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Working Paper

International Migration of Couples

CREAM Discussion Paper Series, No. 19/15

Provided in Cooperation with:

Rockwool Foundation Berlin (RF Berlin)

Suggested Citation: Junge, Martin; Munk, Martin; Poutvaara, Panu (2015) : International Migration of Couples, CREAM Discussion Paper Series, No. 19/15, Centre for Research & Analysis of Migration (CREAM), Department of Economics, University College London, London

This Version is available at:

<https://hdl.handle.net/10419/295527>

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CREAM

Centre for Research &
Analysis of Migration

Discussion Paper Series

CPD 19/15

▶ **International Migration of Couples**

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International Migration of Couples¹

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Earlier versions: NORFACE DP, July 2013 and CESifo WP 4927, July 2014.

Abstract

We develop a theoretical model regarding the 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 with the income of the primary earner, whereas the income of the secondary earner may affect the decision in either direction. We conduct an empirical analysis that uses population-wide administrative data from Denmark. The results are consistent with our model. We find that primary earners in couples are more strongly self-selected with respect to income than single persons. This novel result counters the intuition that family ties weaken self-selection.

JEL Codes: F22; J12; J16; J24

Keywords: International migration; Family migration; Education; Gender differences; Dual-earner couples

¹ We thank Francine Blau, Tomer Blumkin, Leif Danziger, Michael Devereux, Christian Dustmann, Lawrence Kahn, Ilpo Kauppinen, Kai Konrad, Romuald Méango, Till Nikolka, Helmut Rainer, Assaf Razin, Analia Schlosser, and Andreas Wagener, as well as participants at the 4th and 5th Norface Migration Conferences, Journées LAGV, and EEA/ESEM in 2013, IZA Annual Migration Meeting and VfS Annual Conference in 2014, CEMIR and UC Davis Workshop and ESPE in 2015, and in seminars at VATT, the University of Turku, Tel Aviv University, Ben-Gurion University, CReAM (UCL), Saïd Business School (Oxford University), Athens University for Economics and Business, University of Hannover, SOFI (Stockholm University) and Graduate Institute Geneva 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 the 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 single persons, even after controlling for age. An important explanation for this behavior pattern is that a dual-career couple considering migration may face difficulties in finding good employment matches for both partners in the same location. In pioneering contributions, Mincer (1978) and Frank (1978a, 1978b) linked couples' colocation problems with lower earnings by women. If migration decisions are made to maximize joint family incomes and women initially earn less than men, migration decisions will thus disadvantage women even further. Costa and Kahn (2000) concluded that the colocation problem is the primary explanation for why college-educated couples in the United States have increasingly chosen to live in large metropolitan areas after the Second World War.

In this paper, we examine the international migration of couples. Our theoretical model predicts that the likelihood that a couple migrates increases with the primary earner's pre-migration earnings whereas the secondary earner's pre-migration earnings may affect the decision in either direction. Although Mincer (1978) previously developed a model for the general idea that a couple migrates when the sum of the partners' gains exceeds the sum of the migration costs, our model is the first to analyze how the probability that a couple migrates depends on the earnings of the primary and secondary earners when the job opportunities in the destination have individual-specific components. This theoretical model can be used to analyze both internal and international migration.

We test our model using exceptionally high-quality register data from Denmark, which is one of the most gender-equal countries in the world (Klugman 2011). Our analysis includes data regarding the entire Danish population from 1982 to 2010, including age, gender, and household identifiers that allow us to identify cohabiting couples, as well as the educational attainment, income levels and migration events of all Danes registered to live in Denmark. Our main results relate to dual-earner couples in which both partners worked for most of the year and are between 25 and 37 years of age. These restrictions yield more than 500,000 couple-year observations in which the female is the primary earner and more than 2.6 million couple-year observations in which the male is the primary earner. We restrict our attention to male-female couples due to the difficulty of recognizing cohabiting same-sex couples in the data. Following Costa and Kahn (2000), couples in which both the male and female partners have college educations are referred to as power couples, and couples in which neither partner has a college education will be referred to as low-power couples. In male-power couples, the male partner has a college education (but the female partner does not), whereas in female-power couples, only the female partner has a college education.

Although there is a large body of literature addressing family migration in the national context, our study is the first to analyze couple migrations separately for couples in which men earn more compared with those couples in which women earn more. This comparison allows us to test two competing hypotheses. The first hypothesis embodies the traditional male breadwinner model: migration is more strongly influenced by the educational attainment and earnings of the male partner. The second hypothesis is that family migration from Denmark is influenced more strongly by the better educated or higher earning spouse's job opportunities.

Our main empirical finding is that the probability that a dual-earner couple emigrates increases with the earnings of the higher earning partner, regardless of whether the primary earner is male or female. The effect of the secondary earner's income varies and is generally much weaker than that of the primary earner's. Comparisons with the self-selection of singles suggest that the self-selection of primary earners in emigrating couples from Denmark is, if anything, stronger than the self-selection of emigrating single persons. We also find that couples' migration from Denmark is more responsive to the male's education than to the female's education. Couples in which only the male is college educated are more than twice as likely to emigrate than couples in which only the female is college educated. Even among couples in which the female earned more, the emigration rate of male power couples is higher than that of female power couples.

To address the concern that immigration rules in potential destination countries might be driving our results, we separately analyze migration to the United Kingdom and Ireland (countries into which Danes can migrate freely due to joint membership in the European Union) and migration to the United States, Canada, Australia, and New Zealand (countries with immigration rules that impose additional restrictions). Our results hold for both destination groups. We also analyze return migration. Power couples are the most likely to emigrate but also the most likely to return. The probability that a couple returns is decreasing in the primary earner's income, although the effect is statistically significant only among men. As we have data only on pre-migration earnings, we do not include earnings dynamics in the destination or return migration in our theoretical model.

Related literature. Migration research has a long tradition in economics. Adam Smith discussed the persistence of wage differences among different locations in the United Kingdom in *An Inquiry into the Nature and Causes of the Wealth of Nations* and concluded 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 and argued that the prospective migrant should choose the destination that maximizes the net present value of his/her lifetime earnings, net of migration costs. Mincer (1978) and Frank (1978a, 1978b) extended the same logic to couple migration. However, these

authors did not analyze whether the probability of migration depends on the pre-migration incomes of the primary and secondary earners. Subsequently, Mont (1989) showed that a couple may choose a location that is not optimal for either partner. Borjas and Bronars (1991) concluded that family ties weaken migrants' self-selection. A key difference is that Borjas and Bronars assumed that income prospects are perfectly correlated across home and potential destination countries. In our model, both the primary and secondary earners face an individual-specific realization of earnings opportunities abroad. Therefore, our model allows for the possibility that a secondary earner may gain from migration and the primary earner may lose and that the roles of the secondary and primary earners may thus be reversed, at least when initial income differences are not too great.

A general finding throughout much of the previous literature analyzing internal migration is that couples' migration decisions are greatly influenced by the male's job opportunities.² Most previous studies of international migration have focused on men (Chiswick 1978; Borjas 1987; Chiquiar and Hanson 2005; Grogger and Hanson 2011; Abramitzky et al. 2012; 2014; Bandiera et al. 2013; Gould and Moav, forthcoming).³ Borjas and Bronars (1991) concluded that the self-selection of migrants who move to the United States with their partners is not as strong with respect to individual characteristics as the self-selection of single migrants. Cobb-Clark (1993) studied female immigrants to the United States and found that women from rich countries with low returns to education and small income differences have relatively higher earnings in the United States. This result suggests that there is a corresponding selection, as among men. Cobb-Clark also found that women who migrated as household members earn significantly higher income than women who did not. A key difference in our analysis is that Borjas and Bronars (1991) and Cobb-Clark (1993) analyzed immigrants from different countries of origin who migrated to one destination. Their results comparing self-selection between single immigrants and immigrant couples establish the joint effect of the differences in self-selection into emigration between single persons and couples and the differences in productivity distribution between single persons and couples, which may persist even after controlling for age and education. Our study includes information regarding all migrants and non-migrants going to all destinations from one country of

² See Duncan and Perrucci (1976), Sandell (1977), Bielby and Bielby (1992), Compton and Pollak (2007), 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.

³ Borjas et al. (2015) analyze the self-selection of emigrants from Denmark to other Nordic countries and rest of the world separately for men and women. They find that the income distribution for the migrants almost stochastically dominates the distribution for the non-migrants. There is no separate analysis of single persons and those with a partner, which is the focus of this paper.

origin, which allows us to study self-selection into migration among couples and single persons separately from any differences between being single and being part of a couple (see Becker 1985; Dolton and Makepeace 1987).

A major restriction in our analysis, as well as in other papers analyzing international migration, is that the earnings of migrants are observed only in the country of origin or in the country of destination. As a result, we restrict our model and most of the analysis to a once-and-for-all decision on whether to migrate.⁴ There has been some work on repeated migration decisions in theoretical or national context. Guler et al. (2012) concluded that if ex ante identical spouses receive job offers from different locations and incur a cost when living apart, a joint search may result in a worse outcome than a single-agent search. Gemici (2011) presented a dynamic model with intra-household bargaining and repeated migration decisions, tested it using PSID data, and showed that family ties reduce migration and earnings for both men and women.

The remainder of this article is organized as follows: Section 2 presents the model developed for the migration of single persons and dual-earner couples, with a focus on the couples. Section 3 describes the data and summary statistics. Section 4 provides stylized facts regarding the emigration and return migration of couples. Section 5 presents the econometric analyses first for single persons and then for couples. Section 6 analyzes the role of skill price differences and immigration restrictions and section 7 return migration. Section 8 concludes.

2. Theory

2.1. Migration of a single person

We analyze migration in a two-country framework, as in Borjas (1987) and subsequent literature. Individual i with human capital h_i receives net income $y_i^0 = \alpha_i^0 + \beta_0 h_i$ in his or her home country, denoted by 0. Here, α_i^0 refers to the value of various amenities, publicly provided goods and services and income transfers for individual i in country 0, and β_0 gives the rate of return to human capital in country 0. Net income abroad in country 1, y_i^1 , is given by

$$y_i^1 = \alpha_i^1 + \beta_1(1 + z_i)h_i.$$

Here, α_i^1 is value of various amenities, publicly provided goods and services and income transfers available for individual i in country 1, and β_1 gives the rate of return to human capital in country 1. Skill price difference between countries 1 and 0 is given by

⁴ Borjas and Bratsberg (1996) conclude that return migration accentuates the type of selection of immigrants who stay in the United States. For an excellent overview on temporary migration, see Dustmann and Gorlach (forthcoming).

