IZA DP No. 8352

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International Migration of Couples

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Discussion Paper No. 8352
July 2014

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IZA Discussion Paper No. 8352
July 2014

ABSTRACT

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We present a theory on migration of dual-earner couples and test it in the context of international migration. Our model predicts that the probability that a couple emigrates increases in the home-country earnings of the primary earner. The effect of the home-country earnings of the secondary earner may go either way. We test our theory using population-wide Danish administrative data from 1982 to 2010. We analyze migration decisions separately for couples in which men earned more and couples in which women earned more. The empirical results for dual-earner couples are in line with the theory. The elasticity of the probability of emigration with respect to the primary earner's income is very large. When analyzing emigration for 5 or more years the elasticity of the probability of emigration varies between 1.6 and 3.6 for groups with female primary earner and between 2.4 and 3.1 for groups with male primary earner. The elasticity with respect to the secondary earner's income varies in sign and is generally small. Primary earners in couples are more strongly self-selected with respect to their income than singles. This is a novel result that runs against the intuition that family ties weaken self-selection. Secondary earners in couples, on the other hand, are more weakly self-selected with respect to their income than singles. College 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.

JEL Classification: F22, J12, J16, J24

Keywords: international migration, family migration, education, gender differences, dual-earner couples

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* We thank Francine Blau, Tomer Blumkin, Leif Danziger, Michael Devereux, Christian Dustmann, Lawrence Kahn, Ilpo Kauppinen, Kai Konrad, Romuald Méango, Till Nikolka, Analia Schlosser, as well as participants at the 4th and 5th Norface Migration Conferences, Journées LAGV, and EEA/ESEM in 2013, IZA Annual Migration Meeting in 2014 and in seminars at VATT, the University of Turku, Tel Aviv University, Ben-Gurion University, CReAM (UCL) and Saïd Business School (Oxford University) for useful comments. Domagoj Babić, Raghav Gandotra, Amrita Kulka, Emilie Josephine Lindblad, and Laura Pöntinen provided excellent research assistance. Financial support from the NORFACE research program on Migration in Europe - Social, Economic, Cultural and Policy Dynamics (project TEMPO), from Leibniz Association (SAW-2012-ifo-3), from the Danish Council for Independent Research | Social Sciences (FSE), and from the European Social Fund and Growth Forum, Capital Region is gratefully acknowledged.

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 (1978a, 1978b) 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) concluded 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.

In this paper, we study international migration of couples. We present first a theoretical model of migration decisions by dual-earner couples, and then analyze how the probability that the couple migrates depends on the home-country earnings of the higher-earning partner and of the lower-earning partner. Our theoretical model predicts that the likelihood that the couple migrates is increasing in the primary earner's home-country income, while the effect of the secondary earner's home-country income on the likelihood of migration may go either way. While Mincer (1978) has already presented the general idea that a couple migrates if the sum of gains of the partners exceeds the sum of migration costs, ours is the first model that analyzes how the probability that a couple migrates depends on the earnings of the primary earner and of the secondary earner when the job opportunities in the destination have an individual-specific random component. This theoretical model can be used to analyze both internal and international migration.

For simplicity, our model abstracts from differences in average returns to skill between the origin and the destination. It is well known since the pioneering analysis by Borjas (1987) that such differences play an important role in the self-selection of emigrants. The Roy-Borjas model predicts that emigrants from a country with relatively high returns to skill tend to be from the lower part of the skill distribution, and emigrants from a country with relatively low returns to skill tend to be from the upper part of the skill distribution. Modeling differences in returns to skill would require studying different subcases depending on the relative skill prices, without adding much insight to the analysis of couple dynamics, as positive or negative selection would tend to affect both singles and partners in couples. Our theoretical model without differences in returns to skill predicts that the probability that a single person emigrates is increasing in his or her

income. Interestingly, Grogger and Hanson (2011) find that international labor movements tend to be characterized by two stylized facts. First of all, the more educated persons are more likely to emigrate around the world (positive self-selection). Second, more educated migrants are more likely to settle in destination countries with high returns to skill (positive sorting). This suggests that leaving out differences in returns to skill is not a major problem in our main empirical analysis as our focus is on the self-selection of emigrants, not on their sorting. Nonetheless, we return to the question on the effects of differences in returns to skill in the last part of our empirical analysis below, by separately analyzing migration to different destinations.

We test our model using register data from Denmark, which is one of the richest and most gender-equal countries in the world (Klugman 2011). Analyzing Denmark gives us two unique advantages. The first one is exceptionally high-quality register data. Our analysis uses data on full Danish population from 1982 to 2010, including age, gender, household identifier that allows identifying cohabiting couples, education, income and migration events of all Danes who were registered to live in Denmark. Even after imposing age restrictions in line with Costa and Kahn (2000), we have in total more than 7.4 million couple-year observations. The second advantage is that we can separately analyze couples in which male is the primary earner and couples in which female is the primary earner. After restricting the attention to dual-earner couples in which both partners worked most of the year, we have more than 600,000 couple-year observations in which the female is the primary earner, and more than 3.3 million couple-year observations in which the male is the primary earner. A separate analysis of couples with female primary earner is necessary to separate any gender differences arising from traditional male breadwinner model from a competing hypothesis that migration decisions are driven by the primary earner, whether male or female. 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 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 the partners' education? Third, how do the earnings of the primary earner and those of the secondary earner affect the likeli-

hood that a couple emigrates? Related to this, we analyze how the elasticity of the probability of emigration with respect to earnings (from now on: elasticity of migration) differs between singles, and primary and secondary earners in couples. Knowing the elasticity of migration with respect to earnings allows evaluating how important a role family ties play in the self-selection of migrants.

Migration research has a long tradition in economics. Adam Smith already discussed in *An Inquiry into the Nature and Causes of the Wealth of Nations* the persistence of wage differences between different locations in the United Kingdom, concluding that "a man is of all sorts of luggage the most difficult to be transported." Sjaastad (1962) made a connection between migration and investment in human capital, arguing that the prospective migrant should choose the destination that maximizes the net present value of lifetime earnings, net of the migration costs. Mincer (1978) and Frank (1978a, 1978b) extended the same logic to couple migration. However, they did not analyze how the probability of migration depends on the incomes of the primary and secondary earner. Subsequently, Mont (1989) showed that a couple may choose a location which is not optimal to either partner. 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 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. While Guler et al. (2012) analyze search in continuous time but assume that the partners are ex ante identical, we analyze a one-time decision on whether to migrate, but present a model that allows the partners to differ ex ante.

A general finding in the literature analyzing internal migration is that couples' migration decisions are more responsive to male job opportunities.[1] Most of the previous analyses of international migration have 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 to the United States with their partner is not as strong in terms of individual characteristics as the self-selection of single migrants.

[1] See Duncan and Perrucci (1976), Sandell (1977), Bielby and Bielby (1992), Blackburn (2010), Tenn (2010), and Gemici (2011) for the United States, Rabe (2011) for the United Kingdom, Shihadeh (1991) for Canada, Nivalainen (2004) for Finland, and Eliasson et al. (2014) for Sweden.

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. 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 internal migration.

Most related to our work, Borjas and Bronars (1991) examine the role of family ties in determining the skill composition of immigrants both theoretically and empirically. The analyses are complementary. Empirically, the main difference is that Borjas and Bronars (1991) study immigrants in one destination country, while we study the self-selection of emigrants in one country of origin. Borjas and Bronars (1991) also analyze chain migration (the order in which family members immigrate to the United States), while we focus on decisions on joint migration. The main difference in theory is that Borjas and Bronars assume that the income prospects of persons in the country of origin are perfectly correlated across home and potential destination countries, and allow returns to skill to differ systematically across countries. This makes migration decisions of singles deterministic with any given income in the home country, migration cost and returns to skill in the home country and in the destination country. With positive (negative) selection and uniform migration costs, all singles above (below) a certain income level emigrate. When correlation between the earnings of the partners in couples is imperfect, there are couples in which one partner would prefer to emigrate and another would prefer to stay. A key component of our model is that both primary and secondary earners face a stochastic realization of earnings opportunities abroad. While migration decisions in Borjas and Bronars (1991) are motivated only by different returns to skill between the home country and the destination and the level of migration costs, our theoretical model assumes that the returns to skill are the same in the origin and the destination. Instead, migration is motivated by individual-specific job opportunities abroad. Whether each of the partners would emigrate as a single depends on his or her income at home, and an individual-specific random variable related to job opportunities abroad, relative to job opportunities at home. The individual-specific random variables related to job opportunities abroad are independently distributed for the two partners. This means that the identity of the eventual tied mover or tied stayer is not deterministic in

terms of income at home as in Borjas and Bronars (1991). Yet, income at home affects the likelihood of the individual wanting to emigrate.[2]

Our first empirical 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. Part of these differences could reflect self-selection into couples. As our focus is on understanding couple migration decisions, and not on explaining who are in couples, we do not account for the endogeneity of couple formation in our analysis.

