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How Does Parental Divorce Affect Children's Long-term Outcomes?*

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Abstract

Numerous papers report a negative association between parental divorce and child outcomes. To provide evidence whether this correlation is driven by a causal effect, we exploit idiosyncratic variation in the extent of sexual integration in fathers' workplaces: Fathers who encounter more women in their relevant age-occupation-group on-the-job are more likely to divorce. This results holds also conditioning on the overall share of female co-workers in a firm. We find that parental divorce has persistent, and mostly negative, effects on children that differ significantly between boys and girls. Treated boys have lower levels of educational attainment, worse labor market outcomes, and are more likely to die early. Treated girls have also lower levels of educational attainment, but they are also more likely to become mother at an early age (especially during teenage years). Treated girls experience almost no negative employment effects. The latter effect could be a direct consequence from the teenage motherhood, which may initiate an early entry to the labor market.

JEL Classification: J12, D13, J13, J24.
Keywords: Divorce, children, human capital, fertility, sexual integrated workplaces.

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1 Introduction

Numerous papers in various disciplines of social sciences document a strong negative empirical association between parental divorce and a wide range of child outcomes. This nexus is quite persistent and leaves children from divorced parents worse off even as adults. Among others, they have lower human capital and exhibit lower economic productivity. Most scholars are aware that it is not clear to which degree this relationship is causal (see, for instance, Manski *et al.*, 1992; Painter and Levine, 2000; Amato, 2010; Bhrolcháin, 2013; Gähler and Palmtag, 2015). A number of confounding factors that provoke parental divorce may also be detrimental to the child outcomes under consideration. Some, but not all, papers find evidence for such a non-random selection into divorce.[1]

To answer the question whether children are causally affected by parental divorce, exogenous variation in the divorce likelihood is indispensable. The construction of a valid empirical counterfactual is, however, not only necessary for empirical identification, but also essential to ascertain the causal channels through which children are affected, and is thus needed to form any expectation about the effect on child outcomes. If one would use child outcomes emerging from a stable and healthy family background as a benchmark, one would clearly expect a negative effect of divorce, which could work through multiple channels. A probably more relevant counterfactual situation is a family background characterized by (at least temporary) parental conflicts. In such a situation, children may even benefit from divorce, if the post-divorce situation is comparably more beneficial than growing up in a two-parent household fraught with conflicts.

Existing evidence is hard to interpret, since most of the literature does neither sufficiently define the counterfactual situation (which is implicitly presumed in any analysis), nor offer a convincing research design. McLanahan *et al.* (2013) provide a comprehensive survey of this literature. They show that the majority of the papers use single-equation models. These papers must assume that divorce is randomly assigned conditional on observables. Some papers include lagged dependent variables so that they can control for child outcomes measured before divorce. These models are restricted to a specific set of outcomes (e. g. school grades), and, therefore, not applicable to many important outcomes. Moreover, it seems unlikely that a pre-divorce child outcome controls for all remaining confounding factors. For instance, parental behaviour may change over time due to negative life-events (such as health shocks, unemployment, or alcoholism). A final group of papers tries to exploit variation in the age at divorce across siblings. Such sibling fixed-effects estimations are often quite sensitive to specification issues concerning birth order or cohort effects (Sigle-Rushton *et al.*, 2014).[2] There is, to the best of our knowledge,

[1] Compare, for instance Cherlin *et al.* (1991); Piketty (2003) and Morrison and Cherlin (1995).

[2] A recent application of sibling-fixed effects studying children's long term outcomes is Chen and Liu (2014). The authors find a significant negative effect on college admission for children, who were exposed to parental divorce before the age of 18. Another methodological approach is used by Steele *et al.*

no paper analysing the effect of parental divorce using a design-based approach.

We argue that one should aim for an identification strategy that allows for selection into divorce based on unobservables. On top of that, an ideal source of exogenous variation identifies a treatment effect at a margin of broader interest. In this paper, we suggest to exploit idiosyncratic variation in the extent of sexual integration in fathers' workplaces within an instrumental variables (IV) approach to establish a causal effect. McKinnish (2004, 2007) and Svarer (2007) show that individuals who have workplaces with a larger fraction of coworkers of the opposite sex are significantly more likely to divorce later on. This empirical finding is in line with the economic model of marriage and divorce (Becker, 1973, 1974; Becker *et al.*, 1977), which stresses imperfect information at the time of marriage and the acquisition of new information while married as key determinants of divorce. In particular, new information regarding alternative outside options seems decisive. Sexual integrated workplaces reduce the cost of extramarital search and allow married individual to meet alternative mates, which increases the likelihood of divorce. Thus, we aim to identify the causal effect of divorce for those children, whose father left the family, since he met by chance a new partner at work. We would like to argue that this research design evaluates a realistic divorce-scenario and offers a well-balanced relationship between internal and external validity. As such, our estimates of the effect of parental divorce on children's demographic and human capital outcomes can be informative for policy making.[3]

Internal validity Our identifying assumption is that the sexual integration in fathers' workplaces affects his children only through the channel of divorce. While this assumption is not testable, the richness of our data allows us to dispel most concerns. In contrast to McKinnish (2004, 2007) we have the possibility to calculate the extent of sexual integration not only on an industry-occupation-level, but on a more disaggregated level: We define the extent of sexual integration as the share of female coworkers within a firm who belong to a certain age-occupation group. This plant-age-occupation specific measure has two advantages. First, it captures the actual on-the-job contact with the opposite sex. This should strengthen the power of our first-stage. Second, it allows us to control in our estimation analysis for industry fixed-effects and other firm characteristics, such as the *overall* share of female coworkers within a firm. Thus, we do not have to assume that the choice of occupation or industry is exogenous in our context. Our estimates are still valid, even if this choice is related to unobserved parental characteristics that may affect child outcomes. For instance, one might argue that fathers who enter female-

(2009), who use a simultaneous equation model capturing the hazard of family disruption and children's educational attainment jointly.

[3]As Manski (2013) argues, informativeness depends jointly on internal and external validity. Consider a lottery which randomly assigns divorce to stable and healthy families. While a comparison between outcomes of children from treated and control families from this experiment would provide an internally valid estimate, it provides little external validity. As such, estimates from such an experiment will not be very informative to policy-makers.

dominated occupations/industries pursue a different parenting style, which also affects child outcomes. Or, fathers who purposely pick female-dominated occupations/industries to meet more potential partners, may also be less family-oriented and invest less in their children. We allow for a selection into certain industries/firms, and only have to assume that selection into a firm with a particular age-occupation specific sex ratio is exogenous. This assumption seems plausible, since for job applicants age-occupation specific sex ratios may hardly be observable in advance. The plausibility of this assumption is supported by several checks. We show that father's age-occupation specific sex ratio is neither correlated with the child's health at birth, nor with maternal education.

External validity While the external validity of an estimate is, in general, hard to assess, our approach provides us with a treatment effect at a margin of broad interest. Our estimates inform us about the consequences of divorce in situations where the separation was triggered by the father meeting a new partner at work. We consider this type of divorce as (i) a realistic scenario and (ii) in principle preventible. A small increase in the cost of divorce or in the benefit of the existing marriage — for instance, due to a change in divorce legislation or in the social approval of divorce — may avert some of these divorces. In contrast, divorces which result from more sever shocks (such, as domestic violence) can and should not be averted.

Further related literature Next to research on the causal effect of parental divorce, our paper is also related to two further strands of literature. First, scholars are interested in the effect of growing up under different divorce law regimes. A couple of papers compare the long-run outcomes of children who grew up under mutual consent divorce law regime versus a unilateral divorce law regime.[4] The identification of effects on children in these papers is based on variation across states and across years in which states have moved to unilateral divorce law. Gruber (2004) finds that individuals who were exposed to unilateral divorce law as children have lower educational attainment, lower family incomes, marry at a younger age, but separate more often, and are more likely to commit suicide. Cáceres-Delpiano and Giolito (2012) report a positive impact on criminal activities. It is crucial to note that these effects may not be equated with the effect of parental divorce in general. The move to a new divorce law regime has impacts that go beyond any simple effect on the divorce likelihood. Indeed, later papers have shown that the move to a unilateral divorce law regime affected the selection into marriage, female labor supply (Gray, 1998; Genadek *et al.*, 2007) and other dimensions of marriage-specific investments (Stevenson, 2007) as well.

