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## **ABSTRACT**

### **How Interethnic Marriages Affect the Educational Attainment of Children: Evidence from a Natural Experiment**

The allocation of Moluccan immigrants across towns and villages at arrival in the Netherlands and the subsequent formation of interethnic marriages resemble a natural experiment. The exogenous variation in marriage formation allows us to estimate the causal effect of interethnic marriages on the educational attainment of children from such marriages. We find that children from Moluccan fathers and native mothers have a higher educational attainment than children from ethnic homogeneous Moluccan couples or children from a Moluccan mother and a native father.

JEL Classification: I21, J15

Keywords: interethnic marriages, educational attainment

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# 1 Introduction

In research on the socioeconomic position of immigrants much attention is paid to the effects of interethnic contact and to its opposite, social segregation. The so-called network theory states that diversity of social ties is vital to life chances (Granovetter, 1983; Putnam, 2000). The lack of ‘weak ties’ with indigenous people therefore reduces immigrants’ socioeconomic chances. Of special interest to our research is Peach (1981) who finds that the degree of social segregation correlates inversely with the degree of interethnic marriage. Such marriages can be considered as a signal of social integration, and at the same as an indicator of the opportunity to take advantage of the ‘strength of strong ties’ (Granovetter, 1983). As interethnic marriages are becoming more common in immigrant countries research on how these marriages affect the development of human capital of both partners and their children is growing (e.g. Snipp (1997) for the U.S.; Newhouse and Peters (2003) for Canada and Muttarak (2003) for the U.K.).

Our paper presents the results of an empirical analysis of the effects of interethnic marriages on the educational attainment of children from such marriages.<sup>1</sup> In the analysis we use data on Moluccan immigrants in the Netherlands. This population has specific features of special interest for our study. The Moluccan immigrants come from the Moluccas, a group of islands which belong to the Republic of Indonesia. For over three hundred years Indonesia was a Dutch colony, until 1945 when after the Japanese occupation, independence was declared by Indonesian nationalists. In the remainder of the 1940s there was an armed conflict as the Netherlands tried to regain control over the colony. Since Moluccans served as soldiers in the Dutch colonial army it was difficult for them to stay when Indonesia became independent in 1949, especially because at that time a large number of Moluccans pursued an independent Moluccan republic. After some deliberation, about 12.500 Moluccan soldiers, policemen and their families were transferred to the Netherlands in 1951. As a result a group of immigrants with homogeneous socioeconomic characteristics arrived almost at the same time. After their arrival, Moluccans were first accommodated by the Dutch government in temporary dwellings. Subsequently they were sent to different towns and villages all over the country, most often to be accom-

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<sup>1</sup>Interethnic marriages concern Moluccans and native Dutch.

modated in specific Moluccan quarters. The original distribution was to a large degree dependent on the availability of accommodation and therefore on the precise moment of arrival. As differences in religion, island of origin and political affiliation were not taken into consideration, conflicts arose within the Moluccan communities. The Dutch government took such factors into consideration at the moment of redistribution (Verwey-Jonker, 1959). Socioeconomic characteristics, however, and age or household characteristics were not taken into account. As stated, socioeconomic characteristics were not very relevant anyway since the Moluccan population showed hardly any variation in this respect. In this sense the arrival and allocation of Moluccans in the Netherlands resembles a ‘natural experiment’. The resemblance is intensified by the fact that in the following years Moluccans hardly migrated.<sup>2</sup> In 2001, fifty years after their arrival, approximately 75% of the Moluccans still lived in the town or village of their first residency.<sup>3</sup> The combination of an initial random allocation across towns and villages and subsequent low mobility offers a near-laboratory situation which we exploit in our empirical analysis.

Estimating the causal effect of interethnic marriages is not easy. The formation of an interethnic marriage is not a random event. Because of selectivity, treating an interethnic marriage as exogenous to the educational attainment of children from that marriage is problematic. It may be that the partners of interethnic marriages have unobserved characteristics that affect the educational attainment of their children. Ignoring this selectivity and attributing the effect of unobserved partner characteristics to the type of marriage leads to biased parameter estimates. However, due to the way the Moluccan immigrants were distributed across the Netherlands, interethnic marriage formation resembles a ‘natural experiment’ and therefore may be considered as exogenous. Nevertheless, we investigate whether indeed selectivity is no issue by jointly modeling marriage formation and the effect of interethnic marriages on the educational attainment of children. We find no evidence for the presence of selectivity, thus confirming the ‘natural experiment’ character of the distribution of Moluccans across the Netherlands.

Our main conclusion is that children from marriages with a Moluccan father and

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<sup>2</sup>Net-emigration is about 4%. At the moment there are about 42,500 Moluccans living in the Netherlands (Statistics Netherlands, 2002: 15).

<sup>3</sup>Statistics Netherlands, 2001: 28.

a native mother have a higher educational attainment than children from ethnic homogeneous Moluccan couples and children from a Moluccan mother and a native father. We attribute this finding to a combination of two effects. First, in Moluccan families mothers have a big influence on the educational attainment of their children because of their dominant role in child raising. Second, Dutch mothers in such families have an advantage over Moluccan mothers who all belong to the first or second generation, since they have greater knowledge of and experience with the Dutch educational system.

The paper is set-up as follows. In section 2 we present an overview of relevant literature on interethnic marriages. Section 3 gives a brief description of the history of Moluccan immigrants in the Netherlands to highlight why our data are special. Section 4 presents our data and gives stylized information for illustrative purposes. Section 5 presents the estimation results. Section 6 concludes.

