

# International Migration of Couples<sup>1</sup>

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## Abstract

We present theory on international migration of dual-earner couples, and test it using Danish register data. Our model predicts that the probability that a couple emigrates is increasing in the earnings of the primary earner. The effect of the earnings of the secondary earner may go either way. The empirical analysis confirms that migration probability is always increasing in male primary earner's income, and in most specifications in female primary earner's income. Higher education of either partner makes couples more, and having children makes couples less mobile. Power couples are most likely to emigrate, but also most likely to return.

**Keywords:** International migration; Family migration; Education

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## 1 Introduction

Couples are less likely to migrate than singles, even after controlling for age. An important reason for this is that a dual-career couple that considers migrating may face difficulties in finding a good job match for both partners in the same location. In pioneering contributions, Mincer (1978) and Frank (1978) linked couples' colocation problem to the lower earnings by women. If migration decisions are made to maximize joint family income and women earn initially less than men, the possibility of migration puts women at a further disadvantage. Costa and Kahn (2000) showed that the colocation problem is a primary explanation for why college-educated couples in the United States have increasingly located in large metropolitan areas after the Second World War. Gemici (2011) presents a dynamic model with intra-household bargaining and repeated migration decisions. Couples decide in each period whether to stay together where they are currently located, migrate together to a new location, or break up. He analyzes the interplay between migration, labor market outcomes and marital stability, using PSID data. Family ties reduce migration and earnings of both men and women. Without family ties, men would earn 10% and women 3% more.

In this paper, we study international migration of couples. We present first a theoretical model of migration decisions by dual-earner couples, and analyze how the probability that the couple emigrates depends on the income of the higher-earning partner and of the lower-earning partner. We then test this model using register data from Denmark, which is one of the richest and most gender-equal countries in the world (United Nations Human Development Report 2011). We restrict our attention to male-female couples, due to a difficulty in recognizing cohabiting same-sex couples in the data. As Costa and Kahn (2000), we call couples in which both male and female have college education power couples, and couples in which neither spouse has college education low-power couples. In most of the subsequent analysis, we divide Costa and Kahn's group of part-power couples into male-power couples in which the male has college education but the female has not, and female-power couples in which only the female has college education.

We ask a number of related questions. First, how does the probability of international migration differ between singles and couples at various ages? Second, how does the probability that a couple emigrates depend on partners' education? Third, how the earnings of the primary earner and of the secondary earner affect the likelihood that a couple emigrates? Fourth, how earnings, children and partners' education are related to return migration? To answer these questions, we use full population register data from 1982 to

2010, including age, gender, a household identifier that allows identifying cohabiting couples, education, income and migration events of all Danes who were registered to live in Denmark.

Previous literature analyzing domestic migration has found that couples' migration decisions are more responsive to male job opportunities (Blackburn (2010), Tenn (2010), Gemici (2011)). In a theoretical contribution on joint job search, Guler et al. (2012) conclude that if ex ante identical spouses can receive job offers from different locations and incur a cost when living apart, joint search can result in a worse outcome than single-agent search. Most of the previous analysis of international migration has focused on men (Chiswick (1978), Borjas (1987), Chiquiar and Hanson (2005), Grogger and Hanson (2011)). Borjas and Bronars (1991) show that self-selection of migrants who move with their partner is not as strong in terms of individual characteristics. Cobb-Clark (1993) analyzes female immigrants to the United States and finds that women from rich countries with low return to education and small income differences have relatively higher earnings in the United States. This suggests a corresponding selection as among men. In addition, she also finds that women who migrated as household members earn significantly higher wages than women who did not. Therefore, her results are at odds with findings from analyzing domestic migration.

Our first stylized finding is that single men and women are much more mobile than men and women in couples. Therefore, the stylized finding that Mincer (1978) derived for internal migration holds also for international migration. For most age groups, singles are several times more likely to emigrate than couples.

As for family migration, we test two competing hypotheses. One is a traditional pattern, namely that migration would respond more strongly to male education and earnings. On the other hand, Danish women have been better educated than men since 1990s, and female labor force participation rate was above 70% already in 1980s. This suggests an alternative hypothesis that family migration from Denmark would respond more strongly to the better-educated or higher-earning spouse's job opportunities. Therefore, we also study separately couples in which the female earns more and the couples in which the male earns more. To distinguish the effect of earnings from the effect of education, we analyze separately couples belonging to different power types.

In case family migration patterns would be traditional and dominated by male job opportunities, we would expect that the probability of emigration would increase in male earnings, independently of the power type and of which partner earned more before mi-

gration. Our competing hypothesis of migration from relatively gender-equal Denmark being responsive to the higher-earning spouse's job opportunities suggests that male earnings play a bigger role in couples in which the male earns more and female earnings in couples in which the female earns more. Based on the theoretical model, the effect of the earnings of the secondary earner may go either way.

Our main empirical finding is that the probability of emigration is increasing in the earnings of the higher-earning partner, in line with the theoretical model. The effect of the earnings of the secondary earner varies. When the analysis is restricted to dual-earner couples, the estimated effects of female and male primary earner's income tend to be quite similar. The effects of the secondary earner's income vary considerably. In low-power couples and female-power couples in which the female earned more, the effect of the male earnings on the likelihood of emigration is negative. In male-power couples and power couples in which the male earned more, the effect of the female earnings on the likelihood of emigration is positive, although rather small.

We also find that family migration from Denmark is more responsive to male's education than to female's education. Even among couples in which the female earned more, the emigration rate of male power couples is higher than the emigration rate of female power couples. Power couples are most likely to emigrate, but also most likely to return. Couples in which only the male is highly educated are more than twice as likely to emigrate as if only the female is highly educated. Couples in which neither partner is highly educated are least likely to emigrate, but also have lowest return migration rates. This suggests that migration as brain circulation is most pronounced among the highly-educated. Having children reduces the likelihood of emigration, but the return rates do not depend much on the number of children at the time of emigration.

