Distribution of Fitted Values, Immigrants and Natives, Poor and Rich Background

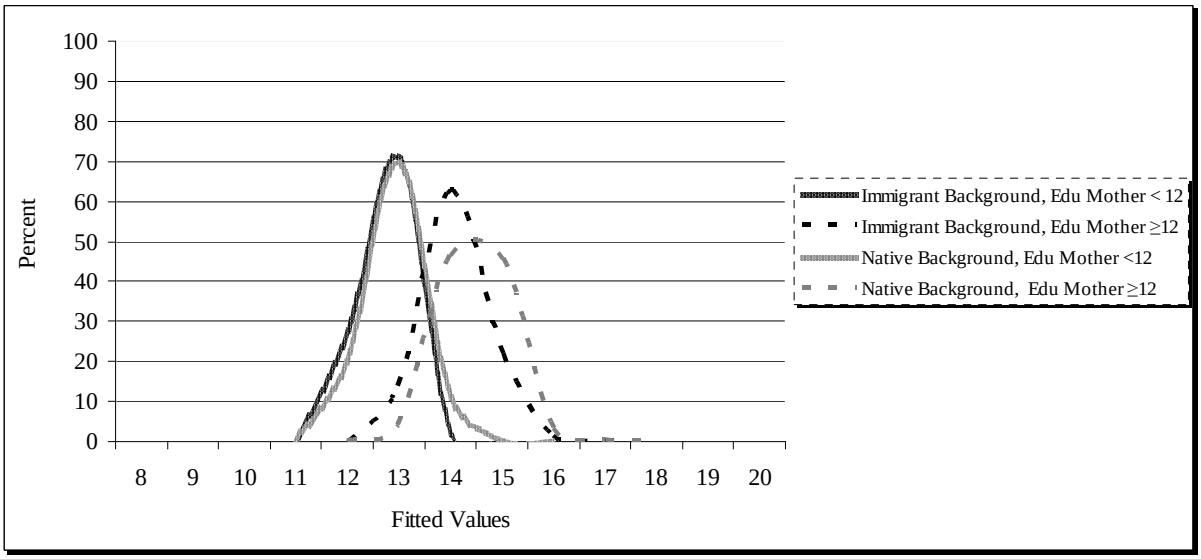