## 2 Interethnic marriages

Research on interethnic marriages can be distinguished along four types. First, there are studies that focus on marriage formation investigating if partners in interethnic marriages differ from those in ethnic-homogeneous marriages. Social capital theory relates these differences to the functioning of social and economic networks. The probability of interethnic contact is considered to be one of the main causes of interethnic marriages. Empirical research shows, among other things, that the incidence of interethnic marriages is affected by the ethnic composition of the local population (Harris and Ono, 2005). Pullum, Peri and Bratter (1998) show that interethnic marriages are concentrated among highly educated couples.

While linked to the first type, the *second* type of studies focus on interethnic marriages as an indicator of social integration of immigrants in the receiving country (Bevelander and Veenman, 2006). In this ‘classical’ sociological approach interethnic marriages are perceived as a sign of the saliency of group boundaries and as a catalyst for future reductions in social distance (Alba and Nee, 1997, Suro, 1999, Fu, 2001). Opposite to this view, others have stated that a rising number of interethnic marriages may provoke ethnic revitalization, partly because of the threat of such marriages to ethnic group survival (Chimbos, 1999).

The *third* type of studies deal with the effects of interethnic marriages, in particular on the development of the human capital of the partners. As Kantarevic (2004) shows, there are two alternative hypotheses. According to the productivity hypothesis immigrants who are married to native-born spouses assimilate faster than comparable immigrants married to foreign-born spouses, because spouses play a crucial role in the human capital accumulation of their partners. According to the selection hypothesis the relationship between intermarriages and human capital accumulation is spurious because intermarried immigrants are a selective subsample from the population of all married immigrants (which fits into the first type of studies mentioned before). Analyzing immigrants' earnings, Kantarevic finds that the empirical evidence favors the selection hypothesis: the estimated intermarriage premium completely vanishes once the selection is accounted for. These findings for the U.S. contradict the results of Meng and Gregory (2001) who document a substantial interethnic marriage premium for non-English speaking immigrants in Australia, even when endogeneity of marriage formation is accounted for. The authors also report that immigrants who marry into another immigrant group do not receive such a premium. Supportive of Kantarevic' findings is Furtado (2006) who shows that assortative matching on education is the most important avenue through which human capital affects the probability of interethnic marriage. All in all, the findings are inconclusive. Choosing an interethnic partner may very well be selective and those who have chosen such partner may experience some benefits from it. The two hypotheses may be complementary rather than competing with each other.

The *fourth* type of studies consider the effects of ethnic intermarriages on the children from such relationships. Sociologists have studied the ethnic or racial identification of the children (Ramakrishnan, 2004), as some economists did (Duncan and Trejo, 2005). Other economists focus on the social mobility of children from interethnic marriages. Furtado (2005a,b) finds that children with a foreign born father and a native born mother have a worse educational attainment than children with same-nativity parents because children from two foreign born parents benefit from ethnic networks.

In our paper we investigate how interethnic marriages among Moluccans residing in the Netherlands affect the educational attainment of the children from those marriages. From the literature we deduce that interethnic marriages may have

a positive effect on the educational attainments of children from such marriages. Although Furtado (2005a,b) finds that this effect is only present in marriages with a native (US) born father, we hypothesize that it is also present in marriages with a Moluccan father and a native born mother. We base this hypothesis on the fact that within the Moluccan group mothers are dominant in child raising (Siwabessy and Van Wijk, 1986), while native mothers have the advantage of greater experience with and knowledge of the Dutch educational system (Veenman, 1996).

### **3 Moluccans in the Netherlands**

#### **3.1 Moluccans arriving in the Netherlands**

Accompanied by their families, in a period of three months from March 21 to June 21, 1951 on board of 12 ships about 570 Moluccan policemen and civilians arrived in the Netherlands next to somewhat more than 3.500 Moluccan soldiers, almost all belonging to the lower military ranks of the Dutch colonial army.<sup>4</sup> At the moment of their arrival in 1951, Moluccan men had an average age of 19,6 years, while Moluccan women were 20,9 years of age. It shows that Moluccans were rather young at the moment of arrival, which is directly related to the military status of the men. A large majority of them solely had primary education or no education at all. Only the few who attended a Dutch school in Indonesia mastered the Dutch language. Given their restricted educational attainment, the Moluccans only qualified for low skilled jobs. In the first years of residency in the Netherlands they hardly participated in the labor market since the Dutch government provided benefits to the Moluccans while labor unions opposed their labor market participation to protect the interests of low skilled Dutch workers. The labor force participation rate started to increase when in 1956 the Dutch government decided to no longer provide financial support to the Moluccan population. Although a minority refused to earn their living as they claimed to be soldiers serving the Dutch army, by 1959 75% of the adult Moluccan men had a regular job (Veenman, 1990). Most men had lower paid industrial jobs, some men and women worked in agricultural jobs in close vicinity to their homes.

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<sup>4</sup>About 64% of the soldiers were privates, 35% sergeant or corporal and only about 1% was lieutenant (Smeets and Steijlen, 2006).