Although there is a large literature on family migration, we are the first to analyze couple migration separately for couples in which men earned more and couples in which women earned more. This allows us to test two competing hypotheses. One is a traditional pattern, namely that migration would respond more strongly to male education and earnings. An alternative hypothesis is that family migration from Denmark would respond more strongly to the better-educated or higher-earning spouse's job opportunities. Previous literature on internal migration has found support for the male breadwinner model. On the other hand, Danish women have been better educated than men since 1990s, and the female labor force participation rate was above 70% already in the 1980s. To distinguish the effect of earnings from the effect of education, we separately analyze 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, independent of the power type and of which partner earned more before migration. Our competing hypothesis of migration 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 that a dual-earner couple emigrates is increasing in the earnings of the higher-earning partner, whether the primary earner is

[2] We abstract from differences in returns to skill to focus on the effect of imperfect correlation in job opportunities that the partners in a couple may face. An empirical justification for this simplification is that our theoretical model also performs well in explaining couple migration from Denmark to other Nordic countries which have relatively similar returns to skill; see section 6.

male or female, in line with the theoretical model. The effect of the earnings of the secondary earner varies.

After deriving the effects of the primary and secondary earner's incomes in a probit model separately for low power couples, female power couples, male power couples and power couples, we estimate the elasticity of migration with respect to the female's income and male's income, separately for couples in which the female earned more and couples in which the male earned more. We find very high elasticities with respect to the primary earner's income. For couples with a female primary earner, the elasticity of migration for five or more years with respect to the female's income varies between 1.6 and 3.6. For couples with a male primary earner, the elasticity of migration for five or more years with respect to the male's income varies between 2.4 and 3.1. These elasticities are considerably larger than those for singles. The elasticity of migration with respect to income is 1.1 for college-educated single men and 1.0 for single men without college education. The elasticity is 0.9 for college-educated single women and 0.2 for single women without college education. An interesting point of comparison for these elasticities is provided by Kleven et al. (2014). They estimate the elasticity of immigration to Denmark with respect to one minus the average tax rate, focusing on immigrants whose earnings exceeded an eligibility threshold of about 100,000 euros, corresponding to about 99th percentile of individual earnings in Denmark. Their estimated range of the elasticity of migration is 1.5 to 2. Therefore, we find that the elasticity of migration among Danish singles with respect to their income is clearly smaller than the elasticity of migration among top income earners who immigrate to Denmark, while the elasticity of migration of Danish couples with respect to the primary earner's income is about the same or larger than the elasticity of migration among top income earners.

Our findings therefore suggest that the self-selection of primary earners in emigrating couples from Denmark is, if anything, stronger than the self-selection of emigrating singles from Denmark. This contrasts with the finding by Borjas and Bronars (1991) who find that self-selection of migrants who move to the United States with their partners is not as strong in terms of individual characteristics as the self-selection of single migrants. On the other hand, we also find that the elasticity of migration with respect to the secondary earner's income is usually close to zero and varies in sign, suggesting only weak self-selection with respect to the secondary earner's income, which is in line with what Borjas and Bronars (1991) find for the United States. Strikingly emigrating male secondary earners without college education are negatively self-selected with respect to their income. Therefore, family ties appear to have a drastically different effect for primary and secondary earners, strengthening self-selection with respect to the pri-

mary earner's income and weakening self-selection with respect to the secondary earner's income.

We also find that family migration from Denmark is more responsive to the male's education than to the 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, with power defined based on education as in Costa and Kahn (2000). Power couples are most likely to emigrate, but also most likely to return. Couples in which only the male is college educated are more than twice as likely to emigrate as if only the female is college educated. Couples in which neither partner is college 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 college-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.

Finally, we analyze migration to different destinations. We find support to both our theoretical model and to the Roy-Borjas model. In line with our theoretical model, the elasticity of migration with respect to the primary earner's income is always positive, while the elasticity of migration with respect to the secondary earner's income varies in sign and is always smaller than the elasticity with respect to the primary earner's income. This suggests that emigration is driven by the primary earner's job opportunities both when it comes to migration to other Nordic countries with relatively similar returns to skill as in Denmark (although the positive elasticity with respect to the female primary earner's income is not statistically significant) and when it comes to migration to English-speaking countries and the rest of the world. At the same time, the elasticity of migration to English-speaking countries and the rest of the world with respect to both the primary earner's and the secondary earner's incomes is always larger than that of migration to other Nordic countries, in line with positive sorting of migrants to less egalitarian destinations.

The rest of the article is organized as follows. Section 2 develops a theoretical model on the migration of single persons and dual-earner couples, with focus on couples. Section 3 presents data and summary statistics. Section 4 presents stylized facts about emigration rates of couples and their return migration. Section 5 presents the econometric analysis first for singles and then for couples. Section 6 extends the analysis to migration to different destinations, to account for a potential role by different returns to skill in different destinations. Section 7 concludes.

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, $x_i \in [\underline{x}, \overline{x}]$, where $\underline{x} < 0 < \overline{x}$:

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

Individual i faces migration cost c_i, which captures also any psychological costs and benefits related to living abroad.[3] 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[4]

$$p_i = \begin{cases} 0, & if \quad c_i \geq \overline{x} w_i \\ \overline{x} - \frac{c_i}{w_i}, & if \quad c_i < \overline{x} w_i. \end{cases} \tag{1}$$

If $c_i \leq \overline{x} w_i$, $\frac{\partial p_i}{\partial c_i} < 0$ 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. For example, 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, and of any flow costs or benefits of living abroad. Furthermore, the model could be extended to allow for uncertainty related to returns abroad, by interpreting x_i referring to the expected value of the individual-specific random variable abroad.

[3] For simplicity, we assume that $c_i \geq 0$. The model could be analyzed also without this restriction.

[4] 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.

Our assumption that the difference between earnings abroad and earnings at home is the product of earnings in the home country and a random variable is stronger than is needed to derive the results, but it simplifies the analysis considerably. All that is needed to generate a higher probability of emigration for high-income earners is that the magnitude of potential gains and losses is positively correlated with wage in the home country.

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 and identically.[5] 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 income (Becker 1974; Mincer 1978; Borjas and Bronars 1991), 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

$$x_a w_a + x_b w_b - c_a - c_b > 0. \quad (2)$$

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

$$\hat{x}_b(c_a, c_b, w_a, w_b, x_a) = max\left(\frac{c_a + c_b}{w_b} - \frac{x_a w_a}{w_b}, \underline{x}\right). \quad (3)$$

We say that wage differences between the partners are **relatively small** when $\hat{x}_b(c_a, c_b, w_a, w_b, \overline{x}) > \underline{x}$, implying that the couple would not emigrate if the lower-

[5] 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 $w_a + w_b$.

income earner faces the worst possible realization abroad even in case the higher-income earner would face the best possible realization. By $\underline{x} = \overline{x} - 1$, this implies that

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

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

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

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

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

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

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

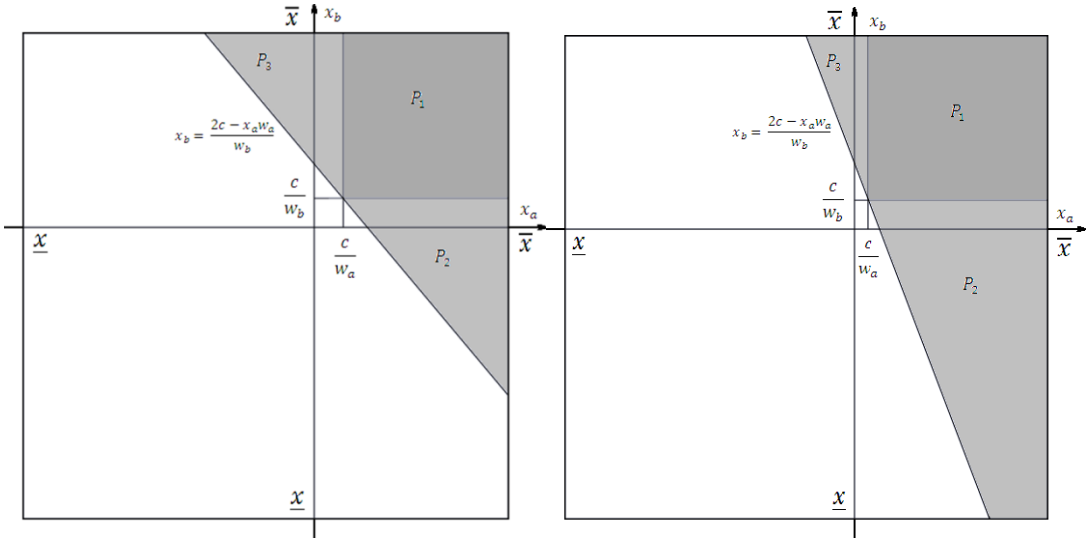
The probability that the couple emigrates is in this case

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

Figure 1 illustrates how migration probabilities are derived when $c_a = c_b = c$. In Panel A, $w_a = w_b$ (small wage differences) and in Panel B, $w_a = 2w_b$ (large wage differences). In both panels, the parameter combinations with which a couple emigrates is shaded with two different shades of grey. The probability that a couple emigrates is found by integrating over all possible combinations of x_a and x_b with which the couple emigrates, using formula (5) for the case of small wage differences (Panel A) and formula (6) for the case of large wage differences (Panel B). The dark grey area denotes the parameter combinations with which both partners would emigrate also as singles. Light grey areas denote parameter combinations with which only one partner would emigrate as single, but his or her gains are sufficiently large to compensate the losses to the other partner who is then a tied mover.

