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Abstract

Assortative mating patterns in two dimensions namely, ethnic background and education are analysed in this paper for individuals with an immigrant background living in Sweden. We focus on the role of individual and spousal characteristics as well as the role of parental composition on partnership formation. Results indicate that assorative mating by ethnic background is significantly lower for second generation immigrants in comparison to first generation immigrants. In the case of assortative mating by education, although the descriptive statistics show that the proportion of educational homogamy is higher for second generation immigrants, after controlling for own and partners' characteristics, educational homogamy is found to be significantly lower for those in the second generation. Gender differences in these patterns suggest that second generation females are significantly less likely than second generation men to be in educational homogamous partnerships relative to their first generation counterparts. In terms of parental composition, having a Swedish background (mother or father) is associated with lower ethnic endogamy, especially for first generation women. Having a Swedish background is also associated with significantly higher probabilities of educational homogamy but primarily only for first generation male immigrants.

JEL Codes: J12, J15, J16, F22
Keywords: Positive Assortative Mating, Immigrant Status, Ethnic Endogamy, Education Homogamy

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1. Introduction

How individuals sort into household units has important implications for many different aspects of society, such as fertility and labour force participation as well as social and economic inequality. A large body of literature in the social sciences and biology shows that partnership formation is more likely to take place among individuals with similar characteristics (so called positive assortative mating), education, income, socioeconomic background, ethnicity, religion and religiosity (Mare, 1991; Pencavel, 1998) but also height, weight, IQ, and social class (Epstein and Guttman, 1984; McPherson *et al*., 2001). There are different explanations in different disciplines to why individuals mate in this pattern. Economists mainly focus on maximizing the potential gains from a partnership and argue that similarity in certain characteristics of the partners lead to efficient utilization of different aspects of the partnership such as joint decision making and rearing children (Becker, 1974). However, regardless of which dimension of assortative mating one discusses, it can be seen as a measure of the degree of openness in the social structures of interest. In other words, analysing how individuals of different ethnic origin sort into household units in a multicultural society might be an indicator of the strength and persistence of social boundaries between ethnic groups. In particular, the role of positive assortative mating/matching is analyzed due to its potential long term impact on sustaining economic and social inequality across generations. The overall aim of this paper is therefore to analyze the determinants of assortative mating patterns by ethnic background and education controlling for both individual and partner characteristics.

The manner in which individuals sort into household units affects not only themselves but can also have an impact on their children and grandchildren in terms of how they choose their mates and integrate within or across social and economic groups and thereby either form new communities or strengthen old ones. As such, high levels of ethnic endogamy, for instance, may spill over to coming generations affecting their children's decisions regarding partner choice. As a proxy for this intergenerational mechanism we use parental composition which may work in different ways. For instance a religious upbringing may limit children's choices in terms of partners within the religion dimension. On the other hand having parents from different countries of origin might make children more open to mixed ethnic relationships. In addition, having a Swedish born parent is thought to imply greater access to beneficial networks, a higher degree of country specific human capital, such as language skills and other forms of social capital, all of which may in turn diminish the social boundaries between

groups and partner choices of children.[1] As such it is important to not only study the determinants of partnership patterns among immigrants but also the role of parental composition on partner choice.

Immigrants in Sweden have lower average income and wage levels, lower average employment levels, and higher average unemployment levels than natives.[2] The research literature stresses the importance of host country human capital; in particular host country language skills and education (Chiswick and Miller, 1995; Borjas, 1982; Rooth, 1999), as well as knowledge about host country institutions.[3] Thus, marriage with a native might be one of the ways to accumulate host country specific knowledge and skills. Note however, that the direction of causality in these correlations with regard to marriage type and labor market outcomes has not been resolved to date (Meng and Gregory, 2005; Kantaravic, 2004; Çelikaksoy, 2007). One study that has successfully dealt with the causality problem with regard to marriage and educational attainment of immigrants shows that marrying a marriage migrant from the same country of origin increases the drop out rate for young immigrants in Denmark due to borrowing constraints (Nielsen, *et al.,* 2009).

In this paper we do not deal with the causality problem in relation to partner choice or partnership type but investigate two dimensions of assortative mating, namely by ethnic background and by level of education. Several studies draw attention to the importance of studying assortative mating patterns in different dimensions especially for individuals with an immigrant background, arguing that over generations assortative mating on the grounds of ascribed characteristics such as ethnicity should decline as attained characteristics such as education become increasingly important as a medium for mating (Kalmijn, 1993; Giddens, 1993)

[1] Studies on parental composition in Sweden have found that having a Swedish born parent is of importance for second generation immigrants (born in Sweden with at least on foreign born parent) in terms of labor market outcomes (Rooth and Ekberg, 2003; Behtoui, 2004).

[2] For studies on income or wage differences between immigrants and natives in Sweden, see Aguilar & Gustafsson (1994), Edin & Åslund (2001), Edin *et al*. (2000, 2003, 2004), Heshmati & Maasoumi (2000), le Grand & Szulkin (2000), Rashid (2004), Rosholm *et al*. (2000) and Österberg (2000). These studies find that income differences between groups are driven by employment differences. For studies on employment disparities, see Arai *et al*., (2000a, 2000b), Arai & Vilhelmsson (2004), Ekberg (1991), Lundborg (2000), Nekby (2003), Vilhelmsson (2002) and Wadensjö (1997). Significant differences to natives have been found even for those born in Sweden with immigrant backgrounds (one or both parents born abroad), see Behtoui (2004), Ekberg & Rooth (2003), Hammarstedt & Palme (2004), Nekby, et al., (2008), Vilhelmsson (2002) and Österberg (2000).

