Migration from East to West Germany: Analysis of the Determinants of Migration Intentions

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Abstract

East-West migration within unified Germany was a large-scale socioeconomic phenomenon that occurred during the last decade of the 20th Century. This paper analyses the determinants of migration intentions using data from the German Socioeconomic Panel across the 1990s. Particular attention is paid to the modelling of wage differentials between East- and West Germans using a variety of econometric techniques. This study finds that the generated wage differentials do not explain migration propensity but finds highly non-linear effects in income, in addition concluding that potential transaction costs in the migratory process have a large impact on migration intentions.

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I. Introduction

Large-scale migration from former East Germany to the West characterised German society for much of the 1990s, leading to not only political turmoil but also to the economic destabilisation of certain regions within the former GDR. The following paper analyses the determinants of the process that precedes actual migration; the formation of intentions to move using data from the German Socioeconomic Panel[1] that spans from 1991 until 1999. Whilst the econometric models employed include a variety of economically and otherwise-motivated variables, particular attention has been paid to modelling wage differentials between East- and West-Germans, through exploiting the panel structure of the data and through using an Instrumental Variable approach, following a Heckman Two-Step procedure. The final analysis is conducted using Ordered Probit Limited Dependant Variable Models.

The primary impetus for the following analysis is the increasingly-apparent negative impact of the migratory process, not on the recipient western states but on the East itself. A recent spate of coverage[2] by the German media has highlighted the fact that the large-scale migration of the 1990s is now severely hindering the development of the East German economy, particularly through the lack of certain types of labour and the geriatrification of the East German countryside. In light of the recent EU enlargement and the upcoming opening of European labour markets to potential migrants from the accession nations, studying the phenomenon on a German Level yields valuable insights for future policies to prevent their economies from suffering a similar fate to East Germany's. In particular, the German case is an ideal testing ground for economic theory as certain real-world complications such as lack of common language, education system and cultural factors do not exist.

Due to the survey design of the GSOEP, intra-German migration is one of the few cases allowing an in-depth study of migration intentions. Previous empirical work in this area has

[1] Hereafter: GSOEP
[2] e.g. Kirbach, R. (2004).*"Die letzten Kinder"* . *Die Zeit (30.9.2004),* no. 41, Dossier

only considered observations in one year of the panel, typically in the earlier half of the decade. However, the recent additions to the dataset have made it possible to study the phenomenon from 1991 until 1999 and this study is the first to do so. Moreover, despite strong theoretical motivations, wage differentials have received little attention in previous papers; a fact remedied in this study.

Whilst the wage differentials modelled using the approaches outlined above were proven to have an insignificant impact on migration propensity, this paper found highly non-linear effects in household income, in line with other studies. Moreover, it appears that the young and educated, without significant attachments such as marriage, presence of young children or homeownership, are more likely to contemplate moving to the West than others, as are individuals who believe they will lose their job soon. In contrast, females and small-town inhabitants are less likely to express the desire to move. The findings suggest that thinking of the migration decision as an investment decision, i.e. in Net Present Value terms, provides a powerful framework for further analysis.

II. Literature Review

Although this paper is empirical in nature, the economic theories that aim to explain migration shall be introduced, before considering some previous applied studies. O'Connel (1997) reviews the existing approaches to migration based on past theoretical research and derives a sophisticated dynamic programming model of migration.

In the past, migration was often considered a method of gaining human capital. The decision is based on determining whether the net present value of the gains from moving, typically defined as the differential between the known wage in the source region (y_s) and the expected wage in the target region, (y_t) exceeds the cost of moving (c).

$$NPV(y_t, y_s, c, t) = \int_0^{\infty} [y_t(t) - y_s(t)] e^{-\rho t} dt - c$$

Equation 1: Migration Decision in terms of NPV[3]

Whilst there are many ways to construct expected wages, most of the literature follows Harris and Todaro[4] (1970), taking the minimum or the average wage and weighting it by the unemployment rate in the target region. The 'search-theoretic' models follow a different approach, emphasising the different ways in which migrants acquire information about the target region. A key implication of this type of model is the possibility of speculative migration arising; the riskier the wages in the target region, the more likely the decision to move.

However, as O'Connel (1997) points out, all models are very sensitive to assumptions about the structure of uncertainty. Depending on whether the variables are remotely observable, completely different outcomes arise. Whilst the author's dynamic programming solution to the migration problem results in a more robust model, testing this approach empirically is virtually impossible as proxies for future values of variables in the available data cannot be obtained.

Hunt[5] (2000) summarises the 'Roy' model, which compares the utility differential between the source (s) and the target (t) region, with the result that if the differential is larger than the disutility incurred from moving (c), migration occurs. The utility is given by Equation 2. The model predicts that the young and the higher-skilled are more likely to migrate.

$$U_{i,s} = U_{i,s}\left[e_{i,s}(U_s, X_i), w_s(w_s, X_i, I_s)\right] \quad where s = s,t$$

Equation 2: Utility in the Roy Model[6], where $e_{i,s}$ is the employment probability, which is given by regional unemployment (U_s) and personal characteristics (X_i). w_s is the wage received (w_s), which is determined by the average wage (w_s), personal particularities (X_i) and the wage inequality in the region (I_i)

3 According to: O'Connel, P. (1997)."Migration under uncertainty: "Try your luck" or "Wait and See"". Journal of Regional Science, vol. 37, no.2, p. 332; ρ is the discount factor

4 Harris, J. and Todaro, M. (1970). "Migration, Unemployment and Development: A Two-Sector Analysis." The American Economic Review, vol. 60, no. 1. p.126 - 142

5 Whilst Hunt (2000) studies the phenomenon of East- West Migration in great detail, the paper's results are not reviewed here, as she focuses on the migration process in its entirety and, in particular, considers the transition phases such as commuting. Similarly, Parikh and van Leuvensteijn (2003) use census, rather than GSOEP, data and is not reviewed here. Interestingly, however, this study also found non-linear effects in workers´ wages and that unemployment rate differentials are insignificant. (see review of results).

6 Hunt, J. (2000). *"Why do East Germans still live in East Germany?"*. NBER Working Paper No. 7564

The classic study of migration between East and West Germany was conducted by Burda[7] (1993), who tries to explain why, in spite of all theoretical factors predicting large-scale migration, it does not occur. Burda states that uncertainty plays a key role and introduces the option value approach to migration. In conventional models, the migration trigger value (Marshallian trigger) can be found by discounting the wage differential and adjusting for convergence; Should this value exceed the cost of migrating, the move occurs (see Equation 1). Instead, under the option theory, there are potential benefits from waiting for more information to be revealed. As in standard option theory, the value of this option increases in line with the underlying variance of the wage process abroad. Therefore, the option value trigger must be higher than the Marshallian trigger.

Burda (1993) conducts a binary logit analysis on the migration intentions in the year 1991 and includes a variety of explanatory variables summarised in Table 1.

Variables	*Effect on Migration Intentions*
Personal Characteristics	
Age	Strong negative impact
Partner	Negative and significant
Home Owner	Insignificant
Job Tenure	Negative and significant
Unemployment	Insignificant
Current Wage	Insignificant, once human capital has been controlled for
Recent wage growth	Insignificant, once human capital has been controlled for
Cost of Migration	
Rent	Lower rents have strong negative effect
Possible or certain loss of job	Positive and marginally significant
Small Town Resident	Negative and significant
Big City Dweller	Negative and significant, but less than small town

Table 1: Summary of key findings in Burda (1993)

He draws the conclusion that migration costs appear to be substantial and that the impact of uncertainty is ambiguous: On the one hand, the option value for waiting increases but agents are also risk-averse.

[7] Burda, M. (1993). "The determinants of East-West German migration". European Economic Review, vol.37, p. 452 – 461

A major issue, already identified by Burda, is the fact that wages are only observed for those who work; constructing a shadow wage would be a better solution than treating these values as missing. Moreover, the study focuses exclusively on current Eastern wages and does not take into account that what really matters, as highlighted by theory, would be the wage differential between East and West.

Burda, Hardle, Muller and Werwatz (1998) build on Burda's previous results but apply a more sophisticated estimation technique to a reduced set of variables from Burda's (1993) original data set. The authors also discuss the limitations of the data available. Migration intentions are problematic as agents may be irrational and unable to make predictions about their future behaviour. Even if they are rational, future realizations of migration may depend on shocks that are correlated across individuals, leading to econometric problems. Furthermore, they stress that the income differential is not easily measured as the potential income of migrants in the west is difficult to quantify and proxies or models are likely to yield biased results.

Initially, they run a logit regression and find that most coefficients have the expected sign: Age, presence of a partner, home ownership and environmental satisfaction negatively affect migration intentions whereas family ties to the west and poor labour market conditions have the opposite effect. An interesting result arises when considering income: The authors find that including a quadratic term in income causes both income terms to be insignificant; however, including terms up to a cubic yields all terms to be individually and jointly significant. Rather than experimenting with various functional forms, a semi-parametric function is estimated, in which all other explanatory variables enter linearly but a function in income, which is to be simultaneously estimated, is also included.

In general, the results of this model are in line with the logit case. However, the striking difference is that the income function is highly non-linear, nearly S-shaped across the

distribution[8]. Burda et al. offer several suggestions for this behaviour ranging from the option theory of migration, risk-aversion considerations, potential liquidity constraints or functional misspecification.

Potentially serious problems in their analysis include heterogeneity across individuals and omitted variable bias, as admitted by the authors themselves. In addition, I believe that the lack of proxies for future expectations or wage development make it virtually impossible to test the validity of the real options approach is valid or not. As previously, Burda et al. make no attempt to estimate wage differentials between the East and West, although they cite the previously mentioned biases as a reason for not doing so.

Buechel and Schwarze (1994) study the migration process from inception to execution by constructing a sequential logit model, using the same set of explanatory variables to first assess their impact on migration intentions and to try to determine their effect on the realization of the intention one year later. Their approach is motivated by the empirical observation that nearly all migrants expressed the desire to move, prior to executing their wish.

The list of explanatory variables is in keeping with other studies (Table 2).

Variables	*Effect on Migration Intentions*
Age	Negative and significant
Male	Positive and significant
Educational Level	Significant: The higher the educational level, the higher the migration propensity
Current State of Employment	Insignificant
Living with partner	Negative and highly significant
Expecting loss of job	Insignificant
Family ties to the West	Positive and highly significant
Household Income	Positive and significant
Subjectively unfair labour compensation	Positive and highly significant
Job tenure	Insignificant
Small town resident	Strongly negative and highly significant

Table 2: Summary of key findings by Buechel and Schwarze (1994)

The determinants of the ensuing migration decision are different from the previous stage[9] but due to the sample size (see below) may not be informative.

[8] The authors test the hypothesis of linearity in income, which is rejected outright.

Whilst the two-stage approach employed by the authors has theoretical merits, such as controlling for unobserved heterogeneity amongst individuals and a better exploitation of the panel structure of the dataset, the principal problem of this study is the fact that only 80 individuals have actually moved within the sample[10]. It is questionable whether statistical inference is valid, given the small sample size, and therefore this approach is not adopted here. Furthermore, the authors implicitly impose rigid assumptions about the decision-making horizon[11], which, given the complex nature of the decision, appear problematic

Generally, a major drawback to all the empirical papers is that they do not study the phenomenon across the 1990s but rather focus on a much shorter time period. In addition, as previously mentioned, whilst the theory suggests that wage differentials are a major driving force behind migration intentions, most papers reviewed avoid the issue altogether. Therefore, this paper aims to solidify previous research by extending the time-frame under analysis and attempting to accurately model the wage differentials that persist between East and West Germany, whilst assessing their explanatory power when considering the intention to move.

III. Methodology and Models

In order to investigate the problem empirically, the wage differentials and subsequently the migration intentions need first to be modelled. For the former case, a Mincer type wage equation shall be used. Naturally, wages are only observed for those who actually working, i.e. those members of the population who form part of the labour force. However, given that selection into the labour force is not a random process but is in fact driven by a variety of characteristics, simply using OLS to estimate the wage equation is likely to yield estimates that

[9] Age and sex no longer have an effect. The employment situation is now a significant factor, especially workers, who were forced to work less, and individuals, who feel their job is insecure, tend to move more often, the unemployed, however, do not. Some of the factors such as whether or not a person commutes to the west or has family ties to the target region are still significant at this stage of the model. Most interestingly, income and home ownership appear to be immaterial at this point in the process.
[10] cf. overall sample size of 4,000 individuals
[11] e.g. that the entire migration process takes two years from inception to execution.

suffer from sample selection bias, as illustrated by Johnston and DiNardo[12] (1997). This paper employs the Heckman Two-Step approach to tackle this problem.

The expected wage, given that a person is working, is illustrated in equation 3, where x_{1i}'are the parameters in the wage equation and x_{2i}'are the parameters that determine whether a person works or not.

$$E\{w_i \mid working = 1\} = x_{1i}'\beta_1 + \sigma_{12}\lambda_i, where\ \lambda_i = \frac{\phi(x_{2i}'\beta_2)}{\Phi(x_{2i}'\beta_2)}$$

Equation 3: Conditional expectations in the case of sample selection bias[13]

The second term, λ_i[14] and can be estimated via obtaining estimates for β_2 using a Probit model on whether a person is working or not. The fitted values can then be used to construct Heckman's λ, before including this correction term in a normal OLS regression for the Mincer wage equations. In this particular case, the Probit model takes the following form[15] (Equation 4)[16].

$$y_{it}* = \beta_0 + \beta_1 * Male_i + \beta_2 * age_{it} + \beta_3 * age^2{}_{it} + \beta_4 * townsize_{it} + \beta_5 * ISCED_{it} + \beta_6 * berlinwest_{it} + ... + \beta_{20} * Sachsen_{it} + \varepsilon_{it}$$

Equation 4: Latent Variable model for Labour Force selection[17] [18]

The approach outlined above, although frequently used, has been criticised heavily. In particular, as outlined by Verbeek[19] (2004), including variables in the Probit equation and then

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[12] Johnston, J. and DiNardo, J. (1997). *Econometric Methods.* Fourth Edition. p. 448

[13] σ_{12} is the covariance between the error of the wage equation and the error of the model for the selection into the labour force

[14] Generally referred to as Heckman's λ or the Heckman correction term

[15] For ease of notation, throughout this paper binary choice or multti-response models are expressed in terms of a latent variable threshold model. In the binary choice model, in this case a probit, model, the model takes the following form.

$$y_i * = x_i'\beta + \varepsilon_i \sim NID(0,1)$$
$$y_i = 1\ if\ \ y_i* > 0$$
$$y_i = 0\ if\ \ y_i* \leq 0$$

[16] Townsize uses the Boustedt System as a classification tool. It is coded from zero to seven, the higher the value of the variable, the bigger the size of the town. ISCED uses the ISCED international system for classifiying educational attainment; It is coded from 0 to 6, the higher the value, the higher the educational attainment.

[17] Please see the Appendix for a complete variable list

[18] Variables 6 to 20 are regional dummies for all regions within Germany: Berlin(West), Schleswig-Holstein, Hamburg, Niedersachsen, Bremen, Nordrhein-Westphalen, Hessen, Rheinland-Pfalz and Saarland, Baden-Würtemberg, Berlin(East), Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Thüringen and Sachsen; Reference Category is Bavaria

omitting them from the ensuing OLS estimation may severely impact on the results, if, in this case, it is not absolutely certain that these particular variables do not affect wages. However, as outlined by DiNardo and Johnston (1997), if the variables in both stages are identical, then the model will not work very well and results hinge exclusively on the normality assumptions being correct, which makes inference potentially tricky. In addition, the standard errors are likely to be incorrect due to heteroskedasticity and the fact that β_2 was estimated. Whilst this can be addressed formally, it is beyond the scope of this paper. Finally, estimation is inefficient compared to other, Maximum-Likelihood, methods.