FIGURE 1: Migration probabilities for singles and couples

PANEL A: Small wage differences PANEL B: Large wage differences



The figure illustrates how migration probabilities are derived for singles and couples. In both panels, the horizontal axis measures all possible realizations of x_a and the vertical axis all possible realizations of x_b. If being single, agent a (b) would emigrate with all realizations of x_a (x_b) to the right of point $\frac{c}{w_a}$ (above point $\frac{c}{w_b}$). If a and b are a couple and $c_a = c_b = c$, inequality (2) tells us that the couple emigrates if $x_b > \frac{2c - x_a w_a}{w_b}$. Given the assumption that x_a and x_b are distributed uniformly and independently on a unit interval, the grey area gives the probability that the couple emigrates. In Panel A, $w_a = w_b$ and the probability that the couple emigrates even if only a would emigrate as single (area of the triangle marked by P_2) is the same as the probability that the couple emigrates even if only b would emigrate as single (area of the triangle marked by P_3). The probability that both partners would like to emigrate (area of the square marked by P_1) is the product of the probabilities that a and b would migrate as singles. In Panel B, other parameter values are as in A but $w_a = 2w_b$ (large wage differences). The rectangle marked by P_1 is larger than in Panel A, as the probability that b would emigrate as single does not change, but the probability that a would emigrate as single increases. The area marked by P_2 has now a trapezoid shape, given that with large wage differences, a couple could emigrate with sufficiently high realizations of x_a also if b faces the worst possible realization $\underline{x}$. The bottom line of the trapezoid is where $\hat{x}_b = \underline{x}$ by (3). The triangle marked by P_3 is clearly smaller than in Panel A. The lower the earnings potential of the secondary earner, the less likely it is that the (pre-migration) primary earner would become a tied mover.

It is illustrative to compare the predictions arising from our model with the predictions arising from Borjas and Bronars (1991). We assume stochastic job opportunities abroad but no differences in skill prices. Borjas and Bronars (1991) assume that earnings abroad are perfectly correlated with earnings at home, but skill prices may differ. If the two partners have the same income in the home country ($w_a = w_b$), the two partners gain or lose equally from migration, so that the model by Borjas and Bronars predicts that there can be no tied movers or tied stayers. In our model, either partner can be tied

mover or tied stayer, with equal probabilities if $w_a = w_b$ (if there could be no tied movers, triangles marked by P_2 and P_3 should vanish). If the incomes differ, Borjas and Bronars (1991) predict that the identity of tied movers or tied stayers depends deterministically on the relative earnings of the partners. If there is positive selection (skill prices are higher in the destination), tied movers are always secondary earners, and tied stayers are always primary earners. In our model, either partner may be a tied mover or tied stayer. However, the probability of being a tied mover is larger for the secondary earner (the trapezoid marked by P_2 is larger than the triangle marked by P_3 in Panel B; note that also in Panel A, increasing w_a relative to w_b would tilt the line so that the triangle marked by P_2 would become larger than the triangle marked by P_3). Finally, Figure 1 can also be used to illustrate that either partner may be a tied stayer in our model. The probability of the secondary earner being a tied stayer can be found by drawing a horizontal line crossing the vertical axis at point $\frac{c}{w_b}$, and is given by the white area above this. The probability of the primary earner being a tied stayer can be found by drawing a vertical line crossing the horizontal axis at point $\frac{c}{w_a}$, and is given by the white area to the right of this line.

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

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

The definition (4) of wage differences being relatively small can be rewritten as

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

Insert next notation $w_a = \alpha w_b$ *into (7). This yields*

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

Further manipulation gives

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

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

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

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

(10) $$\frac{1}{2\alpha}\left(A(A+1)-\overline{x}(\alpha-1)\right)<0.$$

Observe that $A<\frac{2c}{w_b}-2\overline{x}<0$ *as* $\alpha>1$ *and* $A+1=\frac{1}{w_b}[2c-w_b(\overline{x}(1+\alpha)-1)]>0$ *by inequality (8). Therefore (10) 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. $\frac{\partial p_{ab}^{small}}{\partial w_a}=\overline{x}^2\left(\frac{1}{2w_b}-\frac{w_b}{2w_a^2}\right)+\frac{c_a+c_b}{w_a^2}\bar{x}-\frac{(c_a+c_b)^2}{2w_a^2w_b}=\frac{\overline{x}^2}{2w_b}-\frac{(w_b\bar{x}-c_a-c_b)^2}{2w_a^2w_b}$ $>\frac{\overline{x}^2}{2w_b}-\frac{(w_b\bar{x})^2}{2w_a^2w_b}=\frac{\overline{x}^2}{2w_b}\left(1-\frac{w_b^2}{w_a^2}\right)>0$ and $\frac{\partial p_{ab}^{large}}{\partial w_a}=\frac{c_a+c_b}{w_a^2}+\frac{w_b}{2w_a^2}(1-2\overline{x})>0.$ As for the migration costs, we have

$\frac{\partial p_{ab}^{small}}{\partial c_a}=\frac{\partial p_{ab}^{small}}{\partial c_b}=-\frac{1}{w_b}\bar{x}-\frac{1}{w_a}\bar{x}+\frac{c_a+c_b}{w_aw_b}=\frac{1}{w_a}\left(\frac{c_b}{w_b}-\overline{x}\right)+\frac{1}{w_b}\left(\frac{c_a}{w_a}-\overline{x}\right)<0$ 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,* $\frac{\partial p_{ab}^{large}}{\partial w_b}=\frac{2\overline{x}-1}{2w_a}<0$. *With small wage differences,* $\frac{\partial p_{ab}^{small}}{\partial w_b}=\overline{x}^2\left(-\frac{w_a}{2w_b^2}+\frac{1}{2w_a}\right)+\frac{c_a+c_b}{w_b^2}\bar{x}-\frac{(c_a+c_b)^2}{2w_aw_b^2}$. *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. Propositions 2 and 3 already list predictions concerning the effects of the earnings of the primary and of the secondary earner. Additional predictions arise if migration costs are decreasing in the level of education.[6] First, 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, the couple is more likely to emigrate if the 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.[7] 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 corresponding probability of non-college educated couples, and smaller than the corresponding probability of college-educated power couples. Such effects of education should also be present when controlling for age and earnings.

It should be noted that our model could be applied with risk neutrality 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_{offer} for the partner who receives a job offer abroad would be known, while the random term $x_{no\ offer}$ 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,

[6] Using data from Docquier and Marfouk (2006), Grogger and Hanson (2011) show that emigrants are generally better educated than non-migrants. Docquier, Lowell and Marfouk (2009) show that high-skilled emigration rates to OECD destinations exceed emigration rates to OECD destinations of those with less education for all continents, and even for all regional groups using United Nations classification (these groups include North America, Eastern Europe, Northern Europe, Southern Europe and Western Europe). Lower migration costs of the college educated could arise from better language skills and cross-cultural skills. Mobility of the highly-skilled is likely to depend on their type of education; see Poutvaara (2008). We abstract from modeling differences in the degree to which different types of education are internationally applicable here, to keep the analysis tractable.

[7] In a complementary model written after ours, Foged (2014) conditions on total family income and shows that the probability that the couple emigrates has a U-shape in husband's share of total earnings.

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. The age of the partners and the presence and age of children are measured on January 1. Education is measured on October 1 and occupation during the last week of November. When explaining emigration decisions, we use values for education, occupation and earnings from the previous year, and age and the presence of children on January 1 of the year of analysis.

