Marriage and Divorce: The Role of Labor Market Institutions[*]

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Abstract

Marriage and divorce decisions are influenced by the institutional environment they are made in. One example is the social insurance system, which acts as a substitute for within-household insurance against economic shocks. In this paper, we quantify the importance of household-level insurance for marriage and divorce by exploiting an exogenous increase in the need for risk sharing: in January 2003, a German labor market reform sharply reduced means-testing exemptions in the unemployment insurance system and thereby increased the extent to which spouses have to insure each other against unemployment. Using social security register data, we show that the extent to which (potential) spouses were affected by this reform varies with nationality. We them follow a differences-in-differences identification strategy and use data on all marriages and divorces in Germany between 1997 and 2013 to show that increased means testing made the formation of interethnic marriages significantly less attractive. At the same time, the reform increased the stability of newly-formed interethnic marriages.

Keywords: Marriage, Divorce, Interethnic Marriage, Risk Sharing, Unemployment Insurance, Labor Market Reforms, EU Expansion
JEL Classifications: J10, J12, J15, J64, J65

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1 Introduction

Living in a union with another individual offers many benefits. Besides the emotional value of companionship and mutual affection, economic considerations also matter for the decision of whom to marry: first, economies of scale and household specialization increase joint consumption and utility (Muellbauer, 1977; Becker, 1981; Grossbard-Shechtman, 1984). Second, the family facilitates risk sharing: the labor supply of a spouse can provide insurance against income shocks, e.g. due to unemployment or sickness (Lundberg, 1985; Cullen and Gruber, 2000; Shore, 2010). Both sources of economic rents—the benefits gained from living in a union with another individual—constitute what economists refer to as *marital surplus*.[1]

While a thriving literature analyzes household consumption choices, sharing rules, and welfare empirically[2], relatively little is known about the quantitative importance of within-household insurance. Existing studies analyze risk sharing mainly from a business-cycle perspective (Hellerstein and Morrill, 2011; Schaller, 2013; González-Val and Marcén, 2017a,b). Time series evidence suggests that both marriage and divorce rates are pro-cyclical, that is, they decrease in recessions and correlations with the unemployment rate are typically negative.

Our contribution to this literature is a simple and transparent approach to identifying the effect of within-household insurance on marital surplus and stability. The key idea is that insurance against income shocks is not exclusively provided at the household level. In many countries, institutions of the social insurance system act as a substitute. The value of this substitute varies over time as social policies change, altering the demand for within-household insurance and, consequently, marital surplus. Reforms of the social insurance system thus facilitate identification of the effect we are interested in.

We exploit a reform of the German unemployment insurance (UI) system. UI is a substitute for insurance within the household in the aforementioned sense: if unemployment benefits are generous, there is little dependence on the partner upon job loss. Marital surplus is higher because the partner's income stream is less volatile in expectation,

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[1]In dynamic models of marriage market matching, the marital surplus governs marriage formation and dissolution, see e.g. Bruze et al. (2015), Goussé et al. (2017), and Gayle and Shephard (2019).

[2]Blundell et al. (1994), Pesaran and Wickens (1999), and Chiappori and Mazzocco (2017) are excellent surveys of this literature. Lise and Seitz (2011), Browning et al. (2013), and Cherchye et al. (2015) are examples of recent contributions.

implying more marriages and higher marital stability. Conversely, if unemployment benefits are low or means-tested against the partner's income, shocks have to be absorbed within the household to a larger extent, lowering marital surplus. Means testing, in particular, makes individuals who are exposed to unemployment risk less attractive in the marriage market. In January 2003, the "Hartz I"[3] labor market reform—the first of four labor market reform packages implemented in Germany between 2003 and 2005—sharply tightened means testing of long-term unemployment assistance against the partner's income. This reform increased the demand for within-household insurance during a period of high unemployment risk in Germany.[4]

We estimate the effects of the Hartz I labor market reform on marital surplus and stability using three sources of German micro data. First, we have access to the German marriage and divorce registers which are compiled by the statistical offices of the 16 federal states based on information from the civil registry offices and divorce courts, respectively. We observe the universe of legal marriages and divorces in Germany with daily precision and a number of covariates between 1997 and 2013. This allows us to estimate the effects of the reform with high precision. To the best of our knowledge, this is the first paper in the family economics literature using these data.

Despite their richness, using the marriage and divorce registers has two disadvantages: first, we observe only legal marriage. Although the idea of insurance within the household similarly applies to cohabiting and same-sex couples, we have to restrict the analysis to legally-married heterosexual couples due to the nature of our data. Second, the marriage and divorce registers do not include information on individual education, income, employment status, or any other covariate that would allow us to measure the exposure to unemployment risk in a straightforward way. However, we observe the nationality of both spouses. Therefore, we focus our analysis on interethnic marriages and use nationality as a proxy variable for unemployment risk.

We follow a differences-in-differences identification strategy and define interethnic marriages, that is, marriages with one German and one foreign spouse as the treatment group. This is tantamount to assuming that these marriages were more exposed to unem-

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[3]The so-called "Hartz reforms" were named after the chairman of the commission that proposed the reforms, Peter Hartz, who was at that time director of human resources at Volkswagen. We provide more details on the reforms in Section 2.

[4]In 2003, the German unemployment rate was 10% with an increasing trend, see also Figure 1 below.

ployment risk compared to marriages between two native Germans (control group).[5] We provide support for this identifying assumption by estimating survival models conditional on nationality, using process-generated social security records from the German Federal Employment Agency, our second source of micro data.

The third data source we use is the German Microcensus, the largest household survey in Europe. We use it to extrapolate and extract the population of singles for the age-nationality combinations that we use in our empirical analysis. Observing both the single populations and the flow of new marriages, we can estimate our primary outcome variable, the marital surplus, following the structural approach of Choo and Siow (2006). Methodologically, our paper thus combines the well-known theoretical foundations of transferable utility models of marriage market matching (Becker, 1973, 1974) with a quasi-experimental empirical design.

We find that the labor market reform had a sizable negative effect on the marital surplus of interethnic marriages in Germany. According to our preferred specification, the marital surplus of all treated marriages decreased by 7.8% (relative to the estimation constant). For interethnic marriages in which the wife is the German national, the negative effect extends to 8.9%. In accordance with our estimated effects, the intermarriage rate of German men and women declined by about 30% between 2003 and 2008 as shown in Figure 1. Regarding marital stability, we document that interethnic couples formed after the reform faced a significantly lower hazard rate and, thus, were less likely to divorce. This increased marital stability can at least partly be explained by selection.

The sizable and significant feedback effects of the Hartz I labor market reform on the marriage market, and on interethnic marriages in particular, is a finding of high policy relevance. For one thing, the marriage market ramifications of the labor market reform were most probably not intended by the policy-maker. Apart from that, interethnic marriages can be an important vehicle for the integration of migrants (Adda et al., 2019; Azzolini and Guetto, 2017). Reforms of the social insurance system that make intermarriages unattractive may therefore conflict with a successful migration policy.

An important confounding event that we take into account in our analysis is the Eastern expansion of the European Union (EU) in May 2004. The EU expansion granted the right to live and work in any EU country to citizens of eight Eastern European countries,

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[5]Caucutt et al. (2018), who investigate racial differences in marriage market outcomes in the U.S., make a similar identification argument related to unemployment and incarceration rates of black men.

Figure 1: Intermarriage and Unemployment Rates in Germany
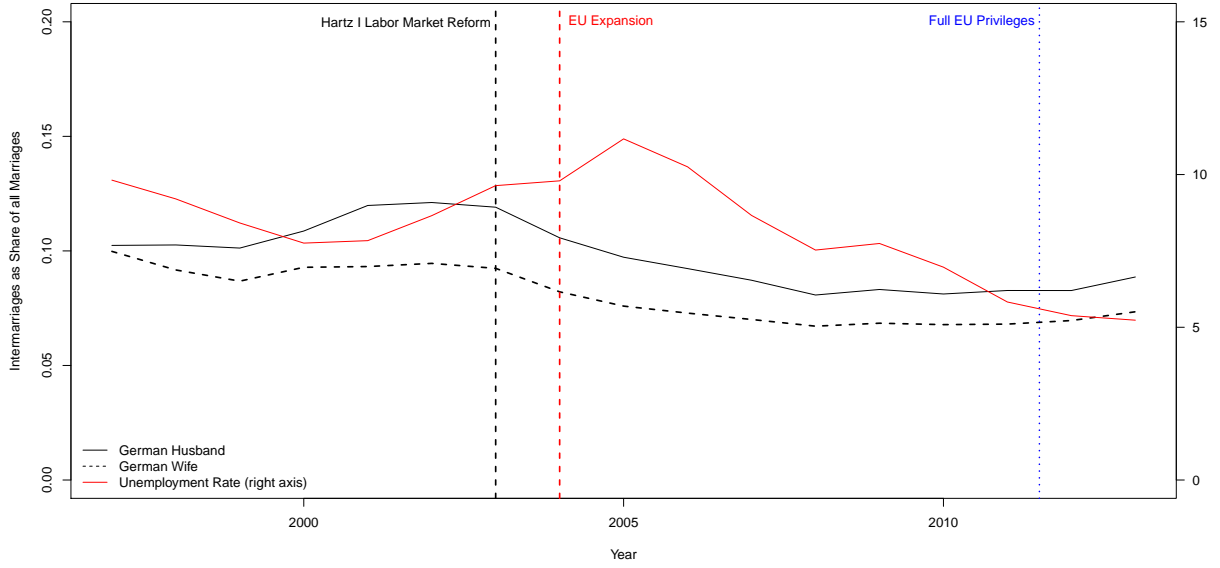
Notes: The black dashed vertical line indicates the year in which the Hartz I Reform became effective (2003), the red dashed vertical line marks the year in which the EU expansion took place (2004). *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register, 1997-2013, own calculations. The unemployment rate is extracted from OECD data.

Malta, and Cyprus (the EU10 countries). It is conceivable that the EU expansion had by itself an impact on the German marriage market, similar to what Adda et al. (2019) find in the Italian context. From a theoretical perspective, the marital surplus of interethnic marriages between Germans and citizens of the new EU member states was negatively affected by the EU expansion. The reason is that marrying a German citizen was no longer necessary to obtain the right to reside and work in Germany. Due to the gradual opening[6] of the German labor market for citizens of the new member states, however, one would expect to find a smaller effect in Germany as compared to Italy, a country that immediately granted full labor market access. We control for the effect of the EU expansion on marital surplus and stability using a double differences-in-differences strategy: we estimate the effect of the EU expansion conditional on the impact of the labor market reform by using a different set of treatment and control groups. Taking into account the labor market reform, we find no statistically significant effect of the EU expansion on the surplus of interethnic marriages.