At arrival, the Dutch government randomly distributed the Moluccan immigrants over villages and small towns in the periphery of the Netherlands, expecting that they would soon return to Indonesia. Since differences in island of origin, religion, and in particular political affiliation caused sometimes violent conflict among Moluccan inhabitants, a re-allocation took place in which the aforementioned differences were taken into consideration. When it became clear that a return to Indonesia was not to be expected soon - partly because the Moluccans refused to live in the Republic of Indonesia, partly because Indonesia was reluctant to embrace the (former) Moluccan soldiers - concerns with the dwelling conditions of Moluccans increased. The homes of the Moluccans originally were temporary dwellings, among which former German concentration camps and monasteries. In a 1959-study the Dutch government was advised to accommodate the Moluccans in regular houses (Verwey-Jonker, 1959). From 1960 on, most villages and cities of first residency started to construct specific Moluccan quarters, often at least partially financed by the Dutch government. Only a few municipalities (e.g. Huizen, Ridderkerk, Woerden) refused to build Moluccan quarters and distributed the Moluccan inhabitants over the local area. The transition from camps and monasteries to the newly built houses was not always easy. Some Moluccan groups considered their first dwellings as military barracks and as they claimed to be soldiers serving the Dutch army, they were reluctant to give up the military symbols in exchange for dwellings of 'civilians'. It was only in 1989 that the last camp (Lunetten in Vught) was renovated to accommodate the Moluccans living there in stone-built houses. Despite the resistance, most Moluccans adapted well to living in the Moluccan quarters. Only a small minority left the quarters voluntarily, often to escape the severe social control within the local community. Most preferred to stay, although the families often were quite large (ten or more children was no exception). From the moment on that these children started to marry, many of them chose to live outside the Moluccan quarters though not always wholeheartedly. They often tried to find a home nearby the Moluccan quarter, to ensure close contacts with those living inside the quarter. As indicated before, fifty years after their arrival, 75 % of the Moluccans still lived in the town or village of their first residency.

### 3.2 Moluccans and Interethnic Marriages

From the moment of their arrival, Moluccans showed a relatively high degree of interethnic marriages. In 1959 a government committee reported that between 1951 and 1958 there were 430 new Moluccan marriages; of these 131 were interethnic (30%), 116 with a Moluccan male and 15 with a Moluccan female (Verwey-Jonker, 1959). Another study found that between 1950 and 1968 36% of the new Moluccan marriages were interethnic marriages (Van Amersfoort, 1971). Veenman (1985) found that in 1983 22.5% of all Moluccan marriages (thus not just the new ones and cohabiting inclusive) were interethnic marriages. In 70% of the couples the Moluccan partner was a male, in 30% a female. He also found that at a younger age, the proportion of interethnic relations was higher (e.g. in the age category 25-30 years: 51% of the males and 20% of the females had such relation). Veenman (1985) furthermore shows that Moluccan youngsters stay unmarried for a relatively long period; 72% of the males between 25 and 30 years of age are still living with the parents, while the same goes for 63% of the females (compared to 42 and 24% respectively among native Dutch youngsters in the same age category). Veenman explains this phenomenon from the Moluccans' disadvantaged labor market position (in 1983 no less than 48% of Moluccans under 30 years of age were unemployed). Van Amersfoort (1971) adds that young Moluccans meet cultural restrictions in choosing a partner, in particular from Moluccan origin. This may not only explain the higher age of marriage, but also the relatively high proportion of interethnic marriages.<sup>5</sup>

In 1986 Siwabessy and Van Wijk applied in-depth interviews to discern specific features of interethnic marriages with a Moluccan partner. They found that in such marriages the native partner often has close contacts with the Moluccan social networks, from churches to folklore clubs and other associations. The native partners furthermore seem to have far more intense contacts with the Moluccan in-laws than with their own family. As a result of the close and intensive contacts with the Moluccan family, children from interethnic marriages often have far more contacts

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<sup>5</sup>The reason is that so-called 'pela' relationships (traditional ties between villages or islands) often prohibit marriages of individuals belonging to these villages or islands. The belief among Moluccans is that ancestors see to conformation to the pela rules, and apply severe sanctions if the rules are broken.

with the Moluccan grandparents than with the Dutch ones. The authors observe that in this manner Moluccan elements and Dutch elements are combined in child raising, in which mothers play a dominant role. An appreciated Dutch feature is personal independence or self-reliance, while Moluccan elements in child raising are respect for elderly, intense family contacts, and knowing Moluccan history and culture.

## 4 Data

### 4.1 The survey

The data for our analysis come from a year 2000 labor market survey among Moluccans.<sup>6</sup> Because of privacy regulations, Moluccans are not registered as such in official data bases. Therefore a two-step sample method was used. In the first stage, 10 municipalities were selected out of 57 towns and villages where Moluccans found their first residency.<sup>7</sup> The selection was based on the following criteria, considered to be relevant for labor market research: (1) distribution over the country, (2) local unemployment rate (high-medium-low), (3) estimated size of the local Moluccan community, (4) kind of housing situation for Moluccans (towns with or without Moluccan quarters), and (5) specific group characteristics such as the island of origin, the religion, and the political attachment (roughly speaking: pro or contra an independent Moluccan republic). This selection led to a representative sample of

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<sup>6</sup>In this study we define Moluccans as those immigrants from Indonesia who arrived collectively in 1951 as well as their descendants born in the Netherlands. At the moment this population comprises both a first, a second and a still young third generation. People belonging to the second and the third generation may be the child of an interethnic relation.

<sup>7</sup>Due to our selection procedure our sample excludes Moluccans living in municipalities that were not the original towns and villages of residency, e.g. big cities like Amsterdam, Rotterdam, The Hague. Since most universities are found in the big cities, we incorporated university students in our sample by explicitly asking questions about their presence and their characteristics in each household, as if the students still live with the parents. In the Dutch educational system schools do not differ in quality across regions. This is the effect of public financing, a centralized administrative system, and nation wide exams. As a consequence we do not have to worry about Moluccans moving outside the towns and villages of first residency for educational reasons, which would have threatened our research design.

towns and villages where Moluccans found their first residence. In the second stage, within the selected towns and villages Moluccan households were chosen on the basis of four complementary procedures. Whenever possible interviewers started in the Moluccan quarters and addressed each household there for an interview, mostly on a door-to-door basis. Besides this approach, lists of Moluccan households outside the quarters were constructed with the help of local Moluccan organizations (often the churches and the social work foundations which both have a broad range of contacts within the Moluccan community). Yet the approach via Moluccan organizations could lead to a biased sample (mostly Moluccans with strong ties to the local community). We therefore also asked the respondents to mention the addresses of their Moluccan relatives and acquaintances living outside the quarter.<sup>8</sup> Finally, each interviewer had a Moluccan guide from the local community who was instructed to complete the list of available addresses if necessary. With these measures we believe to have prevented the possible bias in snowball sampling. In each municipality interviewers used quota sampling to make sure that the number of households visited inside and outside the Moluccan quarter was proportional. Due to the two-stage set-up focussed on the places of first residency, we are able to exploit the randomness of the initial allocation of the first-generation Moluccans across Dutch towns and villages. Because of this, there is no reason to think that the sample is selective with respect to the variable of interest, the educational level of children.