[3] See Borjas, 1999, for an overview of the economics of immigration literature.

The specific aim of this paper is therefore to analyze assortative mating patterns for individuals with an immigrant background, either due to own or parents' birth place being outside of Sweden. The assortative mating patterns is analyzed in two dimensions, ethnic background (ethnic endogamy) and level of education (educational homogamy), in order to see how individual and partner characteristics are correlated with mating in these two dimensions as well as the role of parental composition on partner choice.

Results indicate that ethnic endogamy is significantly lower for second generation immigrants relative to first generation immigrants. Educational homogamy is also found to be less prevalent in the second generation, once controls for individual and partner characteristics are included in estimation. In terms of educational homogamy, these correlations are found to be significantly stronger for women in comparison to men. Cross-section evidence therefore suggests less assortative mating in the second generation.

Analysis of the possible influence of parent composition on partner choice show that having a Swedish born parent is associated with significantly lower probabilities of being in ethnically endogamous partnerships for both first and second generation immigrants. The influence of a Swedish born parent is found to be significantly stronger for first generation females than first generation men. However, in terms of educational homogamy, having a Swedish born parent is found to be associated with higher probabilities of being in an educational homogamous relationship in particular for first generation male immigrants.

The remainder of this paper is structured as follows. Section 2 provides a brief overview of the research literature on mating patterns. This is followed by a description of the data and the empirical setup in Section 3. Results are presented in Section 4 and concluding remarks in Section 5.

2. Brief Literature Review

Studies on the economics of marriage stem back to Becker's (1973, 1974) seminal work on the subject. Becker theorized that individuals try to find mates who maximize their well-being and that this process is optimized by finding spouses that share similar traits to oneself on a number of dimensions including education, physical capital, religious affiliation and ethnic or national background (but not necessarily on wage or employment rates in which men and women (traditionally) were seen as close substitutes in household production (see also Del

Boca *et al*., 2000)). As such immigrants may marry spouses with similar educations and income (homogamy), or similar ethnic, national background (endogamy) or both (Kalmijn, 1998). The implication is that spousal selection is not random and that persons with immigrant backgrounds may choose to marry persons from their own, ethnic, national or religious background because of inherent benefits in doing so. England & Farkas (1986) and Oppenheimer (1988) use search theory, developed for the labor market, to relate the efforts a person can make to find the "best" possible partner to the restrictions that might characterize the marriage market. Limited marriage markets, unbalanced sex ratios within immigrant groups in the host country and group size may therefore induce those with immigrant backgrounds to for example seek mates from origin countries (Angrist, 2002; Becker, 1981, 1991; Çelikaksoy, 2006; Çelikaksoy *et al*, 2006; Gilbertson, et al., 1996; Grossbard-Shechtman, 1993).

That large proportions of immigrants choose to marry within their ethnic or national group or bring spouses from origin countries is documented in several studies on the US and Europe (Chiswick and Houseworth, 2008; Çelikaksoy, 2007; Jasso *et al*., 2000; Lievens, 1999; Kalmijin 1993). These studies also show that endogamous marriages, by national background, are often sustained across generations, although at lower rates and with variations across immigrant groups. Lievens' (1999) study on marriage migration from Turkey and Morocco to Belgium finds that approximately 70 percent of Turkish immigrants and 60 percent of Moroccan immigrants bring spouses from origin countries. A majority of these immigrants were born in Belgium (second generation) or immigrated at an early age (middle generation). On the other hand, Alba and Golden (1986) find that intermarriage rates increase with generation in the US.

Three perspectives commonly link demographic characteristics to marriage formation (Lewis & Oppenheimer, 2000). The first emphasizes sex ratios (Akers, 1967; Muhsam, 1974; Schoen, 1983; Bisin and Verdier, 2000). Some immigrant groups may experience unbalanced sex-ratios in the host country within their ethnic group inducing a higher degree of intermarriage or a search for spouses in home countries.[4]

[4] Unbalanced sex ratios can have economic implications as shown in Becker's (1981) model of marriage and family formation. A change in sex ratios in the direction of a smaller proportion of eligible female candidates, for example, can increase the demand for wives, female marriage rates and family income as females more selectively partner with relatively high income men.

A second perspective known as the "structuralist" approach focuses on the concentration of ethnic groups rather than sex ratios (Blau, 1977; Blau *et al.*, 1982; Blau & Schwartz, 1984; Bisin & Verdier, 2000). The structuralist approach is concerned with social heterogeneity and group cohesion especially among groups small in size relative to the total population. This approach suggests that with a decline in concentration, persons may remain selective along one feature, for example ethnicity or national background, but may compromise on other features such as age, education or income; depending on the prevalent social norms on intermarriage (Lewis & Oppenheimer, 2000). Social and family norms as well as the traditions concerning marriage are likely to vary between different groups in society. The degree of endogamy may therefore be stronger in groups with strong parental or family involvement in marital decisions. Some argue that these norms are strengthened with immigration to another country (Çelikaksoy, 2006; Lievens, 1991; Reiners, 1998; Shaw, 2001). On the other hand, as second and third generation immigrants are expected to have greater opportunities to invest in education and highly educated immigrants tend to have greater autonomy in relation to their families, a pattern of mating based on educational homogamy rather than ethnic endogamy may emerge across generations (Giddens, 1993).[5]