## 2 Theory

### 2.1 Migration of a single person

Individual  $i$  earns net income  $w_i$  in his or her home country. Net income abroad  $w_i^A$  depends on net income at home and an individual-specific random variable  $x_i$ ,  $x_i \in [\underline{x}, \bar{x}]$ , where  $\underline{x} < 0 < \bar{x}$ :

$$w_i^A = (1 + x_i)w_i.$$

Individual  $i$  faces migration cost  $c_i$ , which captures also any psychological costs and benefits related to living abroad.<sup>1</sup> It could also capture any differences in earnings between the home country and the foreign country that do not depend on home-country wage. Therefore, the net return to migrating is given by

$$R_i = x_i w_i - c_i.$$

An individual migrates if the net return to migrating is larger than zero. Assuming that the individual-specific random variable follows a uniform distribution and that  $\bar{x} = \underline{x} + 1$ , the probability of emigration is given by<sup>2</sup>

$$(1) p_i = \begin{cases} 0, & \text{if } c_i \geq \bar{x} w_i \\ \bar{x} - \frac{c_i}{w_i}, & \text{if } c_i < \bar{x} w_i. \end{cases}$$

If  $c_i \leq \bar{x} w_i$ ,  $\frac{\partial p_i}{\partial c_i} < 0$  and  $\frac{\partial p_i}{\partial w_i} > 0$ . In other words, the probability of emigration increases in the net income in the home country and decreases in the migration cost. Individual migration cost can be expected to depend on the level of education, as well as the presence of children. In the empirical analysis, migration costs appear to be lower for the college-educated than for those without college education. This could be explained by their better language skills. It is plausible that the presence of children increases migration costs. From now on, we also assume that  $-1 < \underline{x} < -0.5$ . This guarantees that even without migration costs, less than half of the population would emigrate.

Our model can be interpreted to refer either to a decision on permanent migration, in which case income  $w_i$  would correspond to the net present value of future income flows, or to a decision on whether to migrate for a certain duration, in which case income  $w_i$  would correspond to the net present value of income during the eventual period of temporary migration, and  $c_i$  would be the net present value of emigration and return migration costs. Furthermore, the model could be extended to allow for uncertainty related to returns abroad, by interpreting  $x_i$  to refer to the expected value of the individual-specific random variable abroad.

## 2.2 Migration of a couple

A couple consists of two individuals,  $a$  and  $b$ . Without loss of generality, assume that  $w_a \geq w_b$ . Individual-specific random variables  $x_a$  and  $x_b$  are distributed independently

<sup>1</sup> For simplicity, we assume that  $c_i \geq 0$ . The model could be analyzed also without this restriction.

<sup>2</sup> An individual emigrates if  $x_i > \frac{c_i}{w_i}$ . The probability of emigration equals one minus the cumulative distribution function of  $x_i$  at this point.

and identically.<sup>1</sup> The couple emigrates if  $R_a + R_b > 0$ . This condition could arise either due to a unitary model in which the couple maximizes its joint utility, or a bargaining model in case the partner who gains from emigration could compensate the partner who loses by making a transfer ex ante. The latter interpretation is adopted by Gemici (2011). The condition for emigration can be written as

$$x_a w_a + x_b w_b - c_a - c_b > 0.$$

We denote the probability that the couple emigrates by  $p_{ab}$ , adding below in part of the analysis a superscript to analyze scenarios that differ in terms of wage differences. The couple never migrates with  $x_a = \underline{x}$  as gains to the partner with a smaller income cannot exceed losses to the partner with a larger income by the assumption  $-1 < \underline{x} < -0.5$ . The lowest possible realization of  $x_a$  with which the couple can become indifferent on whether to migrate is denoted by  $\hat{x}_a$  and is given by

$$\hat{x}_a w_a + \bar{x} w_b - c_a - c_b = 0.$$

This allows solving

$$\hat{x}_a = \frac{c_a + c_b}{w_a} - \frac{\bar{x} w_b}{w_a}.$$

Provided that  $x_a \geq \hat{x}_a$ , the realization of  $x_b$  above which the couple migrates is denoted by  $\hat{x}_b$  and is given by

$$\hat{x}_b(c_a, c_b, w_a, w_b, x_a) = \max\left(\frac{c_a + c_b}{w_b} - \frac{x_a w_a}{w_b}, \underline{x}\right).$$

We say that wage differences between the partners are **relatively small** when  $\hat{x}_b(c_a, c_b, w_a, w_b, \bar{x}) > \underline{x}$ , implying that the couple would not emigrate if the lower-income earner faces the worst possible realization abroad even in case the higher-income earner would face the best possible realization. By  $\underline{x} = \bar{x} - 1$ , this implies that

$$(2) w_b > \frac{\bar{x}}{1 - \bar{x}} w_a - \frac{c_a + c_b}{1 - \bar{x}}.$$

The probability that the couple migrates with a given  $x_a$  is now  $\bar{x} - \hat{x}_b(c_a, c_b, w_a, w_b, x_a)$ . Integrating over all possible realizations of individual-specific random variables gives the probability that the couple emigrates with relatively small wage differences:

$$p_{ab}^{small} = \int_{\hat{x}_a}^{\bar{x}} \left( \bar{x} - \frac{c_a + c_b}{w_b} + x_a \frac{w_a}{w_b} \right) dx_a.$$

Inserting  $\hat{x}_a$  and simplifying gives

$$p_{ab}^{small} = \bar{x}^2 \left( 1 + \frac{w_a}{2w_b} + \frac{w_b}{2w_a} \right) - \frac{c_a + c_b}{w_b} \bar{x} - \frac{c_a + c_b}{w_a} \bar{x} + \frac{(c_a + c_b)^2}{2w_a w_b}.$$

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<sup>1</sup> We make this assumption as we have data only on pre-migration earnings. Assuming a positive correlation between the partners' random variables would alleviate trade-offs in couple migration. If correlation would be 1, a couple would correspond to a single person with migration cost  $c_a + c_b$  and wage rate  $w_a + w_b$ .

If income differences between the partners are **relatively large** so that  $\hat{x}_b(c_a, c_b, w_a, w_b, \bar{x}) = \underline{x}$ , we can calculate for each  $x_b$  the minimum value of  $x_a$  with which the couple is indifferent on whether to migrate:

$$x_a(c_a, c_b, w_a, w_b, x_b)w_a + x_b w_b - c_a - c_b = 0.$$

This allows solving

$$x_a(c_a, c_b, w_a, w_b, x_b) = \frac{c_a + c_b}{w_a} - x_b \frac{w_b}{w_a}.$$

The probability that the couple emigrates is in this case

$$p_{ab}^{large} = \int_{\underline{x}}^{\bar{x}} \left( \bar{x} - \frac{c_a + c_b}{w_a} + x_b \frac{w_b}{w_a} \right) dx_b = \bar{x} - \frac{c_a + c_b}{w_a} + \frac{w_b}{2w_a} (2\bar{x} - 1).$$

If migration costs between the partners differ sufficiently, it is trivial to show that the partner with a lower migration cost would be more likely to emigrate as single. More importantly, we can prove that being in a couple reduces the probability of emigration of the higher-income earner also if the migration costs are the same for both partners:

**Proposition 1.** If migration costs are the same for both partners, a couple is always less likely to emigrate than the partner with higher earnings would be as single.