[4]Under mutual consent law both spouses need to agree to divorce. Unilateral divorce law allows either party to file for divorce without the consent of the other. A switch from the former to the latter regime re-assigns the right to divorce from being held jointly, to being held individually. It is debated whether the widespread move from a mutual consent divorce law regime to a unilateral divorce law regime has caused the large rise in divorce rates (Peters, 1986; Allen, 1992; Peters, 1992; Friedberg, 1998; Wolfers, 2006; Matouschek and Rasul, 2008).

Second, scholars analyze the effect of parental death on children's outcomes. While parental death is certainly more drastic than parental divorce, both events create a situation where children grow up (at least partly) with only one parent. That means, children are in either situation not only exposed to an emotional shock, but will also receive reduced parental input. Most papers in this literature assume parental death (or, at least specific causes of death) to be exogenous (see, for instance, Corak, 2001; Lang and Zagorsky, 2001). Most recently, Adda *et al.* (2011) — who aim to account for the fact that parental death is not necessarily exogenous — find a negative effect of parental death on children's cognitive and non-cognitive skills, as well as on adult earnings. The estimated effects vary somewhat across boys and girls, and whether the mother or the father died, but are modest in size.

Preview of results Our results show that parental divorce — due to a high sexual integration in father's workplaces — has a negative effect on children's long term-outcomes. We find for both sexes a substantially lower level of educational attainment: parental divorce reduces college attendance by about 9 to 10 percentage points. The effects on family formation behaviour, labor market and health outcomes differ by sex. In the case of boys, we find little effects on their fertility or marriage behavior. However, we find a higher likelihood of early mortality and worse labor market outcomes. In the case of girls, we find strong effects on their fertility behavior. Parental divorce increases the likelihood of a pregnancy during teenagehood and up to their early twenties. Most of these additional children are born out-of-wedlock; we find only very little treatment effects on the likelihood of (early) marriage. Regarding labor market outcomes, we find some evidence for an increased employment probability for these girls in their early twenties, which dissipates over time. This effect could be a direct consequence from the teenage motherhood, which may initiate an early entry to the labor market.

The remainder of the paper is organized as follows. Section 2 briefly discusses the causal pathways, through which parental divorce may affect long term child outcomes. Section 3 describes the data sources and institutional details. Section 4 discusses our estimation strategy and presents our IV approach. In Section 5 we provide some descriptive statistics. Section 6 presents our treatment effects of parental divorce on human capital and demographic outcomes. Section 7 reports a number of sensitivity checks. Section 8 offers concluding remarks.

2 Causal pathways

The importance of specific causal pathways for children's outcomes will depend on the actual post-divorce living arrangements. The most important legal aspects are the allocation of custody and the regulation of the non-custodial parent's support obligations. Many countries have changed their law such that parents can (or must) share the rights and obligations concerning the child after divorce more equally (Halla, 2013). While these custody law reforms have the potential to improve the situation of divorced families, the following causal pathways apply in either regime:

Parents' allocation of time After divorce, the family is separated in two households and it is no longer possible that the parents spend time with their child jointly. In addition, one parent (the non-custodial) typically spends less total time with the child as compared to the counterfactual situation without divorce. It is not possible to determine how this affects the child development. However, most people would assume that the child is negatively affected by these changes in time allocation. Another source of changing time investment are parental adaptations in their labor market behavior. Typically, after divorce specialization decreases and both parents will participate in the paid labor market. Again, it is unclear how this affects children. On the one hand, one could assume a negative effect due to less time investment into the child. This could, however, be (over)compensated by the additional financial resources available due to additional labor income. Finally, parents may also allocate time to be spent on the re-marriage market. The presence of a step-parent could be either positive or negative.

Financial resources There are two main channels, which could reduce the financial investment in children. First, during marriage the family could share a number of non-rival goods. To maintain the pre-divorce consumption level, more financial resources are needed. One important aspect is housing. Single-parent families can either maintain the same quality of housing, and reduce expenditures on other items, or reduce the quality of housing to maintain non-housing consumption level. In either way, the child can be negatively affected (i. e., less college-funds vs. growing up in a worse neighbourhood). Second, the non-custodial parents' incentives to invest in his or her child are altered (Weiss and Willis, 1985). A reduction in the control over child expenditures and the lack of opportunity to monitor and enforce an optimal level, typically reduces the contributions as compared to marriage (Del Boca and Flinn, 1995; Del Boca, 2003).

Parenting & emotional well-being Other aspects of parenting may also change. Most importantly, children in divorced families are less likely to experience good gender role models. An often raised concern is boys lacking a good male role model (Amato, 1993). In contrast, the effect of divorce on the families' emotional well-being is unclear. Parents' and children's emotional well-being could either improve or deteriorate after divorce. It depends on the reasons of divorce and the prevailing extent of conflicts and disagreements during marriage.[5] Finally, social stigma may have an additional impact on affected children.

[5]Gardner and Oswald (2006) show that the average divorcing couple exhibits higher levels of mental well-being two years after divorce as compared to two years before divorce.

3 Data and institutional background

The empirical analysis is based on several administrative data sources from Austria. To define our sample we first select all children born to married mothers between 1976 through 1987 in the *Austrian Birth Register*. To generate our treatment variable, we link these data to the *Austrian Divorce Register* and categorize a child as treated if her/his parents divorced before their 18-th (or alternatively, 10-th) birthday. Children whose parents never divorced constitute the non-treated. Thus, divorces took place between 1976 and 2005. During this period, Austria witnessed trends in family formation and dissolution comparable to most other industrialized countries. The marriage rate had been decreasing and the divorce rate had been increasing. Thus, a growing share of children was either born out-of-wedlock or was affected by parental divorce. At the same time, divorce became much more socially accepted. Quantitatively, the Austrian marital landscape could be best characterized as in between two extremes defined by the United States and Scandinavia (Frimmel *et al.*, 2014).

During our sample period two major reforms of the Austrian family law took place. First, in 1978, no-fault divorce was introduced and has made, among others, divorce by mutual consent possible. This type of divorce is the simplest and cheapest way to obtain divorce and is the most popular type of divorce ever since. Since 1985, between 80 and 90 percent of all divorces were divorces by mutual consent.[6] Second, in 2001, joint custody after divorce was introduced. Before this reform divorcing parents had to agree on a sole custodian; if not, the judge assigned sole custody to one parent in best interest of the child. After the reform joint custody is now the rule, unless the parents agree on a sole custodian.[7] During the whole period, all financial arrangements relating to the child are irrespective of the grounds of divorce. The non-custodian parent (or the non-resident parent after the joint custody reform) is obliged to pay child-support after divorce until the child can support itself. According to law, the amount of child-support corresponds to the age of the child, to the parents' living standards, to possible further support obligations of the non-custodian/non-resident parent and especially to the non-custodian's/non-resident parent's net income.[8] There are no reliable numbers available, on how many non-custodian parents do not comply with their financial support

[6]The reform in 1978 also introduced *de facto* unilateral divorce, but with a rather long separation requirement of six years. The divorce law regime prior to 1978 can be described as a 'weak fault' regime (Smith, 2002), since a spouse may have obtained a divorce if the 'domestic community' has ceased to exist for a period of three years *and* the marriage has broken down irretrievably. The later criterion was subject to court's assessment.

[7]Nevertheless, in order to sustain joint custody parents have to agree on the primary residence of the child. If no agreement is reached, a judge will assign sole custody to one parent.

[8]In practice, the actual amount is determined by age-related average rates of the non-custodian's/non residents parent's net income and by age-related regular needs. A child should at least receive this age-related regular needs but not receive more than twice (2.5 times) the value for a child below (over) ten 10 years of age.

obligations.

To generate our IV we use the *Austrian Social Security Database* (ASSD). These data are administrative records to verify pension claims and are structured as a matched employer-employee dataset. For each father we can observe on a daily base where he is employed and who his coworkers are. For each worker we obtain his/her basic socio-economic characteristics, such as age, broad occupation, experience, tenure, and earnings; the latter is provided per year and per employer. The limitations of the data are top-coded wages and the lack of information on working hours (Zweimüller *et al.*, 2009).

