Sex and Migration: Who is the Tied Mover?

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Abstract

We study the effects of interregional migration on two-earner household gross earnings as well as on the relative income between married and cohabiting couples. In particular, we examine the link between education level and income gains. The empirical analysis is based on longitudinal data from Sweden as well as on functional regional labour markets that operate as regional entities. Using difference-in-differences propensity score matching, we find that migration increases total gross household earnings and has no significant impact on the male/female earnings gap. We find that pre-migration education level is a key determinant of migration and economic outcomes and is also a determinant of the effect of migration on income distribution within the household. The positive average effect on household earnings is largely explained by income gains among highly-educated males. Females generally experience no significant income gain from migration in absolute terms. Females gain significantly in relative income only if they are highly educated and married or cohabitating with a lower-educated male.

Keywords: Regional migration, labor mobility, two earner households.

JEL Classification: J61, D10.

***** The authors are grateful for comments and suggestions from Xavier de Luna, Robert A. Nakosteen, Kent Eliasson and seminar participants at Umeå University and the 2006 European Association of Labor Economists (EALE) meeting and the 2006 European Society for Population Economics (ESPE) meeting. Financial support from the Wallander-Hedelius foundation and the Ageing and Living Conditions Programme at Centre for Population Studies, Umeå University, is gratefully acknowledged. Westerlund acknowledges financial support from The Swedish Governmental Agency for Innovation Systems (Vinnova).

I Introduction

Investments in human capita, including investments in health, education, and migration, are important for individuals, households, and for society as a whole. In a reasonably functioning economy, these investments are expected to increase the productivity of labour and welfare. They may also have substantial effects on income distribution between income earners within the household and within society in general. Investments in education and geographic mobility may provide opportunities to reduce income differences between males and females, but these investments may also reinforce existing income differences by asymmetrically favouring the careers of one gender.

This study examines the effects of migration on total household gross earnings and the relative income within married or cohabitating couples in Sweden. We devote special attention to the link between education level and the economic effect of migration for the spouses, because education level is a potential indicator of bargaining power, which plays a decisive role in modern theories of intra-household income distribution (Lundberg and Pollak, 1996, 2001). The studies within this field of research are relevant to international trends such as increases in the number of dual-income households, investments in education, proportions of females entering higher education, and interest in issues regarding gender equality.

Empirical economic research on migration has typically been oriented towards examining the determinants of migration and, to a somewhat lesser degree, its effect on income for singles or couples. Only a small fraction of migration research has been designed to study the effects on intra-household income distribution. Jacobsen and Levin (2000) examine interstate migration in the U.S. during the 1980s and report income gains for single women only. For

married couples, they find that the economic outcome of migration is negative, without any effect on the relative income between spouses. Smits (2001) uses data on married couples in the Netherlands and finds that migration has a negative effect on earnings for both spouses. Smits (2001) also finds that most long-distance moves occur in order to accommodate the male's career. Cooke (2003) studies married couples in the U.S. and finds that migration increases the husband's income while leaving the wife's income unchanged, which is consistent with results from an earlier American study by Sandell (1977). Cooke finds that this result holds even if a wife has greater earning potential than her husband. Nivalainen (2004) studies Finnish households and finds that migration largely occurs due to the demands of the husband's career, causing wives to become so-called tied migrants. Employment after migration is examined in Nivalainen (2005). The results indicate that employment among the majority of men is unaffected. However, some groups of migrating husbands have higher employment probabilities after migration, while women never realise the same positive returns in employment opportunities. Taylor (2007) uses information about reasons for migration within the UK to find that a majority of couples moving for job-related reasons are motivated by the husband's job opportunities. Taylor (2007) also finds that the probability of employment following a move is reduced more for tied movers than for non-migrants, and this effect is especially large for women.

Using data on two-earner households in Sweden, Axelsson and Westerlund (1998) find that migration does not affect real disposable income. Nilsson (2000) also examines Swedish data and concludes that migration increases the intra-household income gap within young households in which both spouses hold university-level graduate degrees.

The present study adds to current literature by focusing on the role of education and income levels for changes in internal family income distribution among a broad representation of dual-income households that relocate to another geographic labour market. Sweden provides an excellent ground for exploring these questions because of the high availability of data and the internationally high rate of labour force participation rate among women. We use longitudinal register data on a large sample of individuals who were married or cohabitating prior to and after migration. Regional labour markets are defined by commuting patterns between places of residence and workplaces, rather than by historically-defined administrative borders.