**Proof.** Assume that  $c_a = c_b = c$ . (i)  $p_{ab}^{large} = \bar{x} - \frac{2c}{w_a} + \frac{w_b}{2w_a} (2\bar{x} - 1) < \bar{x} - \frac{c}{w_a} = p_a$ .

(ii)  $p_{ab}^{small} = \bar{x}^2 \left( 1 + \frac{w_a}{2w_b} + \frac{w_b}{2w_a} \right) - \frac{2c}{w_b} \bar{x} - \frac{2c}{w_a} \bar{x} + \frac{2c^2}{w_a w_b}$ .  $p_{ab}^{small} < p_a$  can be rewritten as

$$(3) \quad \bar{x}^2 \left( 1 + \frac{w_a}{2w_b} + \frac{w_b}{2w_a} \right) - \frac{2c}{w_b} \bar{x} - \frac{2c}{w_a} \bar{x} + \frac{2c^2}{w_a w_b} < \bar{x} - \frac{c}{w_a}.$$

The definition (2) of wage differences being relatively small can be rewritten as

$$(4) \quad w_a \bar{x} - 2c < (1 - \bar{x})w_b.$$

Insert next notation  $w_a = \alpha w_b$  into (3). This yields

$$(5) \quad \bar{x}^2 \left( 1 + \frac{\alpha}{2} + \frac{1}{2\alpha} \right) - \frac{2c\bar{x}}{w_b} - \frac{2c\bar{x}}{\alpha w_b} + \frac{2c^2}{\alpha w_b^2} - \bar{x} + \frac{c}{\alpha w_b} < 0.$$

Further manipulation gives

$$\frac{1}{2\alpha} \left[ \bar{x}^2 (\alpha^2 + 2\alpha + 1) - \frac{4\bar{x}c}{w_b} (1 + \alpha) + \frac{4c^2}{w_b^2} - 2\bar{x}\alpha + \frac{2c}{w_b} \right] < 0$$

$$\frac{1}{2\alpha} \left[ \left( \frac{2c}{w_b} - \bar{x}(1 + \alpha) \right)^2 - 2\bar{x}\alpha + \frac{2c}{w_b} \right] < 0$$

$$\frac{1}{2\alpha} \left[ \left( \frac{2c}{w_b} - \bar{x}(1 + \alpha) \right)^2 + \left( \frac{2c}{w_b} - \bar{x}(1 + \alpha) \right) - \bar{x}(\alpha - 1) \right] < 0.$$

Introducing an auxiliary variable  $A = \frac{2c}{w_b} - \bar{x}(1 + \alpha)$ , the condition can be written as

$$(6) \frac{1}{2\alpha} (A(A+1) - \bar{x}(\alpha-1)) < 0.$$

Observe that  $A < \frac{2c}{w_b} - 2\bar{x} < 0$  as  $\alpha > 1$  and  $A+1 = \frac{1}{w_b} [2c - w_b(\bar{x}(1+\alpha) - 1)] > 0$  by inequality (4). Therefore (6) is satisfied, completing the proof.

It is also possible to show:

**Proposition 2.** A small increase in the home-country wage of the higher-wage partner increases the probability that a couple emigrates, while an increase in migration costs of either partner reduces it.

**Proof.**  $\frac{\partial p_{ab}^{small}}{\partial w_a} = \bar{x}^2 \left( \frac{1}{2w_b} - \frac{w_b}{2w_a^2} \right) + \frac{c_a+c_b}{w_a^2} \bar{x} - \frac{(c_a+c_b)^2}{2w_a^2 w_b} = \frac{\bar{x}^2}{2w_b} - \frac{(w_b \bar{x} - c_a - c_b)^2}{2w_a^2 w_b}$   
 $> \frac{\bar{x}^2}{2w_b} - \frac{(w_b \bar{x})^2}{2w_a^2 w_b} = \frac{\bar{x}^2}{2w_b} \left( 1 - \frac{w_b^2}{w_a^2} \right) > 0$  and  $\frac{\partial p_{ab}^{large}}{\partial w_a} = \frac{c_a+c_b}{w_a^2} + \frac{w_b}{2w_a^2} (1 - 2\bar{x}) > 0$ . As for the migration costs, we have

$$\frac{\partial p_{ab}^{small}}{\partial c_a} = \frac{\partial p_{ab}^{small}}{\partial c_b} = -\frac{1}{w_b} \bar{x} - \frac{1}{w_a} \bar{x} + \frac{c_a+c_b}{w_a w_b} = \frac{1}{w_a} \left( \frac{c_b}{w_b} - \bar{x} \right) + \frac{1}{w_b} \left( \frac{c_a}{w_a} - \bar{x} \right) < 0 \quad \text{and}$$

$$\frac{\partial p_{ab}^{large}}{\partial c_a} = \frac{\partial p_{ab}^{large}}{\partial c_b} = -\frac{1}{w_a} < 0.$$

**Proposition 3.** A small increase in the home-country wage of the lower-wage partner has an ambiguous effect on the probability that the couple emigrates if the wage difference is initially small, and a negative effect if the wage difference is initially large.

**Proof.** With large wage differences,  $\frac{\partial p_{ab}^{large}}{\partial w_b} = \frac{2\bar{x}-1}{2w_a} < 0$ . With small wage differences,  $\frac{\partial p_{ab}^{small}}{\partial w_b} = \bar{x}^2 \left( -\frac{w_a}{2w_b^2} + \frac{1}{2w_a} \right) + \frac{c_a+c_b}{w_b^2} \bar{x} - \frac{(c_a+c_b)^2}{2w_a w_b^2}$ . To see that this can be either positive or negative, assume first that  $c_a = c_b = 0.1$ ,  $\bar{x} = 0.4$  and  $w_b = 1$ . With  $w_a = 1.4$ ,  $\frac{\partial p_{ab}^{small}}{\partial w_b} > 0$  and with  $w_a = 1.6$ ,  $\frac{\partial p_{ab}^{small}}{\partial w_b} < 0$ , completing the proof that the effect may go either way.