Figure 1 depicts German intermarriage rates between 1997 and 2013, constructed using the marriage register, along with the unemployment rate according to OECD data.

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[6]Most member states opened their labor markets to citizens of the new member states immediately. Germany and Austria, however, implemented a seven-year transitional period during which labor market access was granted only gradually.

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The purpose of this plot is to illustrate the suggestive correlation between the share of interethnic marriages and the unemployment rate (as a proxy for the risk of job loss). The unemployment rate increased from 7.8% in 2001 to a maximum of 11.2% in 2005 and decreased steadily thereafter. Intermarriage rates evolve almost in parallel for men and women, although the level is always higher for German men marrying foreign women. After some initial increases around the year 2000, the intermarriage rates became flat at first and started to decrease in 2003, the year in which the Hartz I labor market reform was implemented (black dashed line). The negative trend was hardly affected by the EU expansion (red dashed line). Intermarriage rates only started to recover around the year 2011, when the German unemployment rate had reached a historical low. This negative correlation between intermarriage and unemployment rates suggests a link between the relative attractiveness of interethnic marriages and unemployment risk.

Other papers in the related literature share with ours the focus on interactions between social policy and the marriage market. Ortigueira and Siassi (2013) assess the quantitative effects of within-household risk sharing on savings and labor supply using a model with idiosyncratic income risk (Aiyagari, 1994) and two decision makers within the household. Among other findings, their model matches well the elasticity of spousal labor supply with respect to UI estimated by Cullen and Gruber (2000). Low et al. (2018) find that a U.S. welfare reform that introduced lifecycle time limits on the receipt of welfare led, inter alia, to higher marital stability. Persson (2020) argues that the elimination of survivor insurance in Sweden had effects on marriage formation decades before expected payout and, additionally, raised the divorce rate and the degree of assortative matching in the marriage market. Anderberg et al. (2020) study how raising the school-leaving age in the UK in 1972 affected partner choices both in terms of (unobserved) ability and qualification. Finally, our study is related to a number of papers with mixed results that study intermarriage in relation to labor market outcomes (Kantarevic, 2005; Meng and Gregory, 2005; Furtado and Theodoropoulos, 2009; Meng and Meurs, 2009; Basu, 2015; Dribe and Nystedt, 2015).

The remainder of our paper is structured as follows. Section 2 describes the institutional background and analyzes labor market data to support our identification strategy. Section 3 reviews the Choo and Siow (2006) model that we use to estimate marital surplus. Section 4 introduces the marriage market data and discusses pre-trends and descriptive

evidence. Section 5 presents our primary empirical analysis of the reform effects on marital surplus. Section 6 extends the analysis to study marital stability. Finally, Section 7 offers a brief conclusion.

2 Institutional Background

2.1 The Labor Market Reform

Our identification strategy exploits a tightening of household-level means testing in the German unemployment insurance system. Due to lower exemption thresholds, the system became less generous in the sense that spouses and cohabitation partners had to insure each other within the household to a larger extent after the change. This change was part of the comprehensive labor market reform package known as the "Hartz reforms".[7] They were implemented sequentially between 2003 and 2005 and designed to increase labor demand (Hartz I/II), matching efficiency (Hartz III), and labor supply (Hartz II/IV).

The Hartz I reform, which was passed in parliament on December 23 2002 and came into force straight away on January 1 2003, is primarily known for deregulating temporary employment and subcontracted labor. A lesser-known element of Hartz I was a sharp reduction of the threshold above which the income of a spouse or cohabitation partner was counted against, at that time, long-term unemployment assistance.[8] Before the reform, the partner's income below a threshold of 520 Euros per year of age of the partner was exempt from means testing up to a maximum value of 33,800 Euros per year for a partner of age 65 or above. This threshold decreased by more than 60% from 520 to 200 Euros per year of age with a new maximum of 13,000 Euros per year.

Before the Hartz reforms, the German unemployment insurance system featured three types of transfers. The first transfer, unemployment benefits[9], is a social insurance benefit that replaces 60 to 67% of the previous net salary. It was never means-tested and, before 2005, could be received for a maximum duration between 12 and 36 months depending on age and employment history.[10]

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[7]The name is derived from Peter Hartz, who was at that time director of human resources at Volkswagen and chair of the commission that worked out the reform proposals. The commission's work took place during the first half of 2002 and results were presented to the public on August 16, 2002.

[8]"Arbeitslosenhilfe" in German.

[9]"Arbeitslosengeld" in German, renamed to "Arbeitslosengeld I" by Hartz IV in 2005.

[10]Hartz IV limited duration to at most 18 months. Following another reform in 2007, unemployment

Upon exhaustion of unemployment benefits, a second transfer, unemployment assistance, could be received prior to 2005. Claims had to be renewed yearly, but eligibility was not time-limited otherwise. This tax-financed transfer amounted to 53 to 57% of the last net salary and was, as mentioned above, means-tested against the partner's income above an exemption threshold that was lowered significantly in 2003.

In 2005, unemployment assistance was merged with the third transfer, social assistance, as part of the Hartz IV reform.[11] This effectively set the means-testing threshold to zero. Tax-financed social benefits, traditionally the third and lowest tier of transfer payments in the German social security system, are strictly means-tested and additional sources of income, including the partner's income, are counted against benefit entitlements from the first Euro.

2.2   Unemployment Risk and Nationality

To identify the effect of the Hartz I labor market reform on marital surplus, we create treatment and control groups based on spouses' nationalities. The idea is that exposure to unemployment risk differs between native and non-native workers in the German labor market. This makes interethnic marriages more vulnerable in times of high unemployment and, therefore, more strongly affected by the increasing need for insurance at the household level.

To support this identifying assumption, this section studies labor market dynamics by citizenship and gender using German social security records. We rely on the Sample of Integrated Labour Market Biographies (SIAB), an administrative data set provided by the Research Data Center (RDC) of the Institute for Employment Research (IAB) at the German Federal Employment Agency.[12] The SIAB is a 2% random sample of the German social security registers covering the years 1975 to 2014. We drop the first five years because the benefit receipt data is incomplete before 1980. One observation in the data corresponds to a time period (spell) with at least one of the following characteristics:

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benefit receipt is until today restricted to 12 months for workers below 50, 15 months below 55, 18 months below 58, and 24 months for workers who are 58 and older.

[11]This merger resulted in a new transfer called "Arbeitslosengeld II", which is simply referred to as "Hartz IV" in today's colloquial German.

[12]We use the factually anonymous Sample of Integrated Labor Market Biographies (File: `SIAB_7514`). Data access is provided via a Scientific Use File supplied by the Research Data Center (RDC) of the German Federal Employment Agency (BA) at the IAB, project no. 101693. See also Ganzer et al. (2016) for more details on the data set.

(i) employment subject to social security (in the data since 1975), (ii) marginal part-time employment (in the data since 1999), (iii) benefit receipt[13], (iv) officially registered job-seekers at the German Federal Employment Agency or (planned) participation in programs of active labor market policies (in the data since 2000). We observe these (un)employment spells with daily precision.

(Un)employment spells end either by a change of employment status, employer or always at the end of a calendar year. The duration variable (tenure) is the accumulated time from the beginning of employment. We are interested in estimating conditional rates of job loss (firings/quits) and job finding (hirings). To identify the rate of job loss, we count transitions from employment into unemployment and from employment into inactivity. Transitions from unemployment into employment, both full and part time, identify the job finding rate.

We treat changes from full to part-time employment (and vice versa) and transitions between employers as continuous employment. The SIAB includes information about, among other things, gender, nationality (German, non-German), regional identifiers, and education.[14] We do not observe marital status in the SIAB data. To test whether non-natives face a higher unemployment risk, both in terms of transitions into unemployment and duration, we estimate Cox proportional hazard models (Cox, 1972), stratified by education. The proportional hazard model assumes a baseline hazard that is common to both employed and unemployed individuals along with a log-linear function of covariates. The hazard rate for transitions out of and into unemployment after a number of days, d, with the vector of covariates Z is denoted $h(d, Z)$. γ indicates the vector of coefficients to be estimated, $\lambda(d)$ is the baseline hazard, and v is an error term:

$$h(d, Z) = \lambda(d) \cdot \exp(\gamma' Z) \cdot v. \tag{1}$$

With stratification, the five education groups have different baseline hazards.[15] We

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[13] According to the German Social Code: SGB III since 1975 and SGB II since 2005. The introduction of SGB II was part of the implementation of the Hartz IV reform.

[14] The education variable in German social security data suffers from missing values and inconsistencies, essentially because misreporting has no negative consequences. We impute missing and inconsistent observations using the methodology proposed by Fitzenberger et al. (2006). We use five levels of education: Lower secondary education without/with vocational training, higher secondary education without/with vocational training and tertiary education (University, University of Applied Sciences).

[15] As education is unobserved in the marriage and divorce data, we also estimate hazard rates without stratification, see Table A.2 in the Appendix. The conclusions are unchanged.

Table 1: Estimated Labor Market Hazard Rates

	Transitions into Unemployment				Transitions into Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
German	-0.130***	-0.144***	-0.184***	-0.199***	0.025**	-0.025***	-0.005	-0.052***
	(0.012)	(0.011)	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.008)
	[0.878]	[0.866]	[0.832]	[0.820]	[1.025]	[0.975]	[0.995]	[0.949]
Female	-0.191***	-0.125***	-0.188***	-0.116***	-0.161***	-0.143***	-0.160***	-0.143***
	(0.009)	(0.008)	(0.010)	(0.008)	(0.011)	(0.011)	(0.010)	(0.010)
	[0.826]	[0.882]	[0.829]	[0.890]	[0.851]	[0.867]	[0.852]	[0.867]
N	1,857,659	1,857,659	1,857,659	1,857,659	1,232,908	1,232,908	1,232,908	1,232,908
Stratified by Education	✓	✓	✓	✓	✓	✓	✓	✓
Year FE		✓		✓		✓		✓
Region FE			✓	✓			✓	✓

Notes: Robust standard errors (clustered by region) in parentheses. Hazard rates reported in square brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Institute for Employment Research (IAB) at the Federal Employment Agency, SIAB SUF 7514, 1980–2014, own calculations.

calculate hazard rates for transitions into unemployment and into new employment out of unemployment. Table 1 presents the results. The covariates of interest are nationality and gender of the employed/unemployed individuals. Columns (1)–(4) of Table 1 show estimated hazard rates for job loss (transitions into unemployment) and columns (5)–(8) present estimated hazard rates for job findings (transition into employment). We find that the hazard of transitioning from employment into unemployment is significantly higher for non-natives compared to native Germans. Thus, as we conjectured, non-natives face a higher risk of becoming unemployed. Our preferred specification includes both year and labor market region fixed effects, see columns (4) and (8). German nationals have a job loss hazard rate that is 18% lower than the respective hazard rate for workers without German citizenship, who are thus on average more likely to lose their jobs.