Indeed, higher levels of education have generally been found to be positively associated with intermarriage probabilities (Chiswick and Houseworth, 2008; Furtado, 2006; Meng and Gregory, 2005; Lichter and Qian, 2001; Pullman, *et al.*, 1998) although there is some evidence to the contrary. Lievens (1999), for example, finds that highly educated immigrant female residents in Belgium have a higher probability of marrying men from origin countries than less educated female immigrants. Local human capital has also been found to influence intermarriage rates. Anderson and Saenz (1994) for example find that home language retention is correlated with lower levels of intermarriage.[6]

In addition, the well-known phenomenon of positive assortative mating in terms of education (Buss & Barnes, 1986; Henz & Jonsson, 2003; Kalmijn, 1991a, 1991b; Mare, 1991) also appears to be present among immigrants in endogamous marriages (Angrist, 2002; Çelikaksoy *et al.*, 2006; Furtado, 2006; Jasso *et al.*, 2000; Kalmijn, 1993; Lewis & Oppenheimer, 2000; Lievens, 1999). Çelikaksoy *et al.* (2006) finds positive assortative

[5] Chimos (1999) offers another perspective suggesting that increasing rates of intermarriage may stimulate endogamous marriages due to threats to ethnic group survival.

[6] See also Dustmann (1996) who finds a positive relationship between affinity to the German national identity and being married to a native German.

mating in education for the children of guest worker immigrants in Denmark, although Turkish residents that bring spouses from Turkey appear to marry down, i.e., marry spouses with lower levels of education than themselves. On the other hand, Jasso *et al.* (2000) finds high degrees of positive assortative mating in education for US citizens that bring spouses from abroad but less so for couples that immigrate to the US together.

Finally, the third perspective, marriage search theory (also mentioned above), focuses on the association between the distribution of potential mates, the time spent searching for a partner and the type of match achieved (England & Farkas, 1986; Oppenheimer, 1988). The idea is that the distribution of potential mates with specific characteristics varies, some have many well-matched mates and can be selective, others have fewer well-matched mates and must search longer or be less selective, both of which have implications for the type of match made, which in turn may have implications on economic outcomes such as employment and income. Furtado (2006) discusses the "enclave effect" on intermarriage, suggesting that educated immigrants are more likely to exit ethnic residential enclaves and therefore less likely to meet spouses with the same ethnic background. A similar mechanism may develop through less segregated workplaces for relatively well-educated immigrants.

Few studies have analyzed marriage patterns of immigrants in Sweden Dribe and Lundh (2008) study intermarriage patterns of immigrants in Sweden using cross-sectional data from 2003 and find that better educated immigrants, with longer duration of residence who reside outside the major urban areas are more likely to partner with natives. Behtoui (2008) also studies intermarriage to natives of first and second generation immigrants finding that those with origins outside Northwest Europe and North America have smaller probabilities of intermarrying with natives than immigrants originating in Northwest Europe and North America. The same pattern holds true for second generation immigrants.[7]

3. Data and Empirical Setup

3.1. Data

The data used in estimation stems from registered information at Statistics Sweden (SCB) on the entire working age population (16-65 years of age) residing in Sweden in 2005. Included in the data is detailed individual information on personal and demographic characteristics,

[7] See also studies on marriage migration to Sweden (Niedomsyl *et al*., 2008; Åslund *et al*., 2009).

education, employment and income. In addition detailed information is available on country of birth and migration dates for the foreign-born portion of the population as well as parents' country of origin for the entire sample.[8] Due to partner identification numbers we are able to link all individuals with their partners. As such, we have detailed information not only on the main individual but also on the partners provided that partners fall under the given age restrictions.[9] Partnership is defined as marriage, registered partnership or cohabitation with children.[10]

We restrict our sample to those individuals born abroad (first generation immigrants) or those born in Sweden with at least one foreign born parent (second generation) residing in Sweden during 2005. After deleting observations for those individuals who have a partner identification number but for whom we have no partner information, presumably due to the age restrictions (3 percent of the 2005 population) and those with same sex partnerships (less than one percent of the population), we have a sample of 1,755,326 individuals with foreign backgrounds aged 16-65. We restrict the sample further as follows. Firstly, we restrict ourselves to those 760,120 individuals who are in partnerships as defined above. Thereafter we delete those with missing information on own or partner's country of birth (450 persons) as well as those 13,268 persons who are born in Sweden but where we have no information on either parent's country of birth. As this paper examines ethnic endogamy, these restrictions are necessary in order to define partnerships defined by similar national backgrounds (own or parents). Indeed, we lose an additional 10,399 persons when defining ethnic endogamy (see definition in Table 1 below) due to missing information on one or other parent's country of birth. Finally, we restrict ourselves to those individuals who are at least 18 years of age and drop an additional 122 persons. Estimations are therefore based on 735,881 individuals with an immigrant background (first or second generation) between the ages of 18-65 in partnerships during the year 2005 with complete information on both the individual and his/her partner.

[8] The data (Statistics on Immigrants - STATIV) was initially created by the Swedish Integration Board but is now under the maintenance of Statistics Sweden.

[9] Due to the age restrictions of the data, we lose information on partners above the age of 65. We can identify the civil status of those with older spouses due to registered information on civil status but we do not have information on spousal characteristics.

[10] Data on partnerships stems from information on households. To date, Statistics Sweden tracks only married couples, couples in registered partnerships and cohabitants with children. This implies that we do not have partner information on cohabitants without children.

3.2. Empirical Setup

We begin by analyzing assortative mating patterns by country of origin, so-called ethnic endogamy. The definition of ethnic endogamy (see Table 1) is based on information on own and partner's country of origin as well as parent's (own or partners) country of origin.[11] Ethnic endogamy is defined as a dichotomous variable equal to one if the individual is born abroad and the partner is from the same country of origin or, if the partner is born in Sweden, one of the partner's parents is from the same country of origin as the main individual, and zero otherwise. If the main individual is born in Sweden, ethnic endogamy is equal to one if the partner is born abroad and comes from the same country of origin as at least one of the main individual's (non-Swedish) parents or, if both are born in Sweden, at least one of the parents of both partners is from the same (non-Swedish) country of origin.