Our simple theoretical model generates a number of empirically testable predictions. First of all, if migration costs are decreasing in the level of education, we would expect college-educated singles to be more likely to emigrate than singles without college education by equation (1), taking into account that the college-educated also earn more. Second, a couple of partners with the same level of education should be less likely to



emigrate than at least the higher-earning singles with the same level of education. Third, Proposition 2 predicts that the likelihood of emigration is increasing in the earnings of the higher-earning partner, and that when controlling for the level of earnings, couple is more likely to emigrate if partners are college-educated. Fourth, Proposition 3 points out that the effect of the wage of the lower-earning partner on the probability of emigration is ambiguous. Finally, we conjecture that for couples in which one partner is college-educated and another one is not, the probability of emigration is larger than the probability of non-college educated couples, and smaller than the probability of college-educated power couples.

It should be noted that our model could be applied also in cases in which only one partner receives a job offer from abroad before the migration decision, and there is uncertainty related to job opportunities of the other partner. In that case, random term  $x$  for the partner who receives a job offer abroad would be known, while the random term  $x$  for the other partner would reflect his or her expected job opportunities abroad. While it is more plausible to expect that the primary earner is the one receiving a job offer from abroad, the model allows the job offer coming to either partner. Still, the model is restricted in that the duration of the eventual stay abroad has to be known in advance, whether permanent or temporary. In order to model the optimal choice of the duration of stay abroad, we would have to specify the wage process abroad, as well as distinguish between fixed emigration and return migration costs, and flow costs related to staying abroad. We refrain from a more complex modeling of the wage process abroad as the data that we use to test the theory is restricted to the country of origin.

### **3 Data and Summary Statistics**

Like other Scandinavian countries, Denmark collects unusually comprehensive register data. Our main register data sources are the population register, income tax register, education register, register on wages and occupation, and migration register. Data from various registers is combined using a unique personal identification number (social security number). By law, all residents in Denmark must have a social security number which is also necessary in everyday life, including opening a bank account, receiving wages or social assistance, visiting doctor or being registered at school. Registering migration is compulsory. From the migration register, we have information on the dates of migration and country of destination, as well as return migration. This paper uses register data on the full Danish population from 1982 to 2010. We accessed the data through Statistics Denmark.

In this paper, we define a couple as a male and female who have lived in the same address for at least one year.<sup>1</sup> A couple is defined based on a shared address, rather than being married, as cohabiting is common in Denmark. If both partners migrate to the same country within one year, we interpret that the couple migrates together. The attention is restricted to couples in which at least one parent of both partners was born in Denmark.<sup>2</sup>

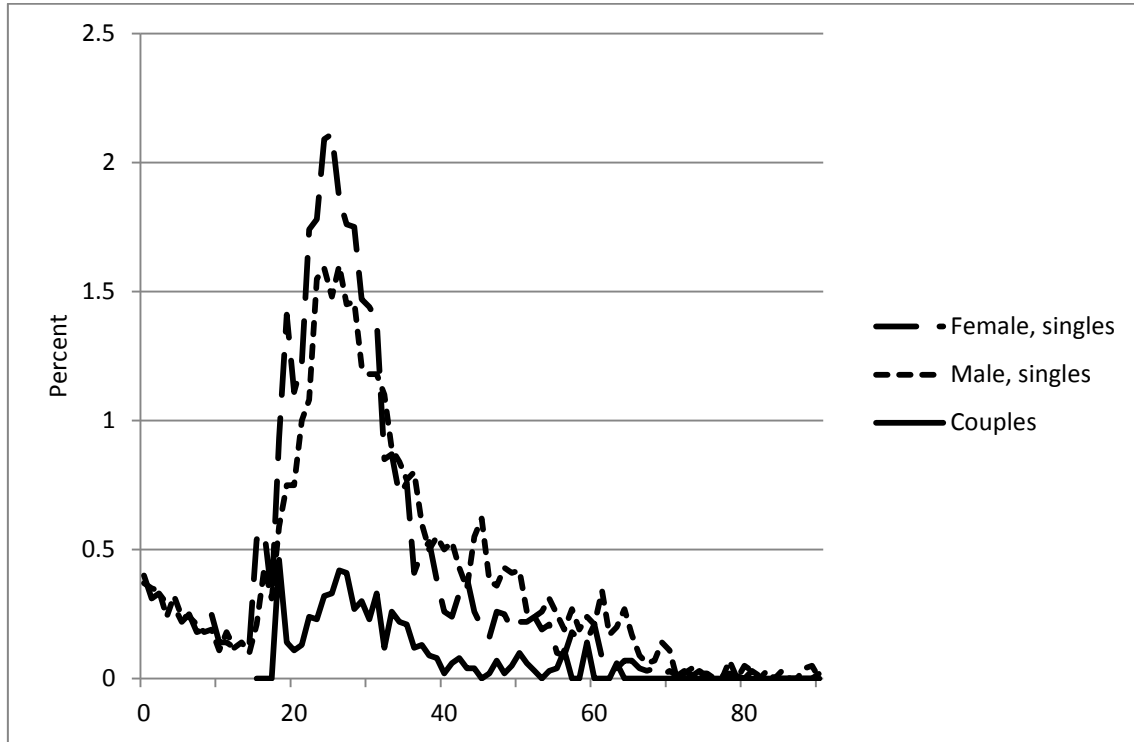
Figure 1 reports emigration rates of single men and women (including children in families until the age of 17), and of couples in which both partners migrate to the same country in 2010. Couples are listed according to the female's age. Also the analysis of singles is restricted to those who had at least one parent who was born in Denmark.

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<sup>1</sup> The Statistics Denmark definition also requires that if the male and female do not have children together, their age difference is less than 15 years. We restrict attention to opposite-gender couples first of all as the number of same-gender couples is clearly smaller, and second because especially among students, there are quite a few cases in which two persons of the same gender share an apartment without forming a couple. We cannot tell from the data who are just living together and who form a couple.

<sup>2</sup> For immigrants, emigrating from Denmark might mean returning to the home country. Therefore, their decisions can be expected to differ significantly from non-immigrants. The analysis excludes couples that migrate to Faroe Islands and Greenland, which are autonomous Danish territories.

FIGURE 1: FAMILY STATUS AND EMIGRATION PROBABILITIES



*Note:* The horizontal axis denotes the age and the vertical axis the percentage of singles (or couples measured according to the female age) of that age that emigrates.

The big picture that emerges is that singles are considerably more mobile than couples. Already Mincer (1978) established that family ties deter within-country migration, and Figure 1 shows that the same holds for international migration.