For transitions into employment, the hazard rate of Germans is 5% lower than the hazard rate for foreigners. Thus, workers without German citizenship find new jobs out of unemployment quicker than Germans and their unemployment duration is on average shorter. An explanation for this finding are lower reservation wages, for example due to lower unemployment benefit entitlements or because for some nationalities continued employment is a necessary requirement for residence status. Selection could also play a role: upon job loss, some foreign workers might return to their home country, so we don't observe those individuals transitioning back into employment.

Note that the estimated hazard rates reflect differences between Germans and a diverse group of individuals without German citizenship. One would expect that labor market

transition probabilities vary greatly across individuals of different foreign nationalities. For example, citizens of other EU15 countries face no legal barriers to employment in Germany and unemployment benefit entitlements can be transferred across countries. Thus, they might be more comparable to German workers in terms of labor market attachment than workers from non-EU countries. The hazard rate differences we find can therefore be interpreted as a lower bound for the differential exposure to labor market risk for workers without German or EU15 citizenship.

Finally, women are 11% less likely to become unemployed and about 13% less likely to move into employment compared to the baseline in our preferred specification. That is, women are on average employed longer, but it also takes them longer to find a new job out of unemployment. From the estimated labor market hazard rates, it is therefore not clear whether interethnic couples in which the female is non-native are more affected by the reform as compared to couples in which the male is non-native. We will get back to this question in our empirical analysis.

3 Theory

To formally investigate how changes of unemployment insurance generosity affect different types of unions in the marriage market, we need a metric to evaluate the relative attractiveness of different marriages. To this end, we use *marital surplus* as our primary outcome variable. To estimate it from the data, we rely on the Choo and Siow (2006) model. In this section, we explain the key properties of this model and discuss the assumptions it places on the data.

Choo and Siow (2006) show that a static marriage market matching model with transferable utility (TU) in the spirit of Becker (1973, 1974) yields a simple non-parametric estimator for marital surplus. A useful property is that, under the assumptions of the model, marital surplus alone is sufficient to characterize behavior. No specific assumptions about male and female preferences are necessary. The estimator is derived from market clearing conditions and depends solely on the observed numbers of married men and women by type and the respective numbers of singles.

3.1 Derivation of Marital Surplus

Marital surplus reflects the gains from marriage for both partners, and those gains vary with both the types of the individual spouses and the institutional environment. In our setting, the types i and j of men and women, respectively, are combinations of nationality and age, as detailed in Section 4. For each type, the number of individuals in the marriage market is denoted m_i for males and f_j for females, respectively. The following set of accounting constraints holds:

$$
\begin{aligned}
\mu_{i0} + \sum_{j=1}^{J} \mu_{ij} = m_i \quad \forall i, \\
\mu_{0j} + \sum_{i=1}^{I} \mu_{ij} = f_j \quad \forall j, \\
\mu_{0j}, \ \mu_{i0}, \ \mu_{ij} \geq 0 \quad \forall i, j.
\end{aligned}
\tag{2}
$$

μ_{ij}, μ_{i0}, and μ_{0j}, are the numbers of ij marriages, single men of type i, and single women of type j, respectively. Capital I and J denote the total numbers of male/female types.

Following Choo and Siow (2006), we assume that the utility of a type i man indexed g who is married to a type j woman consists of a systematic and a random component, see (3). The systematic component is denoted $\tilde{\alpha}_{ij}$ and the utility transfer from a type i man to a type j woman τ_{ij}. Thus, the systematic gain from this marriage for the man is given by $\tilde{\alpha}_{ij} - \tau_{ij}$ and it is independent of both spouses' identity, only the type matters. The random component is an identity-specific idiosyncratic shock, ϵ_{ijg}, which allows for deviations from the systematic utility gain for any combination of types. It is assumed that ϵ_{ijg} is i.i.d. with a type I extreme-value distribution.

$$
V_{ijg} = \tilde{\alpha}_{ij} - \tau_{ij} + \epsilon_{ijg}
\tag{3}
$$

The systematic gain for a female of type j from marrying a type i man is similarly defined and denoted $\tilde{\gamma}_{ij}$.[16] Observing all potential levels of utility, a male (female) individual g chooses whom to marry in the frictionless marriage market by simply picking the highest attainable utility:

$$
V_{ig} = \max_{j}\{V_{i0g}, ..., V_{ijg}, ..., V_{iJg}\},
\tag{4}
$$

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[16]Following the notation of Choo and Siow (2006) the sign of the utility transfer τ_{ij} suggests that women receive a positive transfer. This does not have to be the case.

where V_{i0g} denotes the utility from remaining single. As shown by McFadden (1974), this random utility model, together with the assumed type I extreme-value distribution of the idiosyncratic component and large numbers of men and women, yields a simple quasi-demand function for the number of ij marriages demanded by type i men:

$$\ln \mu_{ij}^d = \ln \mu_{i0}^d + \tilde{\alpha}_{ij} - \tilde{\alpha}_{i0} - \tau_{ij}$$
$$= \ln \mu_{i0}^d + \alpha_{ij} - \tau_{ij}, \tag{5}$$

which depends on the number of type i singles and $\alpha_{ij} = \tilde{\alpha}_{ij} - \tilde{\alpha}_{i0}$, which is the systematic gross return to a type i man from being in a type ij marriage relative to being unmarried. Symmetrically, the number of ij marriages demanded by type j women is given by the quasi-supply function:

$$\ln \mu_{ij}^s = \ln \mu_{0j}^s + \gamma_{ij} + \tau_{ij}. \tag{6}$$

All $I \times J$ submarkets of the marriage market clear in equilibrium. Thus, the surplus of marriages between a type i man and type j woman, our object of interest, can be calculated by adding up equations (5) and (6). The utility transfer cancels out and the two systematic components, α_{ij} and γ_{ij}, remain. They make up marital surplus according to the Choo and Siow (2006) model:

$$\frac{\alpha_{ij} + \gamma_{ij}}{2} = \ln \mu_{ij} - \frac{\ln \mu_{i0}^d + \ln \mu_{0j}^s}{2}, \tag{7}$$

which can be rewritten as

$$\Phi_{ij} = \ln \left(\frac{\mu_{ij}}{\sqrt{\mu_{i0} \, \mu_{0j}}} \right), \tag{8}$$

so Φ_{ij} is the marital surplus according to the Choo and Siow (2006) model. The number of marriages between type i men and type j women, μ_{ij}, in the numerator is scaled by the number of single men and single women of the respective types, μ_{i0} and μ_{0j}. Intuitively, the total systematic gain (surplus) to marriage per partner for any ij pair is high if we observe many ij marriages relative to the respective single populations. The measure exploits that the observed number of singles of a given type is informative about the expected gains of this type in the marriage market. However, with market clearing in the assumed frictionless environment, the surplus itself is not a function of the availability of different types of singles. That is, there is no option value of waiting longer until a

"better" partner arrives, as it would be the case in a search model of the marriage market.

It is worth emphasizing that utility transfers, τ_{ij}, although they do not influence marital surplus, provide an important adjustment mechanism. Transfers change the relative gains to marriage for two partners by transferring resources from one to the other. For example, for a certain married woman of type j, a reduced systematic gain from marriage may have to be compensated by a larger transfer from her type i husband to keep marriage preferable to singlehood for both partners. However, increasing the transfer sufficiently might be infeasible, for example due to budget or time constraints. The number of marriages of this particular combination of types will be lower and, consequently, more existing ij couples might file for divorce. Divorce is not part of the static Choo and Siow (2006) model, but we explore marital stability empirically in Section 6.

Holding the marital surplus Φ_{ij} constant, a percentage increase in the stock of available singles of a given male or female type, μ_{i0} or μ_{0j}, results in an equal increase of marriages involving this particular type, μ_{ij}. Consequently, changes in marital surplus reflect deviations from this constant relationship.[17] Reasons for such deviations can be manifold. The example we consider in this paper is a reduction of social insurance generosity that increases the need for within-household insurance against prolonged unemployment.

3.2   Reform Effects on Marital Surplus

Through the lens of the model, the increased need for within-household insurance due to the Hartz I labor market reform reduced the systematic utility component for married individuals, α_{ij} for men and γ_{ij} for women, respectively. The extent of this reduction depends on the couples' heterogeneous exposure to unemployment risk. We proxy for this heterogeneity using the observed nationality combinations of married couples in accordance with the identification argument presented in Section 2. Because the Hartz I reform affected married couples exclusively through stricter means testing, one would not expect an effect on the systematic utility from being single in this case.

The theoretical effect of the 2004 EU expansion on marital surplus, also included in our empirical model, is slightly different. Marrying a German citizen is one way for foreigners to obtain the right to live and work in Germany. After the EU expansion, EU10 citizens

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[17]Marital surplus is always defined relative to the value of being single. Changes that affect both the value of being single and the value of being married in equal measure will not alter marital surplus.

obtained these rights automatically (with initial restrictions[18]), so marrying a German citizen became less attractive, reflected in lower values of $\tilde{\alpha}_{ij}$ and $\tilde{\gamma}_{ij}$. The negative effect on marital surplus was reinforced by higher utility from singlehood for EU10 citizens: $\tilde{\alpha}_{0j}$ and $\tilde{\gamma}_{i0}$ increased because the new opportunities in Germany were granted independently of marital status, so singles benefited as well.

To sum up, our theory suggests that both the Hartz I labor market reform and the EU expansion had a negative effect on the surplus of interethnic marriages. We estimate and disentangle these two effects in Section 5 to study their relative importance.

3.3   Expected Gains from Entering the Marriage Market

The Choo and Siow (2006) model also provides functional forms for the expected gains from entering the marriage market that can be computed directly from the data. Arguably, the labor market reform also affected these gains for both genders, due to the aforementioned insurance considerations. Thus, in Section 4, we will also study how these gains evolved over time in conjunction with the institutional changes.