The remainder of this paper is as follows. Section II gives a brief summary of distribution theories on families and family migration. Section III presents the data and methods of estimation. Section IV provides the estimation results, followed by a summary of findings in Section V.

II Income distribution within the family and migration

One of the most common theoretical frameworks in economic studies of migration is the human capital model. In this model, individual utility varies across potential locations. An individual chooses to reside in the location that maximises utility based on location-specific costs and benefits (including the long-term costs for relocation). The human capital model has straightforward implications for a single decision-maker; for families, the decision to invest in migration is much more complex.

Within early models of family behaviour, which are often called common preferences models, the consensus model (Samuelson, 1956) and the altruist model (Becker, 1974) imply that family decisions are consistent with maximising a single utility function. One common feature of common preference models involves the pooling of incomes according to which the incomes of both spouses are pooled together and the allocation of expenditures is independent of the relative contributions by husband or wife. This means that a given increase in income has the same effect on family utility and consumer demand, irrespective of which spouse provides the income. Empirical evidence is generally inconsistent with this income pooling assumption, while more recent bargain models of family decisions seem to provide a more credible analysis of the migration decision than older common preferences models (Lundberg and Pollack, 1996).

For a dual-income household, migration affects the future careers and utility of both spouses. Presumably, a substantial share of family migrations involves compromises in the sense that a particular location may be optimal for the family, but it would not necessarily be optimal for an individual spouse if they were single. The term *tied migration* refers to the situation in which a spouse moves along with his/her partner even though the individual gain from the so-called "family optimum" is lower than the gain from the so-called "free optimum". At a location that is optimal for the family, total family utility is maximised, and thus, the tied migrant must receive enough compensation from the partner to migrate and stay in the relationship (Mincer, 1978). Similarly, one spouse may also be a tied stayer, receiving enough compensation from the other spouse to remain in the present location as well as in the marriage. It is also possible that both spouses are tied migrants or tied stayers.

In a bargaining model, it is assumed that individuals maximise their own utility and that family behaviour is not only dependent on total family income *ceteris paribus* but also on the determinants of a payoff in case no agreement is reached, which is called the threat point (Lundberg and Pollak, 1996). A threat point can be either external (such as divorce) or internal (i.e., an inefficient non-cooperative equilibrium within marriage). Presumably, the most extreme threat point for most couples is divorce, an outcome for which the threat point and the bargained outcome depend on external factors such as a spouse's opportunities outside the marriage. In everyday bargaining, the internal threat point is more relevant. A family's consumption is assumed to depend on the income-earning party within the marriage in contrast to pooling-based income models. The bargained outcome depends upon utility at the threat point, and family decisions depend on the higher-earning party within the marriage. It is reasonable to assume that the allocation problem has an external threat point, the spouses separate or divorce when they cannot agree on a residential location.

In the human capital model according to which a single utility function is maximised, it is assumed that the tied mover is compensated for a loss suffered from migration. The cooperative bargaining models assume that all agreements can be reinforced and that there are no restrictions on agreements made within the family. Furthermore, the cooperative models always lead to Pareto efficient outcomes (Chiappori, 1992). It is unlikely, however, that a couple can make binding agreements about the future distribution of resources within a marriage. Lundberg and Pollak (2001) illustrate a non-cooperative two-stage game in which a location is determined in the first stage and the distribution of resources is allocated in the second stage. An investment in human capital thus yields different returns for the two individuals, thereby affecting bargaining power in future negotiations as well as each spouse's ability to claim family

resources in the future. If it is impossible for spouses to make binding agreements about the future transfers of resources, the allocation problem may result in an inefficient outcome, such as an inefficient location or an inefficient divorce. An inefficient location is characterised by failing to maximise total household income. The tied spouse prefers a bigger piece of a smaller pie, and the leading spouse prefers to be married rather than being separated with a higher income.

Modern theories seem to accommodate empirical observations that are inconsistent with the older common preferences and income pooling models, and they generate several interesting and seemingly realistic implications. However, it appears extremely difficult to pursue rigorous empirical tests of these models, and thus, we make no such aspiration.[1] The specific empirical questions addressed here are:

- Does migration yield income gain for the household as a whole?
- Does migration affect relative income between spouses?
- How do observed changes in earnings relate to education level in terms of relative bargaining power?