Table 1: Definition of Assortative Mating by Country of Origin: Ethnic Endogamy

	Partner:	
Main Individual:	Born Abroad	Born in Sweden
Born Abroad	1 if both partners from same country of origin, 0 otherwise	1 if at least one of partner's parents has same country of origin with the observed indiviudal, 0 otherwise
Born in Sweden	1 if partner is from same country of origin as at least one parent	1 if at least one of the parents is from same (non-Swedish) country of origin as at least one of partner's parents, 0 otherwise

Thereafter, we analyze assortative mating by level of education, so called educational homogamy, which is defined according to highest registered level of completed education. Six levels of completed education are identified; less than 10 year compulsory school (denoted as short compulsory), compulsory school (10 years), secondary school (high school/gymnasium), short tertiary, long tertiary (university) and PhD educations. Secondary school is normally of three years duration, while short tertiary is a post secondary education less than or equal to two years. In addition, there is a separate category for those with missing information on level of education (5-6 percent of the foreign born have missing information on highest level of completed education). Assortative mating by educational background is then defined as a categorical variable equal to one if partners have the same level of completed education and zero otherwise.

[11] We recognize that not all ethnic groups are defined by country of origin but use this more general terminology to describe assortative mating patterns by country of birth or parents' country of birth.

Initially, we present descriptive statistics concerning assortative mating by ethnic background and education. Thereafter we estimate probit models focusing on variations across immigrant generations (first and second) in the probability of mating assortatively by ethnicity and education. The idea is to compare assortative mating patterns across immigrant generations (first and second) controlling for a host of individual and spousal characteristics. Note that estimations are based on a cross-section for the year 2005 and therefore do not follow generations over time but rather look statically at individuals from two generations at a given point in time.

Thereafter, we re-estimate our assortative mating equations separately by gender and generation controlling for parental composition. Parental composition is defined according to parents' country of origin into four categories; both parents born abroad, mother born abroad and father Swedish, father born abroad and mother Swedish or both parents born in Sweden.[12] As can be seen from the descriptive statistics presented in Table 2, not all parental composition categories are relevant for each generation, for example second generation immigrants by definition can not have two Swedish-born parents. Finally we use the fact that we have information on parents' country of origin for second generation immigrants to analyze the intergenerational transmissions of ethnic endogamy.

Other control variables used in estimation include own and partner's age (quadratic), employment status, education, marital status (based on registered information on civil status), the presence of children in the household (0/1 variable), sex ratios (proportion female to male within each country of origin) and relative group sizes (proportion of females (males) from a given country relative to the population of females (males) in Sweden). In separate estimations on the foreign born, controls for age at migration, duration of residence and region of origin are also included. Region of origin is defined into nine broad category based on country of origin, these are Sweden, other (non-Swedish) Nordic, EU15, other (non-EU, non-Nordic) Europe, North America, South America, Asia and the Middle East, Africa and Oceania.[13]

[12] Missing information on parents' country of birth is interpreted as foreign born.
[13] Note that Turkey sorts under "Asia and the Middle East".

It should be stressed that the analysis presented here in no way purports to make causal inferences as current information on mating patterns are used and partners can adjust some characteristics according to each other during the course of their partnership. In addition, present data restrictions allow us to analyze only current partnerships without taking into account the number of previous partnerships or the longevity of the current union.

3.3. Descriptive Statistics

Sample means on individual characteristics as well as partner characteristics are provided in Table 2 by gender and immigrant generation. The descriptive statistics on assortative mating indicate that the proportion in ethnically endogamous unions is considerably smaller among second generation immigrants in comparison to first generation immigrants. This is true for both men and women. 54-58 percent of first generation immigrants are in ethnically endogamous unions compared to only 6-7 percent of those in the second generation.

As such, although a majority of first generation immigrants have partners from the same country of origin (or a partner born in Sweden with a parent from the same country of origin), considerably fewer in the second generation have partners with a similar non-Swedish national background. If one instead defines ethnic endogamy to include Swedish backgrounds, i.e., that those born in Sweden have partners born in Sweden or with at least one parent born in Sweden, then ethnic endogamy is much larger for the second generation. With this broad definition, 92 percent of those in the second generation are in endogamous partnerships in comparison to 60 percent of those in the first generation (not shown in table).

Turning instead to assortative mating by education, we find a very different pattern. Descriptive statistics suggest that a larger proportion of those in the second generation are in educationally homogamous partnerships (48 percent) in comparison to those in the first generation (42-43 percent), regardless of gender.

A comparison of individual descriptive statistics with partner characteristics suggest, as expected, that males tend to be older than their female partners and to have higher employment rates, although differences appear to be somewhat smaller for the generation born in Sweden (second generation). On the other hand, men have on average lower proportions with tertiary educations than their female partners.