In this paper, we define a couple as a male and female who have lived in the same address for at least one year.[8] 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.[9]

Figure 2 shows average annual emigration rates from 2001 to 2005 of single men and women, and of couples in which both partners migrate to the same county. Couples are listed according to the female's age. Age is always measured as of 1 January. Also the analysis of singles is restricted to those who had at least one parent who was born in

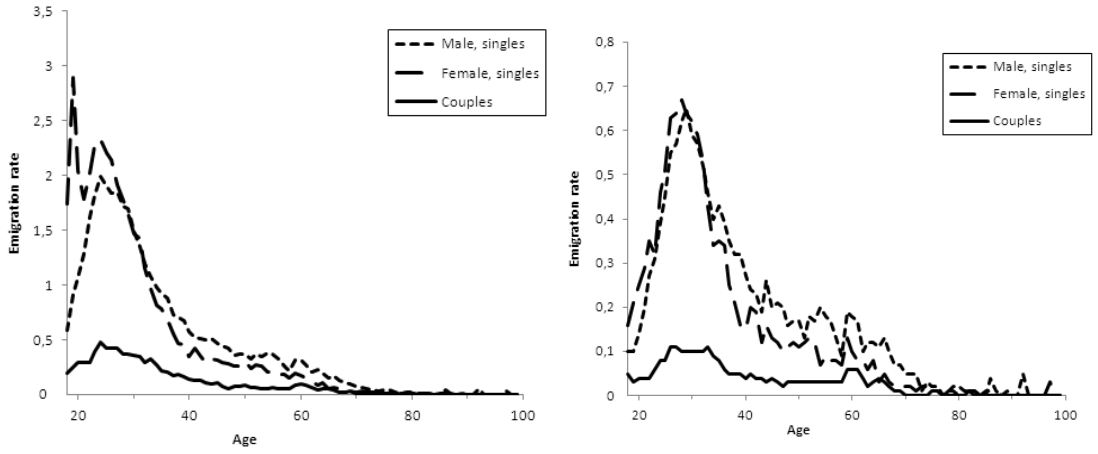
[8] The Statistics Denmark definition also requires that if the male and female do not have children together, their age difference is less than 15 years. We restrict attention to opposite-gender couples first of all as the number of same-gender couples is clearly smaller, and second because especially 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.

[9] 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.

Denmark. Panel A includes all emigration events, while Panel B is restricted to emigration events lasting at least 5 years, which is defined for couples so that neither partner returns to Denmark within five years.

FIGURE 2: FAMILY STATUS AND EMIGRATION PROBABILITIES

PANEL A: ALL STAYS PANEL B: STAYS LASTING AT LEAST 5 YEARS



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.

Figure 2 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 2 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. The big picture that emerges is that singles are considerably more mobile than couples, whether one analyzes all emigration spells or only long spells. Mincer (1978) has already established that family ties deter within-country migration, and Figure 2 shows that the same holds for international migration.[10]

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 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

[10] The difference between singles and couples should not be interpreted as just a causal effect of family ties, given that people in couples may differ systematically from singles. However, the difference between singles and couples is so large that it is not plausible that it would only reflect self-selection into couples, especially as the difference holds independent of age.

increased since mid-1990s, following the introduction of 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	7,613,307

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 the labor force (unemployed). The female works and the male is unemployed (out of the 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 shows in Panel A the likelihood of

emigration of couples with different levels of education. As a comparison, 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%). This shows that couples are considerably less likely to migrate than either single men or women, independent of the level 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 college-educated women are more likely to stay at home to take care of their children, making the emigration decision more dependent on the male's labor market prospects. Panel A of 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 DEPENDING ON EDUCATION, EMPLOYMENT, AND CHILDREN

		Panel A: Emigration rates (in percent) according to partners' education	
		Male education	
		Low	High
Female education	Low	0.10	0.45
	High	0.21	0.60
		Panel B: Emigration rates according to partners' employment status, percent	
		Male	
		Working	Not working
Female	Working	0.20	0.32
	Not working	0.26	0.36
		Panel C: Number of children and emigration rates	
		Number of children	Emigration rates, percent
		0	0.33
		1	0.20
		2	0.17
		3+	0.16

Note: Employment status in Panel B is measured in the year before emigration.

Panel B of Table 2 shows 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 the female not working, again sug-

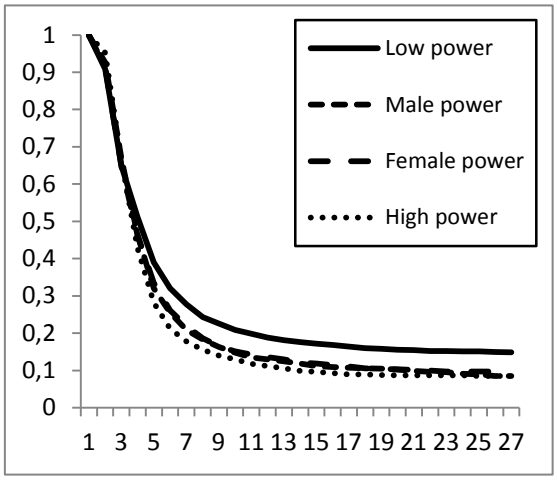
gesting that couples are more willing to sacrifice female's current employment to take advantage of a good job opportunity abroad for the currently unemployed male partner than the other way round. We also find that couples are most likely to emigrate when they have no children; see Panel C of Table 2. This is intuitive as the presence of children adds additional family ties that can be expected to deter migration.

Panels B and C in Table A.1 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.

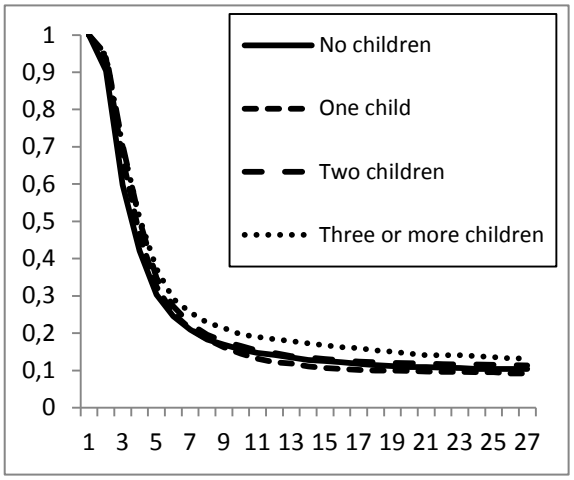
Most of the couples return to Denmark within a few years. Figure 3 presents survival rates of couples who have emigrated. Survival as emigrants is defined so that neither partner has returned to Denmark; there is no data on whether the partners stay together abroad if neither has returned. Panel A presents survival rates with different educational combination and Panel B according to whether the couple had children at the time of emigration. 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 return within 5 years. The number of children at the time of emigration, on the other hand, is quite unrelated to the return hazard; see Panel B.

FIGURE 3: SURVIVAL RATES OF STAYING ABROAD FOR EMIGRATING COUPLES

PANEL A: ACCORDING TO EDUCATION



PANEL B: ACCORDING TO 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. We analyze first emigration decisions of single men and women and then proceed to analyzing dual-earner couples as this is the subgroup of couples to which our theoretical model applies best. In the last subsection, we present an analysis of all couples fulfilling our age restrictions. All regressions in this section include age and year dummies using a separate dummy for each age in full years (not reported, but available upon request) to capture lifecycle patterns evident in Figure 2, time trends and the effect of business cycle on migration.

5.1. Singles

Table 3 presents probit regression for emigration decisions of single women and single men without children, when the analysis is restricted to women aged 23 to 37 and men aged 25 to 39, and the analysis of both men and women is restricted to those who worked at least 60 percent of the full working time in the previous year, corresponding to about seven months.

TABLE 3: PROBIT REGRESSION FOR EMIGRATION OF SINGLES

	Female	Male	Female, no return within 5 years	Male, no return within 5 years
Intercept	-2.72***	-2.60***	-2.77***	-2.55***
	(0.03)	(0.02)	(0.05)	(0.04)
College educated	0.26***	0.34***	0.16***	0.28***
	(0.01)	(0.01)	(0.01)	(0.01)
Log earnings	0.02**	0.25***	0.13***	0.33***
	(0.01)	(0.01)	(0.02)	(0.02)
Observations	1,447,708	2,906,620	1,207,946	2,420,264

Notes: Dummies for age and year are included in all models. The first two columns use data from years 1982 to 2010, and the last two columns from 1982 to 2005. 0.2 percent of men and 0.1 percent of women are excluded from the analysis due to negative reported earnings. Robust standard errors clustered at the individual level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results in Table 3 are in line with our theoretical model which predicted that the probability that a single emigrates is increasing in earnings, for both men and women. The results are also in line with our conjecture that migration costs are lower to the college-educated, making them more mobile than the less educated, even when controlling for age and earnings.