Starting from the demand for marriages, equation (5), the expected value of entering the marriage market for a type i man g before all individual realizations of ϵ_{ijg} is

$$\mathbb{E}V_{ig} = c + \tilde{\alpha}_{i0} + \ln\left(\frac{m_i}{\mu_{i0}^d}\right), \tag{9}$$

where c is a constant and $\tilde{\alpha}_{i0}$ the gains from being a single of this particular type. The value of entering the marriage market is proportional to the log of the number of type i men in the marriage market, m_i, divided by the number of type i men who remain single. The last term can thus be interpreted as the expected gains to entering the marriage market for type i men, denoted

$$Q_i = \ln\left(\frac{m_i}{\mu_{i0}^d}\right). \tag{10}$$

By symmetry, the expected gains to enter the marriage market for women are

$$Q_j = \ln\left(\frac{f_j}{\mu_{0j}^s}\right), \tag{11}$$

where f_j is the number of type j women who enter the marriage market.

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[18]While trade of goods and services and self-employment were unrestricted, regular employment was initially more difficult to obtain. These restrictions were lifted in a staggered fashion.

3.4 Taking the Model to the Data

In principle, a single cross section of data suffices to compute marital surplus according to the Choo and Siow (2006) model. Using the time dimension in our data, we calculate marital surplus on an annual basis. We relate the flow of new marriages to the number of available singles in every particular year. Essentially, this measures the flow out of singlehood.[19]

In the data, we interpret the individual types i and j of men and women as combinations of age and nationality. Thus, we let $\hat{\Phi}(f_{a,n}, m_{a,n})_t$ denote the estimated surplus of a marriage between a man of age a and nationality n and a woman of age a and nationality n in year t. Thus, the estimator in equation (8) becomes:

$$\hat{\Phi}(f_{a,n}, m_{a,n})_t = \ln\left(\frac{\mu(f_{a,n}, m_{a,n})_t}{\sqrt{\mu(0, f_{a,n})_t \; \mu(m_{a,n}, 0)_t}}\right), \tag{12}$$

where the marriage surplus in any particular year t depends on the observed numbers of females $f_{a,n}$ and males $m_{a,n}$ of a certain age a and nationality n who get married, $\mu(f_{a,n}, m_{a,n})_t$, relative to the geometric average of the available singles of the same types, $\mu(0, f_{a,n})_t$ and $\mu(m_{a,n}, 0)_t$. The more new marriages we observe for the given population vectors, the higher is the estimated marital surplus for this particular age-nationality combination. As data inputs, we use observed new marriages from the MR data and single stocks from the MC data in six age groups (18-25, 26-32, 33-39, 40-46, 47-54, 55-68) and eight nationalities (Germany, EU15 (excluding Germany), Poland, Turkey, EU10 (excluding Poland), Romania, former Yugoslavia, Rest of the World). Details follow in Section 4.

To estimate the gains from entering the marriage market for both men ($\hat{Q}_{m_n}$) and women ($\hat{Q}_{f_n}$) of all nationalities n (irrespective of age, for brevity) we use equations (10) and (11), respectively:

$$\hat{Q}_{f_n} = \ln\left(\frac{f_n}{\mu(0, f_n)_t}\right), \; \hat{Q}_{m_n} = \ln\left(\frac{m_n}{\mu(0, m_n)_t}\right). \tag{13}$$

The numerator in both expressions represents the total number of women and men by nationality, respectively. The denominators, $\mu(0, f_n)_t$ and $\mu(0, m_n)_t$, represent the re-

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[19]This approach is also the one used by Adda et al. (2019), who estimate the Choo and Siow (2006) model using Italian census data.

spective numbers of singles. We approximate the total numbers of all male and female individuals in the marriage market by adding to the number of singles from the MC the number of individuals for which we observe a marriage in the same year.[20]

4   Marriage Market Data

4.1   Marriage and Divorce Registers

The marriage and divorce registers, referred to as MR and DR in the following, cover the universe of marriages and divorces in Germany. Data access is provided by the Research Data Centers (FDZ) of the statistical offices of the German federal states. The marriage and divorce registers are two separate sources of process-generated micro data. They originate from the German civil registry offices and divorce courts, respectively. Both data sources contain information on legally registered marriages of different-sex couples only. Although same-sex couples could form a civil union in Germany starting in 2001, these unions are not covered by the marriage and divorce registers.[21]

We have access to all waves of the data between 1991–2013 (MR) and 1995–2013 (DR). A few federal states did not report data prior to 1997, so we start our analysis in 1997 and merge the separate yearly files for marriages and divorces, respectively. We clean the data by removing duplicates, observations where important variables are missing, and marriages formed outside Germany.[22] Moreover, we exclude marriages in which one of the individuals' birth date implies an age below 18. Although this was a legal possibility in Germany during our period of observation, most of these marriages were formed abroad.[23] Both data sets are organized at the couple level and contain information on the birth dates of both spouses, the date of marriage, and, in the DR, the date of divorce. Additionally, the data contain various covariates including religion and citizenship of both spouses, place of residence, number of children (before marriage and at the time of divorce), as

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[20]This is only an approximation since the MC data is survey-based and individuals could potentially get married in the same year after reporting in the survey that they are singles. The numbers of individuals might thus be somewhat upward biased due to double counting.

[21]Same-sex marriages were fully legalized in Germany only in 2017.

[22]Marriages formed outside Germany were not recorded before 2008 and represent only 0.15% of all marriages thereafter. Some descriptive information on marriages formed abroad can be found in Appendix A.1.

[23]Until 2017, it was legal in Germany to form marriages in which one spouse is adult and the other is at least 16 years old. However, this type of marriage needed to be approved by a family court.

well as who filed for divorce and the ruling of the court. The data contain no information about education or other indicators of socioeconomic status.

We use the cleaned MR data to study marriage formation at the level of the individual couple in Section 5. To estimate marital surplus based on the Choo and Siow (2006) model introduced in Section 3, we combine the flow of new marriages observed in the MR with stocks of unmarried individuals by nationality and age group extracted from the German Microcensus (MC, described below). We can only extract and merge these stocks for categories in which the number of observations is sufficiently large. Thus, we compute the surplus for marriages in which the (potentially different) citizenship of the spouses is from the following group of countries: Germany, the EU15 countries (excluding Germany), Poland, Turkey, the EU10 countries (excluding Poland), Romania, former Yugoslavia, and the "Rest of the World" (residual category). We use the age groups 18-25, 26-32, 33-39, 40-46, 47-54, and 55-68.

Due to strict German data protection legislation, we are not allowed to link the MR and DR registers at the level of the individual couple. To study marital stability and the incidence of divorce in Section 6, we link both registers by counting observations in cells formed by the quarter of the marriage date and the nationality of both spouses. We can then merge both data sets at the quarter-nationality-nationality level and "unpack" the linked data-set into individual marriage spells. This allows us to estimate survival models for different types of marriages that were formed before and after the Hartz I labor market reform.

4.2 The German Microcensus

The German Microcensus (MC) is an annual survey that delivers representative statistics on the German population and labor force. Data access is provided by the Research data centers (RDC) of the statistical offices of the German federal states. The MC samples 1% of the population, consisting of all persons legally residing in Germany. It is the largest household survey in Europe. Participation is mandatory[24] and only a subset of questions can be answered on a voluntary basis. One household member responds for all individuals living in the household, including spouse, children, and other cohabitants if applicable. The survey program of the MC consists of a set of core questions that remains the same in

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[24]According to the German Microcensus law, non-response may be fined.

Table 2: Number of Marriages by Nationality and Gender

Nationality	Men	Women
German	6,090,937	5,978,700
EU15 (w/o Germany)	121,023	83,040
Poland	13,380	81,368
Turkey	100,981	55,487
EU10 (w/o Poland)	1,446	15,644
Romania	4,214	24,472
Former Yugoslavia	5,184	33,647
Rest of the World	255,304	313,680
Total	6,626,083	6,626,083

Data Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register, 1997–2013. EU15 (w/o Germany) countries are Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom. EU10 (w/o Poland) countries are Cypress, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Slovakia and Slovenia.

each wave, covering general demographic and socioeconomic characteristics like marital status, education, employment status, individual and household income, among many other things.

We select all individuals between 18 and 68 years of age who live in private households. For the period after German reunification (1993–2013), this MC sample is representative of a roughly constant population of about 53 million individuals.[25] 47% are men and 53% women. 72% of men and 64% of women are married. The average labor force participation rates are 62% for men and 46% for women.[26]

We use the MC data to identify the respective populations of singles out of which new marriages are formed, using the aforementioned age and nationality groups that can be merged with the MR data. To this end, we select all adult individuals of ages 18 to 68 who live in private households as singles, either alone or with cohabitants, including never-married, divorced, and widowed individuals.

4.3 Descriptive Evidence

Table 2 presents the distribution of nationalities in all new marriages we observe between 1997–2013 for men and women, respectively. We observe a total of 6,626,083 marriages.

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[25]Extrapolated from information on 8,426,756 surveyed individuals using sample weights. The average number of observations per wave is 443,513. The population increases somewhat after reunification and reaches a maximum of almost 55 million people in 2007. Afterwards it starts declining.

[26]The participation-age profiles are hump-shaped. In the 2006 MC wave, participation for men is highest in the age bracket 35-39 (88%) and the maximum for women (77%) is reached for ages 40-44.

Roughly 6 million of these marriages have at least one spouse with German nationality. The largest groups of non-Germans who get married in Germany are citizens of the other EU15 member states, Turkish men, and Polish women. Interestingly, the numbers of Turkish women and Polish men, respectively, are much smaller. For most nationalities, the foreign spouse is more often the wife. Exceptions are the EU15 countries and Turkey, for which the number of foreign husbands is higher. Marriages in which at least one spouse is non-European ("Rest of the World" in Table 2) also make up a significant share of all observed marriages in Germany. Unfortunately, no single non-European country has a sufficient number of observations to calculate the marital surplus by age.

Table 3 provides a closer look by showing numbers of observations, mean ages, and the mean age difference for all combinations of the four big (groups of) nationalities: German, EU15, Polish, and Turkish. Marriages in which both spouses are foreign citizens are relatively rare. They constitute less than 1% of the total number of marriages for the subsample in Table 3. 0.36% are marriages among Turks and 0.37% are marriages among EU15 citizens (not necessarily the same nationality). In 8.2% of all marriages, one spouse is German and the other spouse is a foreign citizen. This is the time average of the intermarriage rate in our sample. There are slighty more marriages between German women and foreign men than there are between German men and foreign women. German men who marry a non-German woman are on average older compared to German-German couples, although they are much younger in case the wife is Turkish. Conversely, German women who marry a non-German man are on average younger compared to German-German couples, and again much younger in case the husband is Turkish.