The wage equations now take the following form (Equation 5).

$$\log wages_i = \beta_0 + \beta_1 * age_{it} + \beta_2 * age_{it}^{\ 2} + \beta_3 * educ_{it} + \beta_4 * ISCED_{it} + \beta_5 * FT_{it} + \beta_6 * \hat{\lambda}_{it} + \beta_7 * berlinwest_{it} + \ldots + \beta_{21} * Sachsen_{it} + \varepsilon_{it}$$

Equation 5: Wage Equation[20] [21]

Wages here are monthly gross wages rather than hourly wages for a variety of reasons. Apart from data availability, the primary reason is that politically-motivated labour market programmes such as forced reduction of working hours in the East may adversely impact on a person's monthly earnings potential, whilst having no impact on hourly wages. In order to capture this effect, monthly wages are used.

However, there are probably a variety of factors that determine whether or not a person works full-time, such as, for example, being a single parent or being a single-parent with a young child (Equation 6).

$$FT_{it} = \delta SP_{it} + u_{it}$$

Equation 6: Factor explaining Full-time work

[19] Verbeek, M. (2004). *Modern Econometrics*.p.230

[20] EDUC is the number of years spend in education, ISCED uses the ISCED international system for classifiying educational attainment; two different educational variables are used, due to the vastly different educational systems in East and in West Germany and due to the fact that years spent in German tertiary education do not necessarily translate to certain qualifications obtained, in addition, years in education do not adequately reflect vocational qualifications; FT is a dummy variable takes the value 1 if a person is in full-time employment and zero otherwise.

[21] Townsize has not been included at this stage of the wage differential modelling as once selection into the labour force has been controlled for, the size of the town no longer has an effect on wages, in particular in Germany, where most labour contracts are still set by some sort of collective bargaining mechanism.

If that is the case and $\text{cov}(\varepsilon_i, u_i) \neq 0$, then a break-down of the Gauss-Markov Assumptions occurs and OLS will no longer be BLUE. Moreover, as $E\{\varepsilon_i FT_i\} \neq 0$, the variable is said to be endogenous and hence OLS suffers endogeneity problems. This paper uses two approaches to deal with this problem. The first one employs the panel nature of the data and the second one uses a standard Instrumental Variable approach.

If the problem $\text{cov}(\varepsilon_i, u_i) \neq 0$, as certain individual characteristics affect both the error term in the main and in the auxiliary equation, one solution is to purge the error term of these personal effects to avoid the correlation, which leads to a break-down of OLS, by, for instance, imposing a fixed-effect type error structure.

$$\log wages_i = \alpha_i + \beta_0 + \beta_1 * age_{it} + \beta_2 * age_{it}^{\ 2} + \beta_3 * educ_{it} + \beta_4 * ISCED_{it} + \beta_5 * FT_{it} + \beta_6 * \hat{\lambda}_{it} + \varepsilon_{it}$$

Equation 7: Fixed Effects Solution

The separation of the error may have led to a time-invariant error α_t, as it now captures personal criteria, which are, by definition, time-invariant, whereas the remainder of the error is simply a white-noise process and hence will not lead to estimation bias. Therefore, by taking first differences of the entire equation (Equation 6), it will be possible to estimate an unbiased coefficient β_5.

$$\Delta \log wages_i = \mu + \beta_5 * \Delta FT_{it} + \beta_6 * \Delta\hat{\lambda}_{it} + \eta_t \ \ where\ \eta \sim NID(0,1)$$

Equation 8: Fixed Effects Model in first differences[22]

The coefficient estimates obtained for β_5 and β_6 can then be used to obtain an accurate prediction for wages, in the East and in the West, respectively, using equation 7[23].

[22] μ captures the fact that taking the differences of age and age^2 will be non-zero but constant

[23] Due to the fact that using the within estimation technique, the fixed effects does not deliver coefficient estimates for time-invariant variables, such as educ and ISCED, the analysis is conducted using random effects estimation. The basic argument, however, still holds (as advised by Prof. Ian Walker). Generally speaking, more sophisticated

An alternative approach to the one outlined above is the so-called 'Instrumental Variable' approach, theoretically based on the moment conditions arising in the OLS case. Loosely speaking, in order to identify the unknown coefficients, it is required that the expectation of the product of the residuals with each explanatory variable is equal to zero. In the case of k explanatory variables, this means that there are k conditions. If one of these conditions fails to hold, it is no longer possible to identify the k corresponding coefficients and an additional moment coefficient is required. In this case, $E\{\varepsilon_i FT_i\} \neq 0$ and therefore one condition fails to hold. In order to solve these issues, an additional moment condition needs to be generated in order to determine the coefficients. A so-called instrumental variable, which is assumed to be uncorrelated with the error of the model, i.e. ε_i but correlated with the endogenous regressor, in this case FT_i. This paper suggests that two potential instrumental variables, namely single parent status and being a single parent with children below the age of 16, may explain the decision to work full-time or not but, once the other factors in the wage equation have been controlled for, it is not correlated to the error of the model.

In practice, the Instrumental Variable Estimator is frequently obtained by two-stage least square estimation[24]. In the first stage, the endogenous variable is regressed on the instrument and all other explanatory variables. The fitted values obtained in the first stage are then used in the second stage to deliver unbiased and consistent estimates. The first stage estimation in this case is given below (Equation 9).

$$FT_{it} = \beta_0 + \beta_1 * male_i + \beta_2 * age_{it} + \beta_3 * age_{it}^{\ 2} + \beta_4 * educ_{it} + \beta_5 * ISCED_{it} + \beta_6 * \hat{\lambda}_{it} + \beta_7 * IV_{it} + \beta_8 * berlinwest_{it} + \ldots + \beta_{22} * Sachsen_{it} + \varepsilon_{it}$$

Equation 9: First Stage in IV regression

Both procedures outlined above are used to generate wage differentials between East and West Germans (Equation 10).

estimation techniques such as the Hausman-Taylor Estimator would be preferred, but are beyond the scope of this paper.

[24] Johnston, J. and DiNardo, J. (1997). *Econometric Methods.* Fourth Edition. p. 157

$$wagedifferential_{it} = actualwages(east)_{it} - predictedwages(West)_{it}$$

Equation 10: Wage Differential

However, this formulation misses the crucial point that the difference between actual and predicted wages is the error term that occurs within the prediction model, which is obviously not present in the first term of equation 8. Therefore, a more empirically sound procedure (Equation 9) is used.

$$wagedifferential_{it} = predictedwages(east)_{it} - predictedwages(West)_{it}$$

Equation 11: Wage Differentials (Predictions)

Having constructed the wage differentials, their impact along with the effects of other explanatory variables on migration intentions will be examined using an Ordered Probit model, which is a direct extension of the binary Probit model introduced earlier in the Heckman Two-Step estimation. As the question for migration intentions has four possible outcomes (see data section), there are three thresholds, rather than one, if the model is thought of in terms of a latent variable again.

$$\begin{aligned} y_{it}* = {} & \beta_o + (\beta_1 * wage\_differential_{it}) + \beta_2 * age_{it} + \beta_3 * male_{it} + \beta_4 * educ_{it} + \beta_5 * hhincome_{it} + \\ & \beta_6 * hhincome^2 + \beta_7 * unemp_{it} + \beta_8 * married_{it} + \beta_9 * nykids_{it} + \beta_{10} * tenure_{it} + \beta_{11} * smallt_{it} + \\ & \beta_{12} * city_{it} + \beta_{12} * jloss_{it} + \beta_{13} * dsubh + \beta_{14} * dhowner + \beta_{14} * d1991_{it} + ... + \beta_{21} * d1998_{it} + \\ & \beta_{20} * berlineast_{it} + \beta_{21} * brandenburg_{it} + \beta_{22} * sachsenanhalt_{it} + \beta_{23} * mecklenburgvorpommern_{it} + \\ & \beta_{24} * thuerigen_{it} + \varepsilon_{it} \end{aligned}$$

Equation 12: Ordered Probit Model[25] [26] [27] [28]

The error is assumed to be $\varepsilon_{it} \sim N(0,1)$ and the observed dependant variable is assumed to take the following form, where γ_i are the respective thresholds (i=1,2,3).

[25] Reference Categories: Medium-sized city, 1999 and Saxonia are the reference categories for townsize, year and regional dummies respectively
[26] Final Model controls for Missing values
[27] nykids ist the number of children under the age of 16 in the household, tenure measure the years of tenure with the current employer and jloss is the subjective jobloss probability
[28] To capture potential non-linear effects in terms of income, several specifications are used

$$y_{it} = \begin{cases} 1 & if\ y_{it}^* < \gamma_1 \\ 2 & if\ \gamma_1 \le y_{it}^* < \gamma_2 \\ 3 & if\ \gamma_2 \le y_{it}^* < \gamma_3 \\ 4 & if\ y_{it}^* \ge \gamma_3 \end{cases}$$

IV. Data

The following analysis uses data from the German Socioeconomics Panel[29] (GSOEP); a social survey that has been conducted by the *Deutsches Institut für Wirtschaftsforschung* (DIW) since 1984. In June 1990, the original sample[30] was increased by an East German subsample[31], which represented about 1.7% of the East German population at the time. During the timeframe of analysis, 1991 until 1999, the GSOEP was increased by two additional subsamples[32], leaving, on average, a potential of 13,500 individuals in the total sample analysed. The data is collected using two questionnaires, one which gathers household level information and the other used for data-gathering on a personal level

The dataset for the subsequent analysis was constructed using the SOEPinfo[33] tool, designed by DIW for data extraction purposes, but also by merging certain files directly to circumvent unnecessary loss of data and contains both East and West Germans as necessitated by the wage differential modelling outlined above.

	East	*West*	*Total*
Average	1837	4063	5900
Standard Deviation	15.29	15.20	0.33

Table 3: Sample Size[34] over 1991 – 1999

[29] This analysis uses the 100% version of the GSOEP, not the 95% version that is available in certain survey bundles. The data was obtained under license for research purposes by DIW.
[30] The original sample groups are referred to as A and B and contain German Residents of West Germany, whose household head does not belong to one of the major immigrant groups, and Foreigners in West Germany, whose household head belongs to one of the major immigrant groups, e.g. Turks and Italians, respectively. Samples A and B originally included 12,245 adult individuals and 3,915 children who responded.
[31] This sample is referred to as sample C. It contained 2179 households, out of which 4,453 adults and 1,591 children responded
[32] The two additional samples are labelled D and E; the former reflecting households, whose head moved to West Germany from abroad post 1984 and the latter a refreshment sample, selected independently from all ongoing samples. In the former sample, 1078 individuals and 517 children and in the latter, 1923 adults and 468 children responded.
[33] http://panel.gsoep.de/soepinfo2004/
[34] Variable $sampreg used to distinguish between East and West, where $ takes different values for each wave

As indicated by Table 3, the sample size used is considerably smaller than the potential, mainly due to losses in effort to avoid attrition during the timeframe of analysis, lack of values of tracking variables for some individuals and non-responses to certain key explanatory variables[35].

As the final analysis focuses exclusively on the Eastern population of this sample and given the substantial regional differences within the East, close examination of the regional decomposition of the sample is necessary.

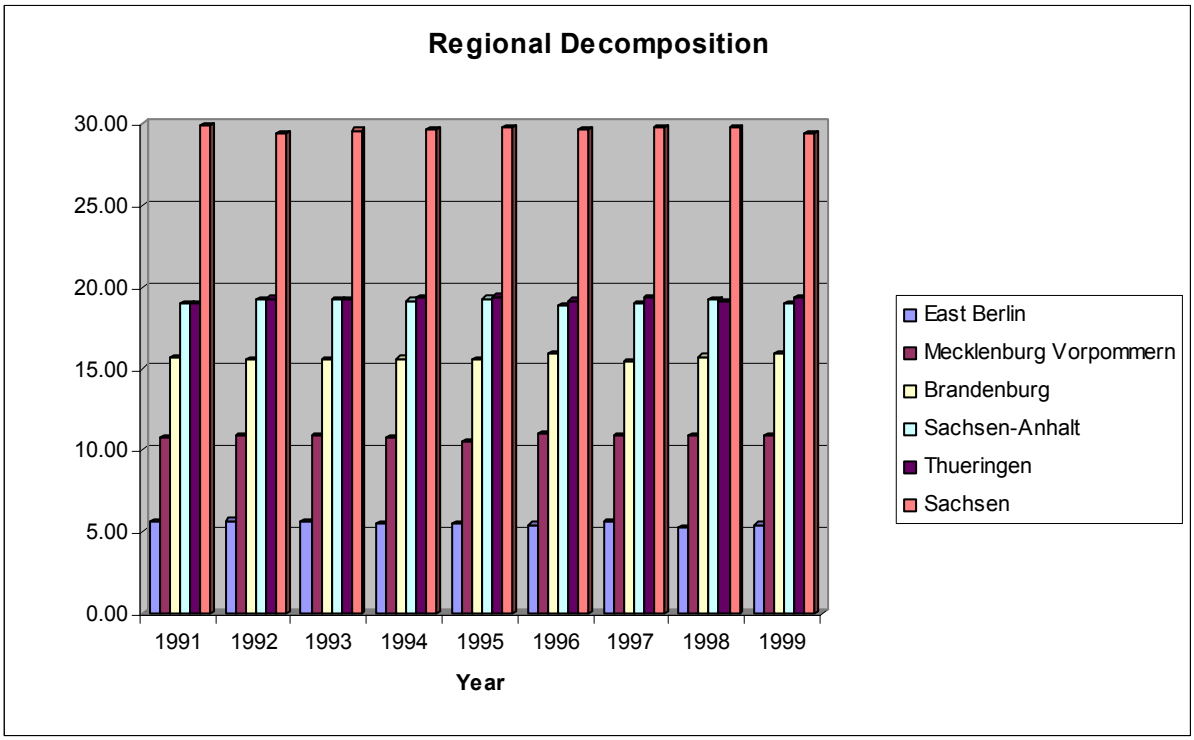

Figure 1: Regional Decompostion of Eastern Sample

Figure 1 reveals that the regional make-up of the sample is constant over time and roughly reflects the respective sizes of the population of the various Eastern *Länder*, with Saxonia (Sachsen) as the largest region and East-Berlin the smallest.

Considering the average wages[36] of those individuals within the sample (Figure 1), it is evident that, in spite of strong convergence in the early 90s, substantial differentials between East and the West still exist at the end of the decade.