Educational attainment is correlated with potential wage level. Therefore, it is reasonable to presume that education would affect a family's location decision as well as any returns from migration for both parties. Moreover, bargaining models suggest that some covariates in empirical household models of migration and post-migration income may be perceived as indicators of bargaining power. As pointed out by Lundberg and Pollak (2001), education is a possible candidate in this respect.

[1]Naturally, changes in wages or incomes do not translate into changes in utility by necessity. It is, for example, very difficult to incorporate a complete set of relevant indicators of compensating wage and income differentials into empirical models.

III Data and estimation

Data

We use annual panel data from various official registers from the Swedish National Tax Board, the National Labour Market Administration of Sweden, and Statistics Sweden. An advantage of this data is that spatial migration dimensions are delineated in terms of functional regions called Labor Market Areas. Created by Statistics Sweden, Labor Market Areas are based on an algorithm that exploits commuting flows within and between clusters of municipalities. The algorithm creates a set of 89 regions during the period of study in which commuting flows across borders are minimised. Since commuting options are limited between Labor Market Areas, migration is the most viable option for workers who are taking advantage of employment opportunities in other regions. This makes data more amenable to studies of labour-related migration, as opposed historically- or politically-defined regions. Migration is thus defined to occur when the Labor Market Area of residence changes between years.[2]

The sample used in this study pertains to residents in Sweden who were between 25-45 years old in 1997 and married or cohabitants with the same partner during 1997 and 2003. In the register data, two individuals are cohabitants if they are registered at the same address and if they have a child in common. Registered partnerships of same-sex couples are excluded. In line with most previous studies, we confine the analysis to couples who remained married or cohabitating during the period of observation, as such couples have

[2] This is the place of residence in December 31 according to official registers.

internalised the external effects of family ties (Mincer, 1978).[3] Using propensity score matching and balancing tests, we found strong indications of lacking comparability between moving and staying households with respect to the variable measuring pre-migration unemployment. For this reason, we confine the analysis to households with spouses that were either employed or outside the labour force in 1997.[4] This sample includes 125,891 couples, of which 1,911 migrated in 1998 or 1999. Sample means are given in Table 1, which distinguishes the sample by migration status and gender. For males, the mean of pre-migration earnings in 1997 terms is around 240,000 (SEK) for both movers and stayers, while the mean of post-migration earnings is higher among movers. The time path of average earnings for females indicates a slightly larger increase among migrants. Movers tend to be younger and have higher education than stayers, which is in line with our expectations.

[3]Couples that divorce during the period are not included. Descriptive statistics show that most divorces occur prior to a move and that couples that move together are not more or less likely to divorce.

[4] We conduct separate analysis for households experiencing unemployment in 1997; the results are discussed briefly in Section IV.

Table 1. Descriptive statistics

	Stayers		Movers	
Variable[5]	Females	Males	Females	Males
Individual attributes				
Gross wage earningsearnings 1997	1345.98	2426.08	1184.83	2417.62
Gross wage earningsearnings 2000	1610.80	2841.27	1474.71	3143.56
Gross wage earningsearnings 2001	1690.11	2923.94	1612.84	3254.29
Gross wage earningsearnings 2002	1764.26	2938.02	1700.33	3320.75
Gross wage earningsearnings 2003	1819.99	2934.96	1797.11	3378.10
Female earnings share 1997	0.376		0.342	
Female earnings share 2000	0.388		0.345	
Female earnings share 2001	0.394		0.363	
Female earnings share 2002	0.402		0.364	
Female earnings share 2003	0.409		0.376	
Age	35.55	37.43	33.22	34.87
Student 1997	.051	.015	.097	.063
Elementary school or Compulsory school	.101	.169	.074	.085
2-year secondary school	.398	.374	.224	.215
3-year secondary school	.133	.122	.116	.119
<3 years of university	.220	.173	.266	.223
≥3 years of university	.143	.151	.311	.319
Ph. D	.003	.0118	.006	.036
Farming	.011	.032	.004	.021
Manufacturing	.108	.273	.077	.196
Construction	.013	.108	.0131	.058
Retail	.154	.238	.127	.193
Private sector	.103	.143	.105	.166
Public sector	.537	.171	.532	.301
Couple attributes				
Child(ren)	.927	.927	829	.829
Small children	.335	.335	.519	.519
Welfare benefit	.018	.018	.049	.049
Migration history	.031	.031	.268	.268
Regional attributes:				
Access	-3.063	-3.063	-3.190	-3.190
Stockholm county	.201	.201	.209	.209
South of Sweden	.141	.141	.103	.103
Population	402,213	402,213	387,124	387,124
Number of observations:	123,980	123,980	1,911	1,911

[5] Definitions of the variables are given in the Appendix, Table A1.