Age differences between men and women are almost always positive, that is, the husband is on average older than the wife in almost all nationality combinations. The only case with a (slightly) negative average age difference are couples of EU15 women and Polish men, but this is a very small subsample. The largest average age differences exist between Polish women and German or EU15 men. In these marriages, the woman is on average more than 6 years younger than the man. This is more than twice the average age gap in German-German couples. Overall, the descriptive evidence from the MR data points towards substantial differences in marriage market matching behavior across the different nationalities present in the German marriage market.

Table 3: Number of Marriages by Nationality Combination and Age

		Wife German	Wife EU15 (not German)	Wife Polish	Wife Turkish
Husband German	Mean Age Husband	35.82	36.18	37.40	30.34
	Mean Age Wife	32.91	33.21	31.08	26.37
	Difference	2.91	2.96	6.32	3.97
	Share	93.79%	0.89%	1.18%	0.49%
Husband EU15 (not German)	Mean Age Husband	35.89	30.92	35.62	30.16
	Mean Age Wife	32.87	27.83	28.90	26.54
	Difference	3.02	3.09	6.72	3.62
	Share	1.38%	0.37%	0.04%	0.02%
Husband Polish	Mean Age Husband	30.32	29.27	33.01	30.00
	Mean Age Wife	29.68	29.76	29.72	27.46
	Difference	0.64	-0.49	3.29	2.54
	Share	0.16%	0.00%	0.06%	0.00%
Husband Turkish	Mean Age Husband	27.94	27.23	32.46	27.17
	Mean Age Wife	27.79	26.24	27.55	24.51
	Difference	0.14	0.99	4.91	2.67
	Share	1.19%	0.03%	0.02%	0.37%

Data Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register, 1997–2013. Values rounded to two decimal places. Total number of observations in the table is 5,957,349.

## 4.4 (Pre-)Trends in the Marriage Market

Figure 2 presents the estimated marriage surplus, $\hat{\Phi}$ according to equation (12), for different nationality combinations of spouses over time. We plot the surplus for marriages where at least one spouse, either the wife or the husband, is German: German-German marriages (black line), German-EU15 marriages (blue line), German-EU10 marriages (orange line), and one German spouse with any of the remaining nationalities (other, gray line).

From 1997 until the implementation of the Hartz I labor market reform (black dashed line), the marital surplus for all nationality combinations evolves in a highly parallel manner on a slightly decreasing trend. After 2003, the trends in marital surplus diverge. On the one hand, we observe an accelerating decline for marriages in which one spouse has EU10[27] or "Other" citizenship. On the other hand, the marriage surplus for German-German and German-EU15 couples starts to increase somewhat.

According to our hypothesis, the divergence in marital surplus after 2003 can be explained by differences in the unemployment risk that households face. We have verified in Section 2.2 that nationality can be interpreted as a proxy for this unemployment

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[27]By far the largest group of EU10 spouses are Poles. Figure A.1 in the Appendix separates the surplus of German-Polish marriages and German-Other-EU10 marriages, The trends are broadly the same, but the decline is steeper for non-Polish EU10 Spouses.

Figure 2: Development of Marital Surplus (Φ̂) over Time
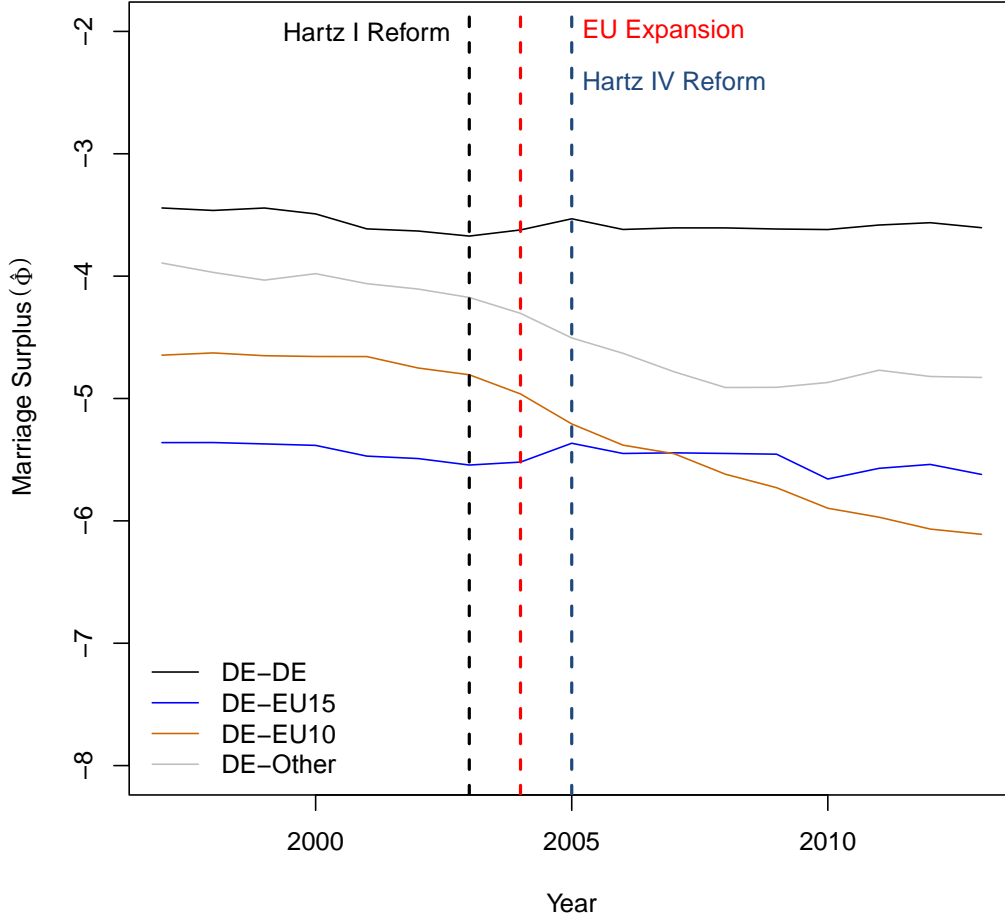
Notes: Marriage surplus for marriages where at least one spouse is German by nationality of the non-German spouse. The black dashed vertical line indicated the year in which the Hartz I and IV reforms became effective, the red dashed vertical line marks the year 2004 in which the EU expansion took place. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations.

risk. Following the tightening of the means-testing regulations, marriages in which one spouse had a foreign nationality and thus, at least on average, a higher unemployment risk, required a higher degree of within-household insurance and, therefore, became less attractive. According to the Choo and Siow (2006) model, this decline in surplus is reflected in fewer new marriages and more singles in the respective groups.

It is interesting to note that the negative trend in marital surplus for German-EU10 and German-Other marriages continues up until 2008, when the latter stabilizes but the former continues to fall. Neither the EU expansion (red dashed line) nor the Hartz IV reform (blue dashed line), which eliminated means-testing exemptions completely, seem to affect the declining trend in marital surplus for these marriages. For German-German and German-EU15 marriages, however, the Hartz IV reform seems to have stopped the increase that started in 2003. A potential explanation is that individuals (and hence

couples) with stronger labor market attachment might be relatively more affected by generosity reductions in primary unemployment benefits, which Hartz IV implemented by reducing duration. For individuals with weaker labor market attachment, however, the generosity reductions in long-term unemployment assistance, which Hartz I implemented by tightening means testing, might be relatively more important.

Adda et al. (2019) argue that the EU expansion in 2004 had a sizable and significant negative effect on the surplus of interethnic marriages in Italy because it was no longer necessary to marry an Italian person to gain labor market access. From Figure 2 alone, one does not get the impression that the EU expansion had alone a distinct negative effect on the surplus of German-EU10 marriages. A potential explanation for the difference between Germany and Italy is that access to the German labor market was initially restricted for citizens of the new member states. We further investigate the potential confounding effect of the EU expansion in our analysis by controlling for it in the next section. To this end, we use separate treatment and control groups to isolate the EU expansion effect in our differences-in-differences setup.

Figure 3 presents the expected gains to entering the marriage market for men (left sub-figure) and women (right sub-figure) according to the Choo and Siow (2006) model, see equations (10) and (11). According to the model, the estimated gains only depend on the total number of individuals relative to singles of any particular type. As before, they are shown for German men/women in black, for EU15 men/women in blue, for EU10 men/women in orange and gray for all remaining nationalities.

The declining marriage surplus for interethnic marriages with non-EU15 spouses is also reflected here. The gains decrease more substantially for foreign women than for foreign men. This is mainly driven by EU10 women, who had very high gains in the beginning of our sample but a rapid decline thereafter. This is consistent with the fact that we observe relatively many women from Poland and other EU10 countries getting married in Germany as compared to men from these countries, recall Table 2. For EU10 men, the gains are essentially flat before the labor market reform, decrease between 2003 and 2005, and reach another relatively stable level thereafter. Rest-of-the-world men's and women's gains are very similar. They are decreasing before the reform, but the negative trend accelerates in 2003–2005.

Figure 3: Expected Gains to Entering the Marriage Market ($\hat{Q}$)
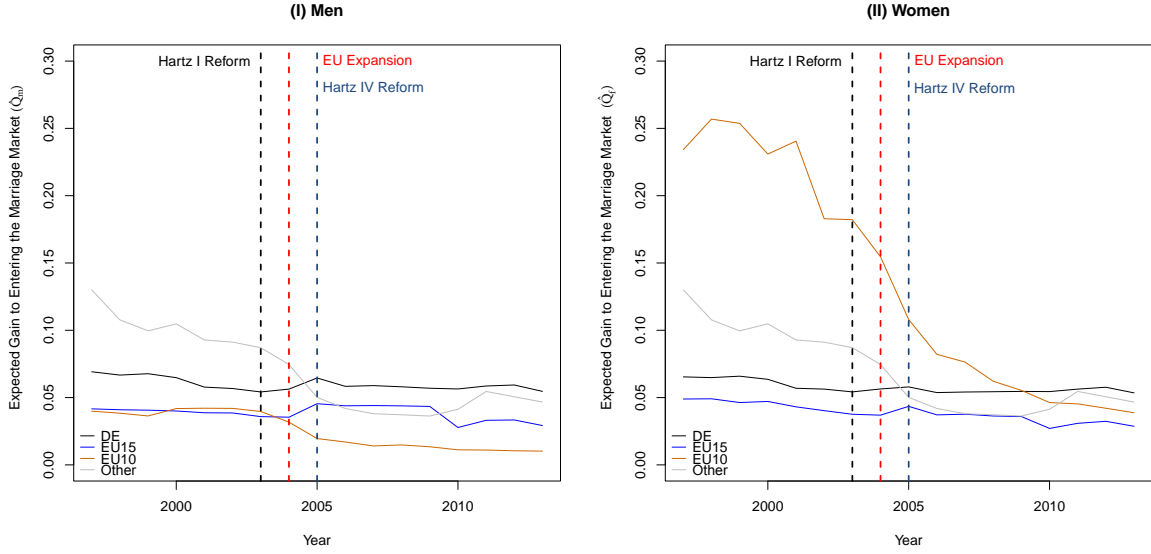
Notes: Expected gains to entering the marriage market for men (left sub-figure) and women (right sub-figure) by nationality of the spouse. The black dashed vertical line indicated the year in which the labor market reform became effective, the red dashed vertical line marks the year 2004 in which the EU expansion took place. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations

5 Reform Effects on Marital Surplus

We are now in a position to estimate the effect of the Hartz I labor market reform on the marriage market. Our outcome variable is marital surplus. We use a differences-in-differences specification to identify the effect of the reform on the treated population. As in the previous section, we restrict attention to marriages in which at least one spouse is German and define treatment and control groups as illustrated in Table 4.