[35] Where possible, missing values have been controlled for in the subsequent analysis.
[36] Please refer Appendix A.1 for a detailed variable guide, including all coding and unit information

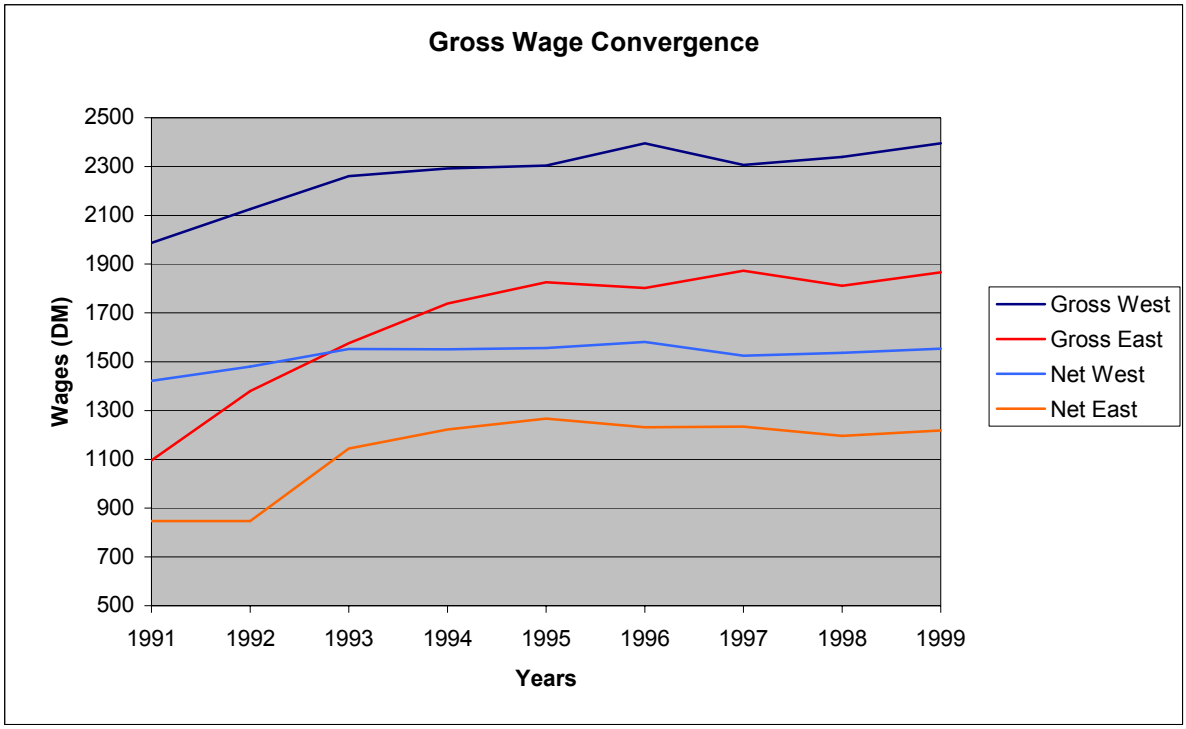

Figure 2: Wages over time

Moreover, wage inequality, as measured by the standard deviation, is substantially lower in the East than in the West (see Table 2); however, it is increasing over the course of the 90s (Figure A.1[37]).

	Gross Average Wages		Net Average Wages	
	West	East	West	East
Average	2267.12	1663.32	1528.80	1133.97
Average Standard Deviation	2745.30	1698.66	1759.37	1128.26

Table 4: Summary Statistics on Wages

In addition to the summary statistics above, the appendix contains the same information for all variables used in this paper, as well as a detailed description of every variable for easy reference.

The key dependent variable in all subsequent analysis originates from the question asked in the GSOEP: "Could you imagine moving to the other part of Germany?[38]". However, this question is preceded by a filter question, asking whether or not the individual could imagine moving at all. If the person answered in the affirmative, the above question was to be

[37] Figure A.1 can be found in the Appendix
[38] Translated from German. Original Question: „Könnten Sie sich vorstellen, in den westlichen (östlichen) Teil Deutschlands, also die alten (neuen) Bundesländer, umzuziehen?"

answered. For the purpose of this analysis, all negative responses to the filter question have been included, in the "Never" category of the key dependant variable.

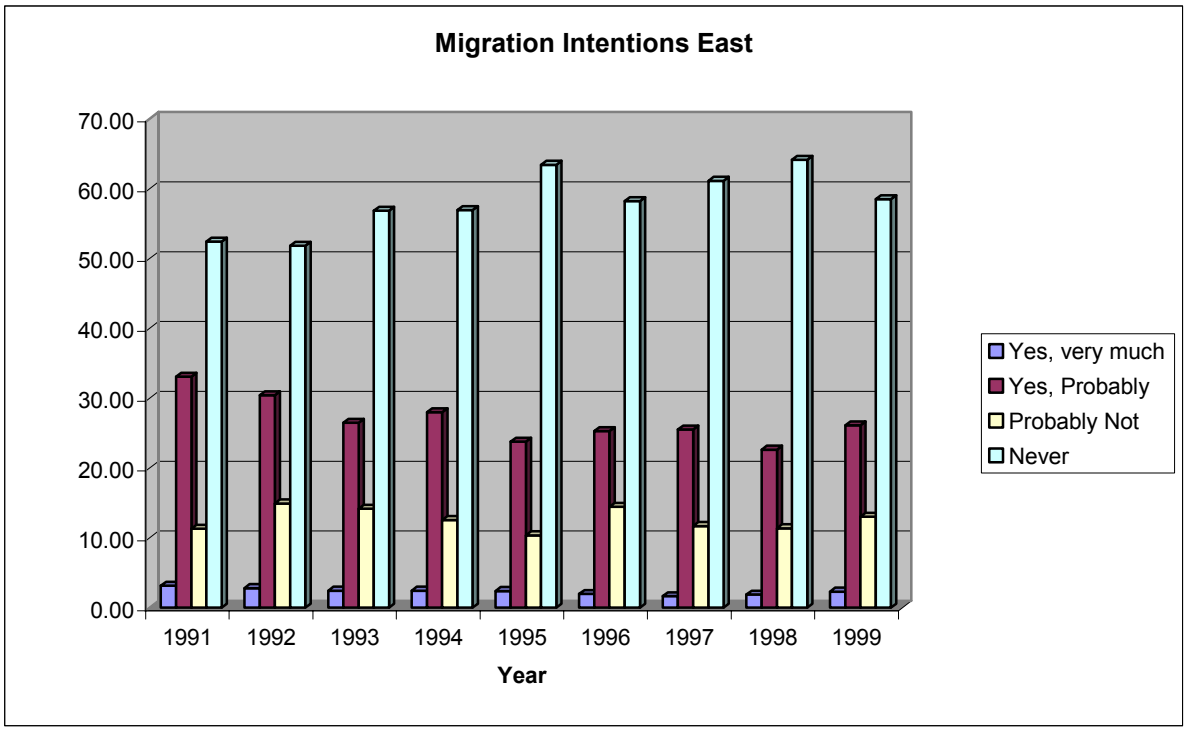

Figure 3: Migration Intentions over time (in percentages)[39]

	Yes, very much	*Yes, Probably*	*Probably Not*	*Never*
Average	43.00	491.44	231.78	1064.56
Median	44.00	475.00	230.00	1058.00
Minimum	30.00	412.00	189.00	954.00
Maximum	59.00	617.00	275.00	1168.00
Standard Deviation	8.99	63.76	29.49	72.71

Table 5: Summary Statistics on Migration Intentions (Absolute Figures)

This explains the apparently large percentage of responses in the "Never" Category with respect to the other possible outcomes; this response group is also increasing over time. Evidently, the proportion of individuals in the most enthusiastic category is small and constant across time, whereas the proportion of people in the other affirmative category is large and declining over time. Finally, the "probably not" category remains more or less constant over time, with moderate fluctuations.

[39] The absolute figures have been included in the Appendix for completeness

It has been frequently cited in the literature that age is a very strong predictor of whether or not a person is likely to consider moving, in particular in the East-/ West German case. Breaking the responses down by age group reveals that this is indeed the case (Figure 4).

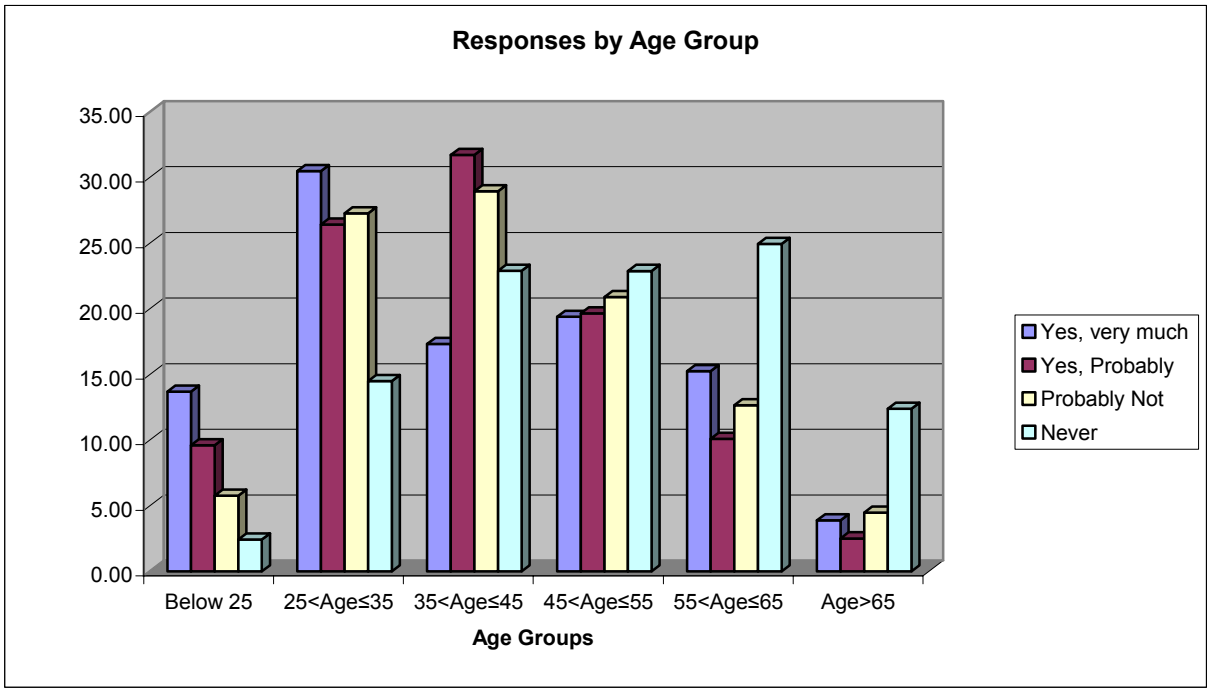

Figure 4: Responses by Age Group[40]

Both positive response categories are far more pronounced in the younger age groups and this relationship appears to shift in the category of respondents aged between 35 and 45. This preliminary analysis indicates that older people are far less likely to want to move.

Similarly, it has been suggested that the propensity to migrate increases with educational attainment. Comparing the responses across groups with different educational attainment indicates that this may indeed be the case, although it seems less obvious than predicted, as a substantial part of the positive responses still originate from individuals with middle vocational qualifications. The group that has completed the highest level of secondary education, the *Abitur*, and has completed some vocational training, a route now commonly taken by many young Germans, is also interesting. Combined with the above decomposition by

[40] Crosstabulation Tables are included in the Appendix, Section 4

age group and the high positive responses in the group with higher tertiary education, it seems to confirm that young East Germans at the end of their education are likely to move.

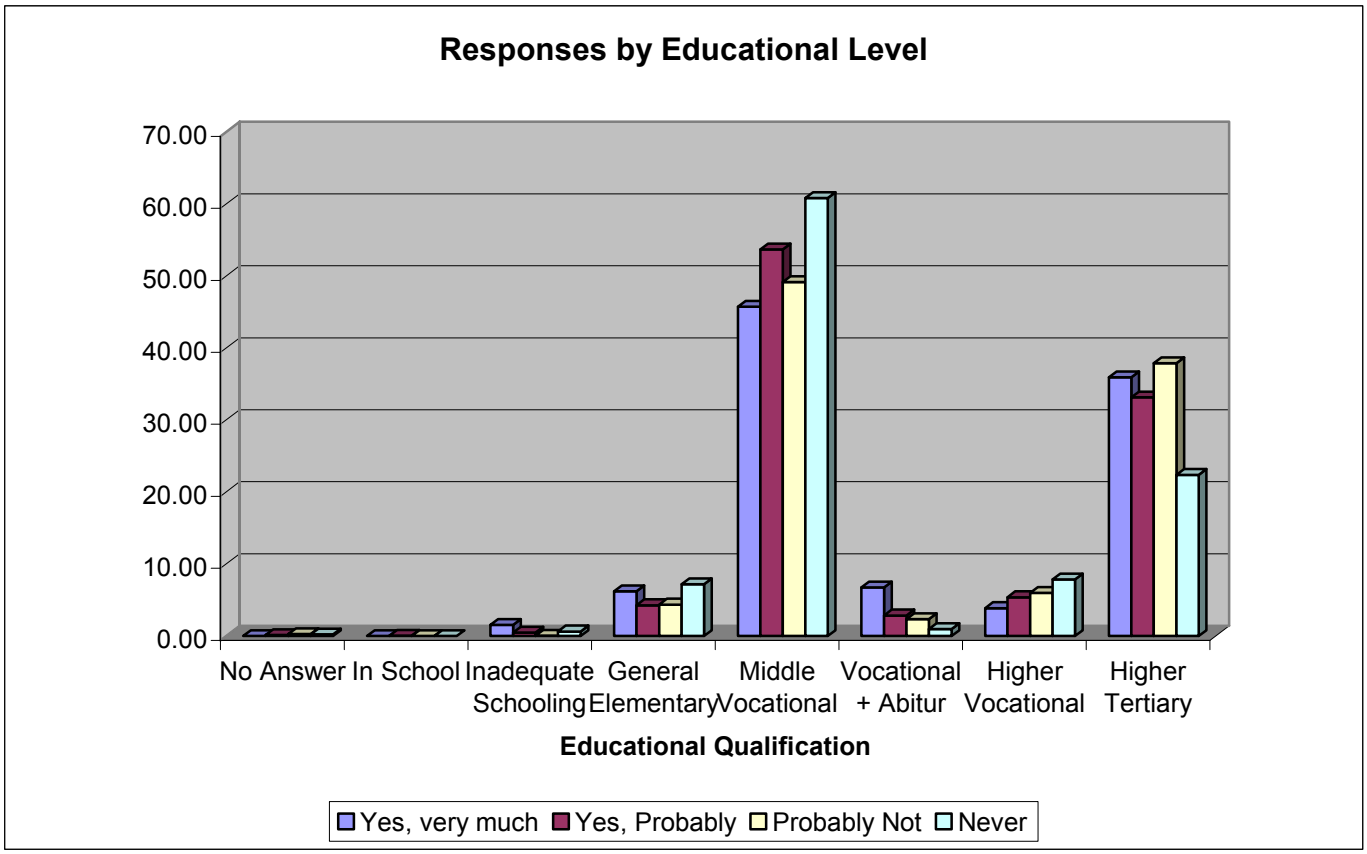

Figure 5: Reponses by Education Level[41]

It has also been stereotypically suggested that it is the poor and the unemployed, who would be most inclined to move. Interestingly, and in line with findings by Burda et al. (1998), decomposing the responses by household income (Figure 6) reveals that there may be non-linear effects of income on migration propensity. Whilst in households with a middle income, the negative reply outweighs the positive, in very poor and in very wealthy households, people are more inclined to migrate. Moreover, it is not evident from cross-tabulation that unemployed individuals express a stronger desire to migrate than their working counterparts (Figure 7).