Estimation[6]

Migration can be perceived as a treatment as compared to the non-treatment alternative of staying. The potential outcomes are Y_1 for migration and Y_0 for staying. For each individual, there is a pair of outcomes of which only one can be observed. The parameter of main interest is in this case the one which measures the average treatment effect on the treated, $ATT = E[Y_1 - Y_0 \mid M = 1]$, where M equals 1 for migration and 0 for non-migration. Clearly, $Y_0 \mid M = 1$ (i.e., what would happen to the migrants if they had not moved) cannot be observed. The outcomes of a sample of stayers thus serve as an estimate for this counterfactual outcome. The estimated effect of treatment can be biased if the selection mechanism is correlated with the outcome, such as in cases in which migrants have attributes that make them more mobile and more productive in any location.

Propensity score matching relies on the assumption that conditional on some observable characteristics X, potential outcomes are independent of the assignment to treatment. Rosenbaum and Rubin (1983) show that this conditional independence assumption also holds for some function of X; that is, $Y_0 \perp M \mid p(X)$, where $p(X)$ is the so-called propensity score and the probability that $M = 1$ given X. A condition of common support is added, which is that $p(X) < 1$ if ATT is the parameter of interest. This guarantees that a non-treated match exists for each treated individual. The propensity score may be estimated, for example, by binomial logit or probit.

We have a large set of non-migrants that is exploited to construct our comparison group. By using more than one individual as a counterfactual, bias

[6] See *e.g.*, Heckman et al., (1998).

increases, but variance is reduced. When propensity scores are asymmetrically distributed, a kernel-based procedure is beneficial, since it only uses the additional observations if they actually exist. The kernel-based procedure matches a migrant with comparable individuals among stayers. Assuming a migrant with outcome Y_i and propensity score p_i, kernel matching constructs its counterfactual outcome, $\hat{Y}_0$, from non-treated individuals with p_j within a predetermined bandwidth h of p_i and attaches more importance to closer matches. Given that $| p_i - p_j | < h$, the matched outcome $\hat{Y}_0$ is given by:

$$\hat{Y}_0 = \frac{\sum_{j \in \{D=0\}} K\left(\frac{p_i - p_j}{h}\right) y_j}{\sum_{j \in \{D=0\}} K\left(\frac{p_i - p_j}{h}\right)}$$

Note that the weights of the kernel K sum to one.[7] The purpose of the matching procedure is to balance the covariates between migrants and non-migrants, making the distribution of the counterfactual outcome of staying the same for the group of migrants. The estimated effect of migration is the observed average difference between the outcomes of the migrants and non-migrants in the matched sample.

In the present study, we use the method of difference-in-difference propensity score matching to estimate the effect of migration on household incomes and

[7] The weight of each untreated y_j is $K\left(\frac{p_i - p_j}{h}\right) \Big/ \sum_{j \in \{D=0\}} K\left(\frac{p_i - p_j}{h}\right)$.

relative incomes between spouses. By using information about the outcome variable before treatment, it is possible to eliminate potential bias due to time-invariant heterogeneity.[8] The difference-in-differences estimator can be written as $Y_1 - Y_0 = (Y_{1t+i} - Y_{1t}) - (Y_{0t+i} - Y_{0t})$, where the subscripts t and $t+i$ denote periods of time before and after migration.[9] The outcome variable in our main approach is constructed as $[WE_{1997+i} - WE_{1997}]$, where WE denotes real annual wage earnings, and i is between three and six years. We do this to distinguish eventual differences between immediate effects from effects that emerge over a few years.