In line with the trends presented in Figure 2 and our identifying assumption discussed in Section 2.2, we define German-German and German-EU15 marriages as the control group. All other interethnic marriages form the treatment group for estimating the labor market reform effect. We are able to separately identify the effects of the labor market reform and the EU expansion due to the fact that couples with an EU10-spouse were treated by both reforms while couples in which the spouse has another foreign nationality (i.e. not EU10 or EU15) were treated by the labor market reform only.

To capture the labor market reform treatment, we define a dummy variable $Treat_{HartzI}$ which takes on the value 1 for marriages where the non-native partner has one of the following citizenships: EU10, Turkish, Romanian, former Yugoslavia, Rest of the World. The indicator function $\mathbb{1}\{t \geq 2003\}$ returns the value 1 for marriages formed after January 1 2003, the enactment date of the reform.

Table 4: Types of Marriages in Treatment and Control Groups

Nationalities of Spouses (c_h, c_w)	Hartz Treatment (Jan 01, 2003)	EU Treatment (May 01, 2004)	Treatment Dummy $Treat_{HartzI}$	$Treat_{EU}$
German-German	No	No	$= 0$	$= 0$
German-EU15	No	No	$= 0$	$= 0$
German-EU10	Yes	Yes	$= 1$	$= 1$
German-Other	Yes	No	$= 1$	$= 0$

Our empirical specification to estimate the effect of the labor market reform has the following form:

$$
\begin{aligned}
\Phi_t(c_h, c_w, a_h, a_w) &= \beta_1 \cdot Treat_{HartzI}(c_h, c_w) + \beta_2 \cdot \mathbb{1}\{t \geq 2003\} \\
&+ \beta_3 \cdot Treat_{HartzI}(c_h, c_w) \cdot \mathbb{1}\{t \geq 2003\} \\
&+ \gamma \cdot X_t(c_h, c_w) + \alpha_t + \delta_c + u_t(c_h, c_w, a_h, a_w), \quad (14)
\end{aligned}
$$

where the coefficient of interest is β_3, the treatment effect on the treated of the Hartz I labor market reform. c_h and c_w indicate citizenship of husband and wife. a_h and a_w are the age of husband and wife. The year fixed effect α_t controls for time trends such as the generally declining marriage rate in Germany. The fixed effect for the foreign spouse's nationality δ_c controls for any confounding factors specific to interethnic marriages with particular nationalities. $\Phi_t(c_h, c_w, a_h, a_w)$ is the marriage surplus for a particular combination of age and country or origin for both partners in year t. $u_t(c_h, c_w, a_h, a_w)$ is the residual and $X_t(c_h, c_w)$ is a citizenship and time-specific vector of control variables that, among other things, captures the effect of the 2004 EU expansion. We study the effect of different control variables and perform robustness checks in Sections 5.2 and 5.3.

5.1 Main Results

We present estimation results for multiple specifications in Table 5. Columns (1) and (2) include all marriages where at least one spouse is German. Columns (3) & (4) condition on the husband being German and columns (5) & (6) condition on the wife being German, respectively. Columns (1), (3) and (5) include fixed effects for the year and the nationality of the non-German spouse, so these specifications correspond exactly to equation (14).

Table 5: Labor Market Reform Effects on Marital Surplus

Dependent Variable	Marriage Surplus ($\hat{\Phi}$)					
	All Marriages		German Husband		German Wife	
	(1)	(2)	(3)	(4)	(5)	(6)
$Treat_{HartzI} \cdot \mathbb{1}\{t \geq 2003\}$	−0.441***	−0.473***	−0.370**	−0.443***	−0.519***	−0.535***
	(0.119)	(0.106)	(0.154)	(0.133)	(0.157)	(0.137)
Constant	−6.237***	−6.055***	−6.275***	−6.498***	−6.191***	−5.987***
	(0.144)	(0.154)	(0.169)	(0.194)	(0.167)	(0.191)
Year, Nation FE	✓	✓	✓	✓	✓	✓
Age FEs		✓		✓		✓
Observations	6,730	6,730	3,703	3,703	3,635	3,635

Notes: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations.

For the estimations shown in columns (2), (4), and (6), we additionally control for the age of both spouses using fixed effects. Robust standard errors are reported in parenthesis.

The estimated coefficient $\hat{\beta}_3$ is negative and highly significant in all specifications. Specification (1) shows a decrease of 0.441 log points in the surplus of treated marriages. That is, relative to the constant, marital surplus decreased by 7.1%. Including age fixed effects for husband and wife in specification (2) slightly increases the effect size to 0.473 log points or 7.8%. The labor market reform had a sizable and significant negative effect on the surplus of interethnic marriages in which the foreign spouse has a non-EU15 citizenship.

When we condition the estimation on either the wife or the husband being German, we see that the negative effects are bigger for marriages with German wives as compared to German husbands. We find a maximum decline of 0.535 log points in specifications (6), corresponding to a surplus reduction of 8.9%. In specification (4), the negative impact is only 6.8%. One possible explanation for the asymmetric impact across genders could be that marriages in which the husband is more exposed to labor market risk are generally more vulnerable. Labor force participation and income is on average lower for women in Germany, which is at least partly due to strong and persistent gender norms in large parts of Germany (Bauernschuster and Rainer, 2012; Lippmann et al., 2019). Thus, wives' ability to insure (their) husbands against unemployment risk could be lower compared to the converse case.

Overall, we find that the Hartz I reform significantly reduced the attractiveness, as

measured by marital surplus, of interethnic marriages in Germany. Provided that both the identifying assumption discussed in Section 2 and the assumptions underlying the Choo and Siow (2006) model hold we can interpret the reform effect on marital surplus as causal.

This main result of our study provides evidence for significant marriage market repercussions of the German labor market reforms. This constitutes an interesting finding for at least two reasons. First, it is conceivable that policy-makers did not intend to affect the marriage market when they implemented a series of reforms primarily designed to reduce unemployment. Second, interethnic marriages are often viewed as a sign of the successful integration of ethnic minorities and immigrants in the receiving country (Azzolini and Guetto, 2017; Adda et al., 2019). Living with natives can alleviate barriers to labor market access, for example by providing incentives for a fast acquisition of language skills or providing access to labor market networks. By negatively affecting intermarriage rates, the labor market reform might thus have lowered the integration potential for the non-native population.[28]

5.2 The Effect of the EU Expansion

Adda et al. (2019) study marriage market effects of the EU expansion in Italy and find that it negatively influenced interethnic marriage formation. Here, we check whether the same mechanism confounds the negative effect we attribute to the Hartz I labor market reform in Germany. Adda et al. (2019) argue that lower marital surplus in the Italian case reflects that it was no longer necessary to marry an Italian citizen to gain labor market access. A priori, it is not clear which role this channel played in Germany due to at least two substantial differences between the two countries.

First, Germany restricted labor market access for citizens of the new member states that joined the EU in 2004 and 2007 until 2011 and 2013, respectively. This restriction should weaken the labor market access channel highlighted by Adda et al. (2019). Second, Germany has a very different history of receiving migrants as compared to Italy.[29]

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[28]For studies on labor market outcomes and intermarriage, see for example: Kantarevic (2005); Meng and Gregory (2005); Furtado and Theodoropoulos (2009); Meng and Meurs (2009); Basu (2015); Dribe and Nystedt (2015).

[29]According to Adda et al. (2019), the share of foreign residents in Italy had been below 2% during the 1990s and started increasing only in the 2000s. It reached around 9% in 2013. Germany has experienced sizable inflows of migrants already in the 1950s/60s. According to the federal statistical office, the share

Intermarriages have been relatively common for a long period of time. About 10% of all new marriages in Germany in 1997, the first year of our data, were intermarriages. In contrast, Adda et al. (2019) report intermarriage rates of below 3% for Italian men and around 1% for Italian women for newly formed marriages in 1996. The higher baseline level of intermarriages in Germany, including many marriages with immigrants from non-European countries, could make the EU expansion quantitatively less important for the German marriage market as compared to the Italian one.

The expansion granted citizens of the new member states the right to live and (with initial restrictions) work in Germany. From a theoretical perspective, this should decrease the demand for German-EU10 marriages. As a result, we expect fewer interethnic marriages relative to the single stocks, which should result in a lower marriage surplus.

To capture this effect, the vector of control variables $X_t(c_h, c_w)$ in our main specification, equation (14) above, includes a second differences-in-differences term to estimate the effect of the EU expansion, conditional on the effect of the labor market reform that preceded the EU expansion. Recall Table 4: we compare interethnic marriages in which the non-native spouse is from a country that joined the EU in 2004 (EU10) with interethnic marriages in which the non-native spouse is from a country unaffected by the EU expansion (Turkey, Romania, former Yugoslavia, Rest of the World). The single stocks extracted from the MC are available only on an annual basis, so we capture treatment using the indicator function $\mathbb{1}\{t \geq 2004\}$ that returns the value 1 for marriages formed after January 1 2004. The new member states joined the EU only on May 1 2004 but very few marriages are formed during the winter months. Spelling out the additional treatment dummies and their interaction yields the full model

$$
\begin{aligned}
\Phi_t(c_h, c_w, a_h, a_w) \;=\; & \beta_1 \cdot Treat_{HartzI}(c_h, c_w) + \beta_2 \cdot \mathbb{1}\{t \geq 2003\} \\
+ \; & \beta_3 \cdot Treat_{HartzI}(c_h, c_w) \cdot \mathbb{1}\{t \geq 2003\} \\
+ \; & \beta_4 \cdot Treat_{EU}(c_h, c_w) + \beta_5 \cdot \mathbb{1}\{t \geq 2004\} \\
+ \; & \beta_6 \cdot Treat_{EU}(c_h, c_w) \cdot \mathbb{1}\{t \geq 2004\} \\
+ \; & \alpha_t + \delta_c + u_t(c_h, c_w, a_h, a_w),
\end{aligned}
\tag{15}
$$

of residents without German citizenship was stable at around 8–9% of the population during the period we study in this paper.