[41] See Appendix for Table, Section A.4

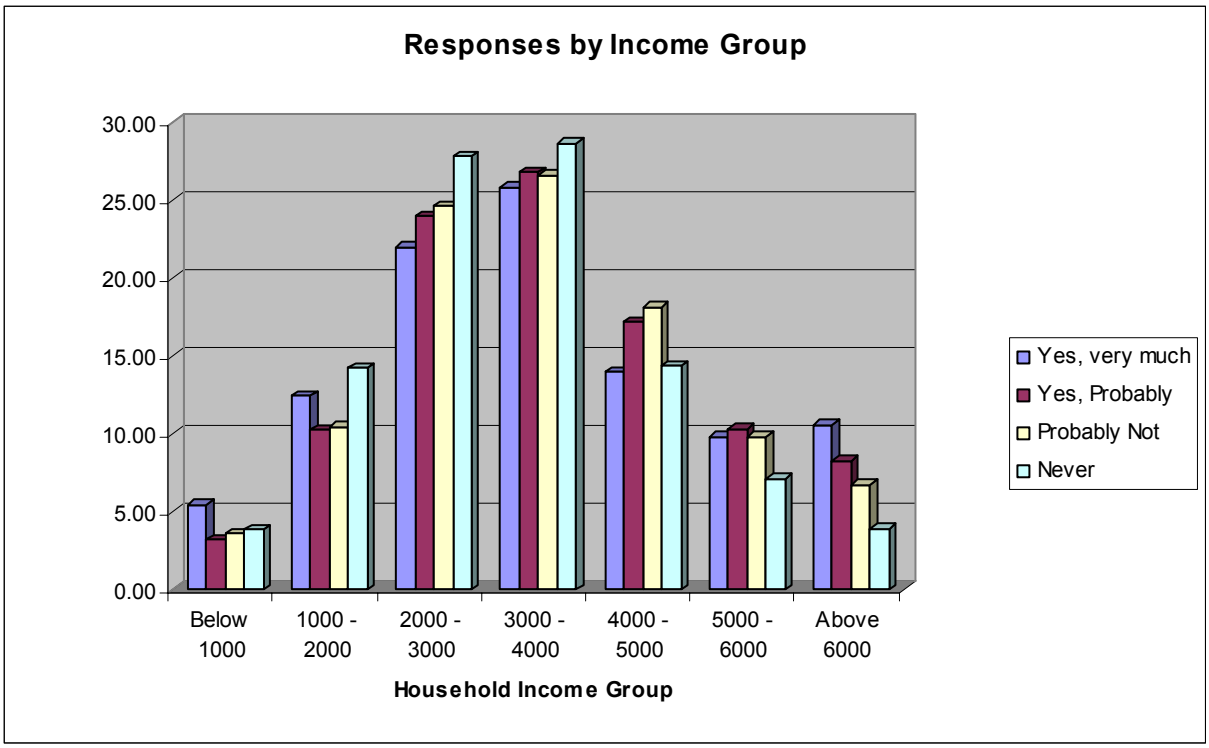

Figure 6: Responses by Income Group[42]

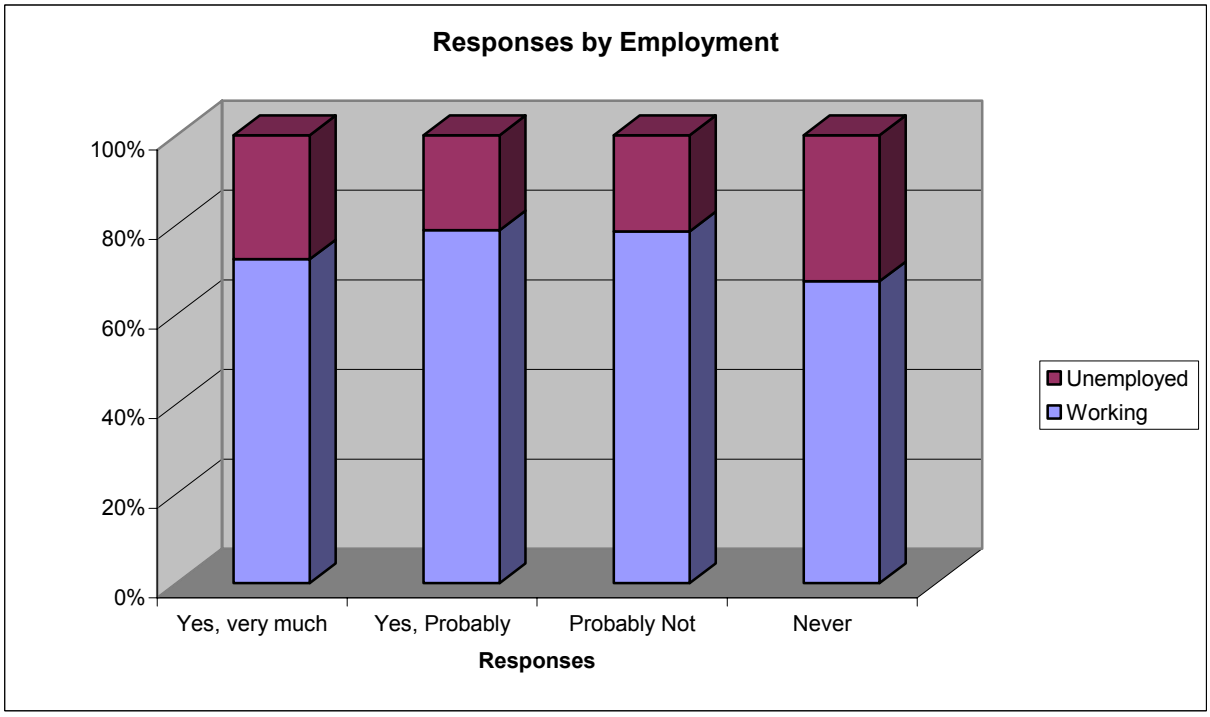

Figure 7: Responses by state of employment (under 65 only)[43]

Moreover, it must be recognised that some East-German states are faring far worse than others and, hence, if one believes that the economic climate is a primary driver of migration

[42] Cross Tabulations have been included in the Appendix, Section A.4
[43] Cross Tabulations have been included in the Appendix, Section A.4

propensity, it is unsurprising that the responses are not uniformly distributed across regions (Figure 8).

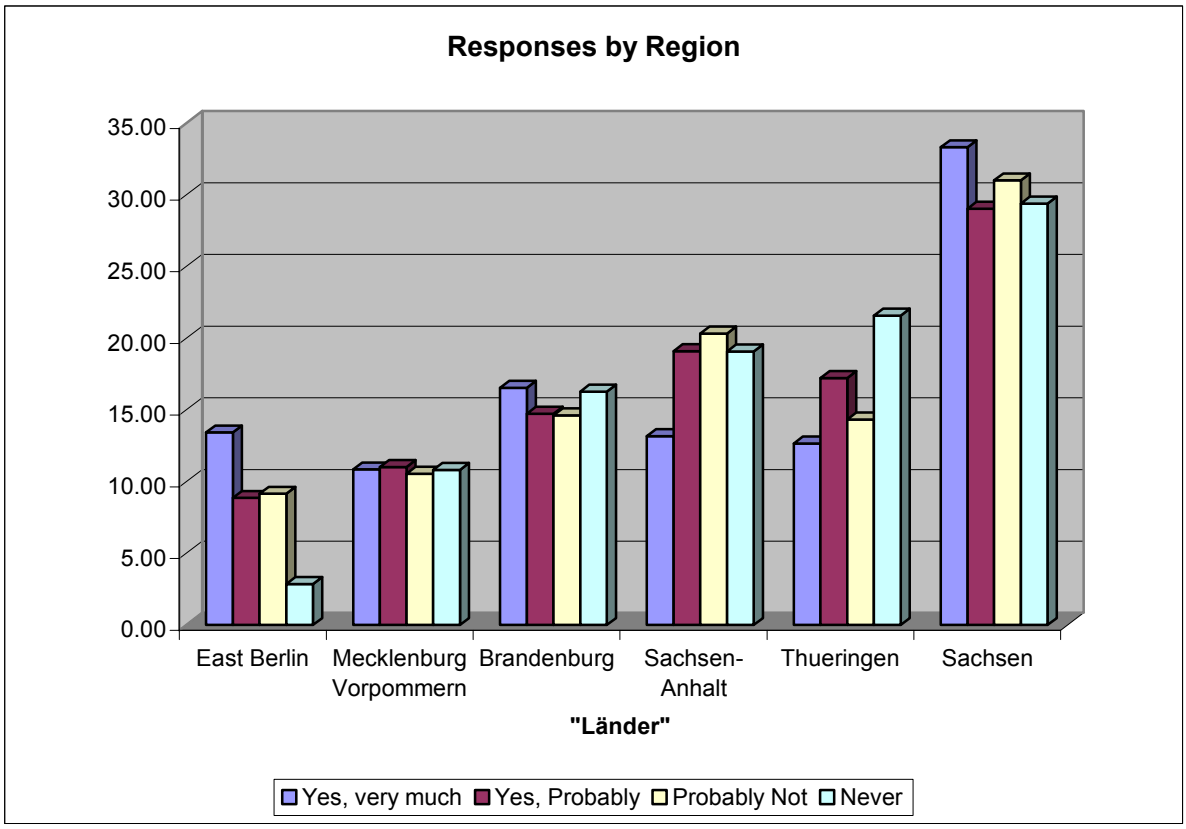

Figure 8: Responses by Region[44]

In particular, a higher proportion of East-Berlin residents express a desire to move, which is not surprising as a move to West-Berlin could be easily accomplished, whereas their counterparts in Thüringen, a state that has shown economic progress, appear to be less likely to want to migrate. Furthermore, more city- and mid size-town residents express a wish to move, as opposed to their

	Migration Intentions
Migration Intentions	1
Years in Education	-0.1951
Age	0.2975
Male	-0.025
Household Income	-0.1139
Unemployment	0.1671
Married	0.1081
Presence of Young Kids	-0.1358
Employer Tenure	0.0043
Small Town	0.1246
City	-0.1355
Medium Town	-0.052

Table 6: Correlation Coefficients[45] [46]

[44] Crosstabulations have been included in the Appendix
[45] Complete Matrix has been included in the Appendix, Section A.5
[46] Correlation Coefficients <-0.10 or >0.10 have been highlighted, apart from perfect correlations

rural counterparts (Figure 9).

Finally the correlation coefficients are considered (Table 4)[47].

	Migration Intentions
Jloss	-0.1143
Berlineast	-0.132
Mecklen-Vorpommern	-0.0019
Brandenburg	0.0165
Sachen-Anhalt	0.0072
Thueringen	0.0596
Sachsen	-0.003

Table 7: Correlation Coefficients (Continued)

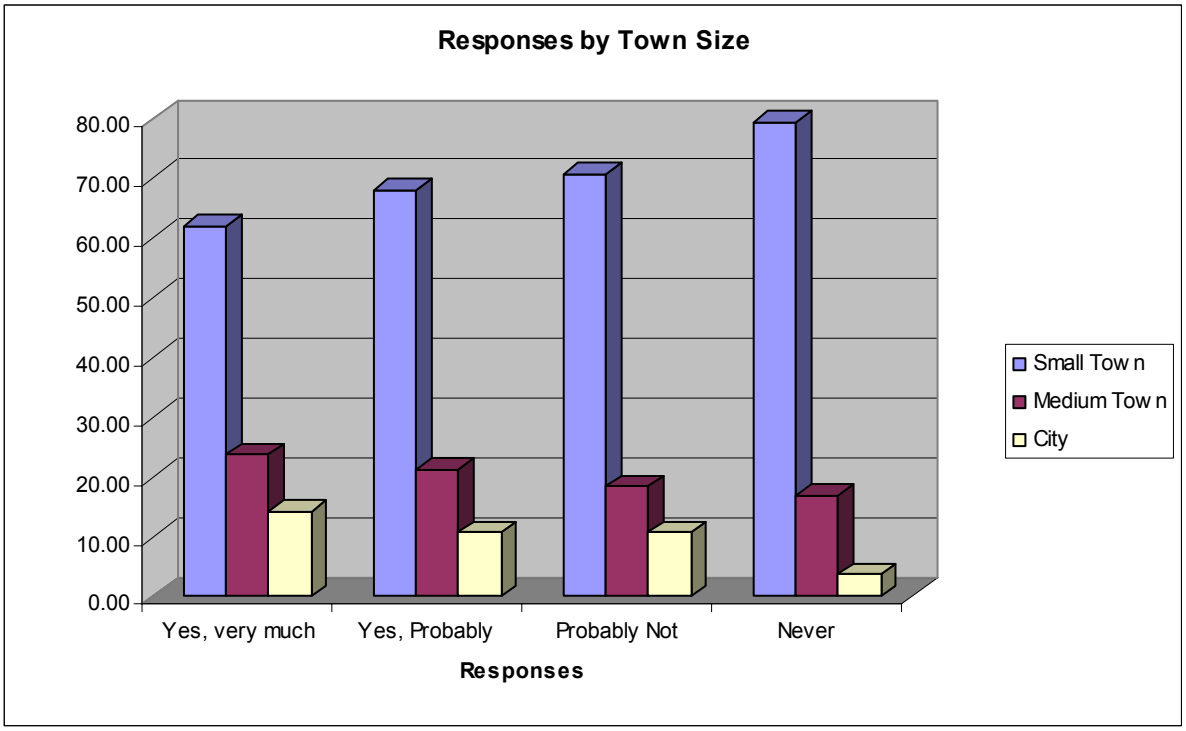

Figure 9: Responses by town size

The signs of the coefficients are as predicted by the preceding analysis: More time spent in education correlates with lower migration propensity values[48]; older individuals have higher scores as do the unemployed, married people and residents of a small town whereas people with small children, city dwellers and individuals who think they are likely to lose their job within the next two years appear to have a higher desire to migrate to the West.

Whilst this preliminary analysis is informative, econometric methods along the lines described earlier shall now be employed to evaluate the relationship more rigorously.

[47] Recalling that the migration propensity variable is coded inversely.
[48] i.e. an increased desire to migrate

V. Results

Prior to examining the results of the Ordered Probit estimation, the results of the wage differential modelling shall be discussed. As the selection equation by itself adds little value to the subsequent analysis, the results are omitted here but are included in the appendix[49].

Considering the results of the fixed effects model in first differences, it is clear that the coefficient on $\Delta\lambda$, i.e. σ_{12} (see Equation 3), the correlation of the error between the selection and the wage equation, is significant (Table 8). This implies that the correlation between errors is significantly different from zero and hence using OLS would not have been appropriate[50].

	West		*East*	
Coefficient	Value	P-Value	Value	P-Value
ΔFT_{it}	0.1210	0.001	0.0807	0.011
$\Delta\hat{\lambda}_{it}$	-0.9801	0.000	-1.1617	0.000
Constant	0.0589	0.000	0.1159	0.000
R^2	0.0258		0.0273	
F-Statistic	48.89	0.000	60.90	0.0000
Number of Observations	16511		7621	

Table 8: Results of Fixed Effects Model in First differences[51] [52]

The coefficients obtained in the first step are then used for subsequent estimation[53] (Table 9) and thus to generate the wage differentials.

	West		*East*	
Coefficient	Value	P-Value	Value	P-Value
Male	0.42164	0.000	-0.0857	0.000
Age	-0.0079	0.012	0.0142	0.006
Age2	0.0005	0.000	0.0007	0.000
Educ	0.0572	0.000	0.0844	0.000
ISCED	0.0498	0.000	-0.0435	0.000
Berlin	0.0287	0.612	-	-
Schleswigh	0.0707	0.141	-	-

[49] Section A.6
[50] However, this conclusion is to be handled with care. As pointed out in the Methodology and Models section, the standard error are unlikely to be correct
[51] These results are robust to using log net wages, instead of log gross wages. Test was conducted to rule out potential distortions arising from tax differentials in different German regions
[52] All subsequent estimation was carried out using sampling weights constructed as instructed by the GSOEP desktop companion, apart from Random Effects estimation, which does not allow for sampling weights.
[53] In practice, the found coefficients were multiplied by the variables FT and lamda and then added together. The sum for each observation was then subtracted from the log of gross wages. This new variable then was used as the dependant variable in estimation.

Ham	0.2551	0.000	-	-
Nieders	-0.0324	0.337	-	-
Bremen	0.3565	0.000	-	-
Nordrw	-0.0059	0.826	-	-
Hess	-0.0085	0.819	-	-
Rheinsaar	0.0467	0.220	-	-
Badenwuert	0.0166	0.562	-	-
Berlinost	-	-	0.2222	0.000
Meckpom	-	-	0.0820	0.036
Brand	-	-	0.0495	0.146
Sachsan	-	-	0.0036	0.912
Thue	-	-	0.0454	0.165
Constant	6.6689	0.000	6.5627	0.000
Within R^2	0.1937	-	0.4240	-
Between R^2	0.2431	-	0.1246	-
Overall R^2	0.2213	-	0.1535	-
Wald Test-Statistic[54]	4338.27	0.000	2767.77	0.000
Number of Observations	20761	-	9911	

Table 9: Fixed Effect Wage Equations[55]

In both cases and as generally expected from the literature, there appear to be significant non-linear effects of age of the respondent on wages. Moreover, an additional year in education as well as an additional qualification increases wages significantly. Finally, there also appear to be significant regional effects; in the West German case, living in Hamburg and in Bremen significantly raises the individual's wages as compared to the reference category, Bavaria. Similarly, in the East Germany, residents in East Berlin and in Mecklenburg-Vorpommern enjoy significantly higher wages in contrast to Saxonia, the reference category.