The rest of this paper restricts the attention to couples in which the male was aged 25 to 39, and the female 23 to 37. This is the same age restriction as in Costa and Kahn (2000). Couples in which information on either education or occupation is missing are excluded. This restriction reduces the number of observations by about one percent. Table 1 in reports the number of households fulfilling the restrictions listed above, and the percentage of couples emigrating together from 1982 to 2010. The emigration rate has increased since mid-1990s, following the introduction of the free mobility within the European Union in 1993.

TABLE 1: EMIGRATION RATES OF COUPLES (IN PERCENT), 1982-2010

	Emigration Rate	Couples
1982	0.16	331.528
1983	0.12	321.879
1984	0.12	312.272
1985	0.13	301.870
1986	0.13	291.525
1987	0.15	284.401
1988	0.20	279.626
1989	0.25	274.688
1990	0.21	272.292
1991	0.18	271.033
1992	0.18	270.470
1993	0.19	269.536
1994	0.21	267.614
1995	0.22	266.290
1996	0.24	265.982
1997	0.25	265.420
1998	0.25	264.417
1999	0.25	262.969
2000	0.30	260.984
2001	0.29	256.910
2002	0.23	251.948
2003	0.22	245.488
2004	0.25	237.784
2005	0.28	228.894
2006	0.29	222.551
2007	0.31	216.411
2008	0.26	211.328
2009	0.20	206.489
2010	0.21	200.708
Total	0.22	7.613307

Note: Calculations are based on couples satisfying the restrictions listed in the text.

61% of couples are low-power couples, 15% power couples, 14% female-power couples and 10% male-power couples. In 78% of couples, both male and female work. In 10% (6%) of couples, male works and female is out of labor force (unemployed). Female works and male is unemployed (out of labor force) only in 2% (2%) of couples. Students are counted among those out of the labor force.

#### 4 Stylized Facts

In this section, we provide an overview on emigration and return migration, before proceeding to econometric analysis in section 5. Table 2 reports the likelihood of emigration of couples with different levels of education. Power couples are six times more likely to emigrate than low-power couples. Male-power couples are somewhat less likely to emigrate than power couples, while the emigration rate of female-power couples is

closer to that of low-power couples than to that of male power couples or power couples. This suggests that emigration decisions respond primarily to the job opportunities of the male. One explanation for this is that even though Denmark has a high female labor force participation rate, partly made possible by extensive daycare system, most destination countries have much more limited or expensive daycare services. This means that even highly-educated women are more likely to stay at home to take care of their children, making emigration decision more dependent on the male's labor market prospects. Table A.1 in the appendix shows that the emigration rates are almost the same if the attention is restricted to married couples.

TABLE 2: EMIGRATION RATES OF COUPLES (IN PERCENT) ACCORDING TO MALE AND FEMALE EDUCATION

		Male education	
		Low	High
Female education	Low	0.10	0.45
	High	0.21	0.60

The emigration rate for single women (men) without college education is 1.00% (0.70%). The emigration rate for single women (men) with college education is 1.77% (1.78%).

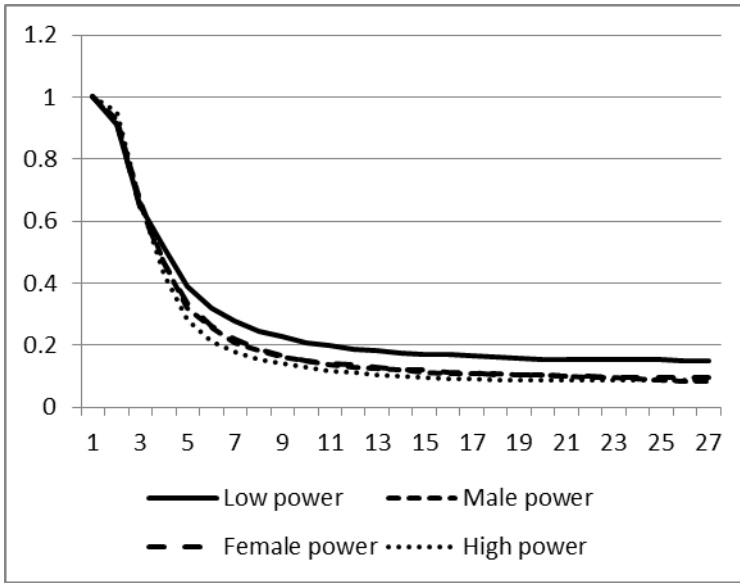
Tables A.2a and A.2b present emigration rates separately for couples in which the female earned more and for couples in which the male earned more. In both groups, emigration rate is highest for power couples, followed by male power couples, with the emigration rate of female power couples being between low-power couples and male-power couples. Emigration rates of low-power and female-power couples are about the same whether the male or the female earned more. The emigration rates of power couples and male-power couples are considerably higher if the male earned more. Together, these stylized findings suggest a rather traditional family migration pattern which is weakened, but not reversed, in couples with the female being the primary earned.

Most of the couples return to Denmark within a few years. Figure 2 presents survival rates with different educational combinations for couples who have emigrated. Survival as emigrants is defined so that neither partner has returned to Denmark; there is no data on whether the partners stay together abroad if neither has returned. High-power and part-power couples are considerably more likely to return than low-power couples. 72 percent of power couples, 67-68 percent of female-power and male-power couples and 61 percent of low-power couples returns within 5 years.

Table A.3 presents emigration rates when only long-term emigration (neither partner returns to Denmark within 5 years) is taken into account. Also among long-term emigrants, male education plays a much bigger role in promoting emigration. Tables A.4a and A.4b show that long-term emigration is more responsive to male education independently of which partner earned more. Overall, long-term emigration of couples is

rather rare. The annual long-term emigration rate of couples with a highly-educated male is slightly less than one per thousand each year. For low-power couples, annual emigration rate is around one per 5,000. Although these numbers are low, they still imply that about one percent of couples in which the male is highly educated emigrate either permanently or at least for more than 5 years within 10 years. If the emigrants are self-selected among the higher-earners, then the overall economic impact can be larger than these numbers alone suggest.

FIGURE 2: SURVIVAL RATES OF STAYING ABROAD FOR EMIGRATING COUPLES



*Note:* The horizontal axis denotes the number of years spent abroad and the vertical axis the fraction of couples still staying abroad.