Table 2: Sample Means by Gender and Generation: Main Individual

	Female		Male	
	Generation		Generation	
	1	2	1	2
Age	41	44	45	47
Education:				
Short compulsory	13	3	12	7
Compulsory	10	10	11	11
Secondary	38	50	41	50
Short tertiary	4	5	4	8
Tertiary	28	31	25	22
Graduate school	1	0.6	2	2
Missing information	6	0.1	5	0.2
Employed	57	82	65	86
Married	89	77	87	77
Children	62	61	63	59
Age at migration	24	--	26	--
Duration of Residence:				
0-2 years	12	--	10	--
3-5 years	7	--	6	--
6-9 years	11	--	9	--
10-19 years	32	--	32	--
>20 years	38	--	43	--
Region of birth:				
Sweden	--	100		100
Other Nordic	22	--	20	--
EU 15 (non-Nordic)	6	--	10	--
Other Europe	26	--	24	--
North America	2	--	2	--
South America	5	--	4	--
Asia & Middle East	34	--	33	--
Africa	5	--	6	--
Oceania	0,25	--	0.4	--
Parental Composition:				
Both parents born abroad	98.10	22.87	97.92	20.18
Mother Swedish born	0.75	43.06	0.79	45.35
Father Swedish born	0.56	34.07	0.54	34.47
Both parents Swedish born	0.60	--	0.75	--
Assortative Mating:				
Ethnic endogamy	53.62	6.83	57.79	6.05
Educational homogamy	42.25	48.02	43.06	48.16
Partner Characteristics:				
Age	45	46	41	44
Education:				
Short compulsory	11	7	12	4
Compulsory	11	12	11	9
Secondary	42	49	40	49
Short tertiary	6	8	4	4
Tertiary	24	22	27	33

Graduate school	2	1.5	1	1
Missing information	4	0.5	5	0.4
Employed	69	87	58	82
Immigrant Status:				
Non-immigrant	28	78	23	79
First generation	65	9	70	9
Second generation	7	13	7	12
Region of birth:				
Sweden	35	91	30	91
Other Nordic	9	3	9	3
EU 15 (non-Nordic)	3	1.6	3	0.8
Other Europe	19	1.7	21	1.7
North America	0.6	0.4	0.6	0.3
South America	3	0.5	3	0.6
Asia & Middle East	27	1.9	29	2
Africa	5	0.5	5	0.2
Oceania	0.1	0.1	0.1	0.04
No. of observations	232,201	141,795	216,942	144,943

Note: proportions from region of origin, duration of residence and education do not always sum to 100 due to errors in rounding off.

Sample means on region of origin show that the largest proportion of first generation immigrants hail from Asia and the Middle East followed by other (non-Nordic, non-EU) European countries and Other (non-Swedish) Nordic countries. Statistics on partner's region of origin indicate that for both women and men, 30-35 percent of first generation immigrants have partners born in Sweden and over 90 percent of second generation immigrants have Swedish born partners. Another way of looking at this is via descriptive statistics on partners' immigrant status. 28 percent of first generation individuals are partnered to a non-immigrant, i.e., a Swedish born person with two Swedish born parents. The majority of first generation unions are to partners who are also first generation immigrants (65-70 percent). Among second generation immigrants, 78-79 percent of partnerships are to non-immigrants.

In terms of parental composition, the vast majority (98 percent) of first generation immigrants have two foreign born parents. A small proportion has mixed backgrounds with one Swedish born parent and one foreign born parent. Finally, 0.6 percent of the foreign-born population has two Swedish-born parents. These are included in the analysis in order to explore assortative mating patterns among all individuals born abroad regardless of background. Among second generation immigrants, 25-28 percent has two foreign-born parents, slightly

more have a Swedish born mother (42-44 percent) and approximately 30 percent have a Swedish born father.

4. Empirical Results

4.1. Ethnic Endogamy

Initially, the determinants of ethnic endogamy are analyzed focusing in particular on immigrant generation status using probit models (see Table 1 for definition of ethnic endogamy). Coefficient estimates are reported as marginal effects evaluated at the mean values of explanatory variables. Three models are estimated, one controlling for immigrant generation only, another that adds other individual characteristics as well as information on sex ratios and relative group size (model 2) and finally a model that in addition, adds controls for partner characteristics (model 3).

Results, reported in Table 3, show that second generation status is associated with significantly lower ethnic endogamy probabilities in comparison to first generation status. This is true for both men and women and there are no significant differences by gender in the coefficient estimate. As mentioned earlier, these estimates are based on cross-section information on two immigrant generations residing in Sweden in 2005 and can therefore not be interpreted as an intergenerational reduction of ethnic endogamy but should rather be seen as an indication that ethnically endogamous relationships are much less prevalent among the second generation even after controlling for possible differences in individual and partner characteristics that may influence assortative mating patterns.

Other interesting results include that education is negatively associated with ethnic endogamy probabilities. In comparison to females with short compulsory school educations, females with tertiary educations are associated with a 20 percentage point lower probability of ethnic endogamy (model 3). For men, tertiary educations are associated with only a 4.5 percentage point lower relative probability of ethnic endogamy in comparison to the reference group. The negative correlation between education and ethnic endogamy is therefore found to be stronger for women.

Employment is also negatively associated with ethnic endogamy probabilities while being married and having children is positively associated with ethnic endogamy. Sex ratios are found to be positively and strongly associated with endogamous partnerships as is relative

group size, especially for women. The coefficient estimates are significantly larger for women than for men. This implies that the larger the relative number of potential spouses from the same country of origin in the population the higher the probability of being in an ethnically endogamous partnership.

Table 3: The Probability of Ethnic Endogamy, Probit Models.