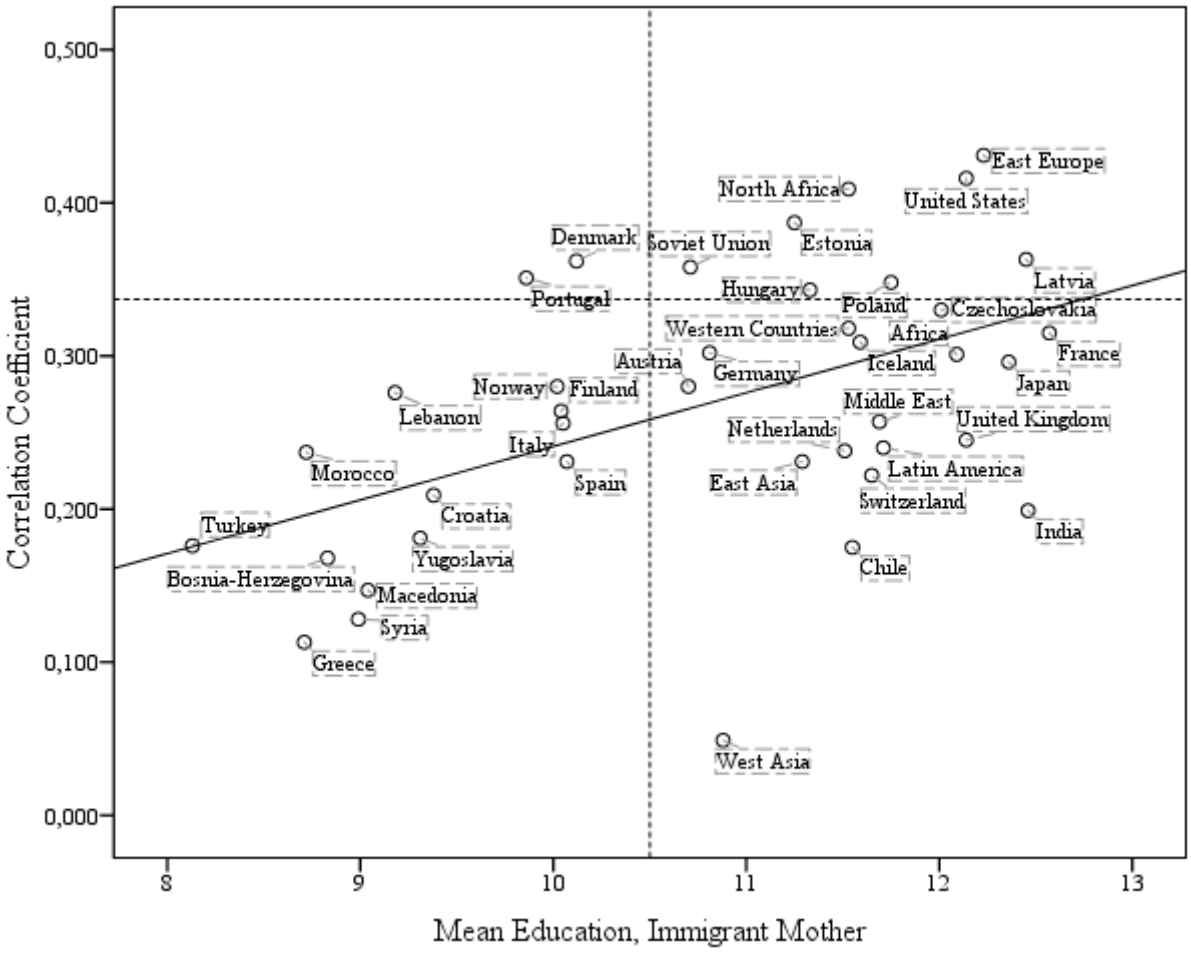
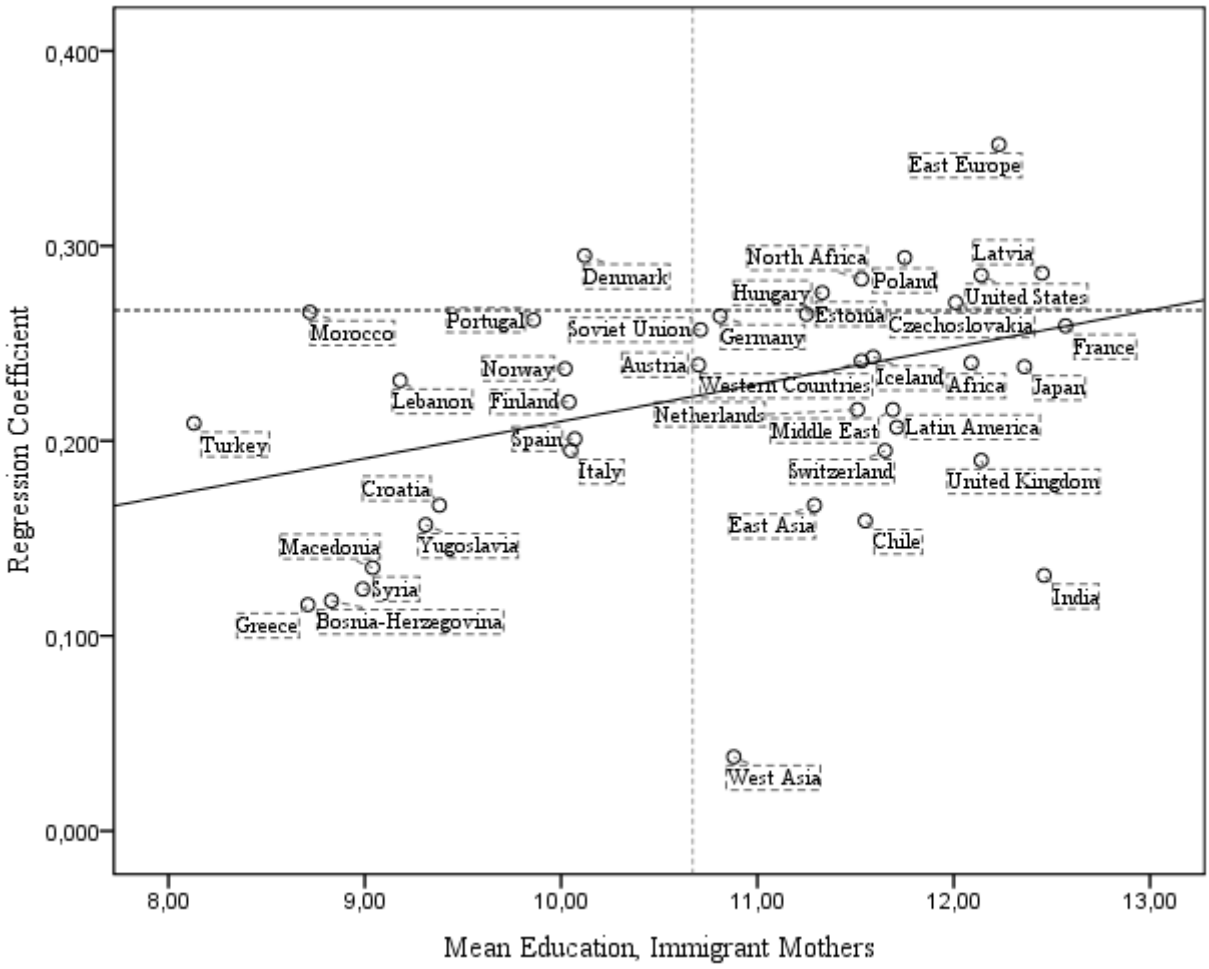