To illustrate how responsive emigration behavior of singles is to their earnings, we have calculated the elasticity of migration with respect to earnings for single women and men with and without college education, separately for all stays and for long stays. The formula for elasticity in each group, omitting group-specific subscripts, is $\frac{dp}{dw}\frac{w}{p}$. Here, w denotes earnings. Earnings is one component of vector **x** of explanatory variables. $p=\Phi(\bar{\boldsymbol{x}}\beta)$ is the probability of emigration as a function of log earnings and other explanatory variables, estimated using the probit regression in Table 3, evaluated at the average values of the analyzed group.[11]

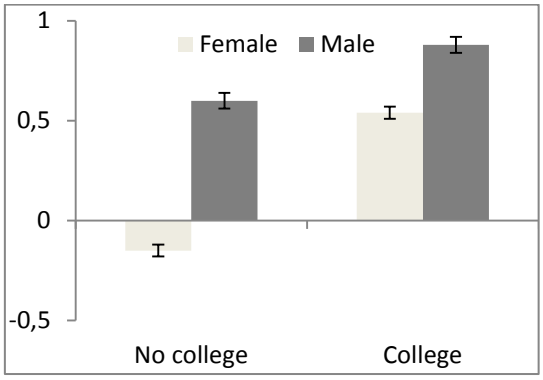
Panel A of Figure 4 shows that the probability of emigration of the college-educated singles and of single men without college education is strongly increasing in their income, in line with the theoretical model for singles. The only exception is formed by single women without college education: for them the probability of emigration is slightly decreasing in earnings. Panel B restricts the analysis to long-term emigration,

[11] Note that $dln(w) = \frac{dw}{w}$. Therefore, $\frac{dp}{dw}\frac{w}{p} = \frac{dp}{dln(w)}\frac{1}{p}$. This is the formula that we use below, given that the probit regression in Table 3 uses log income.

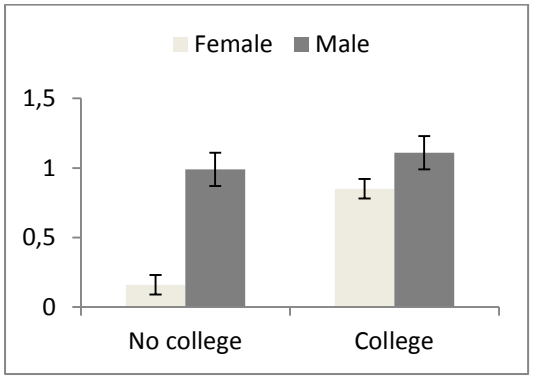
counting only events in which the emigrant does not return to Denmark within five years. Long-term emigration is more responsive to pre-emigration earnings than all emigration events. This implies that conditional on emigrating, the probability of returning within five years is decreasing in pre-migration earnings. Although the point estimate of the elasticity for women without college education is now positive, it is still small. Overall, the elasticity of the migration with respect to earnings varies for men in different groups between 0.60 and 1.11, and for women between -0.15 and 0.85.

FIGURE 4: ELASTICITY OF MIGRATION OF SINGLES WITH RESPECT TO INCOME

PANEL A: ALL STAYS



PANEL B: STAYS LASTING AT LEAST 5 YEARS



Note: Results are presented as elasticity ± standard error of mean, estimated at the average age and income within the group for which the elasticity is calculated. Women are aged 23 to 37 and men 25 to 39. Emigration years are 1982 to 2010 in Panel A and 1982 to 2005 in Panel B. The probability of emigration is estimated based on earnings in the previous year, including only those who worked at least 60 percent of the full working time.

One possible explanation for the gender difference in the relationship between earnings and the probability of emigration could be that women are more likely to work in the public sector, which has smaller income differences than the private sector in which most men work. We do not include any control for the sector of employment or for the field of study, as our main interest in the analysis of singles is how their income level is related to the probability of emigration and how this relationship differs between single men and single women, not in explaining differences in income levels. Our estimated elasticities should not be interpreted as causal claims on how much giving someone additional income would increase that person's probability of emigration. Rather, we establish patterns related to migration at the population level. Once analyzing couples, our main question is how the earnings of the primary earner and of the secondary earner are related to the probability that the couple emigrates, not in explaining why primary and secondary earner earn the amounts they do.

It is of interest to compare the elasticities we estimate with those in Kleven et al. (2014). They use Danish register data to estimate the impact of introducing a special flat-rate tax scheme on top-income earning immigrants on the immigration of top-income earners to Denmark. They estimate the elasticity of migration with respect to one minus the average tax rate on foreigners, finding very large elasticity between 1.5 and 2. According to Kleven et al., a one-percent increase in the fraction of income left after taxes increases the number of high-income immigrants to Denmark by 1.5 to 2 percent. According to our estimates, a one-percent increase in the income of a single man aged 25 to 39 increases the likelihood that he emigrates by about one percent, relative to the baseline probability of emigration. The elasticities we estimate are clearly smaller than the elasticities that Kleven et al. find. However, as Kleven et al. analyze immigrants who belong to the top one percent of income distribution in Denmark, it is not surprising that the elasticity of immigration with respect to the share of income they can keep after taxes is higher than the elasticity of emigration with respect to income we estimate to all singles working at least 60 percent of the full working time in the previous year.

Even though the elasticities we find for singles are smaller than the elasticities Kleven et al. find, they are still rather large. They are likely to be a joint effect of two mechanisms. One is the mechanism highlighted in our model, namely that high-income earners are more likely to emigrate even in the absence of differences in returns to skill when the potential gains depend on earnings in the home country. Another mechanism arises from cross-country differences in returns to skill, omitted from our theoretical model. As Denmark has relatively equal income distribution, the Roy-Borjas model predicts that emigrants from Denmark should be positively selected; see Borjas (1987). However, the effects of skill price differences affect both men and women so they are not likely to change the qualitative conclusions related to gender differences. We return to the implications of the Roy-Borjas model on our findings below in section 6.

5.2 Dual-earner couples

In the analysis of couples, the dependent variable obtains a value of one if the couple migrates together, and zero otherwise. Our main results are in table 4. 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 have positive earnings; it is not plausible that someone who worked more than half a year would have zero or negative earnings (0.2 percent of couples are lost due to either the male or female having 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. To allow testing both the effect of primary earner's income 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.

TABLE 4: 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***	-12.59***	-10.02***	-13.56***
	(0.61)	(0.23)	(1.16)	(0.44)
Power couples	0.48***	0.47***	0.24***	0.21***
	(0.03)	(0.01)	(0.06)	(0.02)
Female-power couples	0.18***	0.16***	0.06	0.06**
	(0.03)	(0.01)	(0.06)	(0.03)
Male-power couples	0.34***	0.38***	0.28***	0.22***
	(0.04)	(0.01)	(0.08)	(0.02)
[Low-power couples]				
Number of children 1	-0.21	-0.30***	-0.14	-0.49***
	(0.21)	(0.08)	(0.23)	(0.19)
2	-0.12	-0.23***	0.74	-0.46**
	(0.21)	(0.08)	(0.22)	(0.19)
3+	-0.03	-0.20**	0.33	-0.39**
	(0.21)	(0.08)	(0.21)	(0.19)
[0]				
Female log earnings	0.61***	0.03*	0.61***	0.06**
	(0.05)	(0.02)	(0.10)	(0.03)
Male log earnings	-0.06	0.69***	-0.11	0.74***
	(0.04)	(0.01)	(0.08)	(0.02)
Observations	621,233	3,353,488	494,341	2,876,877

Notes: Dummies for age of female, age of male, age of oldest child and year are included in all models. Robust standard errors clustered at the household level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results in Table 4 are in line with the predictions from our theoretical model: whether the male or the female earns more, the probability that the couple emigrates is increasing in the primary earner's income. Previous literature on family migration has not studied the effects of male and female earnings separately for couples according to whether the male or the female is the primary earner; see Duncan and Perrucci (1976), Mincer (1978), Shihadeh (1991), Nivalainen (2004), Blackburn (2010), Tenn (2010),

Rabe (2011), Gemici (2011), and Eliasson et al. (2014). When couples with male primary earners and couples with female primary earners are analyzed together, the estimated effect of male income is typically positive, while that of female income is usually insignificant, and may even be negative. The positive effect of the female primary earner's income on the probability of migration is lost if the relatively small number of such families is lumped together with families in which the male is the primary earner.[12]

We find that the probability that a family with a male primary earner emigrates increases in the female secondary earner's income, but that the probability that a family with a female primary earner emigrates does not increase in the male secondary earner's income. The point estimate on the male secondary earner's income is negative, but statistically insignificant. While it is somewhat surprising that the sign of the estimated effect of the secondary earner's income differs according to gender, it is worth noticing that the magnitude of the effects is small.