To assess the long-run effect of divorce we analyze children's human capital outcomes and own family formation behavior. The necessary information to generate an educational outcome is from the database of the *Federal Ministry of Labour, Social Affairs and Consumer Protection*. We define a binary variable equal to one, if a person has ever been to college. In the context of the Austrian education system, this variable comprises also information on the type of secondary school. College attendance implies that this person graduated from a higher secondary school.[9] Labor market outcomes can be tracked in the ASSD. We check the labor market status (employed, unemployed, versus out-of-labor force) up to the age of 25. Fertility is observed in the *Austrian Birth Register*, and marriage behavior can be tracked in the *Austrian Marriage Register*. It turns out that especially, in the case of girls it is essential to study all outcome dimensions to fully understand the effect of parental divorce. Finally, the *Austrian Death Register* allows us to observe early mortality.

4 Estimation strategy

To assess the effect of parental divorce on child c born to parents p we examine several number of binary long-run outcomes O_c^p, for which we estimate the following equation,

$$O_c^p = \alpha + \tau * D_c^p + \beta_c \mathbf{X}_c + \beta^p \mathbf{X}^p + \beta^f \mathbf{X}^f + \varepsilon_c^p. \tag{1}$$

The outcome variables capture the child's educational attainment, labor market success, fertility behavior, marriage behaviour or mortality up to 25 years of age. The treatment is captured by the binary indicator D^p, which is equal to one if parents p divorce before

[9]Austria still has a system of early tracking. After primary school students (of about 10 years of age) are allocated to two different educational tracks. The higher secondary schools (*high track*) comprise a first stage (grades 5 to 8) and a second stage (grades 9 to 12), provide advanced education and conclude with a university entrance exam. The lower secondary schools (*low track*) comprise grades 5 to 8, provide basic general education and prepare students for vocational education either within an intermediate vocational school or within the dual education system. If graduates from the low track want to attend college, they have to transfer to the high track after grade 8. This transition is in practice tough; especially in urban areas where the quality of lower secondary schools tends to be very low.

their child c turned 18 years old.[10] We include a comprehensive set of covariates capturing child ($\mathbf{X}_c$), parents' ($\mathbf{X}^p$) and father's employment and firm characteristics ($\mathbf{X}^f$). The child characteristics are measured at birth and comprise parity, multiple birth, and birth weight. The parental characteristics capture different dimensions of assortative mating (measured at the time of marriage), which have been shown to affect the divorce hazard in Austria (Frimmel *et al.*, 2013). We control for the father's age, the spouses' age difference, religious denominations, and citizenship.[11] We also include a binary variable capturing the few cases (about five percent), where the parents were employed in the same firm before the birth of the index child. The father's employment characteristics are measured at the time of the child's birth and comprise information on broad occupation (blue-collar versus white-collar worker), daily wage and job tenure. The father's firm characteristics are measured at the earliest possible date[12] and comprise information on firm size, share of blue-collar workers, share of females, industry affiliation (32 groups), and location fixed-effects. To account for secular trends, we include a child birth cohort trend and a parental marriage cohort trend. Finally, to account for seasonal fertility patterns, we control for the quarter of birth. Despite this large set of covariates, we cannot rule out a remaining correlation between treatment status and confounding factors included in ε_c^p. Thus, we suggest an IV approach.

Instrumental variables approach To identify a causal relationship we suggest to use variation in the extent of sexual integration in fathers' workplace at the time of c's birth. The basic idea is that the availability of potential partners at the workplace will make interaction more likely. As actual interactions at the workplace are unobservable, we have to construct a quantifiable indicator for sexual integration at the firm level. We suggest an occupation- and age-specific variable. As regards occupation, we distinguish between blue and white-collar workers. Due to the different tasks these two groups perform (i. e. manual labor versus desk job) there is plausibly more interaction within groups than across groups. Moreover, given that white-collar workers typically have higher educational attainment than blue-collar workers, prevailing assortative mating patterns make a coworker from the other group a less-probable partner. The probably even more important factor determining a potential partner is age. We define potential female partners to be not younger than 8 and not older than 3 years. This specification of the age range

[10] Figure 1 shows the distribution of children's age at divorce. We can see an increasing trend to the age of about three, followed by a rather flat development to the age of nine, and a somewhat inverted u-shaped pattern up to the age of eighteen.

[11] With respect to religious denomination, we differentiate between catholic (73.6 percent), no religious denomination (12.0 percent), and others (14.4 percent) (Austrian Census from 2001). This gives rise to six possible combinations, where a marriage between two Catholics serves as the base group. Regarding citizenship we distinguish between Austrian and non-Austrians. This gives four possible combinations, where a marriage between two Austrians is the base group.

[12] In 23 percent of the cases, we measure the characteristics at the time of the establishment of the firm. The remaining 77 percent of the cases, are firms which were founded before 1972 (i.e., before our data-set starts). Here, we measure the characteristics in January, 1972.

provide the best fit of the data.[13] Our IV is thus defined as the share of female employees in the fathers' occupation group o and age range a relative to the sum of all workers in the same occupation and age range:

$$♀_c^{o,a} = \frac{\sum female_c^{o,a}}{\sum female_c^{o,a} + \sum male_c^{o,a}} \tag{2}$$

A higher $♀_c^{o,a}$ is associated with a greater extent of sexual integration. Figure 2 displays the distribution of $♀_c^{o,a}$ by the child's sex. Two things are worth noting. First, the distribution looks the same for father's of girls and boys. Second, there is a substantial degree of sex segregation in Austrian workplaces. Put differently, a substantial share of fathers have no (or few) female coworkers in the respective age-occupation cell. Part of this skewed distribution can be explained by the large number of small firms in Austria; where the probability to have any female colleague in the relevant age-occupation group is simply small. Still, there is substantial variation in the extent of sexual integration, which can be exploited in our first stage estimation:

$$D_c^p = \gamma + \kappa * ♀_c^{o,a} + \Gamma_c \mathbf{X}_c + \Gamma^p \mathbf{X}^p + \Gamma^f \mathbf{X}^f + \mu_c^p \tag{3}$$

The parameter of primary interest κ shows the increase in parental divorce probability, if the sexual integration in the fathers workplace increases by one (i.e., essentially from the sample minimum of zero to the sample maximum of one).

Identifying assumption The identifying assumption is that sexual integration in fathers' workplaces affects his child only through the channel of divorce and is uncorrelated with any confounding factor included in ε_c^p. We see two potential concerns. First, one might be worried that specific men select themselves in occupations or industries with a high share of female workers. For instance, men who choose female-dominated jobs may also have a different parenting style. Or, men who strategically select sexually integrated workplaces to find extramarital affairs, may tend to invest less in their children. An important feature of our set-up is that we (i) control for a comprehensive set of industry fixed-effects, and (ii) for the firm's *overall* share of female coworkers. Thus, we do not only allow for a selection into certain industries, but also for a selection into firms with many female workers. We only have to assume that the share of females in a particular age-occupation cell is exogenous. We consider this assumption as quite plausible, since this particular information is hard to observe for job-applicants. Put differently, it seems not feasible for men to pick firms according to this criteria.

The fact that the age-occupation specific sex ratio is not easily observable to outsiders helps us also to dispel a second concern. This concern is related to a potential effect of the

[13] We tried several alternative specifications of the relevant age range. While we find in each case a significant effect of sexual integration on the divorce likelihood, the chosen one yields the highest F-statistic among all.

sexual integration in the father's workplace on the intra-household allocation of resources. So-called *external threat point models* claim that bargaining within marriage is conducted in the shadow of the possibility of divorce (Manser and Brown, 1980; McElroy and Horney, 1981).[14] If this claim holds, and if a high extent of sexual integration in the husbands' workplaces increases his expected well-being outside the marriage (i.e., after divorce), then intra-household distribution within marriage could reflect male preferences more strongly in the case where husbands have more female coworkers in the relevant age-occupation cell. This effect would be problematic for our identification strategy, if a strengthened bargaining position for fathers leads to lower investment in children. However, even if all these assumptions hold, wives still have to observe the age-occupation specific sex ratio at their husbands' workplace for our identifying assumption to fail. External threat point models assume information is relatively good or at least not asymmetric. We consider it unrealistic that a wive observes the share of her husband's female coworkers in a particular age-occupation cell, and it seems peculiar for the husband to strategically provide this information to his wive.