	Female			Male		
	(1)	(2)	(3)	(1)	(2)	(3)
Generation (ref: 1st generation)**:**						
2nd generation	-0.468**	-0.993**	-0.992**	-0.517**	-0.858**	-0.878**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)	(0.005)
Education (ref: Short compulsory)**:**						
Compulsory		-0.114**	-0.098**		-0.079**	-0.037**
		(0.003)	(0.003)		(0.003)	(0.004)
Secondary		-0.164**	-0.136**		-0.102**	-0.036**
		(0.003)	(0.003)		(0.003)	(0.003)
Short tertiary		-0.200**	-0.178**		-0.164**	-0.093**
		(0.003)	(0.003)		(0.003)	(0.004)
Tertiary		-0.224**	-0.199**		-0.137**	-0.045**
		(0.002)	(0.003)		(0.003)	(0.003)
PhD		-0.170**	-0.170**		-0.128**	-0.032**
		(0.005)	(0.006)		(0.005)	(0.006)
Missing		-0.058**	-0.084**		-0.061**	-0.055**
		(0.004)	(0.004)		(0.005)	(0.005)
Age		0.008**	0.004**		0.022**	0.023**
		(0.001)	(0.001)		(0.001)	(0.001)
Age^2		-0.000**	-0.000**		-0.000**	-0.000**
		(0.000)	(0.000)		(0.000)	(0.000)
Employed		-0.102**	-0.073**		-0.116**	-0.061**
		(0.002)	(0.002)		(0.002)	(0.002)
Married		0.093**	0.089**		0.150**	0.137**
		(0.002)	(0.002)		(0.002)	(0.002)
Children		0.017**	0.017**		0.025**	0.005*
		(0.002)	(0.002)		(0.002)	(0.002)
Sex ratio		0.308**	0.292**		0.055**	0.071**
		(0.003)	(0.003)		(0.003)	(0.003)
Rel. group size		0.205**	0.204**		0.082**	0.094**
		(0.002)	(0.002)		(0.002)	(0.002)
Partner Characteristics:						
Education (ref: short compulsory)**:**						
Compulsory			-0.086**			-0.165**
			(0.003)			(0.003)
Secondary			-0.086**			-0.213**
			(0.003)			(0.003)
Short tertiary			-0.161**			-0.223**
			(0.003)			(0.003)
Tertiary			-0.072**			-0.235**

			(0.003)			(0.003)
PhD			-0.013*			-0.167**
			(0.007)			(0.006)
Missing			0.040**			-0.053**
			(0.007)			(0.005)
Age			0.016**			0.006**
			(0.001)			(0.001)
Age^2			-0.000**			-0.000**
			(0.000)			(0.000)
Employed			-0.127**			-0.126**
			(0.002)			(0.002)
Observations	373996	373996	373996	361885	361878	361878

Note: Probit models on the probability of being in a relationship that is characterized by ethnic endogamy. Coefficient estimates reported as marginal effects evaluated at the mean of explanatory variables. Robust standard errors in parentheses. ** denotes significance at the 1 % level and * at the 5% level.

The influence of spousal characteristics (model 3) shows that endogamous partnerships are negatively correlated to partner education and employment. Interestingly, partner education seems to be more strongly negatively correlated with the probability of being in an endogamous relationship for men. Indeed, for women, having a partner with a tertiary education is associated with only a 7 percentage point lower probability of an endogamous partnership while for men, a female partner with a tertiary education is associated with a 23.5 percentage point lower probability (in comparison to the reference group short compulsory education) indicating yet again that the negative correlation between education and ethnic endogamy is stronger for women.

Educational Homogamy

Table 4 reports results of probit models on the probability of being in homogamous relationships as defined by education, i.e., partners with the same level of completed education (based on a six level categorization of education plus a separate category for missing information). Results indicate that although on average second generation immigrants are characterized by higher levels of educational homogamy (model 1), the opposite is found when estimations control for differences in individual and partner characteristics. Second generation females are associated with a 24 percentage point lower probability than first generation females of being in educationally homogamous relationships (model 3). For men, second generation status is associated with a 12 percentage point lower relative probability. Again, results are based on a cross-section and therefore reflect differential patterns of educational homogamy by current immigrant generation status rather than a decreasing rate of assortative mating over time across generations.

Other interesting results show that the correlation between individual level of education and ethnic homogamy varies by level of education and gender. Those with compulsory school educations and short tertiary educations are less likely than the reference group (short compulsory educations) to be in such relationships while secondary and tertiary school graduates are more likely, regardless of gender. Interestingly, female PhDs are associated with higher relative probabilities of assortative mating by education while male PhDs are associated with significantly lower relative probabilities of assortative mating by education.

Partner characteristics indicate that for females, having a first generation male partner is associated with higher probabilities of educational homogamy in comparison to having a non-immigrant Swedish born partner, i.e. a partner born in Sweden with two Swedish born parents. For men, a first generation female partner is instead associated with lower relative probabilities of educational homogamy. No differences are found in educational homogamy probabilities between those who have partners with a non-immigrant Swedish background and those who have partners that are second generation immigrants for either men or women.

Table 4: The Probability of Educational Homogamy, Probit Models.