We also examine the effect of migration on changes in the female share of total household earnings. This variable is constructed as $\frac{WE^F_{1997+i}}{\left(WE^F_{1997+i} + WE^M_{1997+i}\right)} - \frac{WE^F_{1997}}{\left(WE^F_{1997} + WE^M_{1997}\right)}$. This is also estimated after one, two, three and four years following the move.

Propensity score matching accounts for observed heterogeneity. The specification of the outcome as the difference-in-differences eliminates bias due to time-invariant unobserved heterogeneity that affects earnings. It should be noted that we take advantage of rich information on both individual and household characteristics. Together with the difference-in-difference approach, this should substantially reduce potential bias from unobserved heterogeneity.

[8] Smith and Todd (2005) find that difference-in-differences propensity score matching estimates are substantially less biased than cross-sectional matching estimates.

[9] The method of matching avoids the functional form restrictions of, for example, ordinary least squares (OLS) and also offers flexibility, as counterfactual outcomes are calculated for each treated individual. OLS regression techniques impose greater weight to the treatment effects for values of X that occur often and in cases in which the variance in M is relatively large. Given heterogeneous treatment effects, the OLS estimate of treatment does not correspond with *ATT*, and as pointed out by Angrist (1998), this may not necessarily be an interesting estimate for an economic researcher.

IV Results

The covariates in the estimation of the propensity score should have a causal effect on the probability likelihood of moving as well as on changes in income. A large number of attributes that according to theory and previous may affect both the the probability of moving and earnings, have been tested in the specification of the propensity score.[10] First, we estimate logit equations to identify which covariates influence the probability to move.[11] Second, we run regressions to see whether the variables from the first stage affect the difference in earnings and the difference in female earnings share in 1997, 2000, 2001, 2002, and 2003. The same set of variables is used in the estimations for all sub-samples. Separate tests for each sub-sample indicate that the matched samples are well balanced with respect to the included covariates. Because the distributions of estimated propensity scores are quite dense (namely, between 0.01 and 0.05), we have chosen a rather small bandwidth of 0.005. The choice of bandwidth is a trade-off between bias and variance. With a high bandwidth, the bias increases, and the variance decreases. Robustness checks using a smaller bandwidth of 0.001 and a larger of 0.01 indicate no substantial changes in results.

A common support restriction is imposed on the treated units, and thus, observations on migrants with propensity scores that are larger (smaller) than the highest (lowest) propensity score in the control group are not matched. Also, the five percent of treated observations with the lowest propensity score of control observations are eliminated. However, relaxing the common support

[10] The specification of the propensity scores is given in Appendix, Table A2. The propensity scores have been estimated for the entire sample and separately conditioned on the educational level of the spouses. This allows for different parameter specifications by education.

[11] Overmatching, i.e., using too many covariates to estimate the propensity score increases the mean squared error and may cause problems with common support (Caliendo and Kopeinig 2005, Waernbaum 2008). We have excluded variables with p-values of .2 or above.

restrictions only marginally changes the estimated results, yielding no implications regarding the conclusions of this study.

The kernel-matching estimate of ATT for the whole sample is given in Table 2.[12] The results indicate a positive average effect on post-migration gross wage earnings at the household level of about 25,700 SEK (about €2,400) four years after the move and about 21,400 SEK for males and 4,300 SEK for females.[13] The definition of migration in this study makes it possible for non-mover couples to actually migrate in subsequent years

Table 2. Propensity score matching estimates of the effect of migration on gross wage earnings (in 100 SEK)

Outcome	Females	Males	Household
WE_{2000}-WE_{1997}	12.00	147.77***	159.77***
	(24.15)	(50.85)	(56.87)
WE_{2001}-WE_{1997}	41.67	121.35***	163.01***
	(25.71)	(27.02)	(54.68)
WE_{2002}-WE_{1997}	26.45	160.67***	187.12***
	(28.23)	(46.94)	(55.91)
WE_{2003}-WE_{1997}	43.16	214.54***	257.69***
	(29.61)	(48.18)	(57.89)
Number of couples			125,891
Movers (off support)			1,911 (9)

Note: The estimates are based on the Normal kernel with bandwidth .005 and a common support restriction. The 5% of observations on migrants with the lowest propensity score density are removed. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Standard errors[14] in parentheses.

[12] Stata/SE 10.1 is used for estimation.