Even after controlling for income, we also find that college education increases the likelihood of emigration. This is in line with our conjecture that higher education makes migration easier, although it is also consistent with an alternative interpretation that the returns to migration are higher for the college-educated. Furthermore, male power couples are more mobile than female power couples independent of whether male or female is the primary earner. This suggests that family migration patterns are still not gender neutral. While family migration decisions respond strongly to the primary earner's income, independent of the primary earner's gender, male partner's college education plays a stronger role in encouraging emigration, independent of which partner earns more.

Our finding on the importance of the primary earner's income is robust to different specifications. Foged (2014) uses the same data as we do, but a somewhat different empirical specification and a shorter time period. Instead of looking at the primary and secondary earner's income, she looks at the husband's income share, and finds that the probability of family migration is U-shaped in the income share of the husband. This is consistent with what our propositions 2 and 3 predict. Note that going for a more

[12] In an earlier version of our paper, circulated as NORFACE Migration DP 18-2013, we made the mistake of not separately analyzing families in which the male was the primary earner and families in which the female was the primary earner. This resulted in us to conclude then that the probability of emigration is increasing in male earnings, but does not depend much on female earnings, which is in line with earlier literature on internal migration. We thank seminar participants at Tel Aviv University and Ben Gurion University for pointing out that to be consistent with our theoretical model we should analyze separately families in which the male is the primary earner and families in which the female is the primary earner.

asymmetric income distribution (moving towards the endpoints of U) is equivalent to increasing the income of the primary earner (Proposition 2) and reducing the income of the secondary earner by the same amount (Proposition 3). Propositions 2 and 3 together imply that this should increase the probability that the couple emigrates.

In Table 5, we study couples with children and couples without children separately. (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). Independent 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 increases strongly in the primary earner's income. The emigration decisions of couples with children and couples without children react to the primary earner's income quite similarly, independent of the primary earner's gender. The effect of the secondary earner's income is small and statistically insignificant, apart from couples with children and male primary earners. In that group, the probability of emigration also increases slightly in the secondary earner's income.

TABLE 5: 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***	-11.97***	-10.98***	-13.20***
	(1.01)	(0.47)	(0.80)	(0.27)
Power couples	0.39***	0.45***	0.54***	0.46***
	(0.04)	(0.02)	(0.04)	(0.01)
Female-power couples	0.10***	0.16***	0.24***	0.15***
	(0.05)	(0.03)	(0.04)	(0.02)
Male-power couples	0.29***	0.36***	0.39***	0.39***
	(0.06)	(0.02)	(0.06)	(0.01)
[Low-power couples]				
Female log earnings	0.61***	0.03	0.60***	0.04**
	(0.09)	(0.03)	(0.07)	(0.02)
Male log earnings	-0.09	0.64***	-0.03	0.70***
	(0.06)	(0.03)	(0.08)	(0.01)
Observations	183,735	709,035	437,498	2,644,453

Notes: Dummies for age of female, age of male, and year are included in all models. Age of oldest child included in models with children. Robust standard errors clustered at the household level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

In Table 6, we finally divide couples according to both power type and the primary earner's gender. This division is motivated by the concerns that there might be collinearity between education and earnings, or that the effects of earnings may interact with education. An analysis of eight groups consisting of the four power types with female

primary earner, and the four power types with male primary earner allows us to separate the effects of income, without any collinearity with education. It also allows separating potential gender differences from the effects of being primary or secondary earner. Given the large number of observations, there is enough variation in earnings to allow the analysis of subgroups. On the other hand, including education and income simultaneously in Table 4 allows us to estimate the direct effects of education, beyond the indirect effects that go through earnings.

Panel A of Table 6 shows that among couples with female primary earner, the probability of migration is strongly increasing in female's earnings for low-power couples, female power couples and power couples. The probability of migration is decreasing in male earnings among low-power and female-power couples, implying that male secondary earners without college education are negatively self-selected with respect to their income. 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, independent of power type; see Panel B. The effect of female earnings is positive among male-power and power couples.

TABLE 6: EMIGRATION ACCORDING TO POWER TYPE AND PRIMARY EARNER'S GENDER

		Panel A: Female earned more			
		Low-power	Female power	Male power	Power couples
Intercept		-9.08***	-10.82***	-9.48***	-11.45***
		(1.29)	(1.51)	(2.25)	(0.84)
Number of children	1	-0.35	0.20	0.66	0.14
		(0.30)	(0.33)	(0.39)	(0.36)
	2	-0.26	0.29	0.66	0.21
		(0.28)	(0.33)	(0.38)	(0.36)
	3+	-0.16	0.33	0	0.35
		(0.27)	(0.35)		(0.37)
	[0]				
Female log earnings		0.62***	0.73***	0.27	0.57***
		(0.10)	(0.11)	(0.18)	(0.08)
Male log earnings		-0.21***	-0.16*	0.20	0.10
		(0.06)	(0.11)	(0.17)	(0.08)
Observations		326,842	141,432	26,262	110,292

		Panel B: Male earned more			
		Low-power	Female power	Male power	Power couples
Intercept		-13.90***	-11.50***	-13.39***	-11.21***
		(0.44)	(0.71)	(0.52)	(0.36)
Number of children	1	-0.36	-0.09	-0.25	-0.50
		(0.11)	(0.23)	(0.17)	(0.31)
	2	-0.33	-0.07	-0.16	-0.40
		(0.11)	(0.23)	(0.17)	(0.31)
	3 +	-0.33	0.01	-0.15	-0.34
		(0.11)	(0.23)	(0.17)	(0.31)
	[0]				
Female log earnings		0.03	-0.06	0.07**	0.05*
		(0.03)	(0.05)	(0.03)	(0.02)
Male log earnings		0.80***	0.71***	0.74***	0.59***
		(0.02)	(0.03)	(0.03)	(0.02)
Observations		2,041,611	438,874	343,984	529,019

Notes: Dummies for age of female, age of male, age of oldest child and year are included in all models. Robust standard errors clustered at the household level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

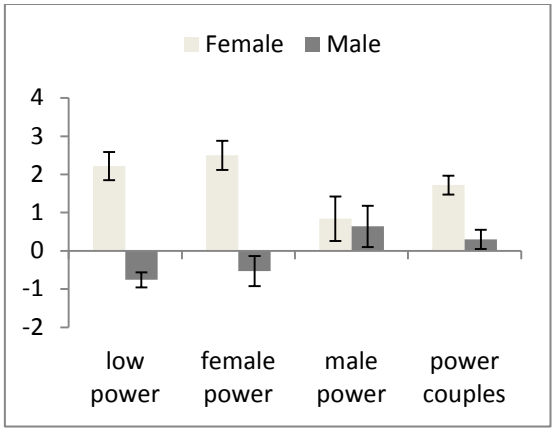
The prediction of Proposition 2 that the likelihood of migrating is increasing in the primary earner's income holds in all specifications, apart from male-power couples in which the female earned more. This group is only 1.3 percent of all couples in Table 6, meaning that the prediction of the Proposition 2 holds among the seven subgroups representing 98.7 percent of couples. Proposition 3 stated that the effect of the secondary earner's income may go either way. We find that this is the case empirically. In low-power couples and female-power couples with female primary earner, the probability of emigration is decreasing in the male income, while in male power couples and power couples with male primary earner the probability of emigration is increasing in the female income. Finding significant estimates for earnings in the separate regressions by power type and female/male primary earner is a strong argument against any collinearity concern.

To illustrate how responsive emigration is to the primary earner's and to the secondary earner's income, we have finally calculated the elasticity of the migration with respect to the primary earner's and to the secondary earner's income for the groups depicted in Table 6. The formula for elasticity in each group, omitting group-specific subscripts, is $\frac{dp_{ab}}{dw_i}\frac{w_i}{p_{ab}}$, where $i \in \{a, b\}$. Here, w_a denotes the earnings of the primary earner and w_b denotes the earnings of the secondary earner. Earnings w_a and w_b are components of vector **x** of explanatory variables, which also includes dummies for age of female, age

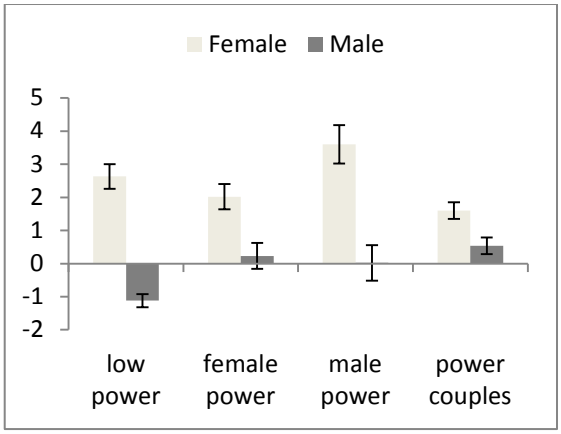
of male, age of oldest child and year. $p_{ab}=\Phi_{ab}(\bar{x}\beta)$ is the probability of emigration as a function of log earnings and other explanatory variables; see footnote 11 above for details. The elasticities are calculated at average values for each of the eight groups and are depicted in Figure 5.