Table 6: EU Expansion Effects on Marital Surplus

Dependent Variable	Marriage Surplus ($\hat{\Phi}$)					
	Panel A: EU Effect Conditional on Labor Market Reform					
	All Marriages		German Husband		German Wife	
	(1)	(2)	(3)	(4)	(5)	(6)
$Treat_{EU} \cdot \mathbb{1}\{t \geq 2004\}$	−0.107	−0.167*	−0.222	−0.201	−0.072	−0.157
	(0.103)	(0.093)	(0.161)	(0.142)	(0.114)	(0.100)
	Panel B: Unconditional EU Effect					
	All Marriages		German Husband		German Wife	
$Treat_{EU} \cdot \mathbb{1}\{t \geq 2004\}$	−0.223**	−0.291***	−0.334**	−0.334**	−0.251**	−0.341***
	(0.101)	(0.092)	(0.159)	(0.141)	(0.111)	(0.099)
	Controls (Both Panels)					
Year, Nation FE	✓	✓	✓	✓	✓	✓
Age FEs		✓		✓		✓
Observations (both Panels)	6,730	6,730	3,703	3,703	3,635	3,635

Notes: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations.

where the treatment dummy $Treat_{EU}(c_h, c_w)$ takes on the value 1 for marriages in which the non-native partner has EU10 citizenship. The interaction $Treat_{EU}(c_h, c_w) \cdot \mathbb{1}\{t \geq 2004\}$ captures the treatment effect on the treated of the EU expansion and β_6 is the respective coefficient of interest.

We report our estimates of β_6 in Panel A of Table 6, again separately for all marriages, marriages with German husbands, and marriages with German wives. Contrary to the Italian case discussed in Adda et al. (2019), we do not find significant effects of the EU expansion on interethnic marriages in Germany if the labor market reform is taken into account. Throughout all specifications and sub-samples, we find negative coefficients, in line with the expected effect sign. However, apart from one marginally significant case, none of the estimated coefficients can be distinguished from zero.

The unconditional EU expansion effect, obtained from estimating model (15) without the labor market reform differences-in-differences term, is reported in Panel B of Table 6. This model suggests a significant and negative effect of the EU expansion on interethnic marriages in Germany, similar to what Adda et al. (2019) find in the Italian context. We conclude that taking the labor market reforms into account is important to understand marriage market effects of the EU expansion in Germany. Conditional on changes in the labor market, the EU expansion did not affect the surplus of interethnic marriages. More-

Table 7: Controlling for Single Stocks

Dependent Variable					Marriage Surplus ($\hat{\Phi}$)				
	All Marriages			German Husband			German Wife		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Treat_{HartzI} \cdot \mathbb{1}\{t \geq 2003\}$	−0.411***	−0.456***	−0.438***	−0.255	−0.373**	−0.258*	−0.518***	−0.697***	−0.681***
	(0.119)	(0.119)	(0.120)	(0.157)	(0.153)	(0.157)	(0.149)	(0.156)	(0.148)
log(female singles)	−0.123***		−0.049	−0.290***		−0.289***	−2.208***		−2.180***
	(0.010)		(0.047)	(0.090)		(0.090)	(0.096)		(0.100)
log(male singles)		0.124***	0.076		0.422***	0.421**		0.580***	0.532***
		(0.010)	(0.046)		(0.164)	(0.164)		(0.059)	(0.057)
Constant	−4.564***	−7.930***	−6.606***	−2.323*	−12.031***	−8.072***	23.969***	−14.101***	16.315***
	(0.198)	(0.198)	(1.261)	(1.220)	(2.219)	(2.612)	(1.309)	(0.815)	(1.609)
Year, Nation FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	6,730	6,730	6,730	3,703	3,703	3,703	3,635	3,635	3,635

Notes: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations.

over, significant and negative effects from the EU expansion in Germany, as suggested by the unconditional estimation, would be a puzzling finding. The reasons are that, as mentioned before, labor market access was restricted for citizens of the new EU member states and Germany has a relatively high baseline level of interethnic marriages.

5.3   Further Controls

Marital surplus according to the Choo and Siow (2006) model, as shown in equation (8), implies that a percentage increase in the available number of singles results in a percentage increase in the number of marriages, holding constant the gains to a particular type of marriage. Thus, marital surplus can change for two reasons. First, underlying factors, e.g. exposure to unemployment risk may fundamentally change the attractiveness of certain types of spouses. Second, the availability of singles of particular types may change. So far, we have focused our attention on the first reason only.

To make sure that our results are not merely a result of the changing availability of singles of different types in the German marriage market, we include the (log) number of available singles by age and nationality into our main specification, equation (14), and re-estimate the model. We include either the (log) stock of male singles, female singles, or both for every age-nationality cell. As before, we estimate the model for all marriages first and then condition on either the husband or the wife being German. This yields nine estimated specifications which are presented in Table 7.

Our preferred specifications are the ones that control for both single stocks as these are conceptually clean. The marital surplus depends on the number of both male and female singles, so one should also control for both stocks jointly. For the effect of the labor market reform in the full sample (all marriages), specification (3), we find almost no difference as compared to the baseline specification when adding the single stocks. The estimated coefficient and effect size are very close to column (1) in Table 5. The estimated coefficient in our main specification is -0.441 (without age fixed effects). When including both single stocks, this value decreases only slightly to -0.438. Given that the marriage surplus function of the Choo and Siow (2006) model already implicitly controls for population vectors, the small change we find when adding single stocks is reassuring with respect to the validity of the structural marriage market model underlying our empirical analysis.

Regarding heterogeneity by gender of the German spouse, we again find stronger effects of the labor market reform for couples in which the wife is German. When taking into account the single stocks, the effect on marriages in which the husband is German is only marginally significant and relatively small (3.2%), see column (6). For German wives, the effect remains highly significant but also decreases in size (4.2% as compared to 8.9% in column (6), Table 5). It is also worth noting that the effect of the EU expansion becomes significant for marriages where the wife is German once we control for the number of available singles. This finding would be inconsistent with the insignificant EU expansion effects presented in Panel A of Table 6. It is, however, not credible: an inflow of singles is a concern for identifying the effect of the EU expansion because it introduced free movement for citizens of the new member states. For identifying the effect of the Hartz I labor market reform, however, this is less of a concern. Inflows of singles occurred only some years after the labor market reform, once the (controlled for) EU expansion had been implemented and labor market restrictions were lifted.

6 Reform Effects on Marital Stability

We have documented a significant negative effect of the Hartz I labor market reform on the marital surplus of interethnic marriages in Germany. Provided that both the identifying assumption discussed in Section 2 and the assumptions underlying the Choo

and Siow (2006) model hold we can interpret the reform effect as causal. To obtain this result, we have combined the flow of new marriages with a measure of the availability of different types of singles in the marriage market.

In a final step, we make use of the German divorce register (DR) data and tools of survival analysis to compare the stability of marriages formed before and after the labor market reform. As explained in Section 4, we combine the marriage and divorce registers at the quarter of marriage-nationality-nationality level to study the survival of different types of marriages. This allows us to check whether potential changes of marital stability are consistent with both the theoretical predictions and the negative effect of the Hartz I reform on interethnic marital surplus.

The reduction of interethnic marital surplus due to stricter means testing has important implications for selection into marriage. Essentially, marriages in which one partner is exposed to high unemployment risk are less frequently observed after the reform. This is equivalent to saying that the remaining interethnic marriages—the ones that were formed despite the reform—are (more) positively selected in terms of surplus as compared to the group of marriages formed before the reform. In other words, these marriages have a higher ability to absorb economic shocks within the household. They were aware of the reduced generosity of the unemployment insurance system when deciding to get married. Couples who got married before the reform, however, calculated their gains from marriage based on the more generous pre-reform system.

As a direct result of this selection effect, we expect that interethnic marriages formed after the reform are more stable as compared to pre-reform interethnic marriages. At the same time, selection implies that we cannot interpret reform effects on marital stability as causal. To check this hypothesis, we re-apply our differences-in-differences estimation strategy in a Cox proportional-hazard setting (Cox, 1972).

6.1   Results

The survival model we apply is similar in spirit to equation (1) in Section 2.2. The hazard rate $h(d, Z)$ captures the divorce hazard of a married couple after duration d conditional on a vector of controls Z. γ indicates the vector of coefficients and $\lambda(d)$ is the baseline divorce hazard common to all marriages. As before, we are interested in the estimated coefficient of the treatment dummy interaction $Treat_{HartzI}(c_h, c_w) \cdot \mathbb{1}\{t \geq$

Table 8: Divorce Hazard - Diff-in-Diff Estimates

Dependent Variable	Duration until Divorce								
	All Marriages			German Husband			German Wife		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Treat_{HartzI} \cdot \mathbb{1}\{t \geq 2003\}$	0.089***	−0.306***	−0.456***	−0.085***	−0.388***	−0.453***	0.178***	−0.280***	−0.475***
	(0.010)	(0.009)	(0.010)	(0.016)	(0.016)	(0.016)	(0.012)	(0.012)	(0.012)
	[1.093]	[0.736]	[0.634]	[0.919]	[0.678]	[0.636]	[1.195]	[0.756]	[0.622]
$Treat_{EU} \cdot \mathbb{1}\{t \geq 2004\}$	−0.307***	−0.595***	−0.486***	−0.208***	−0.646***	−0.562***	−0.022	−0.163***	−0.211***
	(0.024)	(0.024)	(0.024)	(0.029)	(0.029)	(0.028)	(0.051)	(0.051)	(0.051)
	[0.736]	[0.552]	[0.615]	[0.812]	[0.524]	[0.570]	[0.978]	[0.850]	[0.810]
Divorce Year FE		✓			✓			✓	
Divorce Year Strat.			✓			✓			✓
Observations	6,592,292	6,592,292	6,592,292	6,417,362	6,417,362	6,417,362	6,431,657	6,431,657	6,431,657

Notes: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage and Divorce Registers, 1997–2013, own calculations.

2003} to compare marriages in which one partner is a non-native before the reform with marriages of the same type after the reform.