[13] The share of the movers (stayers) in higher education in 2000 is 3.7% (1.4%) for men and 9.5% (7.5%) for women. The share taking parental leave in 2000 is 46.9% (38.9%) for men and 63.5% (55.0%) for women. When controlling for age, a substantial portion of these differences disappear. We expect that when controlling for educational level and other covariates, this difference becomes even smaller. This should not influence our results.

[14] In large samples, there is evidence that the component of the variance from the estimation of the propensity scores can be disregarded (Eichler and Lechner, 2002).

If anything, this should bias the results downwards. The point estimates are all positive, indicating positive returns from migration overall. However, the estimated gains for females are not significantly different from zero.

To see whether these results hold when conditioning on the education level of the spouses, which is a potential indicator of bargaining power, we carry out separate estimations for different educational combinations within couples in Tables 3 and 4. If an individual has a university education, he/she is labelled as having a high level of education. If not, the individual has a low level of education.[15]

Table 3. Propensity score matching estimates of the effect of migration on gross wage earnings, conditional on the female having low education.

Outcome	Females		Males		Household	
	Male's education		Male's education		Male's education	
	Low	High	Low	High	Low	High
WE_{2000}-WE_{1997}	-73.53**	-14.38	4.09	374.33*	-69.43	359.95*
	(37.05)	(58.39)	(48.51)	(215.36)	(65.47)	(219.25)
WE_{2001}-WE_{1997}	-13.41	32.02	23.08	626.83**	9.67	658.85***
	(38.82)	(63.28)	(54.17)	(245.16)	(70.49)	(251.05)
WE_{2002}-WE_{1997}	-36.61	-19.60	42.44	591.44***	5.83	571.83**
	(41.83)	(67.21)	(57.91)	(223.94)	(77.00)	(230.99)
WE_{2003}-WE_{1997}	-53.24	-42.18	37.88	593.60***	-15.36	551.42**
	(42.92)	65.53	(62.75)	(223.81)	(81.70)	(225.95)
Number of couples					63,912	15,403
Movers (off support)					556 (17)	239 (4)

Note: The estimates are based on the Normal kernel with bandwidth .005 and a common support restriction. The 5% of observations on migrants with the lowest propensity score density are removed. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses.

Table 3 provides the results conditioned on females having low education. Most estimates are statistically insignificant. Looking at the point estimates of

[15] A separate analysis for households experiencing unemployment in 1997 provides similar results, but the standard errors are larger.

ATT, the estimated effect between 1997 and 2000 for low-educated females married to low-educated males indicate a reduction in earnings of about 7,500 SEK (a point estimate of -73.53). Low-educated females living with high-educated males experience an estimated loss in earnings between 1997 and 2000 of about 1,400 SEK (a point estimate of -14.38). For low-educated males married to low-educated females, the estimated increase in earnings is 400 SEK (a point estimate of -4.09). The estimated effect on earnings between 1997 and 2000 for high-educated males married to low-educated females is an increase of 37,700 SEK (a point estimate of is 374.33).

For a low-educated female in 1997, the returns from migration for the household as a whole differs with respect to her male partner's education level (Columns 5 and 6 in Table 3). A couple in which both spouses have low education experiences no monetary gain. The estimates are small or negative, and the estimated standard errors are relatively large. A couple in which the male has a high level of education but the female does not receives the highest estimated return from migration for the household as a whole (about 55,000 SEK); the male earnings growth of 59,000 SEK far exceeds the estimated female earnings reduction of more than 4,000 SEK. Again, the standard errors are rather large, and only the estimates of the male's gains and total household earnings are statistically significant.

Table 4 presents the results conditioned on a female having a university education. The estimated effect from migration on total household earnings is positive, regardless of the male's education level, but it is only significant when both spouses have a high level of educational attainment. The female's return is insignificant regardless of her husband's education.

Table 4. Propensity score matching estimates of the effect of migration on gross wage earnings, conditional on the female having high education.