Figure 3: Scatter Plot of Grouped Data of Mean Education Immigrant Mothers and the Intergenerational Correlation Estimate.



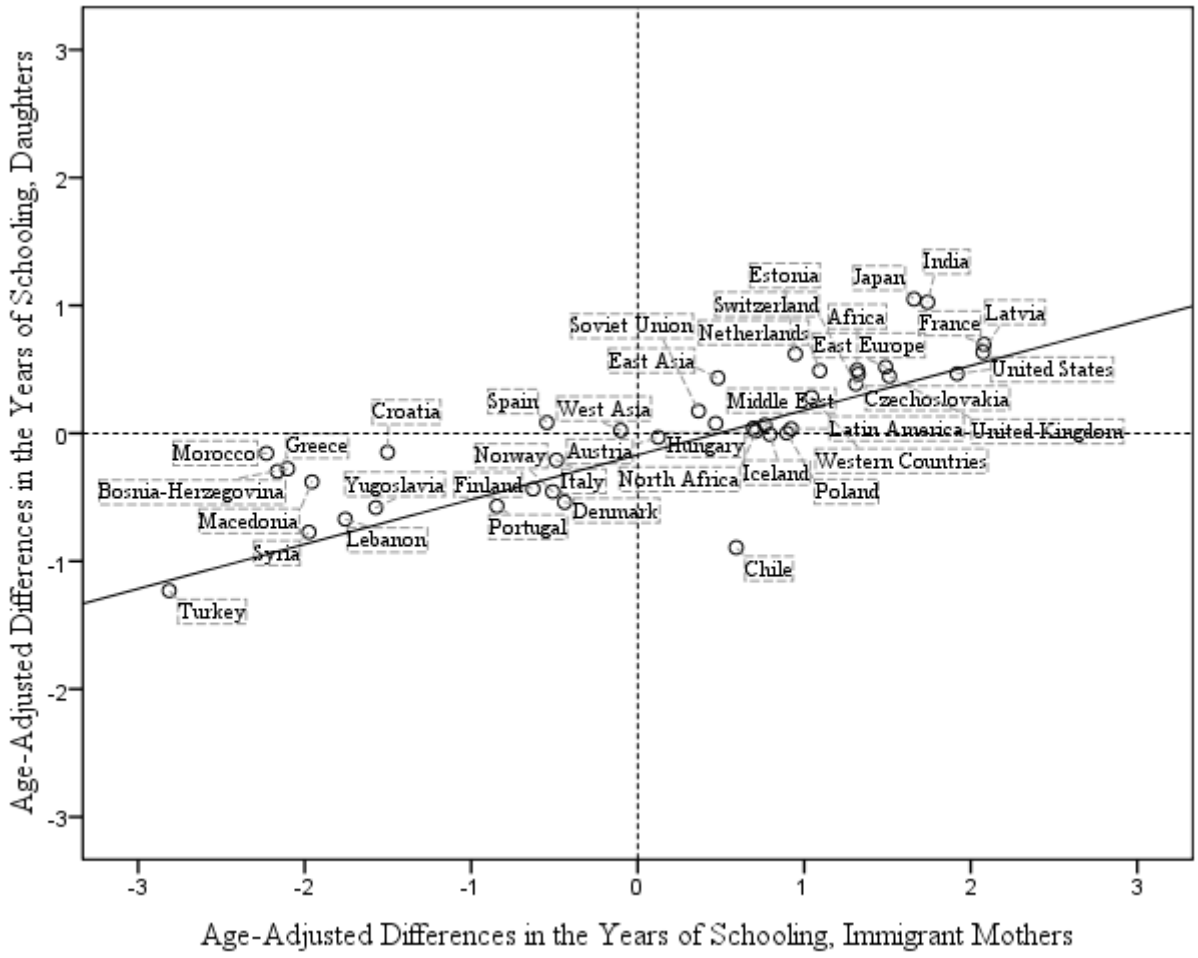
Note: The least squares regression line is statistically significant at 1 % level and has a slope of .035. The intersection point of the dotted lines represents the point observation of natives but is not used in the regression.