Again, we control for the effects of the EU expansion and, additionally, either stratify by divorce year or include fixed effects to control for influences specific to the year of divorce. When stratifying by divorce year, one allows for different baseline hazards for every single divorce year. This is tantamount to assuming that all divorcing couples in a given year are exposed to the same environment, e.g. the same aggregate labor market situation and legal framework. We are primarily interested in the effects of the labor market reform, so this seems to be the appropriate strategy.[30]

The results are presented in Table 8, separately for all marriages, marriages with German husbands, and marriages with German wives. Column (1) shows the results in the full sample without taking divorce year effects into account. The estimated coefficient of $Treat_{HartzI}(c_h, c_w) \cdot \mathbb{1}\{t \geq 2003\}$ indicates that the divorce hazard increased by 9.3% for marriages treated by the labor market reform. This specification suggests that the labor market reform lowered marital stability which is not in line with our expectation based on selection into marriage. However, the sign of the effect changes in columns (2) and (3) once divorce year effects are taken into account. In both specifications, we find significant and sizable negative effects of the Hartz I labor market reform on the divorce hazard. This implies that treated marriages became more stable after the reform, contrary to specification (1) and in line with the selection effect. Thus, it is important to take divorce year effects into account.

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[30]Alternatively, one could control for the year of marriage. Stratification by the marriage year would assume that all couples married in a given year face the same baseline hazard.

With divorce year fixed effects in column (2), the estimate divorce hazard falls by 26.4% relative to the baseline. Thus, marriages with one spouse from a non-EU15 country have significantly lower separation rates after the reform. In column (3) with stratification, the effect is even stronger, the divorce hazard falls by more than one third, 36.6%. Both specifications support our hypothesis that interethnic marriages formed after the labor market reform are (more) positively selected. In Section 5, we found that marital surplus dropped as a result of the labor market reform. Consistently, marriages that were formed despite the reform's negative effect on surplus turned out to be more stable than marriages formed before the reform. In other words, the labor market reform resulted in fewer but more stable interethnic marriages.

We confirm the same trends for the sub-samples of marriages where the husband is German and where the wife is German. There is always a large reduction of the divorce hazards once we control for year fixed effects or stratify by divorce year. We see no clear difference in the effect sizes between the samples of couples with German husbands and wives in this case.

Finally, we display the estimated treatment effects of the EU expansion on marital stability. Contrary to the findings in Section 5, we find significantly lower divorce hazards for couples in which one spouse is an EU10 citizen. That is, the EU expansion had a further stabilizing effect on the (remaining) marriages between Germans and citizens of the new member countries which is comparable in magnitude to the effect of the Hartz I labor market reform. The negative effects of the EU expansion are larger for marriages with German husbands as compared to German wives. This heterogeneity could partly be explained by the fact that marriages between German women and EU10 men are relatively rare.

7 Conclusion

In this paper, we empirically investigate the importance of within-household insurance for marriage formation and stability. Exploiting a sharp generosity reduction in the German unemployment insurance system—stricter means testing within couples, which was part of the Hartz I reform in 2003—we find that marriages in which one partner had an elevated unemployment risk, proxied by nationality, became significantly less

attractive. Provided that both our identifying assumption linking unemployment risk to nationality and the assumptions underlying the Choo and Siow (2006) model hold we can interpret the reform effect on marital surplus as causal. Moreover, we find that interethnic marriages formed after the reform are significantly more stable than those formed before the reform. Our interpretation is that the labor market reform resulted in fewer, but better selected interethnic marriages. These unions are better able to absorb economic shocks within the household and thus more stable.

The significant and quantitatively important negative effect on the marital surplus of interethnic marriages in Germany is a finding of high policy relevance. The marriage market ramifications of the labor market reform were most probably not intended by the policy-maker. Moreover, interethnic marriages are often seen as an indicator for the successful integration of migrants. Reforms of the social insurance system that make intermarriages relatively unattractive may therefore conflict with a successful migration policy and have negative long-run effects. This interpretation of our results is similar in spirit to Adda et al. (2019): if a reform lowers the incentives for intermarriage, paradoxically, the goal of higher labor market participation might interfere with the integration of foreigners.

The German case considered in our paper, however, differs from the Italian context studied by Adda et al. (2019). In Italy, citizens of new EU member state received full access to the labor market immediately. Lower intermarriage rates between Italians and foreigners thus reflect that many migrants no longer needed to marry an Italian spouse to gain labor market access. Germany, however, initially restricted labor market access, so the direct effect of the EU expansion on marital surplus is expected to be weaker. Accordingly, we find an insignificant effect of the EU expansion on marital surplus once the Hartz I labor market reform is taken into account. The decrease of intermarriages rates in Germany after 2003 can be understood as a side effect of the labor market reforms because they made marriages with individuals exposed to unemployment risk less attractive. Intermarriage rates started to increase again around the year 2011 when the German unemployment rate had reached a historical low.

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A   Appendix

A.1   Marriages Formed Abroad

Table A.1: Number of Marriages formed Abroad by nationality of the non-German spouse (selection)

Partner	German	EU15	PL	TR	EU10	RO	Former Yugoslavia	RU	Rest
German Husband	8,619	296	182	173	96	38	69	587	5,442
German Wife	8,619	428	20	528	9	5	71	65	3,315

Data Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register, 1997–2013. Total Number of Observations: 20,117

From 2008 onward, the German marriage registers include an indicator for marriages formed outside of Germany ("Auslandsehen"). In addition to German nationals who get married outside of Germany and register their marriage at home, this category also includes two other forms of marriages: (i) marriages of refugees or stateless individuals who reside in Germany and (ii) marriages formed in Germany by foreigners under the jurisdiction of a foreign country, for instance in case the marriage is conducted at an embassy in Germany. According to this definition, marriages formed abroad make up only about 0.15% of all marriages in the data between between 2008–2013. Table A.1 presents the number of marriages formed abroad by nationality of the spouse we observe between 2008–2013.
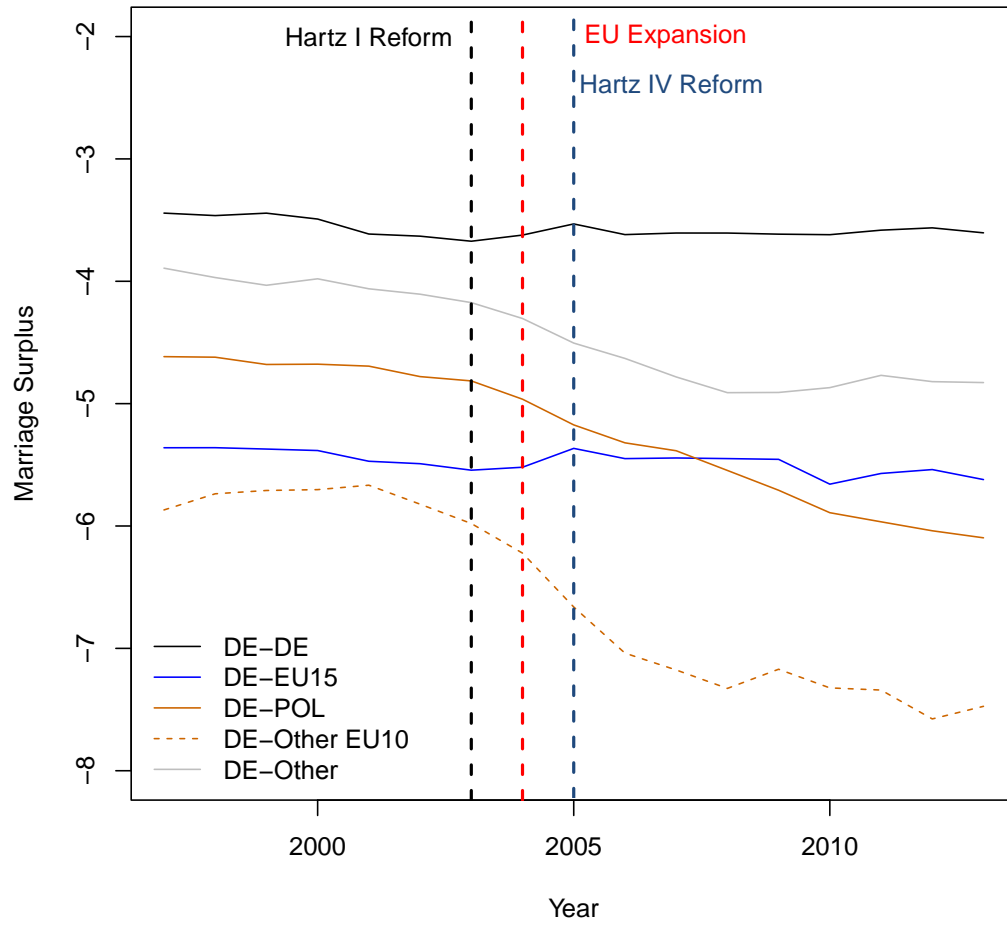
A.2   Labor Market Hazards

Table A.2: Labor Market Hazard Rates (Not Stratified by Education)

	Employment Duration (Firings)				Unemployment Duration (Hirings)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
German	-0.168***	-0.098***	-0.225***	-0.151***	0.100***	0.054***	0.069***	0.028***
	(0.013)	(0.011)	(0.011)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
	[0.845]	[0.907]	[0.799]	[0.860]	[1.105]	[1.055]	[1.071]	[1.028]
Female	-0.178***	-0.123***	-0.174***	-0.115***	-0.158***	-0.139***	-0.156***	-0.138***
	(0.009)	(0.008)	(0.010)	(0.009)	(0.011)	(0.011)	(0.010)	(0.010)
	[0.837]	[0.884]	[0.804]	[0.891]	[0.854]	[0.870]	[0.856]	[0.871]
Year FE		✓		✓		✓		✓
Region FE			✓	✓			✓	✓
Observatons	1,957,289	1,957,289	1,957,289	1,957,289	1,343,678	1,343,678	1,343,678	1,343,678
Firings / Hirings	1,218,625	1,218,625	1,218,625	1,218,625	1,086,943	1,086,943	1,086,943	1,086,943

Notes: Robust standard errors (clustered by region) in parentheses. Hazard rates reported in square brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. *Data Source*: RDC of the Institute for Employment Research (IAB) at the Federal Employment Agency, SIAB SUF 7514, 1980–2014, own calculations.

A.3   Additional Graphs

Figure A.1: Development of Marital Surplus ($\hat{\Phi}$) over Time: PL vs. Other EU10

Notes: Marriage surplus for marriages where at least one spouse is German by nationality of the non-German spouse. The black dashed vertical line indicated the year in which the Hartz I and IV reforms became effective, the red dashed vertical line marks the year 2004 in which the EU expansion took place. *Data Source*: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Marriage Register and Microcensus, 1997–2013, own calculations.