The results from using an Instrumental Variable approach in order to generate the wage differentials, using single parenthood in one case and single parenthood combined with the presence of one or more young children or more in the other have been included in the Appendix[56]. In the former case, it is found that whilst the coefficient on Heckman's lamda is significant at the 1% level for the West, it is not significant for the East at the 10% level. This result holds when using the other instrumental variable.

[54] For overall significance
[55] Most of these results are robust to using log net wages as the dependant variable, rather than log gross wages. However, sex and age, the non-squared term not the squared term, become insignificant in the Eastern case.
[56] See section A.5

Similarly, whilst the non-linear effect of age on wages holds for IVs in the Western Case, at least at the 10% level, both age variables are insignificant in the Eastern case. The impact of education in both Western Cases is similar to the Fixed Effect case, although the coefficient on years spent in education is approximately half. For the Eastern sample, the coefficient on years in education is lower by a similar order of magnitude and the sign of the coefficient on ISCED changes its sign and is only significant with the second instrumental variable. Finally, there are also regional effects present in the instrumental variable case, Hamburg remaining, and Niedersachsen and Baden Württemberg becoming, significant in the West German case and East Berlin and Mecklenburg - Vorpommern remaining so in the East German case.

Whilst it at first appears that certain results such as the validity of the Heckman Two-Step obtained under the imposition of a fixed effects model are not robust to Instrumental Variable modelling, it must be said that there is no possibility of testing the validity of the latter approach. The frequently used Wu-Hausman test for determining the endogeneity of variables would not aid in the decision of whether the instrument employed is valid[57] and other tests, such as the Sargan-Test, require at least two different instruments, which, given the nature of the instruments used, is not given here.

The wage differentials obtained above were then included in the Ordered Probit model introduced in Section III; thus, three models with wage differentials and one control model without them were estimated according to the specification given by Equation 13 (replicated Equation 12).

[57] As it assumes that the correct instrument is used.

$$y_{it}^* = \beta_o + (\beta_1 * wage\_differential_{it}) + \beta_2 * age_{it} + \beta_3 * male_{it} + \beta_4 * educ_{it} + \beta_5 * hhincome_{it} + \beta_6 * hhincome^2 + \beta_7 * unemp_{it} + \beta_8 * married_{it} + \beta_9 * nykids_{it} + \beta_{10} * tenure_{it} + \beta_{11} * smallt_{it} + \beta_{12} * city_{it} + \beta_{12} * jloss_{it} + \beta_{13} * dsubh + \beta_{14} * dhowner + \beta_{14} * d1991_{it} + ... + \beta_{21} * d1998_{it} + \beta_{20} * berlineast_{it} + \beta_{21} * brandenburg_{it} + \beta_{22} * sachsenanhalt_{it} + \beta_{23} * mecklenburgvorpommern_{it} + \beta_{24} * thueringen_{it} + \varepsilon_{it}$$

Equation 13: Reproduction of Ordered Probit Model

Recalling that the dependant variable on migration intentions is coded inversely and the coding information summarised in Appendix A.1, the expected signs of the coefficients based on economic intuition and preceding analysis have been summarised in Table 7.

Variable	*Expected Sign*
HH Income	+
HH Income^2	-
Age	+
Male	?
Educ	-
Unemp	?
Married	+
Nykids	+
Tenure	+
Smallt	?
City	?
Jloss	+
Dsubh	+
Dhowner	+
East Berlin	-
Thüringen	+

Table 10: Expected Signs

The sign on the two terms in income are expected to be thus, in order to display the parabola effect of income on migration intentions identified in Section IV. Low income households are expected to have a low value on the migration propensity scale, as should their high income counterparts, i.e. they should display a high willingness to migrate, whereas middle income households should not. The economic rationale for this behaviour could be that low income households have a lot to gain by moving, hence in NPV terms, the potential differential is so large that it quickly outweighs the transaction cost. In contrast, high income households are easily able to shoulder these costs due to their wealth and hence even small differentials may make the move an attractive option.

As found in previous studies, the older a person is, the less likely she or he is expected to want to migrate. Economically, this can be explained by the fact that the older a person is, the less benefit from income differentials can be reaped. A 60-year old could only benefit from, for instance, a wage differential, for another few years, whereas a 20-year old has her entire

working life to benefit from it. Similarly, as indicated by previous analysis, better educated people are expected to benefit from migrating to areas with higher wage inequality, such as the West[58].

$$NPV(y_t, y_s, c, t) = \int_0^\infty [y_t(t) - y_s(t)]e^{-\rho t}\,dt - c$$

Equation 14: Migration in terms of NPV (replicated Equation 1)[59]

As a person's marital state is already being controlled for, there is no obvious prediction to be made about whether males are more likely to migrate or not. Whilst one would expect the unemployed to express a stronger desire to move into a bigger labour market, earlier analysis indicated that the effect may be ambiguous. In particular, in a regression set up, where educational level has already been controlled for, it may well be the case that there is no impact.

Whether a person is married or not, the presence of young children, tenure with the current employer, whether a person owns their respective dwelling or whether their housing is currently subsidised all increase the transaction cost of moving. If an individual is married, uprooting the partner is costly not only in terms of social networks but also in terms of potentially losing the partner's income. With increasing tenure with the current employer, the employee gains certain skills and knowledge that are firm-specific and could not be used in another job; therefore giving up that job becomes increasingly costly. If the current housing is owned, selling it involves costs both in terms of time and potentially in monetary terms as well, especially since after the collapse of the tightly-regulated housing market in East Germany, house price had a large potential to increase. Similarly, leaving subsidised housing in the East

[58] The plot of standard deviations across time has been included in the Appendix, Section A.3. Although a crude measure of wage inequality, they are illustrative. More sophisticated measures such as Lorenz Curves may be more insightful.

[59] According to: O'Connel, P. (1997)."Migration under uncertainty: "Try your luck" or "Wait and See"". Journal of Regional Science, vol. 37, no.2, p. 332; ρ is the discount factor

and then facing high rents in the West decreases the potential gain from higher incomes in real terms.

Naturally, if a person thinks they are likely to lose their job and thus believes that their potential stream of income in the East is likely to diminish substantially whilst simultaneously decreasing the transaction costs in terms of quitting their current job, the trigger value decreases substantially and hence they are more likely to express a desire to move.

Finally, the effects of the control variables for town size are hard to predict. Whilst general prospects in a small town may be limited in terms of employment and increases in wages, there are also strong network effects present - due to family and other support circles - that may strongly decrease the willingness to move. Whilst these effects are not present in anonymous big cities, living in a city widens the scope of employment possibilities considerably, making it perhaps less necessary to move. The prediction on the two regional dummies is based entirely on preceding analysis.

	Control Model		*Fixed Effect*		*IV1*		*IV2*	
Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Wage Differential	-	-	-0.0979	0.478	-0.0743	0.449	-0.0497	0.416
HHIncome	-0.0859	0.000	-0.0858	0.000	-0.0855	0.000	-0.0855	0.000
HHincome2	-0.0004	0.790	-0.0004	0.787	-0.0004	0.786	-0.0004	0.788
Age	0.0289	0.000	0.0299	0.000	0.0294	0.000	0.0295	0.000
Male	-0.0764	0.003	-0.1250	0.082	-0.1121	0.030	-0.1022	0.009
Educ	-0.0641	0.000	-0.0658	0.000	-0.0643	0.000	-0.0646	0.000
Unemp	0.0466	0.578	0.0494	0.554	0.0463	0.579	0.0459	0.582
Married	0.2031	0.000	0.2000	0.000	0.1932	0.000	0.1919	0.000
Nykidsc	0.0824	0.013	0.0819	0.013	0.0895	0.007	0.0901	0.007
Tenure	0.0024	0.152	0.0023	0.182	0.0022	0.189	0.0022	0.187
Smallt	0.1496	0.000	0.1497	0.000	0.1495	0.000	0.1495	0.000
City	-0.1032	0.297	-0.1022	0.301	-0.1037	0.294	-0.1039	0.293
Jloss	0.0522	0.020	0.0523	0.019	0.0530	0.018	0.0531	0.018
Dsubh	-0.0107	0.878	-0.0102	0.883	-0.0113	0.871	-0.0113	0.871
Dhowner	0.4849	0.000	0.4845	0.000	0.4846	0.000	0.4846	0.000
Year Dummies	1993**	1994*	1993**	1994*	1993**	1994*	1993**	1994*
	1995**	1996*	1995**	1996*	1995**	1996*	1995**	1996*
	1997**	1998**	1997**	1998**	1997**	1998**	1997**	1998**
Regional Dummies	Brand**		Brand**		Brand**		Brand**	
	Sachsan(10)		Meckpom**		Sachsan(10)		Sachsan(10)	
	Meckpom**		Thüringen**		Meckpom**		Meckpom**	
	Thüringen**				Thüringen**		Thüringen**	
Log-Pseudo	-15410.215		-15409.794		-15409.339		-15409.19	

Likelihood								
Pseudo R^2	0.108		0.1081		0.1081		0.1081	
Wald Statistic	1788.8	0.000	1797.5	0.000	1839.49	0.000	1840.69	0.000
Observations	16477		16477		16477		16477	

Table 11: Ordered Probit Results (10 denotes significant at 10%, * at 5% and ** at 1% level)[60]

The most significant result, given the preceding analysis on wage differentials, is that none of the wage differentials are significant, even at the 10% level. This result is robust to introducing a cubic term in income (see below), taking out the quadratic in income, eliminating income altogether and eliminating the two housing market differentials[61]. Whilst this may be for several econometric reasons, ranging from the potential bias arising in wage differential modelling as hinted at by Burda et al (1998)[62], invalidity of the instruments and structures used, model misspecification to issues with the Heckman procedure outlined in Section III, there is also a more intuitive explanation: The approach above imposes the constraint that each individual is highly rational and strictly compares her or his own wage (or potential local wage) with the potential wage she or he could obtain in the West, based on very narrow selection criteria. First of all, as pointed out in the literature by e.g. O'Connel (1997), it could simply be that migration decisions are far more driven by future than by current wage differentials. Secondly, it is possible that aggregate figures or even rumours matter far more than straightforward comparisons and hence "less rational" wage differential modelling might be more successful, such as perceived wage differentials based on reports from friends or relatives in the West. Thirdly, maybe East Germans identify only a few target regions within the West and hence only the wages in these particular areas are relevant.

[60] The wage differential results are robust to construction using net wages. Under the Fixed Effects Model, sex becomes insignificant; signs, significance level and magnitude of all other variables are robust, similarly for the IV1. In the IV2 specification, sex is significant at the 10% level and has the same sign. The signs on the other variables as wells as their significance level and magnitude are robust.

[61] It is also robust to using the Fixed Effects wage differentials estimated ultimately under a fixed rather than a random effects model

[62] Burda, M.; Hardle, W.; Muller, M. and Werwatz, A. (1998)."Semiparametric Analysis of German East-West Migration Intentions: Facts and Theory." Journal of Applied Econometrics, vol. 13, no. 5, p. 527

Moreover, given the preliminary analysis on income, it is surprising that the coefficients do not have the expected sign and that the quadratic term is insignificant. This however, does by no means imply that there are no non-linear effects in income.

	Control Model		*Fixed Effect*		*IV1*		*IV2*	
Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
HHIncome	-0.0915	0.000	-0.0914	0.000	-0.0912	0.000	-0.0912	0.000
HHIncome	-0.0859	0.000	-0.0858	0.000	-0.0855	0.000	-0.0855	0.000
HHincome2	-0.0004	0.790	-0.0004	0.787	-0.0004	0.786	-0.0004	0.788
Joint Significance								
Chi2(2)	71.93	0.000	71.92	0.000	71.16	0.000	71.19	0.000
HHIncome	0.0012	0.973	0.0011	0.975	0.0010	0.977	0.0009	0.98
HHincome2	-0.0140	0.004	-0.0139	0.005	-0.0139	0.005	-0.0139	0.005
HHincome3	0.0004	0.006	0.0004	0.006	0.0004	0.006	0.0004	0.006
Joint Significance								
Chi2(3)	83.45	0.000	83.43	0.000	82.73	0.000	82.72	0.000

Table 12: Estimation with various income terms[63] [64]

Following Burda et al. (1998), the models are estimated with a single income term and terms up to a cubic in that variable. Contrary to Burda et al, in the square configuration, the squared term in income is individually significant in this case and both terms are still jointly significant, as are all terms in the cubic configuration. Again, at odds with Burda et al. (1998), the income term is not individually significant. Whilst these slight deviations may be explained by the increase in data in this paper, the conclusions are still the same: there are non-linear effects in income and a possible extension of this paper would be to employ non-parametric estimation techniques.

Most of the other variables have the expected sign as outlined above. Not surprisingly, given the preceding analysis, unemployment is insignificant. As found in other studies (Table 10), living in a small town appears to exert strong negative effects on migration propensity, perhaps an indication that the aforementioned network effects outweigh any labour market differentials. It is surprising, however, that subsidised housing appears not to impact on

[63] For complete estimation results, please refer to Appendix, Tables A.21 and A.22
[64] These results are robust to using wage differentials based on log net wages

migration intentions and unfortunately there is no literature with which to compare this (see Table 11). This may indicate that the perceived income differential may be far greater than the rent differentials or may even illustrate a lack of contemplation of wages in real terms.

Papers	*Burda (1993)*		*Burda et al. (1998)*		*Büchel and Schwarze (1994)*	
Variables	Sign	Signifance Level (t-ratio)	Sign	Signifance Level (t-ratio)	Sign	Signifance Level
HH Income	+	2.69	-	-0.507	+	10%
HH Income 2			+	1.002		
Age	-	-12.24	-	-14.89	-	1%
Male	-	-3.46	-	-3.03	+	5%
Educ					+	1%
University Degree	+	0.37	+	3.56		
Unemp	-	-1.27	+	2.24	+	Not Significant
Married	-	-2.96	-			
Nykidsc					-	5%
Tenure	-	1.79			-	Not Significant
Smallt	-	-5.45	-	-5.69	-	1%
City	-	-1.72			-	5%
Jloss						
Jloss certain	+	2			+	Not Significant
Jloss possible	+	1.79				
Dsubh						
dhowner	-	-0.97	-	5.79	-	1%
Comments	▪ Female instead of Male used ▪ Partner instead of marital status used ▪ No significant regional dummies ▪ Finds that having an *Abitur* is significant; may explain lack of significance of University Degree ▪ Finds tenure to be significant when sample restricted to working individuals ▪ Several small city categories, both significantly negative		▪ Female instead of Male used ▪ Partner instead of marital status used ▪ Restricted to individuals below 65 ▪ This paper's definition has 10,000 inhabitants in the small city category than Burda et al.		▪ Investigates various kinds of relationships status ▪ Small children to be defined under the age of 6 ▪ Job loss only examined as high level of threat	

Table 13: Summary of Findings in other papers[65] [66]

Moreover, the lack of impact of job tenure is surprising but is in line with previous studies (see Table 11). In general, all findings support previous research, which indicates that

[65] The papers cited above inverted the scale of the migration intentions variable, hence all the coefficients have the opposite sign.
[66] As the papers only consider binary models, a direct comparison of coefficients is not possible

the findings of others, who only analysed a few years, are robust across the entire breadth of time.