	Females		Males		Household	
	Male's education		Male's education		Male's education	
Outcome	Low	High	Low	High	Low	High
WE_{2000}-WE_{1997}	60.72	40.81	10.48	233.20***	71.20	274.02
	(71.84)	(40.52)	(85.35)	(89.49)	(107.20)	(99.02)
WE_{2001}-WE_{1997}	136.84	34.41	-60.66	105.88	75.88	140.29*
	(76.46)	(43.39)	(92.17)	(69.96)	(124.36)	(83.50)
WE_{2002}-WE_{1997}	98.77	39.83	0.17	159.02**	98.94	198.85**
	(76.79)	(49.11)	(117.75)	(68.56)	(136.64)	(85.50)
WE_{2003}-WE_{1997}	94.17	98.67	-14.22	284.84***	79.94	383.51***(8
	(81.66)	(51.56)	(115.08)	(69.09)	(138.75)	7.81)
Number of couples					19,200	27,376
Movers (off support)					251 (3)	(865) (3)

Note: The estimates are based on the Normal kernel with bandwidth .005 and a common support restriction. The 5% of observations on migrants with the lowest propensity score density are removed. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses.

It seems that the education level of the husband is the primary determinant of the effect of migration on total household earnings. When both spouses have higher education, the total household gain from migration after four years is about 38,000 SEK, of which a major part is derived from the effect of the male's earnings.

A general impression from the estimates in Tables 3 and 4 is that the monetary benefit for a male with university education appears to be negatively correlated with the education level of his spouse. A highly-educated male living with a highly-educated female receives an increase in earnings that is substantially lower than for those living with lower-educated females (28,000 SEK as compared to 59,000 SEK four years after the move). For males and females with low education levels, the estimates indicate no statistically significant

effects, and the education level of the spouse does not seem to affect the economic outcome of migration.

Relative earnings within a household may be affected by the educational levels of the spouses. Table 5 gives the matching estimates of the effect on a female's share of household earnings between 1997 and post-migration shares measured each year from 2000 to 2003.

Table 5. Propensity score matching estimates of the effect of migration on the female's share of total household gross wage earnings with

Outcome	Females having low education		Females having high education	
	Male's education		Male's education	
	Low	High	Low	High
$\frac{WE^F_{2000}}{(WE^F_{2000}+WE^M_{2000})} - \frac{WE^F_{1997}}{(WE^F_{1997}+WE^M_{1997})}$	-0.0067 (0.0129)	-0.0079 (0.0166)	0.0324* (0.0181)	-0.0094 (0.0081)
$\frac{WE^F_{2001}}{(WE^F_{2001}+WE^M_{2001})} - \frac{WE^F_{1997}}{(WE^F_{1997}+WE^M_{1997})}$	0.0197 (0.0139)	-0.0061 (0.0173)	0.0428** (0.0178)	-0.0070 (0.0087)
$\frac{WE^F_{2002}}{(WE^F_{2002}+WE^M_{2002})} - \frac{WE^F_{1997}}{(WE^F_{1997}+WE^M_{1997})}$	0.0000 (0.0129)	-0.0168 (0.0174)	0.0356* (0.0189)	-0.0102 (0.0088)
$\frac{WE^F_{2003}}{(WE^F_{2003}+WE^M_{2003})} - \frac{WE^F_{1997}}{(WE^F_{1997}+WE^M_{1997})}$	0.0048 (0.0139)	-0.0147 (0.0193)	0.0377** (0.0190)	-0.0075 (0.0088)
Number of couples	63,359	15,164	18,949	26,511
Movers (off support)	539 (17)	239 (4)	251 (3)	865 (3))

Note: The estimates are based on the Normal kernel with bandwidth .005 and a common support restriction. The 5% of observations on migrants with the lowest propensity score density are removed. *, **, and *** indicates significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses.

When the sample is separated by education level, the signs of virtually all estimates are in line with the hypothesis that the relative education levels of spouses are indicators of bargaining power. However, the estimated effects pertaining to females with a lower level of education are insignificant. Substantial and statistically significant positive effects on a female's share of

household earnings are indicated for the sample of highly-educated females married to lower-educated partners. For this sample, migration seems to increase the female share of total household earnings by around 4%. The estimated results for couples with highly-educated males and lower-educated females are negative but insignificant. This may seem puzzling, since the highly-educated male experiences the largest increase. The estimates for the total sample indicate no significant effects of migration on the female's share of the total household earnings (results not presented here).[16]

V Summary

Our findings indicate that migration has a positive effect on total household gross wage earnings among married and cohabitating couples. The average effect is derived primarily from large earning increases among highly-educated males. The greatest income gains from migration are accrued by highly-educated males married to or cohabiting with lower-educated females. In general, we find little evidence of positive effects of migration on earnings among females. Nevertheless, education level seems to be positively correlated with income gains among females, although the estimated effects are relatively small or statistically insignificant, even for highly-educated females. When examining the change in the female versus male shares of total household earnings, we find that the effect of migration is negligible. However, highly-educated females coupled with lower-educated males experience a 4% increase in income share as compared to non-migrants.