Figure 4: Scatter Plot of Grouped Data of Mean Education Immigrant Mothers and the Intergenerational Regression Estimate.



Note: The least squares regression line is statistically significant at 5 % level and has a slope of .019. The intersection point of the dotted lines represents the point observation of natives but is not used in the regression.

Figure 5: Scatter Plot of Grouped Data of Age-Adjusted Average Years of Schooling for Immigrant Mothers and their Daughters



Note: The weighted least squares regression line is significant at the 1 % level with a slope of .35. The dotted vertical and horizontal lines represent the educational position of native mothers and daughters, respectively.

Appendix

The Swedish Census 1990

(5) What is your **highest** completed educational level?

Only specify one alternative

2 ☐ Elementary school or equivalent, highest 8 years → Continue with question 6 on the next page.

3 ☐ Compulsary school, comprehensive school or equivalent, highest 9 years → Continue with question 6 on the next page.

4 ☐ Other education (general or vocational) → Below describe your highest completed educational level:

The name of the education (course, program, degree, subjects, credits): ……..
……
……

The name of the school/course organizer / country:……..……
What year did you complete your education (degree)? 19…….
The length of the education:…..…...Years…….Months

Table A1: Structure of Attrition

	Number of Observations			
	Immigrant Background		Native Background	
	Total	% of 1.	Total	% of 1.
1. All daughters, born in Sweden in 1960−80, registered as living in Sweden in 2007 and defined as either having an immigrant or native background.	88,925	100	873,213	100
2. All daughters in 1 with a known biological mother.	88,301	99.30	871,028	99.75
3. All daughters in 2 with known age.	88,301	99.30	871,028	99.75
4. All daughters in 3 with known age of the mother.	76,169	85.66	784,098	89.79
5. All daughters in 4 with a known educational level in 2007.	75,891	85.34	782,588	89.62
6. All daughters in 5 with a known educational level of the mother in 1998.	73,724	82.91	768,905	88.05
7. All daughters in 6 without financial student aid in 2007.	68,410	76.93	719,753	82.43