	Female			**Male**		
	(1)	(2)	(3)	(1)	(2)	(3)
Generation (ref: 1st generation)**:**						
2nd generation	0.058**	-0.311**	-0.236**	0.051**	-0.152**	-0.121**
	(0.002)	(0.025)	(0.026)	(0.002)	(0.023)	(0.024)
Education (ref: Short compulsory)**:**						
Compulsory		-0.135**	-0.136**		-0.166**	-0.167**
		(0.004)	(0.004)		(0.004)	(0.004)
Secondary		0.208**	0.206**		0.190**	0.188**
		(0.003)	(0.003)		(0.003)	(0.003)
Short tertiary		-0.262**	-0.264**		-0.335**	-0.339**
		(0.004)	(0.004)		(0.003)	(0.003)
Tertiary		0.097**	0.095**		0.208**	0.203**
		(0.003)	(0.003)		(0.003)	(0.003)
PhD		0.068**	0.062**		-0.182**	-0.190**
		(0.009)	(0.009)		(0.006)	(0.006)
Missing		-0.045**	-0.048**		0.067**	0.067**
		(0.005)	(0.005)		(0.006)	(0.006)
Age		0.003**	0.011**		0.005**	-0.006**
		(0.001)	(0.001)		(0.001)	(0.001)
Age^2		-0.000**	-0.000**		-0.000**	0.000*
		(0.000)	(0.000)		(0.000)	(0.000)
Employed		0.011**	0.010**		0.024**	0.013**

		(0.002)	(0.002)		(0.002)	(0.002)
Married		-0.013**	-0.010**		-0.016**	-0.014**
		(0.002)	(0.002)		(0.002)	(0.002)
Children		0.020**	0.016**		0.012**	0.020**
		(0.002)	(0.002)		(0.002)	(0.002)
Sex ratio		0.032**	0.024**		0.050**	0.045**
		(0.003)	(0.003)		(0.003)	(0.003)
Rel. group size		0.032**	0.025**		0.020**	0.016**
		(0.003)	(0.003)		(0.003)	(0.003)
Partner characteristics:						
Age			-0.010**			0.013**
			(0.001)			(0.001)
Age^2			0.000**			-0.000**
			(0.000)			(0.000)
Employed			0.009**			0.025**
			(0.002)			(0.002)
Generation (ref: Swedish born with Swedish born parents)**:**						
1^{st} generation			0.019**			-0.005**
			(0.002)			(0.002)
2^{nd} generation			-0.000			-0.003
			(0.003)			(0.003)
Observations	373996	373996	373996	361885	361878	361878

Note: Probit models on the probability of being in a relationship that is characterized by educational homogamy. Coefficient estimates reported as marginal effects evaluated at the mean of explanatory variables. Robust standard errors in parentheses. ** denotes significance at the 1 % level and * at the 5% level.

To summarize, the results presented above suggest that ethnic endogamy is considerably less common in the second generation relative to the first generation. The same is true for educational homogamy once differences in individual and partner characteristics are accounted for but differences between generations are weaker than those found for ethnic endogamy. There are no gender differences in these results but some notable gender differences in the determinants of respective type of assortative mating. For example, level of education and ethnic endogamy is found to be negatively correlated for both men and women but the strength of this relationship is significantly stronger for women. In terms of educational homogamy, women at the higher end of the educational distribution, PhD graduates, are associated with higher relative probabilities of positive assortative mating in education, while the opposite is found for men. Finally, women with partners born abroad (first generation immigrants) are associated with higher relative probabilities of being in educationally homogamous relationships in comparison to reference group, partnerships to non-immigrants, while the opposite is found for men.

4.2. Parental Composition

We now turn to analyzing the possible influence of parental composition on assortative mating patterns by running separate estimates by immigrant generation and gender. The model estimated includes the same controls for individual and partner characteristics as used in model 3 above (respectively for ethnic endogamy and educational homogamy). In addition, estimations on the foreign-born (first generation) include controls for age at migration, duration of residence and region of origin.

Results shown in Table 5 indicate that in terms of ethnic endogamy, having a Swedish background is associated with lower probabilities of ethnic endogamy for those in the first and second generation relative to those with two foreign born parents. For first generation females, having a Swedish born mother is associated with a 27 percentage point lower probability of being in an ethnically endogamous relationship in comparison to having two foreign born parents. This is significantly lower than the relative probabilities associated with having a Swedish father (-20 percentage points) or two Swedish born parents (-15 percentage points) and is a significantly stronger relationship than that found for first generation males. For first generation men, although having a Swedish born parent is associated with lower probabilities of ethnic endogamy than having two foreign born parents, there are no differences depending on which parent is Swedish born (mother, father or both).[14] For second generation immigrants, a Swedish born mother is associated with an 8 percentage point lower relative probability of ethnic endogamy and a Swedish father with an approximately 4 percentage point lower probability. Again the relative probability of having a Swedish born mother is significantly stronger than that associated with having a Swedish born father. For the second generation, this is true for both men and women.

Parental composition is found to be generally less important for educational homogamy. For women only one significant result is found. First generation females with two Swedish born parents are significantly more likely to be in relationships characterized by positive assortative mating in education in comparison to those with two foreign born parents. Parental composition appears to matter most for first generation men. Relative to those with two foreign born parents, a Swedish background (in any form) is associated with higher relative

[14] Other interesting results for first generation immigrants are that age at migration is positively correlated with ethnic endogamy as is duration of residence. Relative to those with a (non-Swedish) Nordic background, all other regions of origin are associated with higher relative probabilities of ethnic endogamy.

probabilities of assortative mating by education. No significant differences are however found in terms of whether the father, mother or both are Swedish. Finally, for second generation men, a Swedish born mother is associated with slightly higher probabilities of educational homogamy (weakly significant) in comparison to having two foreign born parents.