The Dutch educational system allows individuals to reach the same educational level through various tracks of different length. Therefore, we focus on educational level rather than years of schooling (see also Van Ours and Veenman, 2003). We distinguish four levels of education: 1 = Primary education, 2 = Lower secondary education (lower vocational or lower general), 3 = Intermediate education (intermediate vocational, GCSE and A-levels), 4 = Higher education (higher vocational and academic).

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<sup>8</sup>Since Woerden has no Moluccan quarter, the second and third procedure were used to construct lists of addresses.

## 4.2 Stylized facts

In the analysis we focus on children aged 12 to 30. The lower boundary is 12 because in the Netherlands most children of this age transit from the non-differentiated primary education to the level-specific secondary education. The upper limit is determined by the fact that almost everyone of this age has left school. Our sample concerns all children of whom the educational level of both parents is known. We have information about children who live with their parents and children who live on their own.<sup>9</sup>

Table 1 presents our data in more detail. The information is distinguished by municipality to illustrate the structure of our data. The first column presents the percentage of Moluccans as measured in a 1981 population survey, the only survey that fully covered the Moluccan population at the level of municipalities. As shown in the table we have information about 359 children from 192 couples. On average 41% of the couples concerns an interethnic relationship; 26% with a native wife and 15% with a native husband. Across the municipalities there are big differences in the incidence of interethnic marriages, from 6% in Wormerveer to 70% in Woerden. The latter outlier is probably due to the fact that Woerden is the only city in our survey without a Moluccan quarter; Moluccans living dispersed have a higher probability of meeting native people. The differences in incidence of interethnic marriages are related to the population density of Moluccans within the municipalities, ranging from a low 0.4% in Wormerveer to a high 3.1% in Nistelrode.<sup>10</sup> As shown, the higher the percentage of Moluccans in the population, the higher the percentage of mixed marriages. This correlation contradicts the results of most sociological studies in which the percentage of interethnic marriages increases with a decrease of the share of immigrants in the population. Emerson, Kimbro and Yancey (2002) found an exception, however, which regards Asians in the United States. Given this finding, the situation among Moluccans, being Asians as well, is not really peculiar. There is a positive outlier in Woerden – which was explained before – and there are two negative outliers, Wormerveer and Nistelrode, which are both

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<sup>9</sup>Of this last group only age and educational attainment is known but not gender; see also footnote 7.

<sup>10</sup>The variation in density across municipalities is due to differences in willingness to offer housing to Moluccans and differences in the availability of government buildings or terrains.

small municipalities. Apparently, conditional on the percentage of Moluccans, in smaller municipalities the percentage of mixed marriages is lower. We will come back to this in the empirical analysis. The average educational level of the parents is approximately the same in every municipality. On a scale from 1 to 4 the average educational level of mothers is 2.2 and the average educational level of fathers is 2.3.

The lower part of Table 1 shows information about the 359 children in our sample. The educational attainment of the children is distinguished for three groups: children living with their parents and still at school, children living with their parents who completed their education and children who completed school and live separately from their parents. There are 205 children who live with their parents and are still at school, 88 children who live with their parents and completed school, and 66 children who completed school and live on their own.

## 5 Empirical analysis

### 5.1 Allocation of Moluccans across municipalities

We interpret the initial allocation of Moluccan families across municipalities in the Netherlands as a ‘natural experiment’. As indicated before, the Dutch government took into consideration factors such as island of origin, religion, and political attachment to avoid internal conflicts, but socioeconomic characteristics were not taken into account. Table 1 indicates that the average educational level of the parents is approximately the same in every municipality, but this concerns parents irrespective of whether they are Moluccan or native. Table 2 shows the distribution of educational attainment of Moluccan mothers and fathers across municipalities. On average 21% of the Moluccan mothers and 16% of the Moluccan fathers have the lowest educational level; about 5% of the Moluccan mothers and 13% of the Moluccan fathers have the highest educational level. The  $\chi^2$ -value of a test of independence between municipality and educational level has a value of 23.4 for Moluccan mothers and 33.4 for Moluccan fathers. Hence, we cannot reject the hypothesis that in terms of their educational attainment Moluccan parents are distributed randomly across municipalities. This is support for the randomness of the way in which Moluccans were distributed across municipalities when they arrived in the Netherlands.

## 5.2 Interethnic marriages

The probability of an interethnic marriage is specified in terms of the latent variable  $c^*$  which is assumed to depend on characteristics  $z$  of the municipality of couple  $j$  and the educational attainment  $x$  of both partners:

$$c_j^* = \gamma'_z z_j + \gamma'_1 x_{1j} + \gamma'_2 x_{2j} + v_j \quad (1)$$

where the  $\gamma$ 's are a vectors of parameters of interest (including a constant) and  $v_j$  is an error term. Furthermore,  $z$  contains two variables, the natural logarithm of the percentage of Moluccans in the municipality and a dummy variable indicating whether or not the municipality is large.<sup>11</sup> Since there is no reason to think that they will have a direct effect on the educational attainment of children these are excellent instrumental variables, which we exploit in the next subsection.