Plausibility checks While our identifying assumption is fundamentally untestable, we provide two types of plausibility checks. We check, whether our IV is correlated (i) with important inputs in the production of children's human capital, and (ii) whether it is correlated with very early child outcomes. We consider maternal education and maternal labor force participation as the most important inputs in the production of children's human capital and as strong predictors of child outcomes. As such, there is a chance that these variables are also correlated with many (unobserved) determinants of children's long-term outcomes. Thus, if our IV would be correlated with these maternal characteristics (measured pre-birth), we would be concerned that it is also correlated with other confounding factors. The *Austrian Birth Register* records mother's educational attainment since 1984. Thus, we can examine the relationship between our IV and maternal education for a subsample of about 39 percent. The information on maternal labor force participation is taken from the ASSD and measured in the year before the birth of the child. For comparison reasons, we use for the analysis of the latter outcome the same subsample which we use for maternal education.[15] The upper panel of Table 2 summarizes the results from this plausibility check. We perform sex-specific regressions of different measurements of maternal education on our IV along with our basic set of covariates. In columns (I) and (II), the dependent variable is an ordinal variable capturing five different levels of educational attainment. In columns (III) and (IV), the dependent variable is bi-

[14] In contrast, so-called *internal threat models* (such as separate-spheres model) or common-preference models predict no impact of divorce on relative bargaining power within the household (Lundberg and Pollak, 1996).

[15] Our main estimation results (to be discussed below) do not use information on mother's educational attainment and are based on a larger sample of children. It should be noted that our qualitative results do not change, though we lose some precision of the estimates, if we use the reduced sample as in the case of the plausibility checks. Results are available upon request.

nary and indicates, whether the mother has a college degree or not. Across specifications, we do not find a statistically significant conditional correlation between any measurements of maternal education and our IV. The estimated coefficients are also quantitatively negligible. The reminder of the upper panel of of Table 2 summarizes the relationship between maternal labor market outcomes and our IV. In columns (V) and (VI), the dependent variable is binary and indicates, whether the mother was in the labor force in the year before birth. In columns (VII) and (VIII), the dependent variable captures the daily wage for the sub-set of employed mothers. We do not find any significant relation between any maternal labor market outcomes and our IV.

The second plausibility check examines children's health at birth. We examine children's birth weight and their gestational length. These important health outcomes reflect paternal investment behavior during pregnancy and are known to proxy very well for family background. The advantage of these child outcomes is that they are measured before treatment. A correlation between the child's birth outcome and our IV, would raise concerns about our the validity of our identifying assumption. The *Austrian Birth Register* records gestational length since 1984. The birth weight would be available for a longer period of time; however, for the purpose of comparison we focus across outcomes on the same sample of children. The lower panel of Table 2 summarizes sex-specific regressions of four outcome variables: birth weight, low birth weight (below 2,500 grams), gestational length and premature birth (birth before 37 weeks of gestation). Across outcomes, we do not find any significant relation between the IV and the respective measure of children's health at birth. We interpret the missing link between our IV and maternal education, maternal labor market outcomes and the child's birth outcomes as a vital support for our identifying assumption.

Method of estimation Our estimation setting has two specific features. First, both the outcome variable(s) and the endogenous treatment are binary. Second, the treatment probability is rather low. In our sample, only 13.5 percent of the families get divorced until the child's 18th birthday. There are two basic estimation strategies. One ignores the binary structure of the outcome and treatment variables and employs a linear IV model to estimate the treatment effect τ. Alternatively, one explicitly accounts for the binary structure and opt for a specialized estimation method. Since the recent econometric literature has shown (Chiburis *et al.*, 2012; Basu and Coe, 2015) that linear IV models perform especially poorly in such a setting, when treatment probabilities are rather low, we choose the second option.

In particular, we suggest to use a *Two-Stage Residual Inclusion* (2SRI) procedure (Terza *et al.*, 2008). The first stage (equation 3) of this *control function approach* is estimated with a logistic regression. The second stage (equation 1) is also estimated with a logistic regression and includes the residual from the first stage as an additional covariate to substitute for unobservable latent factors. However, in nonlinear models the definition of residuals is not unique. Several residuals have been proposed in the literature. In our baseline specification we use the standardized Pearson residual. In a sensitivity analysis (see Section 7), we use the Anscombe residuals as an alternative.[16] Further, we report on estimation results from an alternative estimation method, a *bivariate probit model* (BPM), which assumes that the outcome and treatment variable are each determined by latent linear index models with jointly normal error terms.

In all our estimation, we cluster standard errors on families throughout the paper. This accounts for the fact that our dataset includes siblings (166,387 fathers have one child, and 86,834 fathers have two or more children).

5 Descriptive statistics

Our estimation sample comprises almost 356,500 children. About 13.5 percent of these children experienced parental divorce before they turned 18 years of age. Table 1 compares the child outcomes and covariates by treatment status. The comparison of the average child outcomes suggests that children from divorced parents have worse human capital outcomes. While about 28 percent of the non-treated children ever attended a college, only 21 percent of the treated did. At the age of 25 treated children are less likely to be employed (minus 4.9 percentage points), more likely to be marginally employed (plus 0.2 percentage points)[17], more likely to be unemployed (plus 3.4) and more likely to be on parental leave or out of labor force (plus 0.6 percentage points each). A comparison of average family outcomes shows that treated children are more likely to be a young parent and to marry early. In particular, the likelihood to be a teenage mother is almost twice as high for treated girls.[18]

The comparison of the covariates shows also observable differences in children's and paternal characteristics. Treated children are less likely male and more likely first-born. The former pattern is consistent with a paternal preference for boys over girls (Dahl and Moretti, 2008). That means, fathers are less likely to leave their families in the case of a son as compared to a daughter. The latter observation indicates a relationship between family size and marital stability. Notably, a treated child had significantly lower birth weight;

[16]The Pearson residual seems to be a natural choice since the definition is close to that in linear models. It is defined as the difference between actual and fitted values, standardized by the standard deviation of the actual values. In large samples, the Pearson residual has zero mean and is homoscedastic. We choose the Anscombe residual as an alternative since its distribution is closest to normality with zero mean and unit variance. However, both Anscombe and Pearson residuals are typically highly correlated, but may differ in scale (Cameron and Trivedi, 2013).

[17]This type of employment contract is for jobs with a low number of working hours, low pay (up to just over €406 per month in 2015) and covers only accident insurance. This type of employment is, for instance, very common among college students who work while enrolled.

[18]Table A.1 in the Appendix compares outcomes and covariates by treatment status and sex of the child. While parental characteristics do not differ between boys and girls (treated and non-treated), we can observe partly substantial gender differences in outcomes (e.g., see college attendance, fertility or early marriage).

however, the difference of 40 gram is quantitatively small. The distribution of parents' religious denomination and ethnic background shows that children from uniformly catholic and Austrian families are least likely affected by divorce. The likelihood of experiencing divorce further decreases with paternal age at birth and with the difference in the parents' age. We see also differences in the fathers employment characteristics. While fathers of treated children are less likely blue-collar workers (about minus 2 percentage points), they tend to have somewhat worse labor market outcomes; they have lower wages and a lower tenure with the firm. Note, that our sampling strategy requires all fathers to be employed (as wage earners) at least at birth of the child.[19]

Finally, we compare fathers' firm characteristics. Divorcing fathers tend to work in larger firms, and in firms with a lower share of blue-collar workers (about minus 3 percentage points, and in firms with a higher *overall* share of female workers (about plus 3 percentage points). This unconditional difference could either reflect the effect of sexual integration on divorce or a spurious correlation (i.e., there are more white collar-workers in firms with higher shares of females).

6 Estimation results

In Table 3 we provide full estimation output for the outcome college attendance based on simple logic estimations and based on the 2SRI procedure . For the remaining outcomes we summarize estimation results in Tables 4 and 5, which focus on demographic outcomes and human capital outcomes, respectively. All these estimations use a divorce which happened before the child turned 18 years of age as a treatment definition. Given that we find significant differences in the effect of parental divorce for boys and girls, we present all estimation results based on separate estimations by sex. We present marginal effects throughout.

Naïve logit estimation The naïve logit estimations tabulated in columns (Ia) and (Ib) of Table 3 confirm the pattern shown by the descriptive statistics: children from divorced parents are less likely to attend college. This holds for boys (minus 6.3 percentage points) and for girls (minus 5.4 percentage points). Looking at the estimated effects of the covariates, we find most prior expectations confirmed: College attendance is more likely for first-borns and for children of older fathers. Among the quantitatively most important predictors for a child's college attendance are the fathers employment characteristics. A child of a blue-collar worker is about 17 to 18 percentage points less likely to attend college as compared to a child of a white-collar worker. Or, a *ceteris paribus* increase in the father's wage rate by one sample standard deviation, increases the likelihood of the

[19] We exclude 21,062 self-employed, 36,176 farmers, 14,260 apprentices, 13,912 unemployed, 1,944 father's on long-term sick leave, and 99,503 individuals who are either out-of-labor force or civil servants. (Note, in early years we can not distinguish between the two latter groups).

child's college attendance by about 6 percentage points. A potentially surprising result is that holding other things constant, children with non-native parents are more likely to go to college.