$\beta_1 - \beta_0$. Individual random-specific variable z_i , $z_i \in [\underline{z}, \bar{z}]$, captures the idea that some people get better job offers abroad ($z > 0$), others in their home country ($z < 0$).

The individual-specific random variable is observable to the individual prior to the migration decision but not to the econometrician in our empirical application. Individual i faces migration cost \tilde{c}_i , which also captures any psychological costs and benefits that are related to living abroad. Therefore, the net return to migrating is given by

$$R_i = [\beta_1 z_i + \beta_1 - \beta_0] h_i + \alpha_i^1 - \alpha_i^0 - \tilde{c}_i.$$

An individual migrates if the net return to migrating is larger than zero. To simplify subsequent notation, we can write the net return to migration as follows:

$$R_i = x_i w_i - c_i,$$

where $x_i = \beta_1 z_i + \beta_1 - \beta_0$, $w_i = h_i$ and $c_i = \tilde{c}_i + \alpha_i^0 - \alpha_i^1$. The main idea behind this rearrangement is to divide differences between the job opportunities in the two countries in two components. One component relates to differences in returns to human capital, and is captured by the term x_i . Note that this depends on both individual-specific random variable z_i and returns to human capital in the two countries, β_0 and β_1 . The other term, c_i , depends on individual-specific migration costs and differences between amenities and what the government provides in the two countries.⁵ We replace the human capital term h_i by the term referring to earned income, w_i , as our subsequent empirical analysis uses earned (mostly wage) income as a measure approximating productivity.

Assuming that the individual-specific random variable z follows a uniform distribution, also x follows a uniform distribution. Assuming the unobservable random term to follow a uniform distribution simplifies the analysis considerably; when analyzing migration from Israel to the United States, Gould and Moav (forthcoming) assume that unobservable skills follow uniform distribution and show that the qualitative results derived using such an assumption can be generalized to normal distributions, at the cost of having to resort to simulations. For simplicity, $\bar{x} = \underline{x} + 1$. The probability of emigration is given by⁶

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

If $c_i \leq \bar{x} w_i$, $\frac{\partial p_i}{\partial c_i} < 0$ and $\frac{\partial p_i}{\partial w_i} > 0$. In other words, the probability of emigration increases with net income in the home country and decreases with migration costs. Individual migration cost may 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.

⁵ For simplicity, we assume that $c_i \geq 0$. This model could be analyzed without this restriction.

⁶ 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.

We also assume that $-1 < \underline{x} < -0.5$, which guarantees that even without migration costs, less than half of the population would emigrate.

Our model is static and depicts a once-and-for-all decision on migration, as is common in most of the literature on international migration (see Borjas 1987; Borjas and Bronars 1991; Chiquiar and Hanson 2005; Grogger and Hanson 2011; Gould and Moav, forthcoming). Nonetheless, it can be interpreted to refer either to a decision regarding permanent migration, or to a decision about whether to migrate for certain duration of time. In the first case, income w_i would correspond to the net present value of future earned income flows. In the latter case, income w_i would correspond to the net present value of earned income during the eventual episode 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. This model might be extended to allow for the uncertainty related to returns from abroad by interpreting x_i as the expected value of the individual-specific random variable abroad. Similarly, the migration cost could be stochastic, with c_i reinterpreted as expected migration cost. Our assumption that the difference between earnings abroad and at home is the product of earnings in the home country and a random variable is stronger than necessary 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 is positively correlated with home-country income.

2.2. Migration of a couple

A couple consists of two individuals, a and b . Without loss of generality, assume that $w_a \geq w_b$. The individual-specific random variables x_a and x_b are distributed independently and identically.⁷ The couple emigrates if $R_a + R_b > 0$. This condition might arise either from a unitary model in which the couple maximizes its joint income (Becker 1974; Mincer 1978; Borjas and Bronars 1991) or from a bargaining model in which the partner who gains from emigration can compensate the partner who loses by making a transfer ex ante. The latter interpretation is adopted by Gemici (2011). (The effects of allowing joint migration costs of a couple to be less than the sum of the migration costs of the two partners as singles is discussed at the end of this section.) The condition for emigration can be written as

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

⁷ We make this assumption as we have only data reflecting pre-migration earnings. Assuming a positive correlation between the partners' random variables alleviates trade-offs in couple migration. If the correlation equals 1, a couple corresponds to a single person with migration cost $c_a + c_b$ and wage rate $w_a + w_b$.

We denote the probability that the couple emigrates by p_{ab} , with the addition of a superscript below to analyze any scenarios that differ in terms of wage differences. The couple does not migrate when $x_a = \underline{x}$, because the gains to the partner with the smaller income cannot exceed the losses to the partner with the larger income due to the assumption $-1 < \underline{x} < -0.5$. The lowest possible realization of x_a with which the couple may be indifferent regarding 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 equation 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 where the couple migrates is denoted by \hat{x}_b and given by

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

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

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

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

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

Inserting \hat{x}_a and simplifying results in

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

When income differences between the partners are **relatively large**, such 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 regarding 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 equation 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:

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

Figure 1 illustrates how the migration probabilities are derived when $c_a = c_b = c$. The left panel presents $w_a = w_b$ (i.e., small wage differences), and the right panel presents

$w_a = 2w_b$ (i.e., large wage differences). In both panels, the parameter combinations under which a couple emigrates are shaded two different tones of grey. The probability that a couple emigrates is calculated by integrating over all the possible combinations of x_a and x_b with which the couple emigrates, using formula (5) for small wage differences (left panel) and formula (6) for large wage differences (right panel). The dark grey area denotes the parameter combinations under which both partners would emigrate also as single persons. The light grey areas denote the parameter combinations under which only one partner would emigrate as a single person, but his or her gains are sufficiently large to compensate for the losses to the other partner who is then a tied mover. Figure 1 also illustrates 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 line. 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.

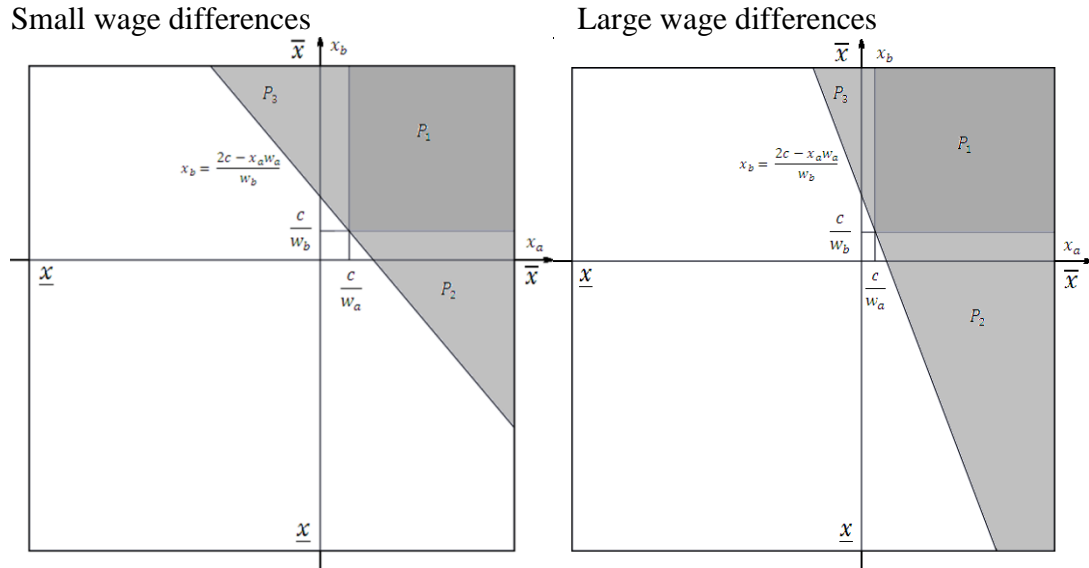


FIG. 1. -Migration probabilities for single persons and couples. The left panel depicts the case of small wage differences and the right panel depicts the case of large wage differences. In both panels, the horizontal axis measures all the possible realizations of x_a and the vertical axis measures all the possible realizations of x_b . If single, agent a (b) would emigrate with all the 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 $c_a = c_b = c$, the inequality (2) indicates that the couple would only emigrate when $x_b > \frac{2c - x_a w_a}{w_b}$. Given the assumption that x_a and x_b are distributed uniformly and independently on unit intervals, the grey area shows the probability that the couple would emigrate. In the left panel, $w_a = w_b$, and the probability that the couple would emigrate even if only a emigrates as a single person (the area of the triangle marked by P_2) is identical to the probability that the

couple would emigrate even if only b emigrates as a single person (the area of the triangle marked by P_3). The probability that both partners would prefer to emigrate (the area of the square marked by P_1) is the product of the probabilities that a and b would migrate as single persons. In the right panel, the other parameter values are as in the left panel but $w_a = 2w_b$ (i.e., large wage differences). The rectangle marked by P_1 is larger than in the left panel because the probability that b would emigrate as a single person does not change, whereas the probability that a would emigrate as a single person increases. The area marked by P_2 (partner b is the tied mover) now has a trapezoid shape because, with large wage differences, a couple should emigrate with sufficiently high realizations of x_a also when b faces the worst possible realization of x . The bottom line of the trapezoid is where $\hat{x}_b = \underline{x}$ by (3). The triangle marked by P_3 (partner a is the tied mover) is clearly smaller than in the left panel. The higher the earnings of the (pre-migration) primary earner, the less likely it is that he or she will become a tied mover.

If migration costs between the partners differ sufficiently, it is trivial to show that the partner with the lower migration cost is more likely to emigrate as a single person. Importantly, we can show that being in a couple reduces the probability of emigration for the higher income earner when 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 a single person.

It is also possible to show the following:

PROPOSITION 2. An increase in the home-country wage of the higher wage partner increases the probability that a couple emigrates.