Table 3 reports emigration probabilities according to whether the spouses are employed. Emigration rates are highest for couples in which neither partner is working, and lowest for couples in which both partners are working. It is intuitive that couples in which both partners are working are less likely to emigrate, as the tied mover has more to lose in such couples. Emigration is more likely if the male is not working and the female is working than if the male is working and female not working, again suggesting that couples are more willing to sacrifice female’s current employment to take advantage of a good job opportunity abroad for the currently unemployed male partner than the other way round.

TABLE 3: EMIGRATION RATES OF COUPLES ACCORDING TO EMPLOYMENT STATUS, PERCENT

Male

		Working	Not working
Female	Working	0.20	0.32
	Not working	0.26	0.36

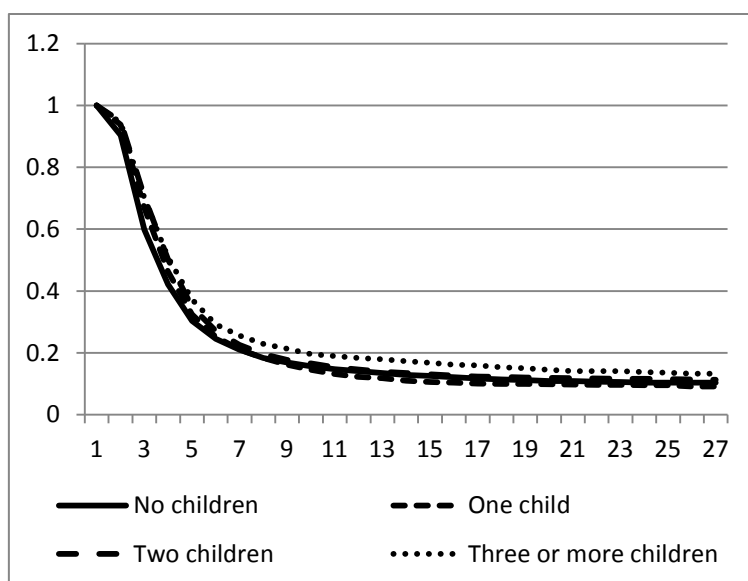
Note: employment status is measured in the year before emigration.

We find that couples are most likely to emigrate when they have no children; see Table 4. This is intuitive as the presence of children adds additional family ties that can be expected to deter migration. However, the number of children at the time of emigration is quite unrelated to the return hazard; see Figure 3.

TABLE 4: NUMBER OF CHILDREN AND EMIGRATION RATES, PERCENT

0	0.33
1	0.20
2	0.17
3+	0.16

FIGURE 3: SURVIVAL RATES FOR COUPLES AND THE NUMBER OF CHILDREN



Note: The horizontal axis denotes the number of years spent abroad and the vertical axis the fraction of couples still staying abroad.

## 5 Econometric Analysis

The previous section established that the emigration rate is highest among power couples, followed by male-power couples, and lowest for low-power couples. To find out which are the effects of various background characteristics when other characteristics are taken into account, we next turn to regression analysis. Given that a decision to emigrate is a zero-one decision we use a probit model for emigration. The unit of observa-

tion is a couple, and the dependent variable obtains a value of one if the couple migrates together, and zero otherwise.

The first two columns of Table 5 explain the decision to emigrate by male's and female's education, the number of children, the age of the female, the age of the oldest child and year dummies (not reported) to capture trends and the effect of business cycle in migration. The third and the fourth columns add labor market status and earnings. If the annual earnings are less than DKK 1, log of earnings is replaced by zero. This allows keeping also partners who stay at home without any income in the analysis.

To allow testing both the effect of primary earner and potential gender differences, the first and the third column analyze couples in which the female earned more and the second and the fourth column couples in which the male earned more. In all cases, power couples are most likely to emigrate, followed by male power couples. Low-power couples are always least likely to emigrate.

In line with the theoretical model, we find that the probability of emigration is increasing in the primary earner's income, both in couples in which the male earned more and in couples in which the female earned more. In couples in which the female earned more, the probability of emigration is increasing in male earnings. In couples in which the male earned more, the opposite is the case: the probability of emigration is decreasing in female earnings. This suggests that in addition to the general pattern of migration being responsive to the primary earner's income, there is a traditional gender pattern of couples being more likely to migrate if the male earns more. This pattern could be partly driven by most destination countries being less gender-equal than Denmark, meaning that even high-earning women may end up staying at home to take care of their children, or work shorter hours.



TABLE 5: PROBIT REGRESSION FOR FAMILY EMIGRATION

		Female earned more	Male earned more	Female earned more	Male earned more
Intercept		-3.29*** (0.06)	-3.13*** (0.03)	-3.04*** (0.12)	-6.17*** (0.10)
Power couples		0.50*** (0.02)	0.57*** (0.01)	0.49*** (0.02)	0.54*** (0.01)
Female-power couples		0.20*** (0.02)	0.21*** (0.01)	0.20*** (0.02)	0.20*** (0.01)
Male-power couples		0.34*** (0.02)	0.48*** (0.01)	0.33*** (0.02)	0.44*** (0.01)
[Low-power couples]					
Number of children	1	-0.34** (0.15)	-0.41*** (0.06)	-0.35** (0.15)	-0.39*** (0.06)
	2	-0.29** (0.14)	-0.36*** (0.06)	-0.30** (0.14)	-0.34*** (0.06)
	3+	-0.26* (0.14)	-0.30*** (0.06)	-0.26* (0.14)	-0.28*** (0.06)
	[0]				
Female occupation	OLF			0.01 (0.05)	0.01*** (0.01)
	Student			0.06 (0.04)	0.15*** (0.02)
	Unem- ployed			-0.00 (0.04)	-0.04*** (0.01)
	[Work]				
Male occupation	OLF			0.14*** (0.03)	0.29*** (0.04)
	Student			0.15*** (0.02)	0.53*** (0.04)
	Unem- ployed			-0.02 (0.02)	0.11*** (0.03)
	[Work]				
Female log earnings				-0.02*** (0.01)	-0.01*** (0.00)
Male log earnings				0.01*** (0.00)	0.24*** (0.01)
Observations		1,606,270	5,832,231	1,606,270	5,832,230

Note: Dummies for age of female, age of male, age of oldest child and year are included in all models. In case annual earnings are smaller than DKK 1, log of earnings is replaced by zero. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses. OLF is out of labor force.