A possible interpretation for the statistical significance of the father's firm characteristics is that the firm-level covariates (i. e., the firm's structure) allow further inference on the type of job an individual has. We find that a child whose father is employed in a firm with a high share of blue-collar workers or a low share of female workers is less likely to attend college. This finding highlights that the *overall* share of female workers would be a problematic candidate for an IV for parental divorce, since it is potentially correlated with unobserved father's job characteristics that may also have an impact on child outcomes. Our estimation strategy, in contrast, controls for these and other firm characteristics and exploits only variation in the share of female coworkers in a given occupation-age cell. Thus, our instrument is not a simple firm-level variable, but a variable that varies across workers within a firm.[20] This makes our IV less suspicious to be correlated with confounding factors.

First stage estimation results The estimation of our child-sex-specific first stage equations (3) are tabulated in columns (IIa) and (IIb) of Table 3. We find statistically significant positive effects for the age- and occupation-specific share of females in the father's firm (at age of birth) and the likelihood of subsequent divorce. The estimated effects do not differ for fathers of boys and girls. An increase in the extent of sexual integration in the father's workplace from the sample minimum of zero to the sample maximum of almost one is predicted to increase the divorce likelihood by about two percentage points. The F-statistic of the IV is between 16 and 18. For 2SRI no specific study appears to exist that provides threshold values that these statistics should exceed for weak identification not to be considered a problem. For a comparable 2SLS estimation (i. e., with one endogenous variable and one IV) the critical F-value is 16.38 (Stock and Yogo, 2005). Taking this as a reference point, we can conclude that our IV is sufficiently strong.

The estimated effects of the covariates are in line with existing evidence on the determinants of divorce in Austria (Frimmel *et al.*, 2013): A later marriage, and a marriage among homogenous spouses reduces the likelihood of divorce. The estimated effects on the father's employment characteristics further show that the divorce likelihood is lower for blue-collar workers. Given that blue-collar workers have low educational attainment, this reflects that the divorce hazard decreases *ceteris paribus* with education. Interestingly, income has an opposite effect on the divorce risk.

Second stage estimation results The estimation output of our child-sex-specific second stages for college attendance are tabulated in columns (IIIa) and (IIIb) of Table 3. To begin with, it is important to point out that none of the estimated effects of the covariates

[20]Note, we do not have enough father's in our sample, who are working in the same firm to control for firm fixed-effects.

significantly change as compared to the naïve logit estimations. This shows that there are no large correlations between the IV and the covariates.

This estimation procedure confirms the qualitative treatment effect obtained by the naïve logit estimations. The 2SRI estimation, however, provides a quantitatively different estimate. Parental divorce is predicted to reduce the child's propensity to attend college by about 10 percentage points for boys, and about 9 percentage points for girls. Thus, ignoring the endogeneity of parental divorce leads to an upward biased estimate showing less detrimental effects on children's educational attainment. The endogeneity of parental leave can be more formally assessed with a Wald test on the coefficients of the first-stage residuals included in the second-stage. As can be seem in columns (IIIa) and (IIIb), the first-stage residual is highly statistically significant and has a positive sign. This provides two conclusions: First, parental divorce is endogenous. Second, unobserved latent factors that promote divorce are positively correlated with children's human capital. Put differently, divorce is correlated with unobserved family characteristics, which facilitate children to obtain higher educational attainment. This finding is consistent with the observed difference in the estimated treatment effects obtained by a naïve logit estimation and the 2SRI. Further, it is consistent with our finding that families with a blue-collar father — who tend to have a lower educational attainment and a lower socio-economic status (SES) — are less likely to divorce. It is possible that low SES families can financially not afford a divorce and/or are more likely to have mental barriers to resolve a dysfunctional marriage.

Demographic outcomes Next, we turn to the estimation results on demographic outcomes, which are summarized in Table 4. Here, we examine the effect of parental divorce on early fertility, early marriage, and early mortality. We concentrate on the 2SRI results. In the case of fertility, we have two outcomes, which capture parenthood before the age of 20 and 25 years of age, respectively. Early marriage is defined as having married before 20 years of age; and early mortality refers to death before the age of 25. In the case of boys, we hardly find statistically significant effects. Early parenthood increases by 0.8 percentage points, parenthood at age of 25 by 1.4 percentage points, but both effects are only significant at the 10-percent level. The only exception is early mortality, which increases by 0.6 percentage points. This quantitatively significant effect most likely reflects either risky behavior or suicide. In the case of girls, we find statistically significant effects for early fertility. Both teenage parenthood as well as parenthood below 25 years of age increase due to parental divorce. The estimated effects are plus 2.7 and 5.6 percentage points, respectively. This finding is in line with the negative effect on educational attainment. We only find a rather weak effect on the likelihood of early marriage (plus 0.6 percentage points), this means that most of these additional children are born out-of-wedlock. A possible interpretation for the effect on early fertility, which goes beyond the discussed causal pathways in Section 2, is that parental divorce changes girl's family-oriented behavior and that girls consciously form their own family early in life.

Human capital outcomes The estimation results for the human capital outcomes are summarized in Table 5. The first column reiterates the results for college attendance. In the remaining columns, we summarize the estimated effect of parental divorce on labor market outcomes measured at the age of 25. This is the latest year, in which we can observe the outcomes for children from all birth cohorts. We distinguish between five mutually exclusive labor market states: employed, marginally employed, unemployed, parental leave and out of labor force. For treated boys, we find clear negative effects on theit labor market success: They are less likely employed or marginally employed (minus 5.3 and minus 1.7 percentage points, respectively) and more likely unemployed or out of labor force (plus 2.7 and 2.6 percentage points, respectively). Thus, for boys the findings across outcomes provide a consistent pattern: treated boys have worse human capital outcomes.

The case of girls is different. Our estimates show that treated girls do not have a systematically different employment probability at the age of 25, despite having lower educational attainment. We do find some differences in the probability of being marginally employed and being unemployed. Treated girls are less likely to be marginally employed (minus 1.4 percentage points) and more likely unemployed (plus 2.6 percentage points). While these two effects indicate a worse labor market performance, we also find a reduced probability of being out of labor force (minus 2.1 percentage points). In sum these countervailing effects lead to a practically zero effect on the probability of employment. Thus, we find (as compared to boys) no clear effects on labor market outcomes. A potential explanation for this different finding is the estimated treatment effect on early fertility (discussed above). It is possible that the early fertility — which is particularly pronounced during teenage years — leads to a higher degree of sense of responsibility and/or a comparable earlier entry into the labor market. Both effects could explain why the negative employment effects for boys are not present for girls. Notably, this supposition is supported by literature studying the employment effects of teenage motherhood. Design-based papers find that the effects of teen birth on subsequent employment are either zero (Geronimus and Korenman, 1992) or even positive (Hotz *et al.*, 2005).

So far, we discussed the effect of parental divorce on labor market outcomes at the age of 25 years. In a final step, we show how the effect on labor market outcomes evolves over time. Figure 3 depicts the estimated effects on the employment probability based on a series of separate estimations, which consider the effect at the age from 20 to 25 years in one year intervals for boys in the upper panel and girls in the lower panel. It turns out that negative employment effects for boys are only statistically significant starting from the age of 22. In the case of girls, we find a small significant positive employment effect at age 20. However, this disappears and the estimated effects remain close to zero thereafter. These non-negative effects are in line with our supposition discussed above that early pregnancy may even help (or force) treated girls to be more focused in life.

7 Sensitivity analysis

We check the sensitivity of our estimation results to a number of variations with respect to the definition of the treatment, the definition of the control group, and the method of inference. We briefly report on these sensitivity checks below. Detailed estimation results are delegated to the Web Appendix.