PROPOSITION 3. An increase in the home-country wage of the lower wage partner has an ambiguous effect on the probability that the couple emigrates. If the effect is positive, it is always smaller than the effect of a corresponding increase in the primary earner's home-country wage.

PROPOSITION 4. An increase in migration costs for either partner reduces the probability that a couple emigrates.

PROPOSITION 5. If migration costs are the same for both partners, the elasticity of migration of a couple with respect to the primary (secondary) earner's home-country wage is always larger (smaller) than the elasticity of migration of the primary (secondary) earner with respect to his or her home-country wage would be as a single person.

Proofs for these propositions are presented in Appendix A.

The probability of emigration always increases with the primary earner's income because the potential gains for the couple increase with the primary earner's income. Additionally, when one partner is a tied mover, it is typically the secondary earner; see Figure 1. An increase in the secondary earner's income has two conflicting effects. There is a positive effect when the potential gains from a good job opportunity abroad are proportional to pre-migration productivity. There is a negative effect when an increase in the secondary earner's income generates possible losses as a result of being the tied mover, thereby making it more likely that partner *a* would have to give up a good job offer abroad because the gains are not sufficient to compensate for partner *b*'s losses. It is not clear which effect dominates, as illustrated in the proof of Proposition 3.

Our simple theoretical model generates a number of empirically testable predictions. Propositions 2 and 3 list predictions regarding the effects of the earnings of the primary and secondary earners. There are additional predictions if migration costs decrease with the level of education.⁸ Proposition 4 would then imply that – controlling for wages – power couples should be most likely to emigrate and low-power couples should be least likely to emigrate, with female- and male-power couples' likelihood falling in between. According to equation (2), a reduction in migration costs has the corresponding effect of a proportionate increase in the wage rates. Thus, Proposition 4 implies that a proportional increase in the home-country wage rates of both partners increases the likelihood that a couple will emigrate. Proposition 5 allows us to test our model against the model developed by Borjas and Bronars (1991), which predicts that both primary and secondary earners in couples are more weakly self-selected to migrate than single persons. The different predictions are driven by us assuming stochastic job opportunities abroad,

⁸ Examining data from Docquier and Marfouk (2006), Grogger and Hanson (2011) showed that emigrants are generally better educated than non-migrants. Docquier, Lowell and Marfouk (2009) showed that high-skilled emigration rates to OECD destinations exceed emigration rates to OECD destinations for those with less education across all continents – and even across all regional groups using the United Nations classifications (these groups include North America, Eastern Europe, Northern Europe, Southern Europe and Western Europe). The lower migration costs of college-educated individuals may be due to better language and cross-cultural skills. The mobility of highly skilled individuals may depend on the type of their education (Poutvaara 2008). To keep the current analysis tractable, we abstract from the modeling of differences in the degree to which different types of education are internationally applicable.

whereas Borjas and Bronars (1991) assume that earnings abroad are perfectly correlated with earnings at home.⁹

It should be noted that our model might be applied with risk neutrality when only one partner receives a job offer from abroad prior to the migration decision and there is uncertainty regarding the job opportunities for the other partner. Here, the individual-specific term x_{offer} for the partner who received the job offer abroad is known, whereas the term $x_{no\ offer}$ for the other partner reflects his or her expected job opportunities abroad. This model considers that the job offers may be made to either partner. Nonetheless, the model is restricted because the duration of the eventual stay abroad must be known in advance, regardless of whether it is permanent or temporary. To model the optimal choice regarding the duration of the stay abroad, we must specify the wage process abroad, as well as distinguish between fixed emigration and return migration costs, in addition to flow costs related to staying abroad. We refrain from suggesting a more complex modeling of the wage process abroad because the data used to test our theory are restricted to the country of origin.

Throughout the analysis we assumed that the migration cost of a couple is the sum of the migration costs of the two partners as singles. It would be easy to extend the analysis to allow the migration costs to have a fixed component which would allow savings for a couple, or the psychological migration costs to depend on whether the person is single or in a couple. Allowing a couple to have lower migration costs than the sum of the migration costs that partners would have as singles would increase the likelihood of couple migration, but would have no effect on propositions 2, 3 and 4. If savings when migrating as a couple would be sufficiently large, this could, theoretically, change results of propositions 1 and 5. As shown below, empirical results suggest that if there are scale effects, they are not big enough to overturn the predictions of propositions 1 and 5.

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 occupations, and the migration register. Data

⁹ If two partners have the same income in a home country ($w_a = w_b$), then they gain or lose equally from migration in the Borjas and Bronars model. In our model, either partner has an equal probability of being the tied mover or stayer when $w_a = w_b$ (if there could be no tied movers with equal home-country wages, the triangles marked by P_2 and P_3 should vanish in the left panel of Figure 1). If the partners' incomes differ, Borjas and Bronars (1991) predict that the identity of the tied movers or stayers depends deterministically on the relative earnings of the partners. If skill prices are higher at the destination, the tied movers are always the secondary earners and the tied stayers are always the primary earners. In our model, either partner can be a tied mover or stayer whether skill prices are higher at home or abroad; however, the probability of being a tied mover is greater for the secondary earner.

from these registers are combined using a unique personal identification number (i.e., social security number). By law, all residents in Denmark have a social security number, which is necessary for everyday life events, including opening a bank account, receiving wages or social assistance, visiting a doctor or being registered at school. Registering migration is compulsory if the stay abroad is longer than six months. The migration register provides information regarding the dates of migration and the countries of destination, as well as return migration. The present paper uses register data from the entire Danish population from 1982 to 2010. We accessed these data through Statistics Denmark. The age of the partners and the presence and ages of children are measured on January 1. Education is measured as of 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 for age and the presence of children on January 1 of the year of analysis.

In this paper, a couple consists of a male and female who have lived at the same address for at least one year.¹⁰ A couple is defined based on having a shared address rather than being married given that cohabiting without marriage is common in Denmark. If both partners migrate to the same country within one year, we interpret that event as the couple migrating together. We restrict our focus to couples in which at least one parent of both partners was born in Denmark.¹¹

Figure 2 presents the average annual emigration rates from 2001 to 2005 for single men and women, and for couples in which both partners migrate to the same county. Couples are listed according to the female's age, which is measured as of January 1. The single person analysis is restricted to those who had at least one parent who was born in Denmark. Panel A includes all emigration events, whereas panel B is restricted to emigration events that last at least five years, which is defined for couples as neither partner returning to Denmark within five years. We present results both without restricting the duration of the stay abroad and with this restriction given that there are good arguments for both approaches. On one hand, couples do not need to know how long they are going to stay abroad and plans may change, which is an argument in favor of not restricting the duration of stay abroad. On the other hand, many short stays abroad occur when one partner is sent abroad by his or her employer, typically for one year or

¹⁰ The Statistics Denmark definition requires that if the male and female do not have children together, their age difference should be less than 15 years. We restrict our attention to opposite-gender couples because the number of same-gender couples was clearly smaller and because there are many cases – particularly among students – in which two persons of the same gender share an apartment without forming a couple.

¹¹ For immigrants, emigrating from Denmark might mean returning to the home country. Therefore, their decisions may differ significantly from non-immigrants. The current analysis exclude couples that migrated to the Faroe Islands and Greenland, as these are autonomous Danish territories.

for a few years. Unfortunately, register data does not allow identifying posted workers even when they continue working for a Danish company. Because most couples return within five years, the results for that group may be driven to a large extent by the couples in which at least one partner is a posted worker. We present the results for all stays and for only the longer stays to show the extent to which the results hold for both groups. There is no data on income earned abroad after migration as such income is not subject to taxation in Denmark.

A: All stays

B: Stays lasting at least five years

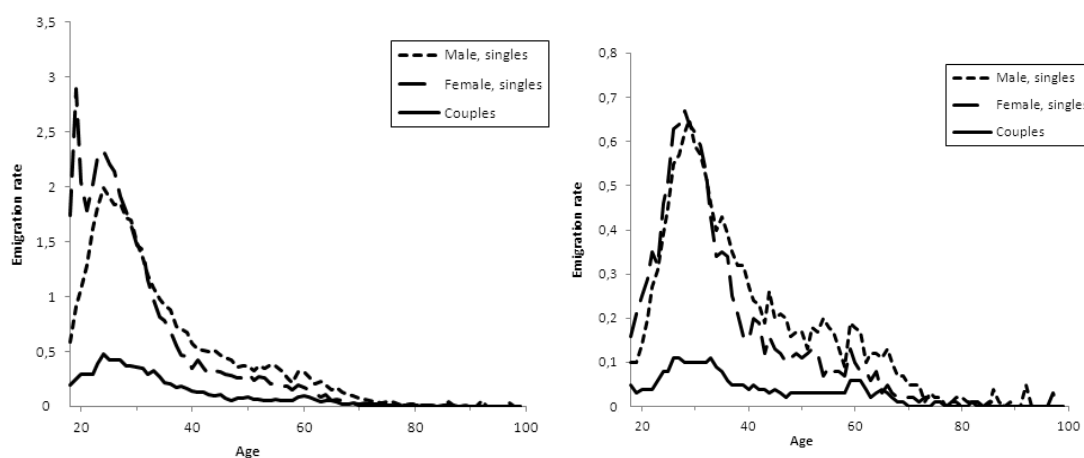


FIG. 2. - Family status and emigration probabilities. The horizontal axis denotes age and the vertical axis denotes the percentage of single persons (or couples measured according to female age) who emigrated at that age.

Figure 2 shows that single persons are considerably more mobile than couples regardless of whether one analyzes all the emigration episodes or only the long episodes. Mincer (1978) established that partnership ties deter within-country migration, and Figure 2 shows that the same result holds for international migration.¹²

The remainder of this paper focuses on couples in which both the female and male are between 25 and 37 years of age and – for purposes of comparison – single women and men in the same age group.¹³ Couples with missing information regarding either

¹² The difference between single persons and couples in migration behavior should not be interpreted as just a causal effect of partnership ties because people in couples may differ systematically from single persons. However, the differences between single persons and couples are so great that it is not plausible that they would only reflect self-selection into couples, particularly as these differences hold independent of age. Because our focus is on understanding couple migration decisions and not on explaining those who are in couples, we do not account for the endogeneity of couple formation in our analysis.