Source: Own calculations

Our main results are in table 6. In it, we restrict the analysis to couples in which both partners worked at least 60 percent of the full working time in the previous year, corresponding to about seven months. We also require that both partners has positive earn-

ings; it is not plausible that someone who worked more than half a year would have zero or negative earnings. This restriction brings the empirical analysis closest to the theoretical model. We present results first for all emigration spells, and then for long emigration spells, defined so that neither partner returned to Denmark within 5 years. The results in Table 6 are in line with the predictions from our theoretical model: whether male or female earns more, the probability that the couple emigrates is increasing in the primary earner's income. Yet, there are certain gender differences. In couples in which the female earns more, migration is less responsive to the primary earner's income than in couples in which the male earns more. On the other hand, in couples in which the male earns more, the probability of emigration is increasing, although weakly, also in the female income. In couples in which the female earns more, the effect of the male income on the probability of emigration is statistically insignificant, and the point estimates are negative.

TABLE 6: PROBIT REGRESSION FOR EMIGRATION OF DUAL-EARNER COUPLES

		Female earned more	Male earned more	Female earned more, 5+ years abroad	Male earned more, 5+ years abroad
Intercept		-10.50*** (0.56)	-12.59*** (0.23)	-10.02*** (1.16)	-13.56*** (0.17)
Power couples		0.48*** (0.03)	0.47*** (0.01)	0.24*** (0.06)	0.21*** (0.02)
Female-power couples		0.18*** (0.03)	0.16*** (0.01)	0.06 (0.06)	0.06** (0.03)
Male-power couples		0.34*** (0.04)	0.38*** (0.01)	0.28*** (0.08)	0.22*** (0.02)
[Low-power couples]					
Number of children	1	-0.21 (0.22)	-0.30*** (0.08)	-4.39 (9960.98)	-0.49*** (0.19)
	2	-0.12 (0.22)	-0.23*** (0.08)	-4.17 (9960.98)	-0.46*** (0.19)
	3	-0.03 (0.22)	-0.20** (0.08)	-3.91 (9960.98)	-0.39*** (0.19)
	+				
	[0				
	]				
Female log earnings		0.61*** (0.05)	0.03* (0.01)	0.61*** (0.10)	0.06** (0.03)
Male log earnings		-0.06 (0.04)	0.69*** (0.01)	-0.11 (0.08)	0.74*** (0.02)
Observations		621,233	3,353,488	512,478	2,876,877

Note: Dummies for age of female, age of male, age of oldest child and year are included in all models. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses.

Source: Own calculations

Table A.5 in the appendix shows that emigration decisions of single men are more responsive to their income than emigration decisions of single women in that a given proportional increase in earnings increases the likelihood of emigration more for men.

In Table 7, we study separately couples with children and couples without children. (An analysis of couples with one child, couples with two children, and couples with three or more children suggests that accounting for the number of children does not make much of a difference). Independently of the number of children, power couples are most likely to emigrate, followed by male-power couples and then by female-power couples. We find that the probability of emigration is increasing only in the primary earner's income.

TABLE 7: CHILDREN AND EMIGRATION OF DUAL-EARNER COUPLES

	No children, female earned more	No children, male earned more	With children, female earned more	With children, male earned more
Intercept	-10.25*** (0.90)	-11.97*** (0.44)	-10.82*** (0.75)	-13.06*** (0.27)
Power couples	0.39*** (0.04)	0.45*** (0.02)	0.55*** (0.04)	0.46*** (0.01)
Female-power couples	0.10*** (0.05)	0.16*** (0.03)	0.24*** (0.04)	0.16*** (0.02)
Male-power couples	0.29*** (0.06)	0.36*** (0.02)	0.39*** (0.06)	0.39*** (0.01)
[Low-power couples]				
Female log earnings	0.61*** (0.08)	0.03 (0.03)	0.59*** (0.07)	0.03 (0.02)
Male log earnings	-0.09 (0.06)	0.64*** (0.03)	-0.03 (0.06)	0.71*** (0.02)
Observations	183,735	709,035	437,498	2,644,453

Note: Dummies for age of female, age of male, and year are included in all models. Age of oldest child included in models with children. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses. OLF is out of labor force.

Source: Own calculations

In Tables 8a and 8b, we divide couples according to both power type and the primary earner's gender. Among couples with female primary earner, female earnings play a strong positive role in increasing migration probability in low-power couples, female power couples and in power couples, while the probability of migration is decreasing in male earnings among low-power and female-power couples. Together, these findings suggest that among couples in which the female earned more, migration decisions reflected more female job market opportunities in all other groups apart from male-power

couples. Among couples with male primary earner, the probability of migration is increasing in male earnings, independently of power type. The effect of female earnings is positive among male-power and power couples.

TABLE 8a: EMIGRATION OF DUAL-EARNER COUPLES, FEMALE EARNED MORE

		Low-power	Female power	Male power	Power couples
Intercept		-9.08*** (1.13)	-10.82*** (1.33)	-9.48*** (2.07)	-11.45*** (0.87)
Number of children	1	-4.25 (6682.06)	0.20 (0.35)	-4.52 (46490.32)	0.14 (0.38)
	2	-4.16 (6682.06)	0.29 (0.34)	-4.52 (46490.32)	0.21 (0.37)
	3+	-4.06 (6682.06)	0.33 (0.34)	-9.29 (48221.24)	0.35 (0.37)
	[0]				
Female log earnings		0.62*** (0.09)	0.73*** (0.11)	0.27 (0.20)	0.57*** (0.09)
Male log earnings		-0.21*** (0.06)	-0.16* (0.09)	0.20 (0.18)	0.10 (0.08)
Observations		334,516	142,627	32,482	111,608

Note: Dummies for age of female, age of male, age of oldest child and year are included in all models. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses.

Source: Own calculations

TABLE 8b: EMIGRATION OF DUAL-EARNER COUPLES, MALE EARNED MORE

		Low-power	Female power	Male power	Power couples
Intercept		-13.90*** (0.42)	-11.50*** (0.67)	-13.39*** (0.53)	-11.21*** (0.37)
Number of children	1	-0.36 (0.12)	-0.09 (0.24)	-0.25 (0.18)	-0.50 (0.31)
	2	-0.33 (0.11)	-0.07 (0.23)	-0.16 (0.18)	-0.40 (0.31)
	3+	-0.33 (0.12)	0.01 (0.23)	-0.15 (0.18)	-0.34 (0.31)
	[0]				
Female log earnings		0.03 (0.03)	-0.06 (0.04)	0.07** (0.03)	0.05* (0.02)
Male log earnings		0.80*** (0.02)	0.71*** (0.04)	0.74*** (0.03)	0.59*** (0.02)
Observations		2,041,611	438,874	343,984	529,019

Note: Dummies for age of female, age of male, age of oldest child and year are included in all models. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses.