First, we use an alternative treatment definition. So far, we considered a divorce before the child's 18th birthday as decisive. One rationale to pick 18 is that this is the age of consent in Austria (since 2001; before it was 19). This implies, for instance, that divorcing parents do not need a formal custody agreement for any child older than 18 years of age. On the one hand, one might expect parental divorce to be more 'effective' the earlier it happens. First, the different causal pathways have a longer period of time to operate. Second, parental divorce might be more emotionally challenging if it happens at younger age. On the other hand, a later divorce might also reflect a longer period of exposure to marital conflicts. To test for potential differences, we restrain in an alternative specification our treatment to cases, where the divorce happened before the age 10 of the child. The cases where the divorce happened after the child's 10th birthday are excluded from the estimation sample. It turns out that the estimated treatment effects do not change substantially (see Tables A.2 and A.3 in the Web Appendix). The only notable difference is that we now find also statistically significant positive effects on parenthood before 25 years of age for boys. Overall, we conclude that the impact of an early divorce cannot be distinguished from that of a later divorce.

Second, we re-define our control group. In our baseline estimation, the control group was given by children, whose parents never divorced. Thus, we eliminated children, whose parents divorced after their 18th birthday from the sample. If we include the latter group in our control group, the results do not change significantly (see Tables A.4 and A.5 in the Web Appendix). The only notable difference is that the treatment effects on the demographic outcomes for boys increase in statistical significance.

Third, we consider variations in the method of estimation. First, we consider a 2SRI estimation using the Anscombe residuals instead of the Pearson residual. Second, we replicate our results using a *bivariate probit model* (BPM). The BPM assumes that the outcome and treatment are each determined by latent linear index models with jointly normal error terms (Wooldridge, 2010), and allows to report average partial effects for the treatment indicator.[21] Table 6 summarizes estimation results from these variations in

[21] As a consequence, average partial effects can be interpreted as average treatment effects rather than local average treatment effects as in the case of a 2SRI approach (or in conventional linear IV models).

method for the outcome 'college attendance'. The upper panel reports results for boys, while the lower panel focuses on girls. Column (Ia) re-iterates our baseline specification. Column (Ib) summarizes the results based on an eqivalent 2SRI estimation, which uses the Anscombe residuals. For both sexes the estimated effects are qualitatively unchanged, however, increase in size in absolute terms. Column (II) summarizes the results from the BPM. It turns out that the BPM provides estimates which are quite similar to those from our 2SRI baseline specification. For all other outcomes the BPM are also quite comparable (see Tables A.6 and A.7 in the Web Appendix). The only notable difference is that the positive effect on employment of girls turns statistically significant.

8 Conclusions

We examine the effect of parental divorce on children's long term-outcomes based on an IV approach that exploits idiosyncratic variation in the extent of sexual integration in fathers' workplaces. We find that parental divorce has mostly negative effects on children that differ significantly between boys and girls. Treated boys have lower levels of educational attainment, worse labor market outcomes, and are more likely to die early. Treated girls have also lower levels of educational attainment, but they are also more likely to become mother at an early age (especially during teenage years). Treated girls experience almost no negative employment effects. The latter effect could be a direct consequence from the teenage motherhood, which may initiate an early entry to the labor market.

These findings are consistent with expectations based on a theoretical appraisal of the possible causal pathways. After divorce children typically grow up in female-headed households, since maternal sole custody is the dominant arrangement. These households have lower incomes, tend to live in worse neighborhoods, have fewer and weaker male role models, and access to smaller social networks. Moreover, treated children may suffer from separating from the father, parental hostility and residential and school dislocation (Painter and Levine, 2000).

The negative consequence of parental divorce on children's long term-outcomes should ideally not only be internalized by parents, but also by policy makers, who design policies affecting the parents' incentive to divorce or programs, which support children from disrupted families.

If the complier population is very specific, average marginal effects and local average treatment effects may differ substantially (Chiburis *et al.*, 2012).

References

Adda, J., Björklund, A. and Holmlund, H. (2011). *The Role of Mothers and Fathers in Providing Skills: Evidence from Parental Deaths*. IZA Discussion Paper 5425, Institute for the Study of Labor (IZA), Bonn, Germany.

Allen, D. W. (1992). Marriage and Divorce: Comment. *American Economic Review*, **82** (3), 679–685.

Amato, P. R. (1993). Children's Adjustment to Divorce: Theories, Hypotheses, and Empirical Support. *Journal of Marriage and Family*, **55** (1), 23–38.

— (2010). Research on Divorce: Continuing Trends and New Developments. *Journal of Marriage and Family*, **72** (3), 650–666.

Basu, A. and Coe, N. (2015). *2SLS vs 2SRI: Appropriate Methods for Rare Outcomes and/or Rare Exposures*. Unpublished mansucript, University of Washington, Seattle.

Becker, G. S. (1973). A Theory of Marriage: Part I. *Journal of Political Economy*, **81** (4), 813–846.

— (1974). A Theory of Marriage: Part II. *Journal of Political Economy*, **82** (2), S11–S26.

—, Landes, E. M. and Michael, R. T. (1977). An Economic Analysis of Marital Instability. *Journal of Political Economy*, **85** (6), 1141–1187.

Bhrolcháin, M. N. (2013). 'Divorce Effects' and Causality in the Social Sciences. *European Sociological Review*, **17** (1), 33–57.

Cáceres-Delpiano, J. and Giolito, E. P. (2012). How Unilateral Divorce Affects Children. *Journal of Labor Economics*, **30** (1), 215–248.

Cameron, A. C. and Trivedi, P. K. (2013). *Regression Analysis of Count Data*. Cambridge University Press, 2nd edn.

Chen, Y. and Liu, J. (2014). *Less Parental Resources, Less Possibility to go to College? Effects of Parental Divorce and Job Loss on Child Education ess Parental Resources, Less Possibility to go to College? Effects of Parental Divorce and Job Loss on Child Education*. Unpublished mansucript, National Chi Nan University, Taiwan.

Cherlin, A. J., Furstenberg, F. F., Chase-Lansdale, L., Kiernan, K. E., Robins, P. K., Morrison, D. R. and Teitler, J. O. (1991). Longitudinal Studies of Effects of Divorce on Children in Great Britain and the United States 232(.'ioll): 1386-89,. *Science*, **252** (5011), 1386–1389.

Chiburis, R. C., Das, J. and Lokshin, M. (2012). A Practical Comparison of the Bivariate Probit and Linear IV Estimators. *Economics Letters*, **117** (3), 762–766.

Corak, M. (2001). Death and Divorce: The Long-Term Consequences of Parental Loss on Adolescents. *Journal of Labor Economics*, **19** (3), 682–715.

Dahl, G. B. and Moretti, E. (2008). The Demand for Sons. *Review of Economics Studies*, **75** (4), 1085–1120.

Del Boca, D. (2003). Mothers, Fathers and Children after Divorce: The Role of Institutions. *Journal of Population Economics*, **16** (3), 399–422.

Del Boca, D. and Flinn, C. J. (1995). Rationalizing Child-Support Decisions . *American Economic Review*, **85** (5), 1241–1262.

Friedberg, L. (1998). Did Unilateral Divorce Raise Divorce Rates? Evidence from Panel Data. *American Economic Review*, **88** (3), 608–627.

Frimmel, W., Halla, M. and Winter-Ebmer, R. (2013). Assortative Mating and Divorce: Evidence from Austrian Register Data. *Journal of the Royal Statistical Society: Series A*, **176** (4), 907–929.

—, — and Winter-Ebmer, R. (2014). Can Pro-Marriage Policies Work? An Analysis of Marginal Marriages. *Demography*, **51(4), 1** (4), 1357–1359.

Gähler, M. and Palmtag, E. (2015). Parental Divorce, Psychological Well-Being and Educational Attainment: Changed Experience, Unchanged Effect Among Swedes Born 1892–1991. *Social Indicators Research*, **123** (2), 601–623.

Gardner, J. and Oswald, A. J. (2006). Do Divorcing Couples Become Happier By Breaking Up? *Journal of the Royal Statistical Society: Series A*, **169** (2), 319–336.

Genadek, K. R., Stock, W. A. and Stoddard, C. (2007). No-Fault Divorce Laws and the Labor Supply of Women with and without Children. *Journal of Human Resources*, **42** (1), 247–274.

Geronimus, A. and Korenman, S. (1992). The Socioeconomic Consequences of Teen Childbearing Reconsidered. *Quarterly Journal of Economics*, **107** (4), 1187–1214.

Gray, J. S. (1998). Divorce-Law Changes, Household Bargaining, and Married Women's Labor Supply. *American Economic Review*, **88** (3), 628–642.