¹³ A previous version of this paper, which is available as IZA DP 8352, featured age restrictions in which the male was between 25 and 39 years of age, and the female was between 23 to 37 years of age, following Costa and Kahn (2000). The gender differences were somewhat larger than in the current version, which employs the same age restrictions for women and men.

education or occupation are excluded, which reduces the number of observations by approximately one percent. Table 1 reports the number of households that satisfied the aforementioned restrictions and the percentage of couples that emigrated together from 1982 to 2010. The emigration rate has increased since the mid-1990s, which may be the result of the introduction of free mobility in the European Union in 1993.

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

	Emigration Rate	Couples
1982	0.16	266,517
1983	0.12	256,726
1984	0.12	246,510
1985	0.13	236,674
1986	0.13	228,747
1987	0.15	223,851
1988	0.20	221,245
1989	0.25	218,592
1990	0.21	217,093
1991	0.18	217,335
1992	0.18	218,862
1993	0.19	220,244
1994	0.21	219,675
1995	0.22	218,447
1996	0.24	218,078
1997	0.25	218,275
1998	0.25	218,731
1999	0.25	217,514
2000	0.30	216,217
2001	0.29	213,441
2002	0.23	208,650
2003	0.22	202,257
2004	0.25	195,533
2005	0.28	187,404
2006	0.29	183,343
2007	0.31	179,817
2008	0.26	176,235
2009	0.20	171,859
2010	0.21	165,511
Total	0.22	6,183,383

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

In total, 61% of couples are low-power couples, 15% are power couples, 14% are female-power couples and 10% are male-power couples. In 78% of the couples, both the male and female work. In 9% (7%) of the couples, the male works and the female is out of the labor force (unemployed). The female works and the male is out of the labor force (unemployed) in only 2% (2%) of the couples. Students are included as among those who are not part of the labor force.

4. Stylized Facts

In this section, we provide an overview of emigration and return migration before proceeding to the econometric analysis in section 5. Panel A in Table 2 presents the likelihood that emigration will occur in couples with different levels of education. Low education denotes less than a college degree, and high education denotes a college degree or more. As a comparison, the emigration rate for single women (men) without a college education is 0.82% (0.74%), whereas the emigration rate for single women (men) with a college education is 1.65% (1.89%). Thus, couples are considerably less likely to migrate than either single men or women, independent of education. Table A.1 in the Appendix shows that the emigration rates are almost identical when the focus is restricted to married couples. Therefore, the remainder of the paper presents results only when cohabiting couples are also included.

TABLE 2. EMIGRATION RATES OF COUPLES DEPENDING ON EDUCATION, EMPLOYMENT, AND CHILDREN

		Panel A: Emigration rates (in percentages) according to partners' education	
		Male education	
		Low	High
Female education	Low	0.10	0.45
	High	0.21	0.60
		Panel B: Emigration rates (in percentages) when females earned more	
		Male	
		Low	High
Female education	Low	0.09	0.34
	High	0.19	0.50
		Panel C: Emigration rates (in percentages) when males earned more	
		Male	
		Low	High
Female education	Low	0.10	0.49
	High	0.22	0.65
		Panel D: Emigration rates (in percentages) according to partners' employment status	
		Male	
		Working	Not working
Female	Working	0.22	0.34
	Not working	0.26	0.37
		Panel E: Number of children and emigration rates	
		Number of children	Emigration rates (in percentages)
		0	0.36
		1	0.22
		2	0.18
		3+	0.17

Note: Employment status in panel D is measured in the year before emigration.

Panels B and C in Table 2 present the emigration rates separately for couples in which females earn more and in which males earn more. In both groups, the emigration rate is highest for power couples, followed by male-power couples. One possible explanation for higher emigration rates among male-power couples than among female-power couples is that most destination countries have much more limited or expensive daycare services than Denmark. This means that even college-educated women are more likely to stay at home to take care of their children thereby making the emigration decision more dependent on the male's labor market prospects. Restricting the analysis to dual-earner couples in which both partners worked at least 60% of the full working time in the previous year does not change the qualitative picture.

Panel D in Table 2 shows the emigration probabilities based on whether the spouses are employed. The 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 because the tied mover has more to lose in this type of couple. Emigration is more likely to occur when the male is not working and the female is working than when the male is working and the female not working, suggesting that couples are more willing to sacrifice the female's current employment to take advantage of a good job opportunity abroad for the currently unemployed male partner than the reverse. We also find that couples are most likely to emigrate when they have no children (see panel E in Table 2), which is also intuitive because the presence of children adds additional family ties that may deter migration.

Most couples return to Denmark within a few years. Figure 3 presents the survival rates of couples that emigrated. Survival as emigrants is defined as neither partner returning to Denmark. There are no data indicating whether the partners remained a couple abroad when neither returned. High-power and part-power (male-power and female-power) couples are considerably more likely to return than low-power couples. With respect to emigration between 1982 and 2005, 81% of the power couples, 77-78% of the female-power and male-power couples and 70% of the low-power couples return within five years of leaving Denmark.

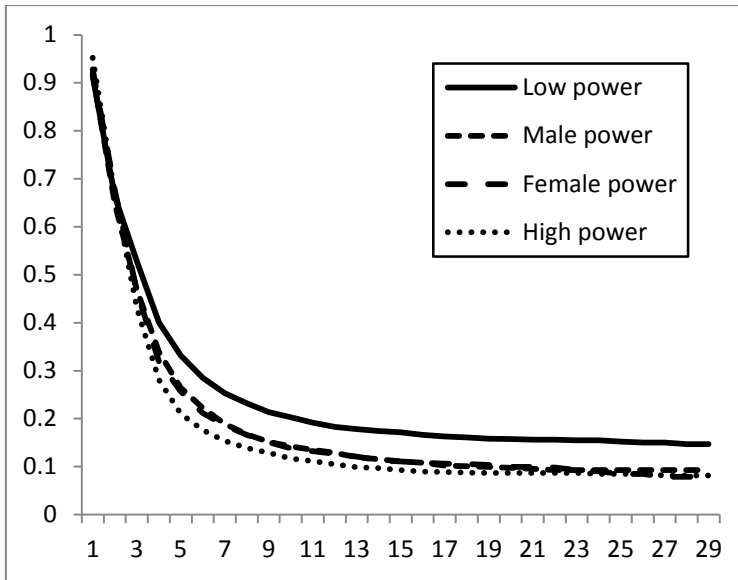


FIG. 3. - Survival rates for staying abroad in emigrating couples. The horizontal axis denotes the number of years spent abroad and the vertical axis denotes the fraction of couples still staying abroad.

5. Econometric Analysis

The previous section established that the emigration rate is highest for power couples, followed by male-power couples. The lowest emigration rate is for the low-power couples. To test how the primary and secondary earners' incomes are related to the probability of emigration when other characteristics are taken into account, we utilize a regression analysis. Because the decision to emigrate is a zero-one decision, we use a probit model for emigration. First, we analyze the emigration decisions of single men and women and then we analyze these decisions for the dual-earner couples because these couples comprise the subgroup of couples to which our theoretical model applies best. In the final subsection, we present an analysis of all couples satisfying our age restrictions. All regressions in this section include age and year dummy variables with a separate dummy variable for each age in full years (not reported, but available upon request) to capture the lifecycle patterns that are evident in Figure 2, as well as the time trends and the effect of business cycles on migration.

5.1. Single persons

Table 3 presents probit regressions for emigration decisions of single women and men without children. This analysis is restricted to those between 25 and 37 years of age who worked at least 60% of the full working time during the previous year, which corresponds to approximately seven months.

TABLE 3: PROBIT REGRESSION FOR THE EMIGRATION OF SINGLE PERSONS

	Female	Male	Female, no return within five years	Male, no return within five years
Intercept	-4.33*** (0.18)	-5.98*** (0.14)	-5.70*** (0.32)	-7.08*** (0.27)
College-educated	0.25*** (0.01)	0.35*** (0.01)	0.16*** (0.01)	0.29*** (0.01)
Log earnings	0.12** (0.01)	0.25*** (0.01)	0.22*** (0.03)	0.33*** (0.02)
Observations	1,096,857	2,535,762	934,235	2,191,160

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

The results in Table 3 are consistent with our theoretical model that predicts that the probability that a single person emigrates increases with earnings for both men and women. The results are also consistent with our prediction that migration costs are lower for college-educated individuals, which makes them more mobile than less-educated individuals, even when controlling for age and earnings.

To illustrate how responsive the likelihood of emigration of single persons is to their earnings, we calculate the elasticity of migration with respect to earnings for single women and men with and without a college education separately for all the stays and then for only the long stays. The formula for elasticity in each group, omitting group-specific subscripts, is $\frac{dp}{dw} \frac{w}{p}$. Here, w denotes earnings, which is one component of vector \mathbf{x} for the explanatory variables. $p = \Phi(\mathbf{x}\beta)$ is the probability of emigration as a function of the log earnings and other explanatory variables, as estimated using the probit regression summarized in Table 3, evaluated at the average values for the analyzed group.¹⁴

Panel A in Figure 4 shows that the probability of emigration for college-educated single persons and for single men without a college education is strongly positively correlated with their incomes, which is consistent with the theoretical model for single persons. The only exception to this result is evident in the results for single women without a college education: For them, the probability of emigration only slightly increases with

¹⁴ Note that $d \ln(w) = \frac{dw}{w}$. Therefore, $\frac{dp}{dw} \frac{w}{p} = \frac{dp}{d \ln(w)} \frac{1}{p}$. We use this formula next because the probit regression in Table 3 uses the log income. Kleven et al. (2014) use this formula to estimate the impact of introducing a special flat-rate tax scheme for top-income earning immigrants on the immigration of top-income earners to Denmark.

earnings. Panel B illustrates long-term emigration by focusing on only the events in which the emigrant did not return to Denmark within five years. Long-term emigration is more strongly correlated with pre-emigration earnings compared with all other emigration events. Overall, the elasticity of migration with respect to earnings varies for men across the different groups between 0.59 and 1.10, and for women between 0.14 and 0.90.