We assume that  $v_j$  follows a normal distribution and we estimate the parameters of equation 1 using a Probit model. Table 3 shows the parameter estimates. Both the percentage of Moluccans and the dummy variable for large municipalities have a positive and significant effect on the incidence of interethnic marriages. While the second effect seems obvious the first effect is somewhat surprising. This unexpected fact probably has to do with the closeness of the Moluccan group. Whenever in a clear numerical minority position, they tend to stay closely together. When in larger numbers, they are more sociable with others. The first column of Table 3 shows that the educational attainment of the partners does not affect the occurrence of an interethnic marriage. Indeed, as shown in the second column we cannot reject the hypothesis that the educational attainment of the partners does not affect marriage formation.<sup>12</sup> The third and fourth column of Table 3 focus on interethnic marriage formation with a native mother or with a native father. The third column shows parameter estimates if we remove couples with a native father from the sample, the

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<sup>11</sup>Appingedam, Nistelrode and Wormerveer are the small municipalities, the others are large.

<sup>12</sup>The LR test has a value of 2.0. Note also that there is no difference in the average educational level of the Dutch mothers and fathers. The average educational level of the 49 Dutch mothers equals 2.35 (compared to 2.18 of their Moluccan spouses), while the 29 Dutch fathers have an average educational level of 2.31 (compared to 2.17 of their Moluccan spouses). Note that in the homogenous Moluccan marriages the average educational level of the mother is 2.18 (2.39 for the father). So, on averages there are hardly differences in parental educational attainment distinguished by marriage type.

fourth column shows parameter estimates if we remove couples with a native mother from the sample. The parameter estimates are very much the same except for the constant, which is lower in the fourth column. This suggests that the probability of a mixed marriage with a native mother is influenced in the same way by the percentage Moluccans and the size of the municipality as the probability of a mixed marriage with a native father. Conditional on the characteristics of the municipality, the latter type of marriage is less likely to occur.<sup>13</sup>

### 5.3 Educational attainment of children

We distinguish between the desired level of schooling and the observed level of schooling, which is completed for schoolleavers and incomplete for children that are still at school. We assume that the desired level of education  $s^*$  of child  $i$  depends on parental education  $x$  and the type of marriage of their parents:

$$s_i^* = \beta' x_i + \delta c_i + \varepsilon_i \tag{2}$$

where  $c_i$  indicates whether ( $c = 1$ ) or not ( $c = 0$ ) there is an interethnic marriage,  $\beta$  is a vector of parameters and  $\varepsilon_i$  is an error term. The desired level of education is unobserved. Furthermore, since the actual level of (completed or incomplete) schooling  $s$  is a discrete variable we apply an estimation procedure that combines an ordered probit model for completed schooling and a probit model for individuals that are still at school. We assume that  $\varepsilon_i$  is normally distributed across observations. Then, we know for individuals that left school that their desired level of education is equal to the level of completed education:  $s_i = 1$  if  $s_i^* \leq 0$ ,  $s_i = 2$  if  $0 < s_i^* \leq \mu_1$ ,  $s_i = 3$  if  $\mu_1 < s_i^* \leq \mu_2$ ,  $s_i = 4$  if  $\mu_2 < s_i^*$ . For individuals that are still at school we only know that the desired level of education is at least equal to the current level:  $s_i = 1$  if  $s_i^* > -\infty$ ,  $s_i = 2$  if  $s_i^* > 0$ ,  $s_i = 3$  if  $s_i^* > \mu_1$ ,  $s_i = 4$  if  $s_i^* > \mu_2$ .

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<sup>13</sup>Indeed in additional estimates – not shown – where we investigated the probability of a native father conditional on having a mixed marriage we found no effect of the percentage of Moluccans or the size of the municipality. We did find a significant negative constant.



Therefore,

$$\begin{aligned}
\Pr(s_i = 1) &= d \cdot \Phi(-\beta'x_i) + (1 - d) \\
\Pr(s_i = 2) &= d \cdot (\Phi(\mu_1 - \beta'x_i) - \Phi(-\beta'x_i)) + (1 - d) \cdot (1 - \Phi(-\beta'x_i)) \\
\Pr(s_i = 3) &= d \cdot (\Phi(\mu_2 - \beta'x_i) - \Phi(\mu_1 - \beta'x_i)) + (1 - d) \cdot (1 - \Phi(\mu_1 - \beta'x_i)) \\
\Pr(s_i = 4) &= 1 - \Phi(\mu_2 - \beta'x_i)
\end{aligned} \tag{3}$$

where  $d$  is an indicator with a value of 1 if the educational level concerns completed education and a value of 0 if the educational level concerns incomplete education of people still in school. Furthermore, the  $\mu$ 's are unknown parameters, which are estimated jointly with the elements of vector  $\beta$ .

By estimating equation (2) directly it is assumed that an interethnic marriage is exogenous to the educational attainment of children from that marriage. This may not be a valid assumption. If there are unobserved characteristics that affect both the educational attainment and the formation of an interethnic marriage, the error terms of the educational attainment equation are not i.i.d. To investigate the potential endogeneity of an interethnic marriage we have to take marriage formation into account.