	Control Model			
Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never
Additonal Income Unit	0.34	2.56	0.56	-3.46
Additional Year of Age	-0.33	-0.82	0.07	1.08
Additional Year in Education	0.25	1.85	0.40	-2.50
Additional Year of Job Tenure*	-0.01	-0.07	-0.02	0.09
Additonal Unit of Job Insecurity	-0.17	-1.45	-0.38	1.99
Female over Male	-0.28	-2.18	-0.50	2.96
Emp over Unemp*	0.17	1.33	0.31	-1.80
Married vs. Not	-0.85	-5.92	-1.19	7.95
Young Kids vs. Not	-0.30	-2.34	-0.55	3.19
Small Town vs. City	-0.53	-3.87	-0.83	5.22
Subsidised Housing vs. Not*	0.04	0.31	0.07	-0.41
Home Owner vs. Not	-1.62	-13.29	-3.42	18.33

Table 14: Marginal Effects of Control Model (in percent) [67] (* denotes insignificant variables)

Considering the marginal effects (Table 14), the amount by which home ownership raises the probability of never wanting to move is very large, compared to other marginal effects, thus making a strong predictor of migration propensity and further underlining that transaction cost consideration play a key role in the migratory process, similar things can be said about being married versus not being married. In contrast, an additional year spent in education, reduces the probability of being in the last category by 2.5%, whilst raising the probability of considering moving to some degree by a total of 2.1%. Also surprising is the strong impact that being female has on migration propensity. Apparently, females are 2.96% more likely to be in the final category than males. Living in a small town compared to a city has an even stronger effect. In addition, the impact of age is probably still the strongest, even if it may not appear so at first sight. It has to be considered that the marginal increase of not wanting to move at all by 1.08% per additional year of age is ten times as strong when comparing a 25- with a 35-year old, for instance, holding everything else constant. Thus, in line with other studies, age is still the strongest predictor of migration intentions.

[67] Only the marginal effects for the control model have been included, as the marginal effects for the other models are very similar. For a complete output, please refer to the Appendix, Section A.6

Finally, it is informative to consider the probabilities of the average individual in the dataset.

Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never
Average (Control)	1.45	24.21	14.90	59.44

Table 15: Average Probabilities[68]

Whilst the probabilities of not wanting to move are clearly larger than their counterparts, the probability of considering moving at least to some extent is still 25.66%, which illustrates the substantial migratory potential within the East German population between 1991 and 1999.

[68] The probabilities for the other three models are identical

VI. Conclusion

This paper analysed the determinants of migration intentions of residents in former Eastern Germany from 1991 to 1999. In particular, it attempted to model wage differentials between Easterners and Westerners via a Heckman Two-Step model, followed by both Fixed Effects and Instrumental Variable approaches. These, amongst other economically and intuitively motivated variables, were included in an Ordered Probit model to assess their impact on migration intentions.

Whilst the estimated wage differentials were insignificant in explaining migration propensity, it was found that current household income has highly non-linear effects. Moreover, it is predominantly the young, educated, free from attachments such as marriage, home ownership and young children, who would like to move to the West. Furthermore, it appears that males have a stronger wish to migrate, as do individuals who are in fear of loosing their job. Finally, living in a small city is likely to make an individual wish to remain in the East.

A natural limitation of this paper and opportunity for improvement is the empirical approach employed in the wage differential modelling process. Throughout the paper certain econometric weaknesses, ranging from the validity of the Heckman Approach to the appropriateness of instrumental variables, have been highlighted. Whilst some remedies that were beyond the scope of this paper have been suggested, using non-parametric methods such as Propensity Score Matching to identify East German "cells" and matching them to their Western equivalents to generate wage differentials in this way would allow us to see whether the current wage differentials envisaged by this paper really do not matter.

In contrast to modelling nominal wage differentials, a natural extension of this paper would be to construct differentials using real wages. However, the GSOEP does currently not contain detailed enough price level information on an individual level. Perhaps matching price

level information from other databases to the individuals contained in this dataset would allow for testing the robustness of the results obtained in the case of nominal wages.

Furthermore, whilst the non-linearity in household income has been identified, the final functional form is far from certain. It would be instructive to see whether or not semi-parametric estimation methods such as those employed by Burda et al. (1998) would confirm the functional form identified in their paper and to see whether it remains constant over time.

Moreover, none of the usual diagnostic tests were applied to the Ordered Probit model and it would be very helpful to see whether any of the inferences made above needed to be qualified, based on their results.

Additionally, the dataset used does in principle allow the study of what determines Westerners decision to move to the East. Whilst the paper tested the validity of straightforward economic factors such as income and wage differentials, completely different factors may drive the decision from the other side as most economics arguments would indicate that Westerners should stay where they are.

Finally, comparing the results obtained using this data with results on migration intentions data[69] from other countries could result in useful insights how much perhaps cultural factors, such as language barriers, limit migration in, for instance, the European Union.

[69] Although the author is currently unaware of the existence of such a data set

VII. Acknowledgements

I would like to thank Dr. Lei Zhang for advising me throughout the duration of this project, in particular during the very early phase of my research. I would also like to express my gratitude to Dr. Jeremy Smith, Prof. Ian Walker and Giorgia Maffini for their continued support on econometrics and other technical matters without which this project would not have been feasible. I am deeply indebted to Dr. Joachim Frick, Dr. Jan Göbel and the DIW for helping me understand the data and answering a great many of my queries. I would also like to thank the German National Academic Foundation for supporting my studies here at Warwick and Caroline Escott, for her unwavering encouragement, care and understanding. Finally, I would like to express my appreciation and sincere gratitude to my parents for their unconditional support and love.

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Appendix

A.1 List & Coding of Variables

Variable Name	**Description**
Age	Age of the individual
Age2	Age Squared of the individual
Badenwuert	Dummy Variable, 1 if the household is located in the state of Baden-Württemberg, 0 otherwise. (West)
Berlin	Dummy Variable, 1 if the household is located in East Berlin, 0 otherwise. (East)
Berlinwest	Dummy Variable, 1 if the household is located in West Berlin, 0 otherwise. (West)
Brand	Dummy Variable, 1 if the household is located in the state of Brandenburg, 0 otherwise. (East)
Bremen	Dummy Variable, 1 if the household is located in the state of Bremen, 0 otherwise. (West)
CASMIN	Educational Level of the individuals, classified using the CASMIN system;

0	In School
1	Inadequately completed schooling
2	General Elementary Education
3	Basic vocational qualification
4	Intermediate General Qualification
5	Intermediate Vocational
6	General Maturity Certificate
7	Vocational Maturity Certificate
8	Lower Tertiary Education
9	Higher Tertiary Education

City	Dummy Variable; 1 if the household situated in a city, 0 otherwise. City defined as having 500,000 or more inhabitants.
D199x	Dummy variable, 1 if the year is 199x, 0 otherwise. x = 1,…,9
Educ	Number of years an individuals spent in education, Minimum:0, Maximum:18.
FT	Dummy Variable, 1 if the individual is in full time unemployment, 0 otherwise; generated using the GSOEP employment state variable
Gross	Gross Wages of the individuals earned last month, variable is continuous and measured in German Mark
Ham	Dummy Variable, 1 if the household is located in Hamburg, 0 otherwise. (West)
Hess	Dummy Variable, 1 if the household is located in the state of Hessen, 0 otherwise. (West)
HHINCOME	Monthly Net Household Income measured German Marks, continuous variable, Maximum 50,000.
HHINCOME2	Square of the above variables, divided by 1,000
ISCED	Educational Level of the individuals, classified using the ISCED

system;

0	In school
1	Inadequate schooling
2	General Elementary
3	Middle Vocational
4	Vocational + Abitur
5	Higher Vocational
6	Higher Education

Jloss — Likelihood of loosing current job within the next two years according the individual; Question not asked in 1995 and 1997

1	Very Likely
2	Likely
3	Not very likely
4	Absolutely unlikely

Married — Dummy Variable, 1 if the individuals is married, 0 otherwise, Generated using the GSOEP Household typology variable

Meckpom — Dummy Variable, 1 if the household is located in the state of Mecklenburg-Vorpommern, 0 otherwise. (East)

Nieders — Dummy Variable, 1 if the household is located in the state of Niedersachsen, 0 otherwise. (West)

Nordrw — Dummy Variable, 1 if the household is located in the state of Nordrhein-Westphalen, 0 otherwise. (West)

NYKIDS — Dummy Variable, 1 if the household has one child or more under the age of 16, 0 otherwise

Rheinsaar — Dummy Variable, 1 if the household is located in the states of Rheinland-Pfalz and Saarland, 0 otherwise. (West)

Sachsenan — Dummy Variable, 1 if the household is located in Sachsen-Anhalt, 0 otherwise. (East)

Schleswigh — Dummy Variable, 1 if the household is located in Schleswig-Holstein, 0 otherwise.

Singleparent — Dummy Variable, 1 if the individual is a single parent, O Otherwise; Generated using the Household Typology Variable in the GSOEP

SPNYKIDS — Dummy Variable, 1 if the individuals is a single parent with a child under the age of 16, Generated using the GSOEP Household Typology Variable and the presence of young children Variable, nykids

Smallt — Dummy Variable, 1 if the household is situated in a small town, 0 otherwise, Small town is defined as town with up to 50,000 inhabitants

Tenure — Time spent with current employer, measured in years and continuously using a decimal system, maximum value is 57.2

Thue — Dummy Variable, 1 if the household is located in state of Thüringen, 0 otherwise. (East)

Townsize — Variable that captures the size of the town the household is in

(Boustedt Classification);

1	Under 2,000 inhabitants
2	2,000 – 5,000 inhabitants
3	5,000 – 20,000 inhabitants
4	20,000 – 50,000 inhabitants
5	50,000 – 100,000 inhabitants
6	100,000 – 500,000 inhabitants
7	500,000+ inhabitants

Unemp — Dummy Variable, 1 if the individual is not-employed in any form, 0 otherwise

Working — Dummy Variable, 1 if the individual is working, 0 otherwise; Generated using the Employment state variable in the GSOEP; Employment defined as individuals in full- and part-time employment, apprenticeships, irregular work and maternity/paternity leaves.

A.2 Summary Statistics

a) Wage Equations

Variable	*West*		*East*	
	Mean	Standard Deviation	Mean	Standard Deviation
Working	0.6375	0.4807	0.6509	0.4767
Age	45.8511	14.7178	46.2763	13.5807
Age2	2318.9330	1434.0580	2325.9230	1314.4170
Townsize	4.2308	1.7771	3.1904	2.0565
CASMIN	3.8907	2.1818	5.3738	2.4713

Table A. 1: Summary Statistics for Selection Equation

Variable	*West*		*East*	
	Mean	Standard Deviation	Mean	Standard Deviation
Gross	2267.533	2764.553	1661.386	1754.135
Net	1528.938	1765.253	1150.465	1172.283
Educ	11.015	2.697	12.104	2.454
ISCED	3.122	1.350	3.902	1.439
FT	0.479	0.500	0.535	0.499
Single Parent	0.045	0.207	0.038	0.191
SPNYKIDS	0.024	0.154	0.033	0.179

Table A. 2: Summary Statistics Wage Equations

	West		*East*	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
HHINCOME	4190.541	2264.013	3290.942	1593.251
Unemp	0.361	0.480	0.347	0.476
Married	0.715	0.451	0.770	0.421
NYKIDS	0.370	0.483	0.405	0.491
Tenure	7.163	9.571	4.793	8.377
Smallt	0.593	0.491	0.748	0.434
City	0.147	0.354	0.067	0.250
Jloss	1.374	1.708	1.391	1.512

Table A. 3: Summary Statistics for Ordered Probit

A.3 Additional Graphs for Data Section

a) Wage Equations

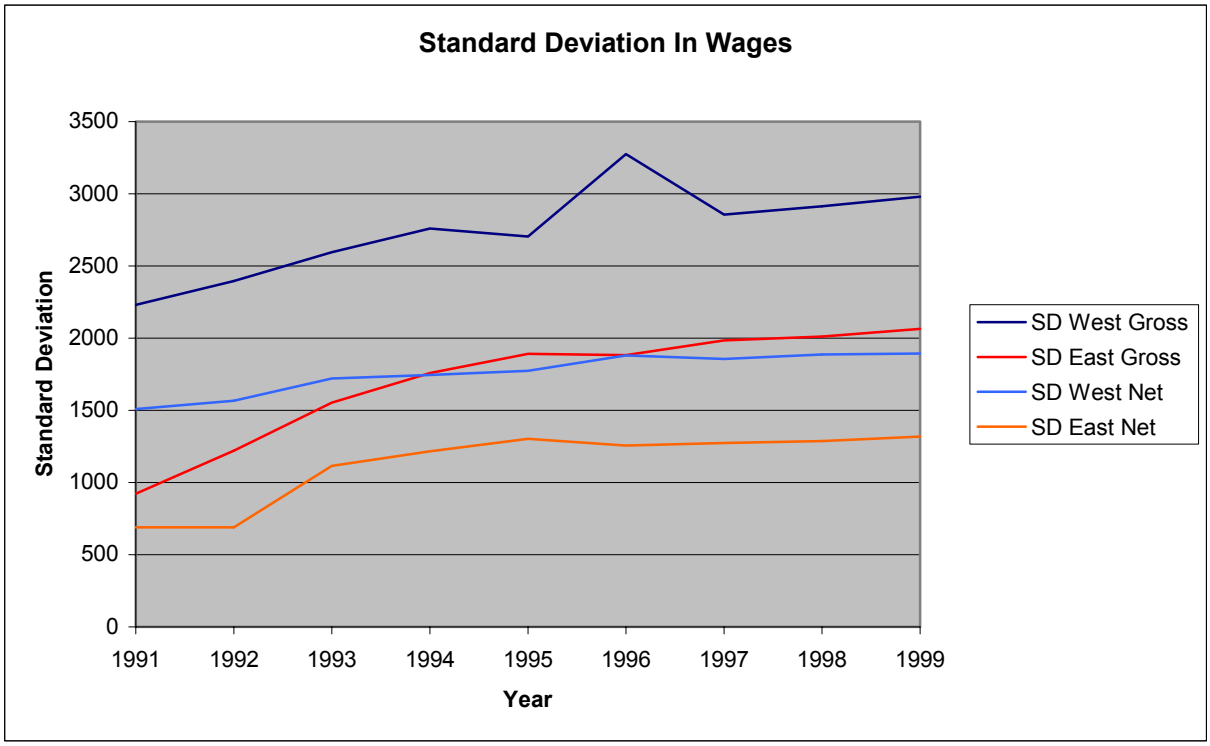

Figure A. 1 Standard Deviation of Wages over time

b) Ordered Probit

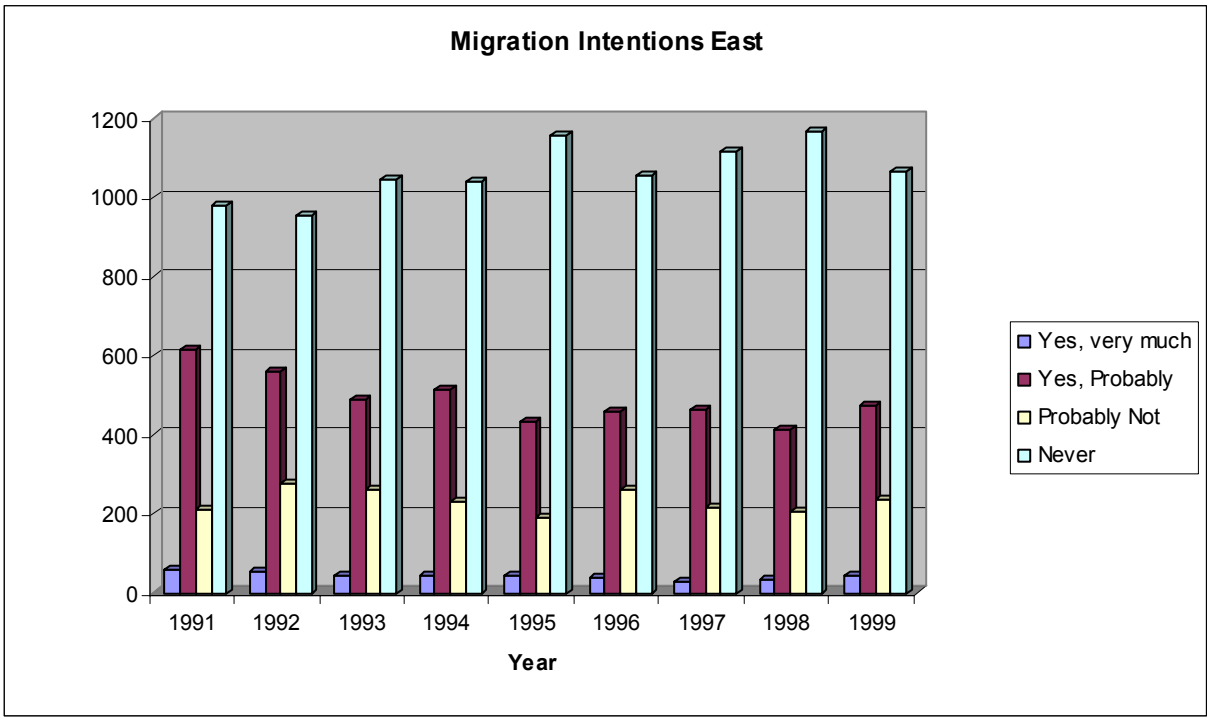

Figure A. 2: Absolute Migration Intentions Figures

A.4 Crosstabulations Tables

	Age						
	Below 25	25<Age<=35	35<Age<=45	45<Age<=55	55<Age<=65	Age>65	Total
Yes, very much	53	118	67	75	59	15	387
Yes, Probably	425	1,169	1,403	869	446	111	4423
Probably Not	120	569	604	436	264	93	2086
Never	232	1,388	2,194	2,192	2,389	1,186	9581
Total	830	3244	4268	3572	3158	1405	16477