Table 5: The Effect of Parental Composition on Assortative Mating Probabilities, Probit Models

	Female		Male	
	1st generation	2nd generation	1st generation	2nd generation
	Ethnic Endogamy			
Parental Composition:				
Both Foreign	Ref	Ref	Ref	Ref
Mother Swedish	-0.268**	-0.079**	-0.146**	-0.079**
	(0.020)	(0.001)	(0.020)	(0.001)
Father Swedish	-0.199**	-0.045**	-0.148**	-0.034**
	(0.023)	(0.001)	(0.024)	(0.001)
Both Swedish	-0.151**	--	-0.148**	--
	(0.017)		(0.016)	
	Educational Homogamy			
Parental Composition:				
Both Foreign	Ref	Ref	Ref	Ref
Mother Swedish	0.012	0.003	0.038**	0.008*
	(0.013)	(0.004)	(0.013)	(0.004)
Father Swedish	0.012	0.004	0.048**	0.005
	(0.014)	(0.004)	(0.016)	(0.004)
Both Swedish	0.044**	--	0.034**	--
	(0.014)		(0.013)	

Note: Probit models on the probability of being in a relationship characterized by positive assortative mating. Coefficient estimates reported as marginal effects evaluated at the mean of explanatory variables. All models control for individual and spousal characteristics as well as sex ratios and relative groups size. Models on first generation immigrants also control for duration of residence, age at migration and region of origin. Robust standard errors in parentheses. ** denotes significance at the 1 % level and * at the 5% level.

Parental composition therefore seems to be more important for ethnic endogamy patterns than for educational assortative mating. A general pattern seems to be that although parental composition is important for both men and women in terms of ethnic endogamy, the strength of coefficients suggests that having a Swedish born parent in general and a Swedish born mother in particular, is more important for females. In terms of educational homogamy, results suggest that a Swedish born parent matters most for first generation men, although two Swedish born parents is associated with higher educational homogamy for both men and women.

Results so far are based on cross-section comparisons of two immigrant generations residing in Sweden during the year 2005. As such, estimates say very little about the intergenerational transmission of assortative mating patterns. However, as we have information on parents' country of origin, especially for second generation immigrants, we can look at this issue as well, i.e, how parental endogamy is correlated with children's endogamy patterns. Parental ethnic endogamy is defined as a zero/one variable equal to one if parents to second generation immigrants are born in the same non-Swedish country of origin and zero otherwise. Note that although we have information on parent's country of birth, we do not have information on whether or not parents are still in a relationship (married or cohabiting). Approximately 18-15 percent (female and male respectively) of second generation immigrants have two foreign born parents stemming from the same country of origin. Remaining individuals either have parents from different countries of origin or missing information on one parent's country of origin.

Re-estimation of our ethnic endogamy equations for second generation immigrants controlling for parental ethnic endogamy yields results (see Table 6) indicating that ethnic endogamy probabilities are higher for those individuals with parents from the same country of origin. After controlling for individual and partner characteristics, second generation immigrants with parents from the same country of origin are associated with 10-11 percentage point higher probabilities of ethnic endogamy in comparison to those with parents from different countries of origin (or a parent with missing information on country of origin). As such, there is evidence of some intergenerational transmission of ethnic endogamy.

Table 4: Ethnic Endogamy Probabilities and Parental Similarity in National Origin; Second Generation Immigrants

	Female			**Male**		
	(1)	(2)	(3)	(1)	(2)	(3)
Parents from same country of origin	0.17** (0.003)	0.111** (0.002)	0.108** (0.002)	0.152** (0.003)	0.100** (0.002)	0.097** (0.002)
No. of obs.	141,795	141,795	141,795	144,943	144,943	144,943

Note: Probit models on the probability of being in a relationship that is characterized by ethnic endogamy. Estimated models are similar to those presented in Table 3. Full results available from authors by request. Coefficient estimates reported as marginal effects evaluated at the mean of explanatory variables. Robust standard errors in parentheses. ** denotes significance at the 1 % level and * at the 5% level.

5. Conclusions

This study aims to analyze the determinants of assortative mating in different dimensions namely, ethnic background and education, looking at both individual and partner characteristics. Estimation is based on the population of working age individuals with an immigrant background residing in Sweden in 2005. The focus is on describing assortative mating patterns by immigrant generation status and how these patterns vary with parental composition.

Two types of assortative mating patterns are studied, ethnic endogamy and educational homogamy. Results indicate that the probability of ethnic endogamy is considerably lower for second generation immigrants in comparison to first generation immigrants. The same is true for educational homogamy once differences in individual and partner characteristics are accounted for, but differences between generations are weaker than those found for ethnic endogamy. There are no gender differences in these results but some notable gender differences in the determinants of respective type of assortative mating. For example, the negative correlation between education and ethnic endogamy is significantly stronger for women in comparison to men.

In terms of parental composition, a Swedish background (mother or father) is associated with lower levels of ethnic endogamy for both first and second generation immigrants, regardless of gender. The correlation between some Swedish background and ethnic endogamy is, however, significantly more negative for first generation women in comparison to first generation men. Having a Swedish born mother is found to be particularly important for first generation females. In terms of educational homogamy, results suggest that a Swedish born parent matters primarily for first generation men where having a Swedish born parent is associated with significantly higher probabilities of assortative mating by education in comparison to having two foreign born parents. Few other correlations between parental composition and educational homogamy are found.

In summary having some Swedish background either through individual's own birth place or her/his parents' birth place is negatively associated with the probability of having formed an ethnically endogamous partnership. This may be due to the fact that a Swedish born person has a higher degree of host country specific knowledge, social / human capital and access to networks that contribute to weaken the ethnic social boundaries through their own or their

children's partnership choices. In addition, the finding that parental ethnic endogamy is positively associated with the probability of their children forming endogamous partnerships draws attention to the intergenerational aspect of partnership patterns. However, we find the opposite in the case of the relationship between parents' birth place and educational homogamy, where having some Swedish background has a positive effect on educational homogamy. On the other hand, lower degrees of positive assortative mating for second generation on both dimensions draw attention to a relatively more free-from-boundaries choice for individuals born in Sweden relative to those born abroad.

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