As before, the probability of an interethnic marriage is specified in terms of the latent variable  $c^*$  that is dependent on municipality characteristics  $z$ :

$$c_i^* = \gamma'_z z_i + v_i \tag{4}$$

where now child  $i$  is the unit of analysis,  $\gamma_z$  is again the vector of parameters of interest (including a constant) and  $v_i$  is an error term.<sup>14</sup>

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<sup>14</sup>The municipal characteristics, percentage of Moluccans and a dummy variable for large municipalities are excellent instrumental variables; the exclusion restriction is easily satisfied as a direct effect on the educational attainment of children is very unlikely. First, the percentage of Moluccans in each of the municipalities is very low and it is difficult to imagine that such a small group could affect the quality of the educational system. Second, Dutch municipalities only have a limited influence on educational policy which is determined on a national level. From data of the OECD Program for International Student Assessment (PISA; <http://www.pisa.oecd.org>) it appears that although on average across the OECD there is a positive relationship between size of municipality and skills of 15-year old children this is not the case for the Netherlands. The following table is based on PISA 2000 data and concerns av-

In case the error terms  $\varepsilon_i$  and  $v_i$  follow a bivariate normal distribution, the contributions to the likelihood are similar to those of a bivariate probit model taking into account that one of probits has an ordered specification. The likelihood contribution for individual  $i$  who completed educational level 2 and has parents from different ethnic origin is

$$L_i = \Phi_2 [\mu_1 - \beta'x_i - \delta c_i, \gamma'z_i, \rho] - \Phi_2 [-\beta'x_i - \delta c_i, \gamma'z_i, \rho] \quad (5)$$

and the other combinations of educational attainment and interethnic marriage are specified similarly.

Table 4 shows that in all estimates the educational attainment of children is affected by the educational attainment of their parents. The education of both mother and father has a positive effect on the educational attainment of their children. The first column of Table 4 shows that the variable mixed marriage has a positive but insignificant effect on the educational attainment. In the second column we distinguish between the type of interethnic marriage. Interethnic marriages with a native mother have a positive effect on the educational attainment, while interethnic marriages with a native father have no such effect. The third column shows that indeed, if we impose the effect of native fathers to be equal to zero the parameter estimates hardly change.<sup>15</sup> The fourth column shows parameter estimates if we exclude couples with a native father from the sample. The estimation results are hardly affected by this. The fifth column shows very similar parameter estimates if we restrict the analysis to children living with their parents.<sup>16</sup> For this group we can also study the average reading, math and science scores of 15-year old children distinguished by size of municipality:

Number of inhabitants	OECD-average			Netherlands		
	Reading	Math	Science	Reading	Math	Science
3000-15000	486	487	488	528	565	537
15000-100,000	501	499	500	539	574	534
100,000-1,000,000	504	504	506	515	537	512
> 1,000,000	522	520	520	–	–	–

Note that the numbers for cities with more than 1 million inhabitants refers to children living near the city center. Also note that in the Netherlands there are no cities of this size.

<sup>15</sup>Note that the LR test statistic comparing the second and third column has a value of 0.2

<sup>16</sup>We excluded one individual from this subsample of whom the gender was unknown.

effect of gender. It turns out that conditional on the other characteristics girls have no higher educational attainment than boys.

The middle and lower parts of Table 4 show relevant parameter estimates if we impose restrictions to the model. The middle part of Table 4 shows that the effects of mixed marriages on the educational attainment of children hardly change if we impose the correlation between marriage formation and educational attainment to be equal to zero. From this we conclude that selectivity in marriage formation is not a relevant issue among Moluccans in the Netherlands and that indeed the initial distribution of Moluccans across the Netherlands at arrival in 1951 may be considered as a natural experiment. The lower part of Table 4 shows that in some cases the correlation parameter  $\rho$  is significantly positive if we impose the effect of mixed marriages on educational attainment to be equal to zero.

## 5.4 Sensitivity analysis

To investigate the robustness of our findings we performed a sensitivity analysis of which the results are summarized in Table 5. First, we replaced the percentage of Moluccans and the size of the municipality by dummy variables for each municipality. This did not affect the relevant parameter estimate. Second, we allowed for the possibility of children who are still at school to drop out. So far, we assumed that  $s_i^*$  is the desired level of education. However, it is possible that a child does not achieve this desired level but drops out of the educational system; for example a child that is currently at level 3 may drop out of level 3 and therefore has level 2 as final educational attainment. If we account for the possibility of drop out,

$$\begin{aligned}
 \Pr(s_i = 1) &= d \cdot \Phi(-\beta'x_i) + (1 - d) \\
 \Pr(s_i = 2) &= d \cdot (\Phi(\mu_1 - \beta'x_i) - \Phi(-\beta'x_i)) + (1 - d) \\
 \Pr(s_i = 3) &= d \cdot (\Phi(\mu_2 - \beta'x_i) - \Phi(\mu_1 - \beta'x_i)) + (1 - d) \cdot (1 - \Phi(-\beta'x_i)) \quad (6) \\
 \Pr(s_i = 4) &= 1 - \Phi(\mu_1 - \beta'x_i)
 \end{aligned}$$

As shown in Table 5 the estimated effect of a mixed marriage increases somewhat, but is not significantly different from previous estimates. We also investigated whether the age of the child at the time of the survey should be taken into account. If age is included as a regressor in the educational attainment specification it

has a significant negative effect. This might be a cohort effect since we would expect a positive correlation between age and educational attainment. Although the size of the mixed marriage effect decreases somewhat it is still significantly different from zero. The same happens if we use dummy variables for age (16-20, 20-25, 25+) instead of a linear age specification. All in all, the positive effect of interethnic marriages with a native mother on the educational attainment of children from these marriages is quite robust.

In addition to the sensitivity analysis shown in Table 5 we investigated whether the language skills of the parents affect the educational attainment of their children. Language skills are measured at the time of the survey and unfortunately not at the time when the children were young so the measure is not strictly exogenous.<sup>17</sup> The introduction of parental' language skills variables does not affect the parameter estimates for the interethnic marriage effects.

Finally, we investigated whether a more flexible specification of parental education changes the estimation results. In stead of using continuous variables ranging from 1 to 4 we introduced three dummy variables separately for mothers' and fathers' education. This too did not affect the parameter estimates for the interethnic marriage effects.