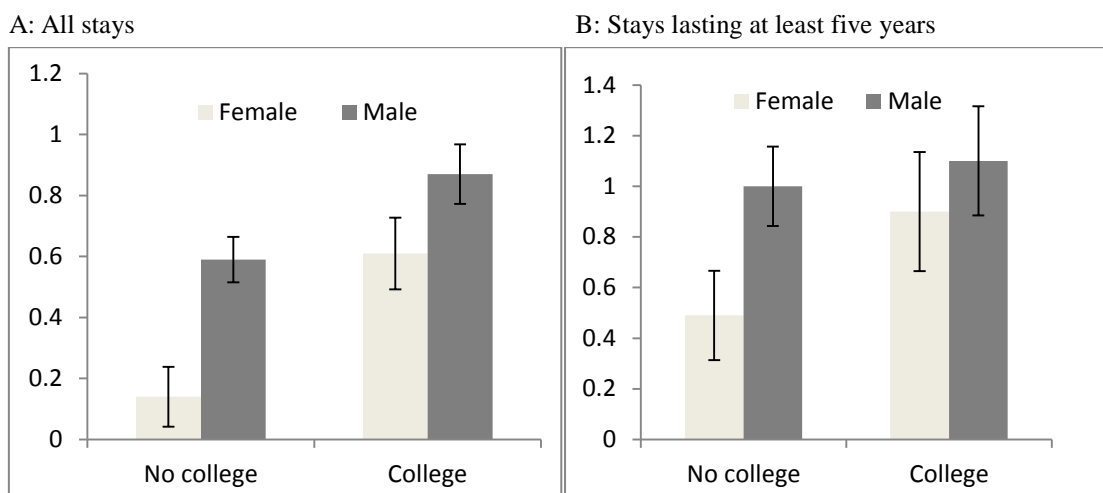


FIG. 4. – The elasticity of migration for single persons with respect to income. The results are presented as elasticity with 95% confidence intervals, which are estimated at the average age and income within the group for which the elasticity is calculated. Women and men are between 25 and 37 years of age. The 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 for those individuals who worked at least 60% of the full working time.

One possible explanation for the gender differences between earnings and the probability of emigration is 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 controls for the sector of employment or the field of study that individuals are engaged in because our main interest lies in how single persons' income levels are related to their probabilities of emigration and how this relationship differs between single men and women, not in explaining differences in income levels. Our estimated elasticities should not be interpreted as causal claims regarding how much providing an individual with additional income would increase his or her probability of emigration. Rather, we aim at identifying patterns related to migration at the population level.

5.2. *Dual-earner couples*

For the analysis of couples, the dependent variable obtains a value of one when the couple migrated together and a value of zero otherwise. Our main results are presented in Table 4. We focus our analysis on couples in which both partners worked at least 60% of the full working time during the previous year, which corresponds to approximately seven months. We also required that both partners have positive earnings. It is not plausible that someone who worked more than half of the year would have zero or negative earnings, although it is technically possible in the register data in the rare cases that involve the self-employed because of various tax deductions (0.07% of couples are excluded because either the male or female had earnings that are not larger than zero). This restriction brings the empirical analysis closest to the theoretical model. We present the results first for all the emigration episodes and then for only the long emigration episodes, which is defined as when neither partner returned to Denmark within five years. To allow for testing of the effect of the primary earner's income and any potential gender differences, the first and third columns analyze couples in which females earned more and the second and fourth columns analyze couples in which males earned more.

TABLE 4: PROBIT REGRESSION FOR THE EMIGRATION OF DUAL-EARNER COUPLES

		Female earned more	Male earned more	Female earned more, 5+ years abroad	Male earned more, 5+ years abroad
Intercept		-10.51*** (0.68)	-12.97*** (0.25)	-10.08*** (1.31)	-14.03*** (0.48)
Power couples		0.49*** (0.03)	0.47*** (0.01)	0.23*** (0.06)	0.22*** (0.02)
Female-power couples		0.18*** (0.03)	0.17*** (0.02)	0.05 (0.07)	0.07** (0.03)
Male-power couples		0.36*** (0.04)	0.39*** (0.01)	0.24*** (0.08)	0.23*** (0.02)
[Low-power couples]					
Number of children	1	-0.27 (0.29)	-0.27*** (0.10)	-0.16 (0.19)	-0.48* (0.27)
	2	-0.18 (0.29)	-0.18* (0.10)	0.01 (0.18)	-0.43 (0.27)
	3+	-0.08 (0.30)	-0.16 (0.10)	0.26 (0.16)	-0.36 (0.26)
	[0]				
Female log earnings		0.62*** (0.06)	0.04*** (0.02)	0.60*** (0.10)	0.07** (0.03)
Male log earnings		-0.06 (0.05)	0.71*** (0.01)	-0.09 (0.09)	0.77*** (0.02)
Observations		502,324	2,658,710	417,587	2,340,201

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

Table 4 presents results that are consistent with the predictions from our theoretical model: regardless of whether the male or female earns more, the probability that a couple will emigrate increases with the primary earner's income. The previous literature regarding family migration has not studied the effects of male and female earnings separately for couples with respect to whether the male or female is the primary earner (see Duncan and Perrucci 1976; Mincer 1978; Shihadeh 1991; Nivalainen 2004; Blackburn 2010; Tenn 2010; Rabe 2011; Gemici 2011; Eliasson et al. 2014). When couples with male and female primary earners are analyzed together, the estimated effect of the male's income is typically positive, whereas that of the female's income is typically insignificant and may even be negative. The positive effect of the female primary earner's income on the probability of migration is lost when the relatively small number of families with female primary earners is analyzed together with families with males as the primary earners.

After controlling for income, we also find that having a college education increases the likelihood of emigration. This result is consistent with our prediction 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 regardless of whether the male or female is the primary earner. This finding suggests that family migration patterns are still not gender neutral.

Our finding regarding the importance of the primary earner's income is robust to different specifications. Foged (2014) used the same data that we use but with slightly different empirical specifications and a shorter time period. Instead of investigating the primary and secondary earners' incomes, she examined the husband's income share and found that the probability of family migration is U-shaped with respect to the income share of the husband, which is consistent with the predictions of Propositions 2 and 3 in the present paper. Moving toward a more asymmetric income distribution (i.e., moving toward the endpoints of the 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). Taken together, Propositions 2 and 3 suggest an increased probability that a couple will emigrate when the income share of the primary earner increases.

Table 5 presents the data for the analyses of couples with and without children separately (An analysis of couples with one child, two children, or three or more children suggests that accounting for the number of children does not make much 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 with the primary earner's income, as Proposition 2 predicts. The emigration decisions of couples with and without children are influenced by the primary earner's income quite similarly, regardless of the primary earner's gender. The income of a female secondary earner has a small and weakly statistically significant positive effect, whereas the effect of the male secondary earner's income is statistically insignificant. Therefore, Proposition 3's prediction, that migration would increase more with the primary earner's income, is confirmed across all the groups.

TABLE 5: CHILDREN AND THE 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	-10.77*** (1.11)	-12.70*** (0.52)	-10.78*** (0.90)	-13.43*** (0.30)
Power couples	0.39*** (0.04)	0.44*** (0.02)	0.56*** (0.04)	0.47*** (0.01)
Female-power couples	0.11*** (0.05)	0.17*** (0.03)	0.24*** (0.04)	0.16*** (0.02)
Male-power couples	0.30*** (0.06)	0.36*** (0.02)	0.40*** (0.06)	0.39*** (0.01)
[Low-power couples]				
Female log earnings	0.62*** (0.09)	0.09** (0.04)	0.62*** (0.08)	0.04* (0.02)
Male log earnings	-0.08 (0.07)	0.64*** (0.03)	-0.05 (0.07)	0.73*** (0.02)
Observations	150,646	532,067	351,678	2,126,643

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

Table 6 presents data from couples according to both power types and the primary earner's gender. This division is motivated by concerns that there may be collinearity between education and earnings and that the effects of earnings may interact with education. An analysis of the eight groups consisting of the four power types with females as the primary earners, and the four power types with males as the primary earners allows us to separate the effects of income without any collinearity with education. It also separates any potential gender differences from the effects of being a primary or secondary earner. Given the large number of observations, there is enough variation in the earnings to allow for an analysis of the subgroups. However, the inclusion of education and income together in Table 4 allows us to estimate the direct effects of education beyond the indirect effects associated with earnings.

Panel A in Table 6 shows that among couples with females as the primary earners, the probability of migration strongly increases with females' earnings for low-power couples, female-power couples and power couples. The probability of migration decreases with male earnings among low-power and female-power couples, although the latter effect is statistically insignificant. Nonetheless, it appears that male secondary earners without college education are negatively self-selected with respect to their incomes. Taken together, these findings suggest that among couples in which the females earned more, the migration decisions reflected more female job market opportunities in

all the groups except for the male-power couples. Among couples with males as the primary earners, the probability of migration increases with male earnings, independent of power type (see panel B). The effect of female earnings is positive for the male-power and low-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		-9.23*** (1.49)	-11.49*** (1.64)	-10.18*** (2.59)	-10.75*** (0.93)
Number of children	1	-0.22 (0.19)	-0.17 (0.30)	0.30 (0.35)	0.31 (0.39)
	2	-0.12 (0.18)	-0.00 (0.29)	0.20 (0.35)	0.37 (0.39)
	3+	-0.00 (0.19)	0.01 (0.32)	0	0.53 (0.39)
	[0]				
Female log earnings		0.65*** (0.12)	0.80*** (0.19)	0.20 (0.21)	0.56*** (0.09)
Male log earnings		-0.21*** (0.07)	-0.18 (0.12)	0.37* (0.22)	0.06 (0.08)
Observations		257,569	116,519	21,064	90,607
		Panel B: Male earned more			
		Low-power	Female-power	Male-power	Power couples
Intercept		-14.90*** (0.49)	-11.63*** (0.78)	-13.99*** (0.57)	-11.18*** (0.38)
Number of children	1	-0.44*** (0.17)	-0.09 (0.33)	-0.08 (0.19)	-0.31 (0.31)
	2	-0.37** (0.17)	-0.09 (0.33)	0.03 (0.19)	-0.19 (0.33)
	3	-0.39** (0.17)	0.05 (0.33)	0.04 (0.18)	-0.15 (0.33)
	+				
	[0]				
Female log earnings		0.09*** (0.03)	-0.07 (0.05)	0.10*** (0.04)	0.03 (0.03)
Male log earnings		0.83*** (0.03)	0.71*** (0.04)	0.75*** (0.03)	0.61*** (0.02)
Observations		1,596,144	359,593	273,467	429,506

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

One potential concern related to our analysis is whether the number of emigrating couples is too small in some subgroups. Table A.3 shows that the group sizes are not too small for our analysis.