[16]Results available upon request from the authors.

Although not conclusive, we interpret our empirical findings in relation to the concept of tied migration as follows. The substantial gain in total income among migrating dual-income households implies that eventual negative income effects from tied migration are not large enough to fully offset the increases in household income caused by migration. Moreover, tied migration does not counteract potential income gains to an extent that incurs a decrease in income for either earner. This applies on average for the entire sample.

Disaggregated analyses reveal that education levels affect the gains from migration in terms of individual earnings, total household earnings, and the female share of total earnings. The latter finding is, however, statistically and economically significant only for highly-educated females married or cohabitating with lower-educated males. For this group, the results support the hypothesis that relative education levels between spouses matters for bargaining power when household location decisions are made. Although general patterns of point estimates (that is, of earnings effects) for couples with other educational combinations support this hypothesis, statistical evidence does not provide a sufficient basis for strong conclusions in this regard.

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Appendix

Table A1. Definitions of variables

Individual attributes:
Gross wage earnings 1997-2003; in hundreds of Swedish Kronor (SEK).
Age; in 1997.
Child(ren); couple has at least one child below the age of 18 living at home.
Small children; couple only has children under the age of seven living at home.
Student; individual received study aid for higher education or adult education.
Educational level; highest level of education attained by 1997.
Sector; sector of work in 1997 according to the Industry code (sni92) as defined by Statistics Sweden.
Welfare benefit; family received benefit in 1997.
Migration history; at least one of the spouses has moved between 1994 and 1997.
Regional attributes:
Access; total employment in adjacent labour market regions, weighted by distance between regional centres.
Stockholm; couple lived in Stockholm county in 1997.
South of Sweden; couple lived in Skåne or Blekinge county in 1997.
Population; total population aged 16-64 in labour market region of residence in 1997.

Table A2. Estimation results

Variable	Logit estimation of migration in 1998 or 1999	Regression on difference in total household gross income 1997-2000
Access	-0.0047	1.347 *
	(-1.49)	(1.17)
Population	-4.35E-07 ***	0.0005 ***
	(-5.85)	(26.13)
South of Sweden	-0.3259 ***	-110.35 ***
	(-4.21)	(-6.92)
Age (M)	-0.0472 ***	-4.1240 ***
	(-8.71)	(-3.19)
Child(ren)	-0.7840 ***	564.62 ***
	(-9.7)	(25.64)
Student (M)	0.6241 ***	327.26 ***
	(5.8)	(7.35)
Student (F)	0.3938 ***	358.68 ***
	(4.69)	(14.28)
Welfare benefit	1.1611 ***	-9.8759
	(9.63)	(-0.24)
Small children	0.5870 ***	185.16 ***
	(9.4)	(13.1)
Migration History	1.7367 ***	35.823
	(29.14)	(1.15)
2- year secondary school (M)	-0.0560	1.464
	(-0.59)	(0.09)
3 –year secondary school (M)	0.3285 **	130.47 ***
	(3.07)	(6.1)
University (M)	0.5860 ***	460.96 ***
	(6.22)	(24.68)
2- year secondary school (F)	-0.2772 **	37.433 *
	(-2.72)	(1.89)
3 –year secondary school (F)	-0.1938 *	148.71 ***
	(-1.69)	(6.25)
University (F)	0.1848 *	347.26 ***
	(1.83)	(16.43)
Farming (M)	-0.2795 *	-169.12 ***
	(-1.68)	(-5.13)
Manufacturing (M)	-0.4320 ***	-28.052 *
	(-6.66)	(-1.87)
Construction (M)	-0.4827 ***	-77.538 ***
	(-4.58)	(-3.85)
Retail (M)	-0.2196 ***	11.702
	(-3.34)	(0.76)
Constant	-2.1681 ***	-259.19 ***
	(-9.25)	(-4.43)

Note: *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level. Male and female attributes are indicated with (M) and (F), respectively.