Table A. 4: Cross tabulation Responses by Age Group (Absolute)

	Age						
	Below 25	25<Age<=35	35<Age<=45	45<Age<=55	55<Age<=65	Age>65	Total
Yes, very much	13.70	30.49	17.31	19.38	15.25	3.88	100.00
Yes, Probably	9.61	26.43	31.72	19.65	10.08	2.51	100.00
Probably Not	5.75	27.28	28.95	20.90	12.66	4.46	100.00
Never	2.42	14.49	22.90	22.88	24.93	12.38	100.00
Total	5.04	19.69	25.90	21.68	19.17	8.53	100.00

Table A. 5: Corsstabulation Reponses by Age Group (Relative)

	ISCED								
	No Answer	In School	Inadequate Schooling	General Elementary	Middle Vocational	Vocational + Abitur	Higher Vocational	Higher Tertiary	Total
Yes, very much	0	0	6	24	177	26	15	139	387
Yes,	6	2	21	189	2375	126	238	1466	4423

Probably									
Probably Not	5	0	1	91	1025	49	125	790	2086
Never	19	0	61	689	5826	92	750	2144	9581
Total	30	2	89	993	9403	293	1128	4539	16477

Table A. 6: Cross tabulation Responses by Education Level (Absolute)

	ISCED								
	No Answer	In School	Inadequate Schooling	General Elementary	Middle Vocational	Vocational + Abitur	Higher Vocational	Higher Tertiary	Total
Yes, very much	0.00	0.00	1.55	6.20	45.74	6.72	3.88	35.92	100
Yes, Probably	0.14	0.05	0.47	4.27	53.70	2.85	5.38	33.14	100
Probably Not	0.24	0.00	0.05	4.36	49.14	2.35	5.99	37.87	100
Never	0.20	0.00	0.64	7.19	60.81	0.96	7.83	22.38	100
Total	0.18	0.01	0.54	6.03	57.07	1.78	6.85	27.55	100

Table A. 7: Cross Tabulation by Education Level (in percentages)

	HH Income							
	Below 1000	1000 - 2000	2000 - 3000	3000 - 4000	4000 - 5000	5000 - 6000	Above 6000	Total
Yes, very much	21	48	85	100	54	38	41	387
Yes, Probably	143	454	1,060	1,185	759	456	366	4423
Probably Not	75	218	514	555	379	205	140	2086
Never	369	1,362	2,668	2,748	1,377	682	375	9581
Total	608	2082	4327	4588	2569	1381	922	16477

Table A. 8: Cross tabulation by Income Group

	HH Income							
	Below 1000	1000 - 2000	2000 - 3000	3000 - 4000	4000 - 5000	5000 - 6000	Above 6000	Total
Yes, very much	5.43	12.40	21.96	25.84	13.95	9.82	10.59	100.00
Yes, Probably	3.23	10.26	23.97	26.79	17.16	10.31	8.27	100.00
Probably Not	3.60	10.45	24.64	26.61	18.17	9.83	6.71	100.00
Never	3.85	14.22	27.85	28.68	14.37	7.12	3.91	100.00
Total	3.69	12.64	26.26	27.84	15.59	8.38	5.60	100.00

Table A. 9: Cross Tabulation by Income Group (Relative)

	Unemployment (Only individuals below 65)		
	Working	Unemployed	Total
Yes, very much	266	102	368
Yes, Probably	3,379	910	4289

Probably Not	1,548	423	1971
Never	5,537	2,684	8221
Total	10730	4119	14849

Table A. 10 Cross Tabulation by Employment Status (Absolute)

	Unemployment (Only individuals below 65)		
	Working	Unemployed	Total
Yes, very much	72.28	27.72	100.00
Yes, Probably	78.78	21.22	100.00
Probably Not	78.54	21.46	100.00
Never	67.35	32.65	100.00
Total	72.26	27.74	100.00

Table A. 11: Cross Tabulation by Employment Status (Relative)

	Regions						
	East Berlin	Mecklenburg Vorpommern	Brandenburg	Sachsen-Anhalt	Thueringen	Sachsen	Total
Yes, very much	52	42	64	51	49	129	387
Yes, Probably	392	487	652	845	762	1,284	4422
Probably Not	191	220	305	424	299	647	2086
Never	274	1,037	1,559	1,828	2,067	2,816	9581
Total	909	1786	2580	3148	3177	4876	16476

Table A. 12: Cross Tabulations of Responses by Region (Absolute)

	Regions						
	East Berlin	Mecklenburg Vorpommern	Brandenburg	Sachsen-Anhalt	Thueringen	Sachsen	Total
Yes, very much	13.44	10.85	16.54	13.18	12.66	33.33	100
Yes, Probably	8.86	11.01	14.74	19.11	17.23	29.04	100
Probably Not	9.16	10.55	14.62	20.33	14.33	31.02	100
Never	2.86	10.82	16.27	19.08	21.57	29.39	100
Total	5.52	10.84	15.66	19.11	19.28	29.59	100

Table A. 13: Cross Tabulation of Responses by Region (Relative)

A.5 Correlation Matrix of the Ordered Probit Variables

	Migration Intentions	*Years in Education*	*Age*	*Male*	*Household Income*	*Unemployment*
Migration Intentions	1					
Years in Education	-0.1951	1				
Age	0.2975	-0.1151	1			
Male	-0.025	0.077	-0.0076	1		
Household Income	-0.1139	0.2912	-0.1148	0.044	1	
Unemployment	0.1671	-0.2033	0.5114	-0.1276	-0.2668	1
Married	0.1081	0.0883	0.132	0.062	0.1836	-0.0706
Presence of Young Kids	-0.1358	0.1504	-0.5489	-0.0185	0.0884	-0.3168

Employer Tenure	0.0043	0.0884	-0.0334	0.0944	0.2207	-0.4169
Small Town	0.1246	-0.0919	-0.0634	0.0031	-0.0358	-0.0187
City	-0.1355	0.1232	0.0117	-0.007	0.0521	0.0026
Medium Town	-0.052	0.0233	0.0634	0.0011	0.0065	0.0192
Jloss	-0.1143	0.145	-0.3417	0.114	0.1683	-0.6701
Berlineast	-0.132	0.1157	0.0004	-0.0017	0.0539	-0.0046
Mecklen-Vorpommern	-0.0019	0.0011	-0.0088	-0.0109	0.033	0.0146
Brandenburg	0.0165	0.0102	-0.0015	0.0054	-0.025	0.0012
Sachen-Anhalt	0.0072	-0.0146	-0.0113	-0.0082	0.0186	-0.0226
Thueringen	0.0596	-0.0629	-0.002	0.0037	-0.0373	0.004
Sachsen	-0.003	0.0002	0.0186	0.0076	-0.0134	0.0076

Table A. 14: Correlation Matrix A[70]

	Married	*Presence of Young Kids*	*Employer Tenure*	*Small Town*	*City*
Married	1				
Presence of Young Kids	0.1735	1			
Employer Tenure	0.119	0.0065	1		
Small Town	0.041	0.0686	0.026	1	
City	-0.0775	-0.0081	-0.022	-0.4625	1
Medium Town	0.0041	-0.0715	-0.0149	-0.8205	-0.1274
Jloss	0.0631	0.2193	0.2772	0.0078	-0.0005
Berlineast	-0.0791	0.0063	-0.0165	-0.3815	0.8368
Mecklen-Vorpommern	0.0118	-0.0186	-0.0155	0.0477	-0.0872
Brandenburg	-0.0239	-0.0376	0.0147	0.1388	-0.1054
Sachen-Anhalt	0.0306	0.007	0.0344	0.0734	-0.1284
Thueringen	0.0077	0.017	-0.0008	0.0467	-0.1297
Sachsen	0.0178	0.0189	-0.0217	-0.0559	-0.0525

Table A. 15: Correlation Matrix B (continued)

	Medium Town	*Jloss*	*Berlineast*	*Mecklen-Vorpommern*	*Brandenburg*
Medium Town	1				
Jloss	-0.0084	1			
Berlineast	-0.1128	0.0037	1		
Mecklen-Vorpommern	0.0029	-0.0065	-0.0843	1	
Brandenburg	-0.0873	-0.0019	-0.1041	-0.1502	1
Sachen-Anhalt	0.0006	0.0164	-0.1174	-0.1694	-0.2094
Thueringen	0.0314	0.0061	-0.1181	-0.1704	-0.2106
Sachsen	0.0963	-0.0154	-0.1567	-0.226	-0.2793

Table A. 16: Correlation C (continued)

	Sachen-Anhalt	*Thueringen*	*Sachsen*
Sachen-Anhalt	1		
Thueringen	-0.2375	1	
Sachsen	-0.3151	-0.3169	1

Table A. 17: Correlation Matrix D (continued)

[70] Correlation Coefficients <-0.10 or >0.10 have been highlighted, apart from perfect correlations

A.5 Regression Results

a) Selection Equation

Probit Estimates on : *Working*

Variable	*Coefficient*	*P-Value*
Male	.5458768	0.000
Age	.2249107	0.000
Age2	-.0029461	0.000
Townsize	-.0130276	0.026
ISCED	.1268448	0.000
Berlin	.0008225	0.991
Schleswigh	-.2888725	0.000
Ham	-.4192199	0.000
Nieders	-.1207188	0.004
Bremen	-.5869829	0.000
Nordrw	-.1136922	0.001
Hess	-.0679891	0.181
Rheinsaar	-.0976261	0.025
Badenwuert	.108029	0.009
Berlinost	-.1745711	0.020
Meckpom	-.2560088	0.000
Brand	-.2366904	0.000
Sachsan	-.1407527	0.001
Thueringen	-.2093082	0.000
Sachsen	-.2517338	0.000
Constant	-3.69908	0.000
Log pseudo-likelihood	-23378.422	
Pseudo R^2	0.3418	
Wald Statistic	4131.95	0.0000
Number of Observations	53099	

Table A. 18: Selection Equation Estimation Results

	West		East	
Coefficient	Value	P-Value	Value	P-Value
Male	.7498911	0.000	-.2144497	0.031
Age	.0404437	0.010	.0048439	0.803
Age2	-.0003566	0.074	.0000327	0.896
Educ	.0258365	0.000	.0504009	0.000
ISCED	.0637763	0.000	.0136527	0.280
Lamda	-.6613016	0.000	-.0254762	0.873
IV2 West	-.5497378	0.031	1.072984	0.000
Berlin	.048104	0.123	-	-
Schleswigh	-.0128473	0.730	-	-
Ham	.1736133	0.000	-	-
Nieders	-.0972571	0.000	-	-
Bremen	.0987648	0.263	-	-
Nordrw	-.0107031	0.535	-	-

Hess	-.0669372	0.007	-	-
Rheinsaar	.0265747	0.232	-	-
Badenwuert	-.1140555	0.000	-	-
Berlinost	-	-	.2591296	0.000
Meckpom	-	-	.0733649	0.000
Brand	-	-	.0213225	0.234
Sachsan	-	-	.0092361	0.606
Thue	-	-	-.0040353	0.815
Constant	6.754793	0.000	6.271008	0.000
R^2	0.346		0.2395	
F-Statistic	354.9	0.000	129.82	0.0000
Number of Observations	2076		9911	

Table A. 19: Instrumental Variable Estimation Results (IV: Singleparent)

	West		East	
Coefficient	Value	P-Value	Value	P-Value
Male	.7262115	0.000	.1161795	0.018
Age	.0368258	0.019	.0280458	0.149
Age2	-.0003106	0.120	-.0002505	0.317
Educ	.0261242	0.000	.0448754	0.000
ISCED	.0617056	0.000	.0326561	0.005
Lamda	-.6628532	0.000	-.2166079	0.255
IV1 West	-.4938075	0.051	.3092387	0.194
Berlin	.0473006	0.130	-	-
Schleswigh	-.0059917	0.872	-	-
Ham	.1812145	0.000	-	-
Nieders	-.0938905	0.000	-	-
Bremen	.1069039	0.226	-	-
Nordrw	-.0092026	0.594	-	-
Hess	-.0654243	0.008	-	-
Rheinsaar	.0269772	0.225	-	-
Badenwuert	-.1138625	0.000	-	-
Berlinost	-	-	.2565748	0.000
Meckpom	-	-	.0675345	0.001
Brand	-	-	.0163831	0.378
Sachsan	-	-	-.0003002	0.988
Thue	-	-	-.004395	0.801
Constant	6.802443	0.000	6.193687	0.000
R^2	0.3459		0.2376	
F-Statistic	354.76	0.0000	127.87	0.0000
Number of Observations	20761		9911	

Table A. 20: Instrumental Variable Estimation Results (IV: Single parent with young child(ren))