Gruber, J. (2004). Is Making Divorce Easier Bad for Children? The Long Run Implications of Unilateral Divorce. *Journal of Labor Economics*, **22** (4), 799–834.

Halla, M. (2013). The Effect of Joint Custody on Family Outcome. *Journal of the European Economic Association*, **11** (2), 278–315.

Hotz, V., McElroy, S. W. and Sanders, S. G. (2005). Teenage Childbearing and Its Life Cycle Consequences: Exploiting a Very Natural Experiment. *Journal Human Resources Summer*, **40** (3), 683–715.

Lang, K. and Zagorsky, J. L. (2001). Does Growing up with a Parent Absent Really Hurt? *Journal of Human Resources*, **36** (2), 253–273.

Lundberg, S. and Pollak, R. A. (1996). Bargaining and Distribution in Marriage. *Journal of Economic Perspectives*, **10** (4), 139–158.

Manser, M. and Brown, M. (1980). Marriage and Household Decision-Making: A Bargaining Analysis. *International Economic Review*, **21** (1), 31–44.

Manski, C. F. (2013). *Public Policy in an Uncertain World: Analysis and Decisions*. Harvard: Harvard University Press.

—, Sandefur, G. D., McLanahan, S. and Powers, D. (1992). Alternative Estimates of the Effect of Family Structure During Adolescence on High School Graduation. *Journal of the American Statistical Association*, **87** (417), 25–37.

Matouschek, N. and Rasul, I. (2008). The Economics of the Marriage Contract: Theories and Evidence. *Journal of Law and Economics*, **51** (1), 59–110.

McElroy, M. B. and Horney, M. J. (1981). Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand. *International Economic Review*, **22** (2), 333–349.

McKinnish, T. G. (2004). Occupation, Sex-Integration, and Divorce. *American Economic Review, Papers and Proceedings*, **94** (2), 322–325.

McKinnish, T. G. (2007). Sexually Integrated Workplaces and Divorce: Another Form of On-the-Job Search. *Journal of Human Resources*, **42** (2), 331–352.

McLanahan, S., Tach, L. and Schneider, D. (2013). The Causal Effects of Father Absence. *Annual Review of Sociology*, **39**, 399–427.

Morrison, D. and Cherlin, A. J. (1995). The Divorce Process and Young Children's Well-being: A Prospective Analysis. *Journal of Marriage and Family*, **57** (3), 800–812.

Painter, G. and Levine, D. I. (2000). Family Structure and Youths' Outcomes: Which Correlations are Causal? *Journal of Human Resources*, **35** (3), 524–549.

Peters, E. H. (1986). Marriage and Divorce: Informational Constraints and Private Contracting. *American Economic Review*, **76** (3), 437–454.

— (1992). Marriage and Divorce: Reply. *American Economic Review*, **82** (3), 686–693.

Piketty, T. (2003). *The Impact of Divorce on School Performance: Evidence from France, 1968–2002*. Discussion Paper 4146, Centre for Economic Policy Research, London.

Sigle-Rushton, W., Lyngstad, T. H., Andersen, P. L. and Kravdal, Ø. (2014). Proceed With Caution? Parents' Union Dissolution and Children's Educational Achievement. *Journal of Marriage and Family*, **76** (1), 161–174.

Smith, I. (2002). European Divorce Laws, Divorce Rates, and their Consequences. In A. W. Dnes and R. Rowthorn (eds.), *The Law and Economics of Marriage & Divorce*, Cambridge, MA: Cambridge University Press.

Steele, F., Sigle-Rushton, W. and Kravdal, Ø. (2009). Consequences of Family Disruption on Childrens' Educational Outcomes in Norway. *Demography*, **46** (3), 553–574.

Stevenson, B. (2007). The Impact of Divorce Laws on Marriage-Specific Capital. *Journal of Labor Economics*, **25** (1), 75–94.

Stock, J. and Yogo, M. (2005). Testing for weak instruments in linear IV regression. In D. W. K. Andrews (ed.), *Identification and inference for econometric models*, New York: Cambridge University Press, pp. 80–108.

Svarer, M. (2007). Working Late: Do Workplace Sex Ratios Affect Partnership Formation and Dissolution? *Journal of Human Resources*, **42** (3), 582–595.

Terza, J. V., Basu, A. and Rathouz, P. (2008). Two-Stage Residual Inclusion Estimation: Addressing Endogeneity in Health Econometric Modeling. *Journal of Health Economics*, **27** (3), 531–543.

Weiss, Y. and Willis, R. J. (1985). Children as Collective Goods and Divorce Settlements. *Journal of Labor Economics*, **3** (3), 268–292.

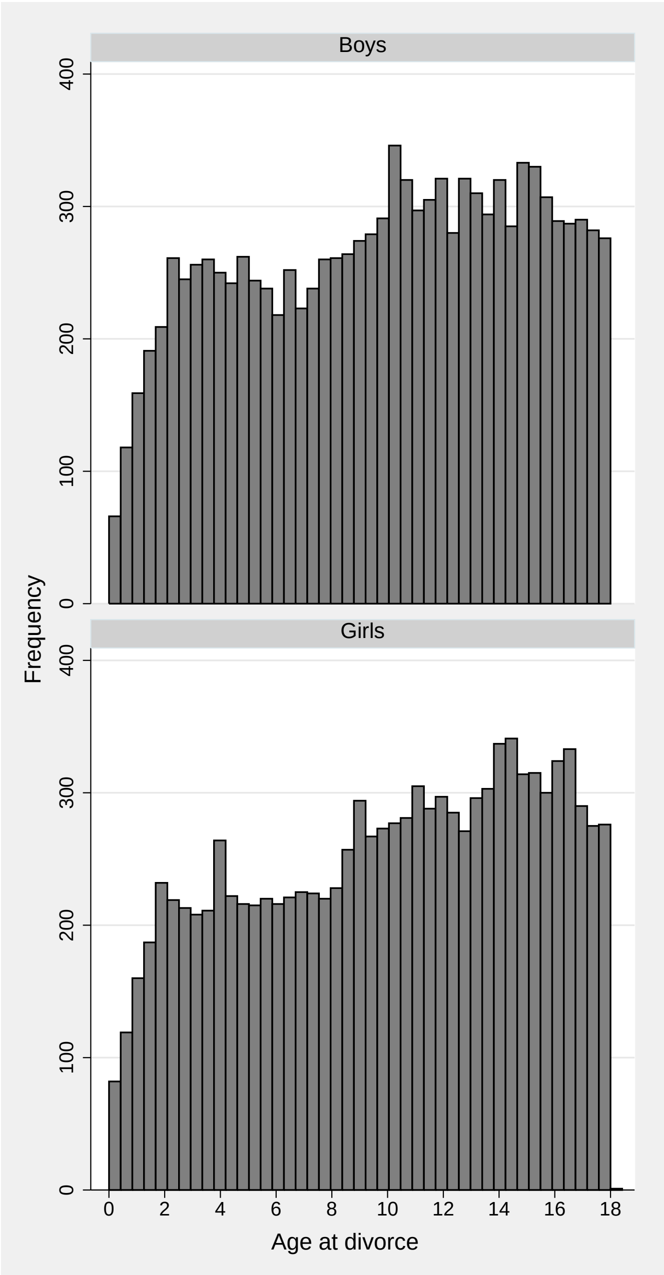
Wolfers, J. (2006). Did Unilateral Divorce Laws Raise Divorce Rates? A Reconciliation and New Results. *American Economic Review*, **96** (5), 1802–1820.

Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data*. The MIT Press, 2nd edn.

Zweimüller, J., Winter-Ebmer, R., Lalive, R., Kuhn, A., Wuellrich, J., Ruf, O. and Büchi, S. (2009). *The Austrian Social Security Database (ASSD)*. Working Paper 0901, The Austrian Center for Labor Economics and the Analysis of the Welfare State, University of Linz.