To examine the influence of the primary and secondary earners' incomes on emigration, we calculated the elasticity of the migration with respect to the primary and secondary earners' incomes for the groups depicted in Table 6. The formula for elasticity in each group, omitting group-specific subscripts, is $\frac{dp_{ab}}{dw_i} \frac{w_i}{p_{ab}}$, in which $i \in \{a, b\}$. 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 \mathbf{x} for the explanatory variables, which also includes dummy variables for the age of the female, age of the male, age of the oldest child and year. $p_{ab} = \Phi_{ab}(\mathbf{x}\beta)$ is the probability of emigration as a function of the log earnings and other explanatory variables (see footnote 14 for details). The elasticities are calculated as the average values for each of the eight groups and are depicted in Figure 5.

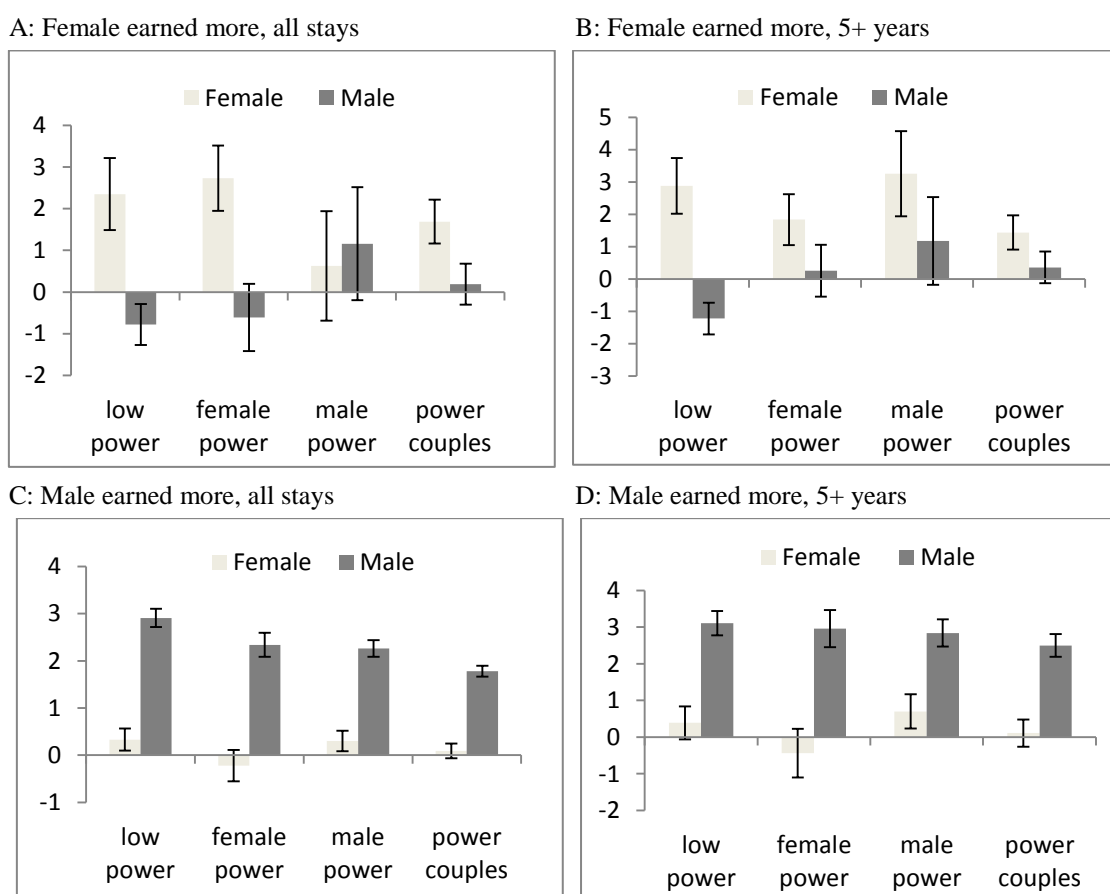


FIG. 5. – The elasticity of migration for couples with respect to incomes. The results are presented as elasticity with 95% confidence intervals, which are estimated at the average ages and incomes within the

groups for which the elasticity is calculated. Women and men are between 25 to 37 years of age. Emigration years are 1982 to 2010 in panels A and C, and 1982 to 2005 in panels B and D. The probability of emigration was estimated based on the earnings during the previous year including only the couples in which both partners worked at least 60% of the full working time.

When analyzing across all emigration events (i.e., panels A and C), the probability that a couple will emigrate increases strongly with the primary earner's income, with the exception of a small group of male-power couples in which the females earn more. With respect to the other groups, the elasticity ranges between 1.69 and 2.73 for the couples with a female primary earner, and between 1.78 and 2.91 for the couples with a male primary earner. The elasticities are larger when the focus is restricted to long stays, ranging between 1.44 and 3.26 for groups with a female primary earner, and 2.50 and 3.11 for groups with a male primary earner. These elasticities are considerably larger than those for single persons (see Figure 4). The elasticity of migration for five or more years with respect to the primary earner's income is always larger than the elasticity of migration for five or more years with respect to the secondary earner's income, which is consistent with Proposition 3. When short stays are included, this result holds for the other groups, with the exception of the 0.7% of couples in which only the male is college educated but the female earned more.

Proposition 5 assumes that migration costs are the same for both partners and predicted that the elasticity of migration for a couple with respect to the primary earner's home-country wage is always larger than the elasticity of migration for the primary earner with respect to his/her home-country wage as a single person, with the opposite pattern holding for secondary earners. Given that migration costs may depend on education and the presence of children, we compared the elasticities between single persons and primary and secondary earners in low-power couples and power couples, restricting the analysis to couples and single persons without children. The elasticities are calculated at the average income levels of the single persons who are the same gender and have identical levels of education. For couples, the average ages and earnings are used for the partners. These are calculated for each power type separately for those couples with female and male primary earners. The elasticities and test statistics, as well as the associated p-values, are presented in Table 7. The test statistics utilized the approximations

for large samples $\frac{el_1 - el_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \xrightarrow{d} Z \sim N(0,1)$ (see Bain and Engelhardt 1992, p. 380).

TABLE 7: ELASTICITY OF MIGRATION AMONG SINGLE PERSONS AND COUPLES

Panel A: Single persons vs. primary earners, all stays					
	College	Single	Primary earner	Z	p-value
Female	No	0.14	2.15	9.24	0.00
	Yes	0.61	1.84	6.40	0.00
Male	No	0.59	2.42	28.97	0.00
	Yes	0.87	2.04	17.32	0.00
Panel B: Single persons vs. primary earners, 5+ years					
	College	Single	Primary earner	Z	p-value
Female	No	0.49	2.29	4.18	0.00
	Yes	0.90	2.10	2.95	0.00
Male	No	1.00	2.87	14.52	0.00
	Yes	1.10	2.59	10.45	0.00
Panel C: Single persons vs. secondary earners, all stays					
	College	Single	Secondary earner	Z	p-value
Female	No	0.14	0.15	-0.03	0.51
	Yes	0.61	0.12	6.53	0.00
Male	No	0.59	-0.19	4.25	0.00
	Yes	0.87	-0.17	6.38	0.00
Panel D: Single persons vs. secondary earners, 5+ years					
	College	Single	Secondary earner	Z	p-value
Female	No	0.49	0.24	1.61	0.05
	Yes	0.90	0.22	4.12	0.00
Male	No	1.00	-0.35	3.94	0.00
	Yes	1.10	-0.32	4.51	0.00

Notes: The elasticities of migration are calculated on each line at the average income levels of the single persons. For each group, the elasticity is calculated at the average age. H_0 is in panels A and B such that the elasticity for the single persons was greater than or equal to the elasticity for the primary earners in the couples. H_0 is presented in panels C and D such that the elasticity for the single person is less than or equal to the elasticity for the secondary earners in

the couples. Z denotes the test statistics for the differences in elasticities and p -values for the confidence levels at which H_0 could be rejected.

Why is the elasticity of couple migration with respect to the primary earner's income so large? Our conjecture is that it reflects the colocation problem and the need for intra-family compensating transfers. Costa and Kahn (2000) showed that the colocation problem plays a major role in American power couples as these couples increasingly chose to live in large metropolitan areas. The colocation problem may be even more severe with regard to international migration. When one partner is a tied mover, the gains for the partner who has a strong preference toward migration must be sufficient to compensate the tied mover. Given that the probability of emigration increases strongly with the primary earner's income, migration decisions may be made in the interest of the primary earner regardless of whether the earner is male or female. If migration decisions were more heavily influenced by the male's job opportunities, then we would expect the elasticity with regard to the male's income to always be positive, which is not the case.

To test the importance of our division of couples according to the primary earner's gender, we calculated the elasticity of migration with respect to the male and female incomes and did not separately analyze couples with male and female primary earners. In this context, the elasticities were similar to those observed for those couples with males as the primary earners.

5.3. All couples

Up to this section, our analysis has focused on dual-earner couples. Although this group is best suited to test our theory, approximately half of the couples satisfying our age restriction do not satisfy these criteria. Therefore, we extend the analysis to include these couples.

The first two columns of Table 8 explain the decision to emigrate according to male and female education levels, number of children, age of the female, age of the male, and age of the oldest child. The main focus here is on estimating the effect of the male and female education levels. The third and fourth columns add labor market status and earnings. When annual earnings are less than DKK 1, the log of the earnings is replaced with a zero, which allows us to keep in the analysis couples with a partner who stays at home and earns no income. The first and third columns analyze the couples in which the female earned more and the second and fourth columns analyze the couples in which the male earned more.