FIGURE 5: ELASTICITY OF MIGRATION OF COUPLES WITH RESPECT TO INCOMES

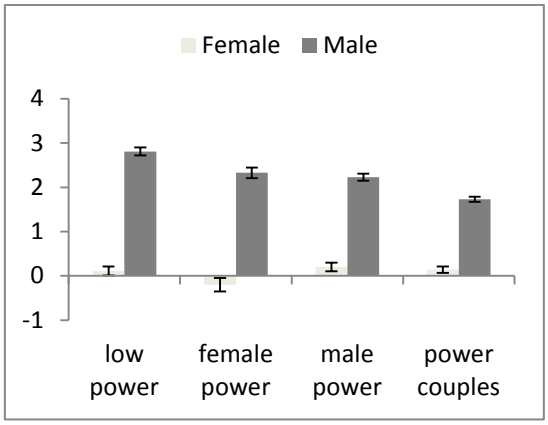
PANEL A: FEMALE EARNED MORE, ALL STAYS



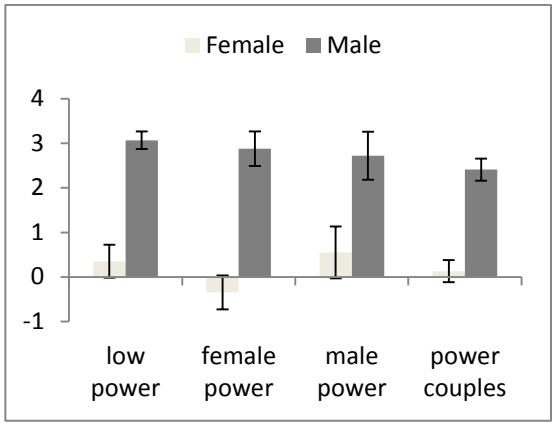
PANEL B: FEMALE EARNED MORE, 5+ YEARS



PANEL C: MALE EARNED MORE, ALL STAYS



PANEL D: MALE EARNED MORE, 5+ YEARS



Note: Results are presented as elasticity ± standard error of mean, estimated at the average age and income within the group for which the elasticity is calculated. Women are aged 23 to 37 and men 25 to 39. Emigration years are 1982 to 2010 in Panels A and C and 1982 to 2005 in Panels B and D. The probability of emigration is estimated based on earnings in the previous year, including only couples in which both partners worked at least 60 percent of the full working time.

When analyzing all emigration events (Panels A and C), the probability that a couple emigrates increases strongly in the primary earner's income, apart from the small group of male-power couples in which the female earned more. For other groups, the elasticity ranges between 1.72 and 2.50 for couples with the female primary earner, and 1.73 and

2.81 for couples with the male primary earner. The elasticities are even larger when the attention is restricting to long stays, ranking between 1.60 and 3.60 for groups with female primary earner and 2.41 and 3.07 for groups with male primary earner. These elasticities are considerably larger than those for singles; see Figure 4. They are also larger than the elasticity of migration with respect to one minus the average tax rate on foreigners with top incomes who immigrate to Denmark, as estimated by Kleven et al. (2014). Elasticity with respect to the secondary earner's income is usually very close to zero, apart from low-power couples with a female primary earner. In that group, the elasticity with respect to the secondary earner's income is -1.12 when the attention is restricted to long stays. This suggests that such couples are most likely to migrate when the male secondary earner has very low earnings, and female primary earner high earnings.

Why is the elasticity of couple migration with respect to the primary earner's income so large? Our conjecture is that this reflects colocation problem and the need for intra-family compensating transfers. Costa and Kahn (2000) showed that colocation problem is likely to play a major role in American power couples locating increasingly in large metropolitan areas, and the colocation problem is likely to be even more severe for international migration. In case one of the partners is tied mover, the gains for the partner with a strong preference to migrate have to be big enough to compensate the tied mover. Given that the probability of emigration increases strongly in the primary earner's income, it appears that the migration decisions are usually made in the interest of the primary earner, whether male or female. If migration decisions would be more responsive to male job opportunities, then we would expect the elasticity with respect to male income to always be positive, which is not the case.

5.3 All couples

Our analysis has so far focused on dual-earner couples. Although this group is best suited to test our theory, about half of all couples satisfying the age restriction in line with Costa and Kahn (2000) do not satisfy these criteria. Therefore, we next extend the analysis to also include these couples.

The first two columns of Table 7 explain the decision to emigrate by the male's and the female's education, the number of children, the age of the female, the age of the male, and the age of the oldest child. The main focus here is on estimating the effect of male and female education. 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 ze-

ro. This allows keeping also partners who stay at home without any income in the analysis. 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.

TABLE 7: PROBIT REGRESSION FOR FAMILY EMIGRATION

		Female earned more	Male earned more	Female earned more	Male earned more
Intercept		-3.29***	-3.13***	-3.04***	-6.17***
		(0.06)	(0.03)	(0.13)	(0.16)
Power couples		0.50***	0.57***	0.49***	0.54***
		(0.02)	(0.01)	(0.02)	(0.01)
Female-power couples		0.20***	0.21***	0.20***	0.20***
		(0.02)	(0.01)	(0.02)	(0.01)
Male-power couples		0.34***	0.48***	0.33***	0.44***
		(0.02)	(0.01)	(0.02)	(0.01)
[Low-power couples]					
Number of children	1	-0.34**	-0.41***	-0.35**	-0.39***
		(0.14)	(0.06)	(0.14)	(0.06)
	2	-0.29**	-0.36***	-0.30**	-0.34***
		(0.14)	(0.06)	(0.14)	(0.06)
	3+	-0.26*	-0.30***	-0.26*	-0.28***
		(0.14)	(0.06)	(0.14)	(0.06)
	[0]				
Female occupation	OLF			0.01	0.01***
				(0.05)	(0.01)
	Student			0.06	0.15***
				(0.05)	(0.02)
	Unemployed			-0.00	-0.04***
				(0.04)	(0.01)
	[Work]				
Male occupation	OLF			0.14***	0.29***
				(0.03)	(0.04)
	Student			0.15***	0.53***
				(0.02)	(0.04)
	Unemployed			-0.02	0.11***
				(0.02)	(0.03)
	[Work]				
Female log earnings				-0.02***	-0.01***
				(0.01)	(0.00)
Male log earnings				0.01***	0.24***
				(0.00)	(0.01)
Observations		1,606,271	5,832,230	1,606,271	5,832,230

Notes: Dummies for age of female, age of male, age of oldest child and year are included in all models. OLF is out of labor force. In case annual earnings are smaller than DKK 1, log of earnings is replaced by zero. Robust standard errors clustered at the household level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The effects of male and female education are in line with the results for dual-earner couples. Power couples and male-power couples are most likely to emigrate, and low-power couples least likely. Having children makes couples less mobile, and either partner being student or out of labor force more mobile. Interestingly, the effects of unemployment, relative to being employed, show up only for couples in which the male earned more. In such couples, the male being unemployed increases the likelihood of emigration, and the female being unemployed reduces it. The most surprising finding is that the likelihood of emigration is increasing in male income and decreasing in female income, whether male or female earns more, although only the effect of the male primary earner's income is large in absolute value. Therefore, the relatively gender-neutral emigration pattern of dual-earner couples is replaced by a more male-centered pattern when couples in which at least one of the partners (typically female) does not fulfill the requirement of working at least 60% of full working time are also included into the analysis. Given that the theoretical model analyzed only dual-earner couples, this finding should not be seen as refuting it. Rather, this finding highlights that although male education plays a bigger role in both dual-earner couples and in other couples, the migration decisions of other than dual-earner couples are more responsive to male earnings.

6 Couple Migration and the Roy-Borjas model

An important concern related to the generalizability of our results to other countries is that Denmark has a very equal income distribution. Given that Borjas (1987) has established that emigrants tend to be positively (negatively) selected from countries with more (less) equal income distribution than the destination country, we would therefore expect emigrants from Denmark to be positively selected also if there would be no uncertainty related to job opportunities abroad; see Borjas and Bronars (1991).