	Control Model		*Fixed Effect*		*IV1*		*IV2*	
Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Wage Differential			-0.0982	0.476	-0.0740	0.451	-0.0496	0.417
HHIncome	-0.0915	0.000	-0.0768	0.000	-0.0912	0.000	-0.0912	0.000
Age	0.0289	0.000	0.0301	0.000	0.0294	0.000	0.0295	0.000
Male	-0.0762	0.003	-0.1214	0.091	-0.1118	0.031	-0.1020	0.009
Educ	-0.0639	0.000	-0.0682	0.000	-0.0641	0.000	-0.0644	0.000
Unemp	0.0466	0.578	0.0540	0.519	0.0463	0.580	0.0459	0.583
Married	0.2057	0.000	0.1918	0.000	0.1959	0.000	0.1946	0.000
Nykidsc	0.0826	0.013	0.0855	0.010	0.0896	0.007	0.0902	0.007
Tenure	0.0025	0.148	0.0021	0.215	0.0023	0.184	0.0023	0.182
Smallt	0.1495	0.000	0.1496	0.000	0.1494	0.000	0.1494	0.000
City	-0.1027	0.299	-0.1025	0.304	-0.1032	0.296	-0.1035	0.295
Jloss	0.0524	0.019	0.0489	0.030	0.0532	0.017	0.0532	0.017
dsubh	-0.0106	0.879	-0.0032	0.964	-0.0112	0.872	-0.0113	0.872
dhowner	0.4855	0.000	0.4746	0.000	0.4852	0.000	0.4852	0.000
Year Dummies	1993**	1994*	1993**	1994*	1993**	1994*	1993**	1994*
	1995**	1996*	1995**	1996*	1995**	1996*	1995**	1996*
	1997**	1998**	1997**	1998**	1997**	1998**	1997**	1998**
Regional Dummies	Brand**, Sachsan(10) Meckpom** Thueringen**		Brand**, Meckpom** Thueringen**		Brand**, Sachsan(10) Meckpom** Thueringen**		Brand**, Sachsan(10) Meckpom** Thueringen**	
Log-Pseudo Likelihood	-15410.354		-15425.231		-15409.483		-15409.332	
Pseudo R^2	0.108		0.1072		0.1081		0.1081	
Wald Statistic	1786.6	0	1768.91	0	1836.98	0	1838.12	0
Observations	16477		16477		16477		16477	

Table A. 21: Estimation Results with a single income term

	Control Model		*Fixed Effect*		*IV1*		*IV2*	
Variable	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Wage Differential			-0.0914	0.506	-0.0691	0.479	-0.0462	0.447
HHIncome	0.0012	0.973	0.0415	0.153	0.0010	0.977	0.0009	0.980
HHincome2	-0.0140	0.004	-0.0185	0.000	-0.0139	0.005	-0.0139	0.005
HHincome3	0.0004	0.006	0.0005	0.000	0.0004	0.006	0.0004	0.006
Age	0.0290	0.000	0.0302	0.000	0.0295	0.000	0.0296	0.000
Male	-0.0799	0.002	-0.1251	0.082	-0.1131	0.028	-0.1039	0.008
Educ	-0.0634	0.000	-0.0662	0.000	-0.0637	0.000	-0.0639	0.000
Unemp	0.0516	0.536	0.0578	0.487	0.0513	0.537	0.0509	0.540
Married	0.1834	0.000	0.1660	0.000	0.1744	0.000	0.1732	0.000
Nykidsc	0.0803	0.015	0.0804	0.015	0.0869	0.009	0.0875	0.008
Tenure	0.0024	0.159	0.0021	0.215	0.0022	0.195	0.0022	0.193
Smallt	0.1497	0.000	0.1501	0.000	0.1496	0.000	0.1496	0.000
City	-0.1054	0.286	-0.1060	0.284	-0.1058	0.283	-0.1061	0.282
Jloss	0.0538	0.016	0.0525	0.018	0.0545	0.014	0.0545	0.014
dsubh	-0.0136	0.845	-0.0112	0.872	-0.0142	0.838	-0.0142	0.838
dhowner	0.4831	0.000	0.4768	0.000	0.4829	0.000	0.4828	0.000
Year Dummies	1993**	1994*	1993**	1994*	1993**	1994*	1993**	1994*
	1995**	1996*	1995**	1996*	1995**	1996*	1995**	1996*

	1997**	1998**	1997**	1998**	1997**	1998**	1997**	1998**
Regional Dummies	Brand**, Sachsan(10) Meckpom* Thueringen**		Brand**, Meckpom** Thueringen**		Brand**, Sachsan(10) Meckpom** Thueringen**		Brand**, Sachsan(10) Meckpom** Thueringen**	
Log-Pseudo Likelihood	-15401.733		-15405.098		-15400.974		-15400.845	
Pseudo R^2	0.1085		0.1083		0.1086		0.1086	
Wald Statistic	1814.55	0	1812.92	0	1862.39	0	1863.41	0
Observations	16477		16477		16477		16477	

Table A. 22: Estimation Results with income terms up to cubic

A.6 Marginal Effects

Assumptions for Marginal Effects

Age	Income	Income2	Education	Wage Differential	Tenure	Jloss
25	3	9	12	1	10	2
26	4	16	13	2	11	3

Table A. 23: Assumptions for calculation of Marginal Effects[71]

	Control Model				Fixed Effects Model			
Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never	Yes, Very Much	Yes, probably	Probably Not	Never
Additional Wage Unit					0.51	2.95	0.43	-3.89
Addtl. Income Unit	0.34	2.56	0.56	-3.46	0.34	2.56	0.56	-3.46
Addtl.Year Age	-0.33	-0.82	0.07	1.08	-0.35	-0.84	0.08	1.11
Addtl. Year Educ	0.25	1.85	0.40	-2.50	0.26	1.90	0.41	-2.57
Addtl. Year Tenure	-0.01	-0.07	-0.02	0.09	-0.01	-0.06	-0.02	0.09
Addtl. Jloss Unit	-0.17	-1.45	-0.38	1.99	-0.17	-1.45	-0.38	2.00
Female over Male	-0.28	-2.18	-0.50	2.96	-0.47	-3.57	-0.81	4.85
Emp over Unemp	0.17	1.33	0.31	-1.80	0.18	1.40	0.33	-1.91
Married vs. Not	-0.85	-5.92	-1.19	7.95	-0.83	-5.83	-1.17	7.83
Young Kids vs. Not	-0.30	-2.34	-0.55	3.19	-0.30	-2.33	-0.54	3.17
Small Town vs. City	-0.53	-3.87	-0.83	5.22	-0.52	-3.84	-0.82	5.19
Sub Housing vs. Not	0.04	0.31	0.07	-0.41	0.04	0.29	0.07	-0.40
H. Owner vs. Not	-1.62	-13.29	-3.42	18.33	-1.62	-13.29	-3.41	18.32
Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never	Yes, Very Much	Yes, probably	Probably Not	Never
Average	1.45	24.21	14.90	59.44	1.45	24.21	14.90	59.44
Wage Differential					1.92	27.54	15.56	54.98
Wage Differential (+1)					2.43	30.49	15.99	51.09
HH Incomes	1.35	23.45	14.71	60.48	1.35	23.45	14.71	60.49
HH Incomes (+1)	1.70	26.01	15.28	57.02	1.69	26.00	15.28	57.03
Age	5.84	42.60	16.20	35.36	6.09	43.23	16.14	34.54

[71] The calculation of the effect of an additional unit is based on the assumptions above, i.e. the additional on year of age results from the differential between 26 and 25 years of age

Age (+1)	5.51	41.78	16.28	36.44	5.74	42.39	16.23	35.65
Male	1.61	25.40	15.15	57.84	1.71	26.16	15.31	56.82
Female	1.33	23.21	14.66	60.80	1.25	22.59	14.50	61.67
Educc	1.43	24.02	14.85	59.71	1.42	24.01	14.85	59.72
Educc (+1)	1.68	25.87	15.25	57.21	1.68	25.91	15.26	57.15
Unemp	1.34	23.35	14.69	60.62	1.33	23.30	14.68	60.69
Emp	1.51	24.68	15.00	58.81	1.51	24.70	15.01	58.78
Married	1.29	22.90	14.58	61.24	1.29	22.92	14.58	61.22
Not Married	2.13	28.81	15.77	53.29	2.12	28.74	15.75	53.39
Young kids	1.28	22.83	14.56	61.33	1.28	22.84	14.56	61.32
No Young Kids	1.58	25.17	15.11	58.14	1.57	25.17	15.11	58.15
Tenurec	1.41	23.85	14.81	59.93	1.41	23.88	14.82	59.90
Tenurec (+1)	1.40	23.78	14.80	60.02	1.40	23.81	14.80	59.99
Small Town	1.32	23.15	14.64	60.89	1.32	23.15	14.64	60.90
City	1.84	27.02	15.47	55.67	1.84	26.99	15.46	55.71
Medium Town	1.89	27.28	15.52	55.32	1.88	27.28	15.52	55.32
Jloss	1.34	23.31	14.68	60.67	1.34	23.31	14.68	60.68
Jloss (+1)	1.17	21.86	14.30	62.66	1.17	21.86	14.30	62.67
Sub Housing	1.49	24.51	14.96	59.04	1.49	24.50	14.96	59.06
Non Sub Housing	1.45	24.21	14.89	59.45	1.45	24.20	14.89	59.45
H owner	0.65	16.29	12.46	70.60	0.64	16.30	12.46	70.60
Not H owner	2.27	29.59	15.88	52.27	2.26	29.58	15.88	52.28
d1991	1.51	24.69	15.00	58.80	1.51	24.69	15.00	58.79
d1992	1.45	24.17	14.89	59.50	1.44	24.15	14.88	59.53
d1993	0.96	19.92	13.74	65.38	0.96	19.92	13.73	65.39
d1994	1.09	21.14	14.10	63.66	1.09	21.14	14.10	63.68
d1995	0.76	17.66	12.97	68.61	0.76	17.66	12.98	68.60
d1996	1.09	21.12	14.10	63.69	1.09	21.13	14.10	63.69
d1997	0.89	19.12	13.48	66.51	0.89	19.13	13.48	66.50
d1998	0.95	19.76	13.69	65.61	0.95	19.76	13.69	65.61
d1999	1.95	27.71	15.59	54.75	1.95	27.71	15.59	54.76
Berlin East	1.59	25.28	15.13	57.99	1.52	24.77	15.02	58.69
Brandenburg	1.14	21.57	14.22	63.07	1.13	21.50	14.20	63.17
Sachsen Anhalt	1.27	22.74	14.54	61.46	1.27	22.76	14.54	61.43
Mecklenburg	1.14	21.60	14.23	63.03	1.12	21.43	14.18	63.27
Thüringen	1.16	21.80	14.29	62.75	1.15	21.69	14.26	62.90
Sachsen	1.69	25.94	15.27	57.11	1.70	26.03	15.28	56.99

Table A. 24: Marginal Effects for Fixed Effects & Control Model[72]

	IV1 Model				IV2 Model			
Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never	Yes, Very Much	Yes, probably	Probably Not	Never
Additional Wage Unit	0.36	2.22	0.36	-2.94	0.22	1.47	0.27	-1.96
Addtl. Income Unit	0.34	2.55	0.56	-3.45	0.34	2.55	0.56	-3.45
Addtl.Year Age	-0.34	-0.83	0.08	1.09	-0.34	-0.83	0.08	1.10
Addtl. Year Educ	0.25	1.86	0.40	-2.51	0.25	1.86	0.40	-2.52
Addtl. Year Tenure	-0.01	-0.06	-0.01	0.09	-0.01	-0.06	-0.02	0.09
Addtl. Jloss Unit	-0.17	-1.47	-0.38	2.02	-0.17	-1.47	-0.38	2.02
Female over Male	-0.42	-3.20	-0.73	4.35	-0.38	-2.92	-0.66	3.96
Emp over Unemp	0.17	1.32	0.31	-1.79	0.17	1.31	0.31	-1.78

[72] Top Half of the Table reports the changes to the probabilities, given in percent, of being in one of the four categories, due to unit increases in the explanatory variables. The lower half reports the probabilities of being in one of the four categories, holding everything else constant.

Married vs. Not	-0.80	-5.63	-1.14	7.56	-0.79	-5.59	-1.13	7.51
Young Kids vs. Not	-0.32	-2.54	-0.60	3.46	-0.33	-2.56	-0.60	3.49
Small Town vs. City	-0.53	-3.88	-0.83	5.24	-0.53	-3.89	-0.83	5.25
Sub Housing vs. Not	0.04	0.32	0.07	-0.44	0.04	0.32	0.07	-0.44
H. Owner vs. Not	-1.62	-13.29	-3.42	18.32	-1.62	-13.29	-3.42	18.32

Marginal Effects	Yes, Very Much	Yes, probably	Probably Not	Never	Yes, Very Much	Yes, probably	Probably Not	Never
Average	1.45	24.21	14.90	59.45	1.45	24.21	14.90	59.45
Wage Differential	1.84	27.00	15.47	55.70	1.69	26.03	15.28	57.00
Wage Differential (+1)	2.20	29.22	15.83	52.75	1.91	27.49	15.55	55.04
HH Incomes	1.35	23.44	14.71	60.49	1.35	23.44	14.71	60.49
HH Incomes (+1)	1.69	25.99	15.28	57.04	1.69	25.99	15.28	57.04
Age	5.95	42.90	16.18	34.98	5.98	42.97	16.17	34.89
Age (+1)	5.61	42.07	16.25	36.07	5.63	42.14	16.25	35.98
Male	1.68	25.95	15.27	57.10	1.66	25.79	15.24	57.31
Female	1.27	22.75	14.54	61.45	1.28	22.87	14.57	61.27
Educc	1.42	24.01	14.85	59.72	1.42	24.01	14.85	59.72
Educc (+1)	1.67	25.87	15.25	57.21	1.67	25.87	15.25	57.20
Unemp	1.34	23.35	14.69	60.62	1.34	23.36	14.69	60.61
Emp	1.51	24.67	15.00	58.83	1.51	24.66	15.00	58.83
Married	1.29	22.95	14.59	61.16	1.29	22.96	14.60	61.15
Not Married	2.09	28.58	15.73	53.60	2.08	28.55	15.73	53.64
Young kids	1.26	22.71	14.53	61.50	1.26	22.70	14.53	61.51
No Young Kids	1.59	25.25	15.13	58.04	1.59	25.26	15.13	58.03
Tenurec	1.40	23.88	14.82	59.90	1.40	23.87	14.82	59.90
Tenurec (+1)	1.40	23.81	14.80	59.99	1.40	23.81	14.80	59.99
Small Town	1.31	23.14	14.64	60.90	1.31	23.14	14.64	60.90
City	1.84	27.02	15.47	55.66	1.84	27.03	15.47	55.65
Medium Town	1.88	27.27	15.52	55.34	1.88	27.27	15.52	55.34
Jloss	1.33	23.29	14.68	60.70	1.33	23.29	14.68	60.70
Jloss (+1)	1.16	21.82	14.29	62.72	1.16	21.82	14.29	62.73
Sub Housing	1.49	24.52	14.97	59.02	1.49	24.52	14.97	59.02
Non Sub Housing	1.45	24.20	14.89	59.46	1.45	24.20	14.89	59.46
H owner	0.64	16.29	12.46	70.61	0.64	16.29	12.46	70.61
Not H owner	2.26	29.58	15.88	52.28	2.26	29.58	15.88	52.29
d1991	1.51	24.68	15.00	58.80	1.51	24.68	15.00	58.81
d1992	1.44	24.14	14.88	59.55	1.44	24.13	14.88	59.55
d1993	0.96	19.91	13.73	65.40	0.96	19.90	13.73	65.41
d1994	1.09	21.12	14.10	63.69	1.08	21.12	14.10	63.70
d1995	0.76	17.66	12.98	68.60	0.76	17.66	12.98	68.60
d1996	1.09	21.13	14.10	63.69	1.09	21.13	14.10	63.69
d1997	0.89	19.13	13.48	66.50	0.89	19.13	13.48	66.50
d1998	0.95	19.75	13.69	65.61	0.95	19.75	13.68	65.62
d1999	1.95	27.70	15.59	54.76	1.95	27.71	15.59	54.76
Berlin East	1.53	24.82	15.03	58.62	1.55	24.99	15.07	58.39
Brandenburg	1.13	21.54	14.22	63.11	1.13	21.55	14.22	63.10
Sachsen Anhalt	1.26	22.70	14.53	61.51	1.26	22.69	14.53	61.52
Mecklenburg	1.12	21.49	14.20	63.18	1.13	21.53	14.21	63.12
Thüringen	1.16	21.80	14.29	62.75	1.16	21.80	14.29	62.75
Sachsen	1.69	25.99	15.28	57.05	1.69	25.97	15.27	57.07

Table A. 25: Marginal Effects for IV1 & IV2 Models