TABLE 8: PROBIT REGRESSION FOR FAMILY EMIGRATION

		Female earned more	Male earned more	Female earned more	Male earned more
Intercept		-3.19*** (0.06)	-3.13*** (0.03)	-2.99*** (0.14)	-6.19*** (0.18)
Power couples		0.51*** (0.02)	0.58*** (0.01)	0.49*** (0.02)	0.55*** (0.01)
Female-power couples		0.21*** (0.02)	0.22*** (0.01)	0.20*** (0.02)	0.21*** (0.01)
Male-power couples		0.36*** (0.02)	0.49*** (0.01)	0.35*** (0.02)	0.45*** (0.01)
[Low-power couples]					
Number of children	1	-0.39** (0.20)	-0.43*** (0.08)	-0.40** (0.20)	-0.40*** (0.08)
	2	-0.34* (0.20)	-0.37*** (0.08)	-0.36* (0.20)	-0.35*** (0.08)
	3+	-0.29 (0.20)	-0.31*** (0.08)	-0.29 (0.20)	-0.29*** (0.08)
	[0]				
Female occupation	OLF			-0.01 (0.05)	0.01 (0.02)
	Student			0.07 (0.05)	0.15*** (0.02)
	Unem- ployed [Work]			-0.02 (0.04)	-0.03** (0.01)
Male occupation	OLF			0.15*** (0.03)	0.32*** (0.05)
	Student			0.16*** (0.03)	0.55*** (0.04)
	Unem- ployed [Work]			-0.02 (0.03)	0.10*** (0.03)
Female log earnings				-0.02** (0.01)	-0.01*** (0.00)
Male log earnings				0.01*** (0.00)	0.24*** (0.01)
Observations		1,277,941	4,607,220	1,277,941	4,607,220

Notes: Dummy variables for the age of the female, age of the male, age of the oldest child and year are included in all the models. OLF is an abbreviation for out of the labor force. When annual earnings are less than DKK 1, the log of the earnings is replaced with a zero. Robust standard errors clustered at the household level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The effects of male and female's education levels are consistent with the results for dual-earner couples. The power couples are most likely to emigrate and the low-power couples least likely to emigrate. Couples with children are less mobile, and couples in which either partner is a student are more mobile. Notably, the effects of unemployment

relative to being employed arise only for couples in which the male earns more. In these couples, the male being unemployed increases the likelihood of emigration and the female being unemployed reduces this likelihood. Note here that the labor market status is measured during the last week of November; someone who was unemployed then could have worked earlier that year. The most surprising finding is that the likelihood of emigration increases with the male's income and decreases with the female's income, regardless of whether the male or female earns more. However, only the effect of the male primary earner's income is large in its absolute value. Given that our theoretical model only analyzes dual-earner couples, this finding should not be understood to refute the model. This finding highlights that the relatively gender-neutral emigration pattern of the dual-earner couples with respect to the primary and secondary earners' incomes is replaced by a more male-centered pattern in couples in which at least one of the partners (typically the female) does not fulfill the requirement of working at least 60% of the full working time.

6. Couple Migration and the Roy-Borjas Model

Our model allows different skill prices in the country of origin and destination. To test the role of different skill prices empirically, we ran our probit regressions separately for different destinations. Other Nordic countries have relatively small wage differences that are similar to Denmark, meaning that the returns to human capital in the country of origin and abroad, β_0 and β_1 , can be expected to be rather similar. English-speaking countries constitute an interesting group to study for two reasons. First, they all have wider wage differentials than Denmark. Second, Danes generally speak English very well, meaning that it is unlikely that either partner would be unable to work in one of these countries due to language difficulties. Finally, the rest of the world generally has wider income differences than Denmark and other Nordic countries, but it is also likely that partners differ in their language skills, suggesting that a tied mover may have to stay at home.

An important concern related to our results is that the self-selection that we observe could be at least partly driven by immigration rules in destination countries. To test the effects of immigration rules, we divided the English-speaking countries into two groups. Danes can migrate freely to the United Kingdom and Ireland because of joint membership in the European Union. The United States, Canada, Australia and New Zealand need not admit everyone who wants to migrate from Denmark. Furthermore, visa rules in the latter group of countries may prevent the accompanying spouse from working.

The elasticity of migration to different destinations with respect to female and male earnings is presented in Table 9. The elasticities are derived using similar specifications

as in Table 4 and then estimated as in Figure 5. Importantly, the qualitative effects of the other explanatory variables are included in all the regressions presented in Table 9 as in Table 4. Regardless of whether all the migration episodes or only the migration episodes that lasted five years or more are analyzed, power couples and male-power couples were the most likely to emigrate to all the destinations, in analyses of both couples in which the male earns more and in which the female earns more. The number of emigrating couples in each subgroup is presented in Table A.4.

TABLE 9: 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	0.707 [0.448]	-0.116* [0.134]	0.306 [0.689]	0.103 [0.287]
Male earnings	-0.611*** [0.182]	1.719*** [0.120]	-0.853*** [0.244]	1.829*** [0.223]
UK and Ireland				
Female earnings	2.268*** [0.665]	0.512*** [0.146]	1.430 [1.673]	0.868*** [0.336]
Male earnings	0.940 [0.745]	3.026*** [0.123]	1.028 [1.376]	3.551*** [0.221]
US, CA, AU, NZ				
Female earnings	2.585*** [0.388]	0.251** [0.122]	4.352*** [0.761]	0.578** [0.276]
Male earnings	-0.260 [0.377]	2.304*** [0.092]	-0.744* [0.445]	2.579*** [0.209]
Rest of the world				
Female earnings	2.254*** [0.296]	0.115 [0.076]	2.637*** [0.706]	0.060 [0.173]
Male earnings	-0.008 [0.330]	2.257*** [0.062]	0.785 [0.909]	3.024*** [0.123]

Notes: In each column, we report the estimated elasticity of migration for a dual-earner couple with respect to female income and male income for each destination. The elasticities are estimated at the average ages and incomes within the groups for which the elasticity is calculated for each country group listed above the cells, and for the groups of couples specified in each column. The coefficients that underlie the elasticities are derived from regressions that include the power type and number of children as additional explanatory variables, and dummy variables for the age of the female, age of the male, age of the oldest child and year – as in Table 4. Full regression tables are available upon request. In each probit regression, the couples migrating to any other destination are excluded. Robust standard

errors clustered at the household level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results presented in Table 9 are consistent with both the Roy-Borjas model (Roy 1951; Borjas 1987) and our theoretical model. In line with the theoretical predictions in Borjas (1987), we find that the emigrants are more strongly positively selected with regard to income for the English-speaking countries and the rest of the world than for the other Nordic countries. This finding holds for both the primary and secondary earners regardless of whether the primary earner is male or female. In line with our theoretical model, the elasticity of migration with respect to the primary earner's income is always positive, whereas the elasticity of migration with respect to the secondary earner's income varies with respect to its sign and is always smaller than the elasticity with respect to the primary earner's income. This finding suggests that emigration is driven by the primary earner's job opportunities for all countries. Elasticity with respect to the secondary earner's income is always larger for the United Kingdom and Ireland than for the United States, Canada, Australia and New Zealand, which may reflect the fact that visa rules in the latter group prevent accompanying spouses from working. Nonetheless, the elasticity with respect to the primary earner's income is of similar magnitude and is larger for male primary earners when migrating to the United Kingdom and Ireland and for female primary earners when migrating to the United States, Canada, Australia and New Zealand. Therefore, our central finding that primary earners in couples are more strongly self-selected than single persons does not appear to be driven by immigration restrictions.

7. Return Migration

Ideally, we would have liked to track migrants' income abroad, to analyze how its development is related to return decisions. As income is observed only in the country of origin, such an ideal setting is not available. Instead, we next analyze how return decisions are related to pre-migration characteristics. Table 10 shows the effects of the female's and the male's log income on the likelihood of return migration, using proportional hazard model. We find that the estimated effect of primary earner's income on returning is always negative, although the effect is not statistically significant among couples with a female primary earner or in low-power couples with a male primary earner. The lack of statistical significance in couples with female primary earners most likely reflects much smaller sample sizes. The estimated effect of the earnings of the secondary earner is sometimes positive and sometimes negative, and statistically insignificant apart from male power couples with male primary earner, among whom the

likelihood of returning is decreasing also in the female secondary earner's income. For example, in male power couples with male primary earner a one-percent increase in the male earnings reduces the likelihood of returning in any given time interval by 0.4 percent, while a one-percent increase of female earnings reduces the likelihood of returning by 0.3 percent.

TABLE 10: THE PROPORTIONAL HAZARD MODEL OF RETURN MIGRATION

	Panel A: Female earned more			
	Low-power	Female-power	Male-power	Power couples
Female log earnings	-0.754 (0.474)	-0.218 (0.578)	-1.142 (2.573)	-0.137 (0.287)
Male log earnings	0.638 (0.477)	0.227 (0.343)	-2.065 (1.195)	0.083 (0.291)
Observations	182	158	72	380
	Panel B: Male earned more			
	Low-power	Female-power	Male-power	Power couples
Female log earnings	-0.078 (0.102)	0.126 (0.153)	-0.316*** (0.096)	-0.080 (0.072)
Male log earnings	-0.041 (0.095)	-0.375*** (0.137)	-0.398*** (0.116)	-0.348*** (0.070)
Observations	1,338	623	1,193	2,548

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

Overall, our results suggest that accounting for return migration accentuates the self-selection of primary earners, in line with what Borjas and Bratsberg (1996) found with respect to return migration from the United States.

8. Conclusion

In this article, we first presented a theoretical model regarding the emigration of dual-earner couples and then we tested it using register data for the entire Danish population. Our theoretical model predicted that the probability of emigration would increase with the primary earner's income, whereas the effect of the secondary earner's income may operate in either direction. The empirical results were broadly consistent with this prediction regardless of whether the couples had children and whether the male or female is the primary earner. Also the prediction that the elasticity of migration with respect to the

primary (secondary) earner's pre-emigration income is larger (smaller) in couples than it would be for the primary (secondary) earner as a single person is in line with empirical evidence. This result is novel and counter to the intuition that partnership ties weaken self-selection due to an imperfect correlation in the earnings potential between the partners (see Borjas and Bronars 1991). If migration decisions were more responsive to male job opportunities, as suggested by the previous literature regarding internal migration, then we would expect the elasticity with regard to the male's income to always be positive, which is not the case.