Source: Own calculations

To sum up: our finding that power couples are most likely to emigrate, followed by male-power couples and then by female-power couples, holds in all specifications. So does the finding that couples without children are more likely to emigrate.

The empirical evidence is broadly in line with the theoretical model. Figure 1 illustrates that single men and women are much more likely to emigrate than men and women in couples. Although we cannot test Proposition 1 directly, given that we do not observe individual migration costs, Figure 1 is consistent with the prediction of Proposition 1 in the special case that migration costs are the same for everyone, whether single or in a couple. That the likelihood of migrating is increasing in the primary earner's income holds in all specifications, apart from male-power couples in which women earned more. This group is only 1.3 percent of all couples on tables 8.a and 8.b, meaning that the prediction of the Proposition 2 holds among the seven subgroups representing 98.7 percent of couples covered in tables 8.a and 8.b. Finally, we found that in some subgroups, the probability of migration was increasing in secondary earner's income, in some decreasing, and in some subgroups there was no effect either way. This is consistent with Proposition 3 that stated that the effect of the secondary earner's income may go either way.

Finally, we analyzed a proportional hazard model for return migration, using low-power couples as the reference category. Table 9 shows that power couples are most likely to return and low-power couples least likely. There is no difference in the return hazard between male-power and female-power couples, except for female power couples in which the female earned more. This is partly in contrast to emigration decisions, in which male-power couples were found to be much more likely to emigrate. The likelihood of returning is decreasing in the primary earner's pre-emigration earnings, in line with the Roy-Borjas model that predicts that emigrants from a country with relatively small income differences, like Denmark, should be positively selected. The effect of the secondary earner's income varies across specifications.

TABLE 9: PROPORTIONAL HAZARD

Variable	Female earned more	Male earned more	Both worked, female earned more	Both worked, male earned more
Female power	0.09 (0.07)	0.15*** (0.04)	0.06 (0.11)	0.17*** (0.05)
Male power	0.16** (0.08)	0.19*** (0.03)	0.07 (0.14)	0.21*** (0.04)
Power couples	0.21*** (0.06)	0.24*** (0.03)	0.20** (0.10)	0.32*** (0.04)
Female Premigration log Earnings	-0.11** (0.05)	-0.00 (0.01)	-0.18 (0.17)	-0.06 (0.04)
Male Premigration log Earnings	0.02 (0.02)	-0.19*** (0.02)	0.10 (0.14)	-0.27*** (0.05)
Dummy for child(ren)	0.09* (0.05)	0.03 (0.03)	0.21** (0.08)	0.07** (0.03)
Emigration year	0.01*** (0.00)	0.01*** (0.00)	0.00 (0.01)	0.01*** (0.00)
Female age	-0.04*** (0.01)	-0.02*** (0.00)	-0.04*** (0.01)	-0.02*** (0.00)
Observations	2340 (449)	11,331 (2,131)	979 (194)	7,054 (1,318)

Note: Standard error in parenthesis, the number of censored observations in parentheses

Finally, we have used register data to study how often couples that emigrate without children have children abroad. We find that 38 percent of couples without children at the time of emigration have one or more children the year after returning. Among these couples, the oldest child is in 73 percent of all cases 0 to 2 years old the year after returning. This suggests that it is quite common to return to Denmark to give birth. Part of the explanation could be that health care is free in Denmark, while having a child can be very expensive in some other countries. Also, couples may want to benefit from support from grandparents or other relatives at the time of having their first child.

## 6 Conclusion

We found that both couples with children and couples without children are most likely to emigrate if both partners have university education, but also most likely to return later. The likelihood of emigration is increasing in the primary earner's earnings, while the effect of the secondary earner's income can be either positive or negative. At the same time, we found that male education plays a bigger role than female education in emigration decisions, independently of which partner earned more in Denmark. Taken together, our findings suggest a mixture of couples emphasizing the primary earner's

income, independently of the primary earner's gender, and still remaining traditional male breadwinner model, at least for a significant subsample among couples.

## Appendix

TABLE A.1: EMIGRATION RATES OF MARRIED COUPLES (IN PERCENT) ACCORDING TO MALE AND FEMALE EDUCATION

		Male education	
		Low	High
Female education	Low	0.10	0.45
	High	0.20	0.60

TABLE A.2a: EMIGRATION RATES WHEN FEMALE EARNED MORE

		Male	
		Low	High
Female education	Low	0.09	0.32
	High	0.18	0.46

TABLE A.2b: EMIGRATION RATES WHEN MALE EARNED MORE

		Male	
		Low	High
Female education	Low	0.10	0.46
	High	0.21	0.61

TABLE A.3: EMIGRATION RATES FOR 5+ YEARS OF COUPLES (IN PERCENT) ACCORDING TO MALE AND FEMALE EDUCATION

		Male education	
		Low	High
Female education	Low	0.02	0.09
	High	0.04	0.09

Note: Only couples in which neither partner returned to Denmark within 5 years are counted as long-term emigrants.

TABLE A.4a: EMIGRATION 5+ WHEN FEMALE EARNED MORE

		Male	
		Low	High
Female education	Low	0.02	0.06
	High	0.03	0.06

Note: Only couples in which neither partner returned to Denmark within 5 years are counted as long-term emigrants.

TABLE A.4b: EMIGRATION 5+ WHEN MALE EARNED MORE

		Male	
		Low	High
Female education	Low	0.02	0.09
	High	0.04	0.09

Note: Only couples in which neither partner returned to Denmark within 5 years are counted as long-term emigrants.

Table A.5: Probit regression for emigration of singles

	Female	Male	Female, no return within 5 years	Male, no return within 5 years
Intercept	-2.72*** (0.03)	-2.60*** (0.02)	-2.77*** (0.05)	-2.55*** (0.03)
Colleged educated	0.26*** (0.01)	0.34*** (0.01)	0.16*** (0.01)	0.28*** (0.01)
Log earnings	0.02** (0.01)	0.25*** (0.01)	0.13*** (0.02)	0.33*** (0.01)
Observations	1,447,708	2,906,620	1,447,708	2,906,620

Note: Dummies for age of female and year are included in all models. \*\*\*, \*\*, and \* is statistical significant at 1, 5 and 10 pct. level. Standard error in parentheses. OLF is out of labor force.

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