## 5.5 How to interpret our findings?

Conditional on parental education, interethnic marriages of a Moluccan father and a native mother have a positive effect on the educational attainment of children from these marriages. How should we interpret this finding? Clearly the effect is not related to the interethnic character of the marriage as it doesn't hold for marriages of a Moluccan mother and a native father. The effect could be related to the characteristics of the Moluccan father or the native mother. One possible explanation of our findings is that families with native mothers are better integrated into Dutch society. To investigate this, we compare different types of families with respect to their housing, family contacts, family visits and language skills.<sup>18</sup> From Table 6 we deduce that the educational advantage of children from a marriage with a Moluccan father

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<sup>17</sup>The language skills were indicated by the interviewer as good–mediocre–bad.

<sup>18</sup>The contacts, visits and language skills are reported for Moluccans only.

and a native mother can not be ascribed to the fathers' characteristics. Compared to Moluccan mothers in interethnic marriages Moluccan fathers have more contact within the Moluccan group, less Dutch friends or acquaintances, and a lower Dutch language proficiency. The integration explanation doesn't hold. If anything, families with native mothers are more integrated than families with two Moluccan parents but less integrated than families with native fathers. These findings support our hypothesis that the positive effects on children's educational attainments are due to the native mothers. The reason is twofold. First, in the Moluccan culture mothers play a dominant role in child raising. Second, the Dutch mother can exploit the positive interethnic spillover effects of having greater knowledge of and experience with the Dutch educational system to the advantage of her children.

## 6 Conclusions

A priori it is not clear whether the educational attainment of children is influenced by the ethnic nature of the marriage of their parents. Children from mixed marriages may benefit from positive interethnic spillover effects but it may also be that they don't profit. Clearly, it is not easy to establish whether there is a causal effect at all. It may be that interethnic marriages are selective because the partners in such marriages have unobserved characteristics that also affect the educational attainment of their children. If this is the case the effects of the unobserved characteristics are wrongly attributed to the interethnic character of the marriage. Exploiting random variation in the formation of interethnic marriages can be helpful in estimating the unbiased effect.

The allocation of Moluccan immigrants at arrival in the Netherlands resembles a natural experiment. The formation of interethnic marriages between Moluccans and native Dutch is influenced by this initial distribution. The exogenous variation in marriage formation allows us to estimate the causal effect of interethnic marriages on the educational attainment of children from such marriages. We find that children from marriages with native mothers have a higher educational attainment than children from ethnic homogeneous Moluccan couples or couples with a native father. In raising Moluccan children, mothers traditionally play a dominant role, and for native Dutch mothers it is easier to support their children in their educational career

because they have more experience with and knowledge about the Dutch educational system than Moluccan mothers from the first and second generation.

It is difficult to generalize the conclusion that interethnic marriages may have positive effects on the educational attainment of children from those marriages. In the Moluccan case the native mothers are important because of their Moluccan-like dominance in child raising and the Dutch advantages of knowledge of and experience with the educational system. For other types of interethnic marriages such a combination of effects may not occur. Our analysis does however show that even conditional on parental education, parents' knowledge on the educational system may benefit the educational attainment of children. That finding is remarkable in itself, since it implies that providing better information to migrant parents on the native education system may help to fight the often disadvantaged educational attainment of immigrant children.

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Table 1: **Descriptives**

	Percentage Moluccans	Mixed marriages (%)			Educational level		<i>N</i>
		Native mother	Native father	Total	Mother	Father	
Appingedam	2.3	0	17	17	1.8	2.5	6
Barneveld	2.6	37	11	48	2.3	2.3	35
Breda	0.6	12	12	24	2.2	2.5	26
Hoogeveen	1.8	33	26	59	2.3	2.3	27
Middelburg	2.1	27	23	50	2.3	2.4	26
Nistelrode	3.1	18	9	27	2.0	2.5	22
Rijssen	1.0	0	22	22	1.7	2.0	9
Sittard	0.7	67	0	67	2.3	1.7	3
Woerden	1.8	50	20	70	2.5	2.3	20
Wormerveer	0.4	6	0	6	2.3	2.3	18
Total	1.8	26	15	41	2.2	2.3	192

Education	Children living with their parents				Other children		Total <i>N</i>
	Still at school	<i>N</i>	Finished school	<i>N</i>	Finished school	<i>N</i>	
Appingedam	2.5	6	2.7	3	2.0	2	11
Barneveld	2.6	31	2.4	16	2.3	9	56
Breda	2.2	22	2.3	10	2.2	13	45
Hoogeveen	2.4	39	2.5	10	3.0	10	59
Middelburg	2.5	26	2.1	12	2.7	11	49
Nistelrode	2.2	29	2.0	7	2.8	6	42
Rijssen	2.3	12	1.3	8	2.2	5	25
Sittard	3.3	4	2.0	1	-	0	5
Woerden	2.8	20	2.3	12	3.1	7	39
Wormerveer	2.6	16	2.6	9	2.7	3	28
Total	2.5	205	2.2	88	2.6	66	359

Note: Educational level measured on a scale from 1 to 4; *N* is the number of observations (upper part: families; lower part: children).

Table 2: **Educational level of Moluccan mothers and fathers**

Municipality	Moluccan mothers					Moluccan fathers				
	1	2	3	4	Total	1	2	3	4	Total
Appingedam	2	3	1	0	6	0	2	3	0	5
Barneveld	1	10	8	3	22	3	20	7	1	31
Breda	6	10	6	1	23	2	11	4	6	23
Hoogeveen	4	7	7	0	18	3	6	8	3	20
Middelburg	4	10	4	1	19	5	9	3	3	20
Nistelrode	5	7	5	1	18	5	6	4	5	20
Rijssen	4	4	1	0	9	3	3	0	1	7
Sittard	0	1	0	0	1	1	2	0	0	3
Woerden	3	2	5	0	10	2	10	3	1	16
Wormerveer	1	11	4	1	17	2	10	5	1	18
Total (Number)	30	65	41	7	143	26	79	37	21	163
Total (%)	21	45	29	5	100	16	48	23	13	100

Note: Educational level measured on a scale from 1 to 4;  $N$  is the number of observations; the  $\chi^2$ -value of a test of independence between municipality and educational level has a value of 23.4 for Moluccan mothers and 33.4 for Moluccan fathers; with 27 degrees of freedom the critical  $\chi_{0.05}^2=40.1$ .