To test whether our results can be expected to hold independent of differences in returns to skill, we ran our probit regressions separately for different destinations. Other Nordic countries have relatively small wage differences just as Denmark, meaning that they provide the best test case for our theoretical model. English-speaking countries form an interesting group to study for two reasons. First, they all have wider wage differences than Denmark. Second, Danes generally speak English very well, meaning that it is unlikely that either partner would be unable to work because of language differences. This means that English-speaking countries would be an ideal subgroup to test a model that would allow differences in returns to skill between the home country and the destination country. Finally, the rest of the world has mostly much wider income differences than

Denmark and other Nordic countries, but it is also more likely that partners differ in their language skills, which may mean that the tied mover would have to stay at home.

The elasticity of migration to different destinations with respect to female and male earnings is presented in Table 8. Elasticities are derived using similar specifications as in Table 4, and then estimating elasticities as in Figure 5. Importantly, the qualitative effects of other explanatory variables are in all regressions underlying Table 8 as in Table 4. Whether analyzing all migration spells, or only migration spells lasting 5 years or more, power couples and male power couples are most likely to emigrate to all destinations, both when analyzing couples in which the male earns more and couples in which the female earns more.

TABLE 8: THE ELASTICITY OF MIGRATION WITH RESPECT TO EARNINGS FOR DUAL-EARNER COUPLES WHEN MIGRATING TO DIFFERENT DESTINATIONS

	Female earned more	Male earned more	Female earned more, 5+ years abroad	Male earned more, 5+ years abroad
Other Nordic countries				
Female earnings	0.630	-0.202*	0.482	0.110
	[0.409]	[0.121]	[0.609]	[0.259]
Male earnings	-0.589***	1.568***	-0.799***	1.698***
	[0.168]	[0.109]	[0.236]	[0.202]
English-speaking countries				
Female earnings	2.665***	0.214**	3.262***	0.475**
	[0.310]	[0.089]	[0.712]	[0.197]
Male earnings	0.012	2.590***	-0.304	2.985***
	[0.339]	[0.069]	[0.644]	[0.140]
Rest of the world				
Female earnings	2.167***	0.125*	2.919***	0.131
	[0.257]	[0.070]	[0.599]	[0.163]
Male earnings	-0.009	2.234***	0.130	2.968***
	[0.293]	[0.056]	[0.755]	[0.116]

Notes: In each column, each pair of cells reports the estimated elasticity of migration of a dual-earner couple with respect to female income and male income. Elasticities are estimated at the average age and income within the group for which the elasticity is calculated for the country group listed above the cells, and for the group of couples specified in the column. Coefficients that are underlying the elasticities are derived from regressions which include as additional explanatory variables power type, number of children, and dummies for age of female, age of male, age of oldest child and year, as in Table 4. Full regression tables are available upon request. In each probit regression, couples migrating to any other destination are excluded. Robust standard errors clustered at the household level are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Results in Table 8 are in line with both the Roy-Borjas model and our theoretical model. In line with the theoretical predictions in Borjas (1987), we find that the emigrants are more strongly positively selected in terms of the income for English-speaking countries and the rest of the world than for other Nordic countries. This holds for both the primary earner and the secondary earner, whether the primary earner is male or female. At the same time, we also find that couples with male primary earners and migrating to other Nordic countries are very strongly positively selected with respect to the male income. The Roy-Borjas model would predict no positive selection, given that returns to skill are about the same as in Denmark, and the theoretical model by Borjas and Bronars (1991) would predict no couple migration between Denmark and other Nordic countries, given the similarity of returns to skill. The elasticity of migration to other Nordic countries with respect to the female primary earner's income is much smaller and not statistically significant. This is the only subgroup for which we do not find strong support for our theoretical model. What makes the gender difference in the elasticity of migration to other Nordic countries with respect to the primary earner's income even more puzzling is that the elasticity is about the same for male and female primary earners when it comes to migrating to English-speaking countries and the rest of the world, including destinations with much bigger gender inequality than in Denmark. Interestingly, the elasticity of migration to other Nordic countries with respect to male primary earner's income is very close to the elasticity of migration with respect to one minus the average tax rate on foreigners that Kleven et al. (2014) estimate for the immigration of top-income earners to Denmark. This suggests that the colocation problem related to family ties plays a very important role in international migration also in the absence of skill price differences.

The effect of the secondary earner's income is sometimes positive and sometimes negative, in line with our theory. The elasticity of migration with respect to the secondary earner's income is always smaller than the elasticity with respect to the primary earner's income. There are interesting gender differences in the effects of the secondary earner's income. When it comes to migration to other Nordic countries, the elasticity with respect to male secondary earner's income is negative suggesting that dual-earner couples with female primary earner are much more likely to migrate to other Nordic countries if the male secondary earner has low income. With male primary earners, the effect of female income is negative but weak for short stays and about zero for long stays. As for English-speaking countries and rest of the world, the effect of the secondary female earner's income is always positive and rather large, while the estimated effect of the male secondary earner's income is rather weak.

To sum up: our qualitative result that the probability that a couple emigrates increases strongly in the primary earner's income holds both when estimating migration to countries with similar returns to skill, and destinations with wider income differences. From a quantitative perspective, Denmark having a relatively equal wage distribution may accentuate the estimated impact of the primary earner's income due to relatively higher returns to skill in other countries. An important topic for future research is to test our theory for migration from a country with wider income differences to a country with narrower income differences, as well as for migration from less gender-equal countries.

7 Conclusion

In this article, we first presented a theoretical model on the emigration of dual-earner couples, and then tested it using register data on the full Danish population. Our theoretical model predicted that the probability of emigration is increasing in the primary earner's income, while the effect of the secondary earner's income may go either way. Empirical results were broadly in line with this, whether analyzing couples with or without children, and whether the male or the female is the primary earner. If migration decisions would be more responsive to male job opportunities, as suggested by previous literature on internal migration, then we would expect the elasticity with respect to male income to always be positive, which is not the case.

We found that the elasticity of the probability that a couple emigrates with respect to the primary earner's income is surprisingly large. It is considerably larger than the elasticity of the probability of emigration with respect to the income for singles. This suggests that emigrating primary earners in couples are actually more strongly positively selected than emigrating singles. This is a novel result and runs against the intuition that family ties should weaken the self-selection, due to imperfect correlation in the earnings potential between the partners; see Borjas and Bronars (1991). Our intuition for this is that the colocation problem raises a bar for couples to emigrate. In case one of the partners does not find a good job abroad, the other partner must gain enough to compensate the tied mover. The likelihood of gaining enough to afford this is increasing in pre-migration income. The effects of the secondary earner's income are generally small.

To test whether our findings are driven by Denmark having relatively equal income distribution, we analyzed migration to other Nordic countries, English-speaking countries and the rest of the world separately. The probability of emigration is increasing in the primary earner's income for each destination group, although the positive effect of the pre-emigration income is stronger for English-speaking countries and the rest of the

world, in line with what the results in Borjas (1987) suggest. Therefore, both rewards to skill and couple dynamics play an important role in the self-selection of migrants. The effect of differences in returns to skill we find is in line with what Borjas (1987) and Grogger and Hanson (2011) suggest, while the difference in the estimated effect of the primary earner's and the secondary earner's income is in line with what our theoretical model suggests for all destinations.

We also found that both couples with children and couples without children are most likely to emigrate if both partners have college degrees, but are also most likely to return later. The male's education plays a bigger role than the female's education in emigration decisions independent of which partner earned more in Denmark. Furthermore, emigration rates for couples with male primary earner are considerably higher than emigration rates for couples with the female primary earner if the male has college education, while the differences among couples in which the male does not have a college education is minor. We also analyzed all couples, without restriction that both partners had to work. Also in this group, emigration increases more strongly in male education. The probability of emigration increases strongly in male income in couples with male primary earner, while the effects of both male and female income are very small in couples with female primary earner. Taken together, our findings suggest a mixture of dual-earner couples emphasizing the primary earner's income, independent 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 FOR DIFFERENT TYPES OF COUPLES

Panel A: Emigration rates of married couples

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

Panel B: Emigration rates of all couples when female earned more

		Male	
		Low	High
Female education	Low	0.09	0.32
	High	0.18	0.46

Panel C: Emigration rates of all couples when male earned more

		Male	
		Low	High
Female education	Low	0.10	0.46
	High	0.21	0.61

TABLE A.2: LONG-TERM EMIGRATION RATES OF COUPLES

		Panel A: Emigration rates for 5+ years (in percent) according to education	
		Male education	
		Low	High
Female education	Low	0.02	0.09
	High	0.04	0.09
		Panel B: Emigration rates for 5+ years when female earned more	
		Male	
		Low	High
Female education	Low	0.02	0.06
	High	0.03	0.06
		Panel C: Emigration rates for 5+ years 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.

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