Table A2: Description of how Years of Schooling is Constructed

Level	Duration	Description of Schooling Level	Years of Schooling
1		Pre upper secondary school < 9 years	7
2		Pre upper secondary school ≥ 9 years	9
3	1	Upper secondary school < 2 years	10
3	2	Upper secondary school ≤ 2 years	11
3	3	Upper secondary school ≤ 3 years	12
4	1	Post upper secondary school < 2 years	13
5	2	Post upper secondary school ≥ 2 years	14
5	3	Post upper secondary school ≥ 3 & < 4 years	15
5	4	Post upper secondary school ≥ 4 & < 5 years	16
5	5	Post upper secondary school ≥ 5 years	17
6	2	Licentiate degree at a University	18
6	4	Ph.D. degree at a University	20

Note: The first column roughly indicates the level of the education and equals the level of ISCED 97.[1] The next column shows the theoretical length at a given educational level. Theoretical length here corresponds to the duration of education at full-time studies. The third column describes the schooling level and the last column gives the transformed years of schooling.

[1] For more information about ISCED 97, see UNESCO (1997).

Table A3: Aggregated Countries

	Aggregated Countries	Includes:
1	Western Countries	Australia, Belgium, Canada, Ireland, Luxembourg and New Zealand
2	East Europe	Bulgaria and Romania
3	Czechoslovakia	Former Czechoslovakia and Czech Republic
4	Yugoslavia	Serbia, Serbia and Montenegro, Slovenia and Former Yugoslavia
5	Latin America	Argentina, Brazil, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinida and Tobago, Uruguay and Venezuela
6	Middle East	Iran, Irak, Israel, Jordan and Palestine
7	North Africa	Algeria, Egypt and Tunisia
8	Africa	Angola , Cameroon, Cape Verde, the Comoros, the Central African Republic, the Democratic Republic of Congo, Ethiopia, Eritrea, Gambia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Mauritius, Nigeria, The Republic of Congo, Senegal, Seychelles, Sierra Leone, Somalia, Sudan, South Africa, Tanzania, Uganda, Zambia and Zimbabwe
9	Soviet Union	Lithuania, Kazakhstan, Russia, Former Soviet Union and Ukraine
10	West Asia	Afghanistan, Bangladesh, Pakistan and Sri Lanka
11	East Asia	Hong Kong, Singapore and Vietnam

Table A4: Indicators of the Magnitude and the Structure of the Measurement Error

Group	Share with Edu from Adm Reg Data (1)	Share that is neither Top nor Bottom Coded (2)	Share with Edu Equal to 7 Years (3)
1 Denmark	.18	.43	.29
2 Finland	.20	.42	.29
3 Norway	.16	.42	.28
4 Iceland	.26	.63	.07
5 Austria	.18	.54	.19
6 France	.27	.71	.07
7 Germany	.14	.55	.18
8 Netherlands	.18	.63	.09
9 Switzerland	.16	.67	.06
10 United Kingdom	.21	.61	.08
11 United States	.25	.59	.13
12 Western Countries	.25	.62	.12
13 Czechoslovakia	.20	.67	.10
14 Estonia	.20	.49	.22
15 Hungary	.21	.61	.17
16 Latvia	.28	.64	.08
17 Poland	.27	.62	.10
18 East Europe	.27	.64	.08
19 Bosnia-Herzegovina	.07	.30	.57
20 Croatia	.13	.39	.42
21 Greece	.13	.22	.53
22 Italy	.17	.42	.33
23 Yugoslavia	.13	.37	.42
24 Macedonia	.13	.31	.44
25 Portugal	.18	.39	.38
26 Spain	.18	.41	.31
27 Chile	.35	.62	.07
28 Latin America	.35	.61	.09
29 Lebanon	.16	.29	.42
30 Syria	.11	.21	.39
31 Turkey	.08	.11	.63
32 Middle East	.28	.61	.10
33 Morocco	.09	.19	.50
34 North Africa	.20	.55	.18
35 Africa	.30	.64	.09
36 India	.30	.57	.10
37 Soviet Union	.21	.48	.29
38 West Asia	.32	.60	.18
39 Japan	.27	.77	.04
40 East Asia	.21	.59	.20
41 Immigrant background	.19	.44	.28
42 High-educated mothers	.37	.88	.00
43 Low-educated mothers	.13	.30	.37

Note: An observation is neither top nor bottom coded when the schooling level lies between 11 and 15 years.