Table 3: **Probability of mixed marriage; parameter estimates probit model**

	All (1)	All (2)	Native mother (3)	Native father (4)
Percentage Moluccans	0.50 (3.1)**	0.50 (3.0)**	0.49 (2.6)**	0.43 (1.9)*
Large municipality	0.86 (3.4)**	0.91 (3.6)**	0.85 (3.0)**	0.84 (2.5)**
Education mother	0.11 (0.9)	–	–	–
Education father	-0.15 (1.3)	–	–	–
Constant	-1.08 (2.8)**	-1.19 (4.7)**	-1.43 (5.0)**	-1.69 (4.8)**
-Loglikelihood	116.3	116.4	90.5	66.5
Number of obs.	192	192	163	143

Note that the educational level measured on a scale from 1 to 4; absolute  $t$ -statistics in parentheses – a \*\* (\*) indicates significance at a 95% (90%) level.

Table 4: **Effect mixed marriages on the educational attainment of children; parameter estimates**

	(1)	(2)	(3)	(4)	(5)
		<i>Probability of mixed marriage</i>			
Percentage Moluccans	0.46 (3.5)**	0.46 (3.5)**	0.46 (3.5)**	0.47 (3.3)**	0.51 (3.2)**
Large municipality	1.13 (5.5)**	1.13 (5.5)**	1.13 (5.5)**	1.08 (4.5)**	1.07 (4.3)**
Constant	-1.42 (6.6)**	-1.41 (6.6)**	-1.41 (6.6)**	-1.63 (7.0)**	-1.51 (6.2)**
		<i>Educational level child</i>			
Education father	0.16 (1.9)*	0.20 (2.3)**	0.20 (2.3)**	0.23 (2.4)**	0.39 (2.9)**
Education mother	0.36 (3.8)**	0.33 (3.6)**	0.33 (3.5)**	0.34 (3.6)*	0.18 (1.4)
Mixed marriage	0.23 (1.4)	–	–	–	–
native mother	–	0.48 (2.4)**	0.50 (2.6)**	0.47 (2.4)**	0.59 (2.3)**
native father	–	-0.11 (0.5)	–	–	–
Girl	–	–	–	–	0.26 (1.3)
$\mu_1$	1.02 (9.3)**	1.05 (9.3)**	1.04 (9.3)**	1.04 (8.3)**	1.02 (6.7)**
$\mu_2$	2.34 (14.3)**	2.39 (14.4)**	2.39 (14.4)**	2.45 (13.7)**	2.44 (9.9)**
Constant	0.34 (1.3)	0.34 (1.3)	0.31 (1.3)	0.27 (1.0)	0.16 (0.5)
$\rho$	0.05 (0.4)	0.07 (0.5)	0.06 (0.5)	0.18 (1.2)	0.34 (2.1)**
-Loglikelihood	471.5	468.7	468.8	372.6	270.7
		<b>Restricted model I (<math>\rho = 0</math>)</b>			
Mixed marriage	0.25 (1.7)*	–	–	–	–
native mother	–	0.50 (2.6)**	0.51 (2.7)**	0.52 (2.7)**	0.61 (2.3)**
native father	–	-0.09 (0.5)	–	–	–
-Loglikelihood	471.6	468.8	468.9	373.3	272.9
		<b>Restricted model II (effect mixed marriage = 0)</b>			
$\rho$	0.10 (0.9)	0.10 (0.9)	0.10 (0.9)	0.23 (1.7)*	0.33 (2.0)**
-Loglikelihood	472.7	472.7	472.7	375.9	274.7
Number of obs.	359	359	359	304	245

Note that the educational level measured on a scale from 1 to 4; absolute  $t$ -statistics in parentheses – a \*\* (\*) indicates significance at a 95% (90%) level.

Table 5: **Effect of having a native mother on the educational attainment of children; sensitivity analysis**

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Table 4 – column (3)	0.50 (2.6)**
Fixed effects municipalities	0.50 (2.6)**
Accounting for drop outs	0.59 (2.6)**
Age – continuous variable	0.42 (2.0)**
Age – dummy variables	0.44 (2.0)**

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Note that the estimates are based on 359 observations; the baseline estimate is third column of Table 4; since the parameter estimates are very much the same as in Table 4 only the effect of having a native mother is presented; explanation: see main text; absolute  $t$ -statistics in parentheses – a \*\* indicates significance at a 95% level.

Table 6: **Characteristics of Moluccan parents distinguished by type of marriage**

	Homogenous Moluccan marriage	Mixed marriage Moluccan father	Moluccan mother	Average <i>N</i>
Housing	0.50	0.76	0.76	192
Contact	0.36	0.26	0.21	183
Visit	0.65	0.81	0.93	183
Language	0.79	0.78	0.86	171

Note that if for a homogeneous marriage both parents provided information this is averaged.

Definitions of the variables:

Housing: 1 = Housing outside the Moluccan quarter, 0 = otherwise

Contact: 1 = More contact with Moluccans than with native Dutch, 0 = otherwise

Visit: 1 = Dutch friends or acquaintances visit, 0 = otherwise

Language: 1 = Dutch language proficiency is good, 0 = otherwise