To test the role of skill price differences, we analyzed migration to other Nordic countries, English-speaking countries and the rest of the world separately. The probability of emigration increases with the primary earner's income for each destination group, although the point estimate for the pre-migration earnings for the female primary earners was not statistically significant with respect to migration to the other Nordic countries. The positive effect of home-country income is stronger for the English-speaking countries and the rest of the world than for the other Nordic countries, which is consistent with previous results concerning skill price difference by Borjas (1987) and Grogger and Hanson (2011). Therefore, both rewards to skill and couple dynamics play important roles in the self-selection of migrants. A separate analysis of the English-speaking destination countries both in the European Union and outside of it suggests that our results are not driven by immigration rules in the destination countries. The predictions of our theory are satisfied for both groups of destination countries.

We also found that couples are most likely to emigrate when both partners have college degrees. The male's education plays a bigger role than the female's education in emigration decisions regardless of which partner earned more in Denmark. Furthermore, the emigration rates for couples with male primary earners are considerably higher than those with female primary earners when the males had college educations, whereas these differences among couples in which the male does not have a college education are minor. We also analyzed all the couples without the restriction that both partners had to work and found that emigration increases more strongly in association with male education levels. The probability of emigration increases strongly with the male's income in couples with male primary earners, whereas the effects of both male and female incomes were small in couples with female primary earners. Taken together, our findings suggest a mixture of dual-earner couples emphasizing the primary earner's income regardless of the primary earner's gender, although the traditional male breadwinner model remains such that greater weight is placed on the male's education, at least for a significant subsample of couples.

Appendix A

Proof of Proposition 1

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

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

$$(A1) \quad \bar{x}^2 \left(1 + \frac{w_a}{2w_b} + \frac{w_b}{2w_a}\right) - \frac{2c}{w_b}\bar{x} - \frac{2c}{w_a}\bar{x} + \frac{2c^2}{w_a w_b} < \bar{x} - \frac{c}{w_a}.$$

Given that the definition (4) of wage differences is relatively small, it can be rewritten as

$$(A2) \quad w_a \bar{x} - 2c < (1 - \bar{x})w_b.$$

Insert the next notation $w_a = \alpha w_b$ into (A1), which yields

$$(A3) \quad \bar{x}^2 \left(1 + \frac{\alpha}{2} + \frac{1}{2\alpha}\right) - \frac{2c\bar{x}}{w_b} - \frac{2c\bar{x}}{\alpha w_b} + \frac{2c^2}{\alpha w_b^2} - \bar{x} + \frac{c}{\alpha w_b} < 0.$$

A further manipulation gives

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

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

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

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

$$(A4) \quad \frac{1}{2\alpha} (A(A + 1) - \bar{x}(\alpha - 1)) < 0.$$

Observe that $A < \frac{2c}{w_b} - 2\bar{x} < 0$ as $\alpha > 1$ and $A + 1 = \frac{1}{w_b} [2c - w_b(\bar{x}(1 + \alpha) - 1)] > 0$

by inequality (A2). Therefore, (A4) is satisfied, completing the proof.

Proof of Proposition 2

$$\begin{aligned} \frac{\partial p_{ab}^{\text{small}}}{\partial w_a} &= \bar{x}^2 \left(\frac{1}{2w_b} - \frac{w_b}{2w_a^2} \right) + \frac{c_a + c_b}{w_a^2} \bar{x} - \frac{(c_a + c_b)^2}{2w_a^2 w_b} = \frac{\bar{x}^2}{2w_b} - \frac{(w_b \bar{x} - c_a - c_b)^2}{2w_a^2 w_b} \\ &> \frac{\bar{x}^2}{2w_b} - \frac{(w_b \bar{x})^2}{2w_a^2 w_b} = \frac{\bar{x}^2}{2w_b} \left(1 - \frac{w_b^2}{w_a^2} \right) > 0 \text{ and } \frac{\partial p_{ab}^{\text{large}}}{\partial w_a} = \frac{c_a + c_b}{w_a^2} + \frac{w_b}{2w_a^2} (1 - 2\bar{x}) > 0. \end{aligned}$$

Proof of Proposition 3

With large wage differences, $\frac{\partial p_{ab}^{large}}{\partial w_b} = \frac{2\bar{x}-1}{2w_a} < 0$. With small wage differences,

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

To determine whether this result 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 $w_a = 1.6$, $\frac{\partial p_{ab}^{small}}{\partial w_b} < 0$, which completes the proof that the effect may go in either direction. With large income differences, an increase in the primary earner's income always increases the probability of emigration more than an increase in the secondary earner's income. To determine whether this also holds for small income differences, note that

$$\begin{aligned} \frac{\partial p_{ab}^{small}}{\partial w_a} - \frac{\partial p_{ab}^{small}}{\partial w_b} &= \frac{\bar{x}^2}{2w_b} - \frac{\bar{x}^2 w_b^2 - 2\bar{x} w_b (c_a+c_b) + (c_a+c_b)^2}{2w_a^2 w_b} + \frac{\bar{x}^2 w_a}{2w_b^2} - \frac{\bar{x}^2}{2w_a} - \frac{(c_a+c_b)\bar{x}}{w_b^2} + \\ \frac{(c_a+c_b)^2}{2w_a w_b^2} &= \frac{(w_a-w_b)[\bar{x}(w_a+w_b)-c_a-c_b]^2}{2w_a^2 w_b^2} > 0. \end{aligned}$$

Proof of Proposition 4

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

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

Proof of Proposition 5

Assume $c_a = c_b = c$ and until point (iii), $w_a > w_b$. The elasticity of migration of k , $k \in \{a, b\}$, as a single person would be $\frac{\partial p_k}{\partial w_k} \frac{w_k}{p_k} = \frac{c}{\bar{x} w_k - c}$. The elasticity of migration for

a couple with respect to w_a is $\frac{\partial p_{ab}^{small}}{\partial w_a} \frac{w_a}{p_{ab}^{small}} = \frac{\bar{x}^2 \left(\frac{w_a}{2w_b} - \frac{w_b}{2w_a} \right) + \frac{2c}{w_a} \bar{x} - \frac{2c^2}{w_a w_b}}{\bar{x}^2 \left(1 + \frac{w_a}{2w_b} + \frac{w_b}{2w_a} \right) - \frac{2c}{w_b} \bar{x} - \frac{2c}{w_a} \bar{x} + \frac{2c^2}{w_a w_b}}$ with a small

wage difference and $\frac{\partial p_{ab}^{large}}{\partial w_a} \frac{w_a}{p_{ab}^{large}} = \frac{\frac{2c}{w_a} + \frac{w_b}{2w_a} (1-2\bar{x})}{\bar{x} - \frac{2c}{w_a} + \frac{w_b}{2w_a} (2\bar{x}-1)}$ with a large wage difference. The

elasticity of migration for a couple with respect to w_b is

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

with a small wage difference. (i) For small wage differences, inserting the terms into $\frac{\partial p_{ab}^{small}}{\partial w_a} \frac{w_a}{p_{ab}^{small}} > \frac{\partial p_a}{\partial w_a} \frac{w_a}{p_a}$, multiplying both sides

by denominators and simplifying yields $\bar{x}^3 \left(\frac{w_a^2}{2w_b} - \frac{w_b}{2} \right) + c \bar{x}^2 \left(1 - \frac{w_a}{w_b} \right) > 0$. This holds

whenever $w_a > w_b$. Inserting the terms into $\frac{\partial p_{ab}^{small}}{\partial w_b} \frac{w_b}{p_{ab}^{small}} > \frac{\partial p_b}{\partial w_b} \frac{w_b}{p_b}$, multiplying both

sides by denominators and simplifying yields $\bar{x}^3 \left(\frac{w_b^2}{2w_a} - \frac{w_a}{2} \right) + c \bar{x}^2 \left(1 - \frac{w_b}{w_a} \right) < 0$. Mul-

multiplying both sides by $\frac{2w_a}{\bar{x}^2}$ and dividing by $(w_a - w_b)$ yields $-\bar{x}(w_a + w_b) + 2c < 0$, which always holds. (ii) For large wage differences, inserting the terms into $\frac{\partial p_{ab}^{large}}{\partial w_a} \frac{w_a}{p_{ab}^{large}} > \frac{\partial p_a}{\partial w_a} \frac{w_a}{p_a}$, multiplying both sides by denominators and simplifying yields $\bar{x}c + \frac{\bar{x}w_b}{2}(1 - 2\bar{x}) > 0$, which holds always. Given that the $\frac{\partial p_{ab}^{small}}{\partial w_b} < 0$ according to Proposition 3, the claim $\frac{\partial p_{ab}^{large}}{\partial w_b} \frac{w_b}{p_{ab}^{large}} < \frac{\partial p_b}{\partial w_b} \frac{w_b}{p_b}$ holds automatically. (iii) Assume that $w_a = w_b$. Inserting this shows that $\frac{\partial p_{ab}^{small}}{\partial w_a} \frac{w_a}{p_{ab}^{small}} = \frac{\partial p_a}{\partial w_a} \frac{w_a}{p_a} = \frac{\partial p_{ab}^{small}}{\partial w_b} \frac{w_b}{p_{ab}^{small}} = \frac{\partial p_b}{\partial w_b} \frac{w_b}{p_b}$.

Appendix B

TABLE A.1. EMIGRATION RATES (IN PERCENTAGES) OF MARRIED COUPLES

		Male education	
		Low	High
Female education	Low	0.10	0.47
	High	0.21	0.63

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

Panel A: Emigration rates for 5+ years (in percentages) according to education			
		Male education	
		Low	High
Female education	Low	0.03	0.11
	High	0.05	0.12
Panel B: Emigration rates for 5+ years (in percentages) when the female earned more			
		Male	
		Low	High
Female education	Low	0.03	0.08
	High	0.04	0.09
Panel C: Emigration rates for 5+ years (in percentages) when the male earned more			
		Male	
		Low	High
Female education	Low	0.03	0.12
	High	0.05	0.13

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

TABLE A.3: THE NUMBER OF EMIGRATING COUPLES

	Low-power	Female-power	Male-power	Power
Female earned more	204	167	79	400
Male earned more	1,428	665	1,253	2,634

TABLE A.4: THE NUMBER OF EMIGRATING COUPLES

	Female earned more	Male earned more	Female earned more, 5+ years abroad	Male earned more, 5+ years abroad
Other Nordic countries	171	889	131	719
UK and Ireland	79	734	69	673
US, CA, AU, NZ	178	1,231	144	1,036
Rest of the world	422	3,126	365	2,739

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