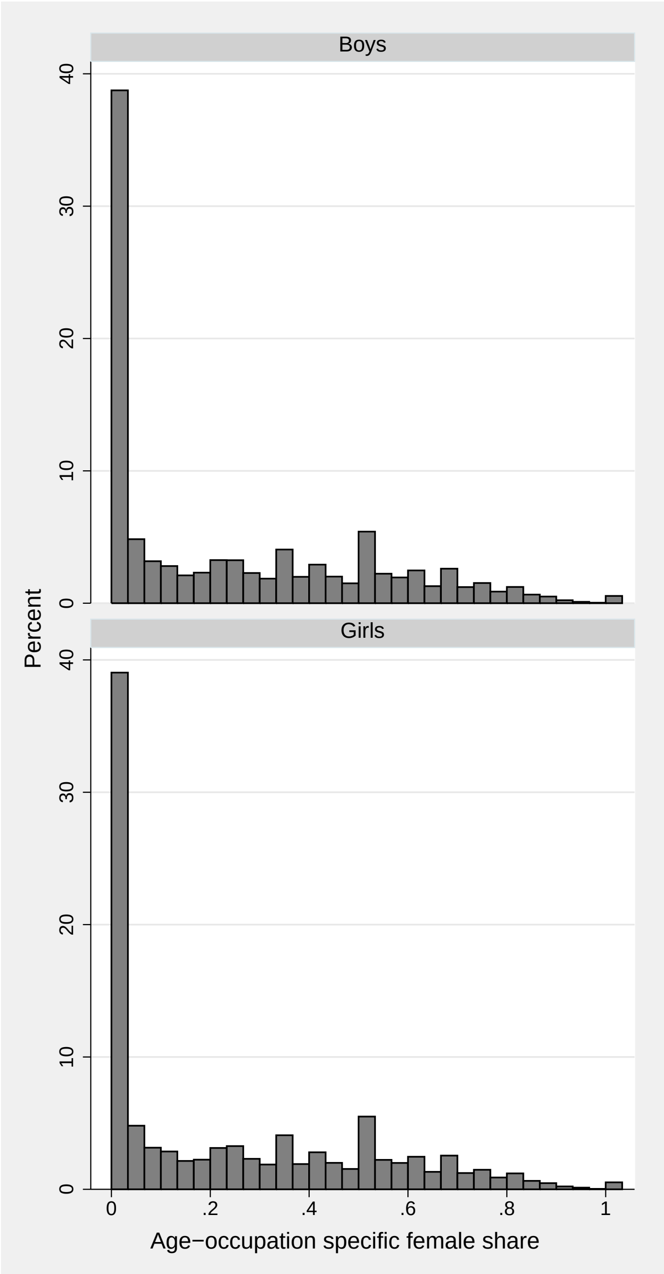
9 Figures and tables (to be placed in the article)

Figure 1: Distribution of the child's age at divorce, by the child's sex



Notes: This figure depicts the child's age at parental divorce measured in years for boys and girls. These figures are calculated based on data from the *Austrian Divorce Register*.

Figure 2: Distribution of the father's age-occupation-specific sex ratio at work, by the child's sex



Notes: This figure depicts the father's age-occupation specific sex ratio at work measured at the time of the birth of the child for boys and girls. These figures are calculated based on data from *ASSD*.

Table 1: Characteristics of divorcing and non-divorcing parents' families

	Divorcing parents		Non-divorcing parents		Statistical difference
	Mean	s.d.	Mean	s.d.	
Child outcomes:					
College attendance	0.212	(0.409)	0.276	(0.447)	***
Employed at age 25	0.620	(0.485)	0.669	(0.471)	***
Marginal employed at age 25	0.058	(0.234)	0.056	(0.229)	**
Unemployed at age 25	0.077	(0.266)	0.043	(0.204)	***
Out of labor force at age 25	0.193	(0.395)	0.187	(0.390)	***
Maternity leave at age 25	0.053	(0.223)	0.047	(0.211)	***
Teenage parenthood[a]	0.047	(0.212)	0.025	(0.157)	***
Being a parent by age 25[a]	0.174	(0.379)	0.127	(0.333)	***
Being ever married by age 20[b]	0.015	(0.121)	0.008	(0.089)	***
Mortality by age 25	0.005	(0.071)	0.004	(0.061)	***
Child characteristics:[c]					
Female	0.490	(0.500)	0.484	(0.500)	**
First born child	0.562	(0.496)	0.458	(0.498)	***
Twin	0.015	(0.122)	0.016	(0.124)	***
Birth weight (in dekgram)	326.81	(50.08)	330.55	(49.38)	***
Father's age at birth and parents' age difference:[c]					
Age 15-19	0.009	(0.095)	0.003	(0.054)	***
Age 20-24	0.293	(0.455)	0.183	(0.386)	***
Age 25-29	0.407	(0.491)	0.421	(0.494)	***
Age 30-34	0.198	(0.398)	0.260	(0.438)	***
Age 35-39	0.067	(0.249)	0.095	(0.294)	***
Age 40+	0.026	(0.160)	0.039	(0.193)	***
Age difference	3.053	(4.021)	3.132	(3.739)	***
Distribution of parent's religious denomination:[d]					
Both catholic	0.783	(0.412)	0.865	(0.341)	***
Both undenominational	0.026	(0.158)	0.014	(0.116)	***
Both other denomination	0.028	(0.165)	0.024	(0.152)	***
Catholic, undenominational	0.056	(0.229)	0.028	(0.164)	***
Catholic, other denomination	0.097	(0.296)	0.065	(0.246)	***
Other, undenominational	0.010	(0.099)	0.005	(0.070)	***
Distribution of parent's ethnic background:[d]					
Both Austrian citizen	0.912	(0.283)	0.957	(0.204)	***
Father Austrian, mother non-Austrian	0.026	(0.159)	0.024	(0.152)	***
Father non-Austrian, mother Austrian	0.018	(0.133)	0.011	(0.106)	***
Both non-Austrian citizen	0.044	(0.205)	0.008	(0.091)	***
Father's employment characteristics at child's birth and firm characteristics[e]					
Blue collar worker	0.545	(0.498)	0.562	(0.496)	***
Daily wage	38.80	(14.06)	39.12	(13.47)	***
Tenure in firm	3.107	(2.989)	3.919	(3.257)	***
Mother employed in same firm	0.048	(0.213)	0.048	(0.213)	
Firm size	1,600.9	(4,494.5)	1,532.2	(4,356.6)	***
Firm's share of blue-collar workers	0.535	(0.343)	0.562	(0.331)	***
Firm's share of females	0.305	(0.255)	0.271	(0.244)	***
No. of observations	48,060		308,315		

Notes: [a] 69 cases where the birth took place before parental divorce are excluded. [b] 2 cases, where the marriage took place before parental divorce are excluded. [c] Characteristics are measured at the time of birth based on information from the *Austrian Birth Register*. [d] Characteristics are measured at the time of marriage based on information from the *Austrian Marriage Register*. [e] Characteristics are measured at birth (father characteristics) and firm establishment (firm characteristics) and based on information from the *Austrian Social Security Database*.

Table 2: Plausibility checks: Cond. correlation between the IV and mother outcomes and children's health at birth

Maternal characteristics	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Maternal education				**Maternal labor market outcomes**			
	Categorical var. [a]		**College degree**		**Labor force**[b]		**Daily wage**[c]	
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
IV	-0.028	0.005	0.006	-0.002	-0.014	-0.000	0.080	-0.119
	(0.026)	(0.027)	(0.005)	(0.005)	(0.009)	(0.010)	(0.307)	(0.319)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	72,337	68,589	72,337	68,589	69,933	66,314	36,605	34,374
Mean of dep. variable	2.42	2.41	0.07	0.07	0.55	0.55	27.33	27.33

Early child outcomes:	**Birth weight**[d]		**Low birth weight**[e]		**Gestation length**[f]		**Premature birth**[g]	
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
IV	0.493	-1.319	0.005	0.003	0.003	-0.033	0.003	0.005
	(1.061)	(1.040)	(0.004)	(0.005)	(0.033)	(0.034)	(0.004)	(0.004)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	69,933	66,314	69,933	66,314	69,933	66,314	69,933	66,314
Mean of dep. variable	337.20	323.15	0.04	0.05	39.64	39.69	0.04	0.04

Notes: Estimation method: OLS with standard errors clustered on families in parentheses. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Set of covariates equals the set of covariates used in our main estimations. For comparison reasons we only consider child birth cohorts of 1984 or younger due to missing information before 1984 for some outcome variables [a]) Maternal education is measured as a categorical variable with value 1 for compulsory schooling, 2 for apprenticeship, 3 for vocational school, 4 for high school degree, and 5 for academic degree. Information on educational attainment is only available since 1984 [b]) The binary indicator 'In labor force' has value 1 if the mother is active on the labor market (either employed or registered as unemployed) in the year before the birth of the child. [c]) The daily wage (in euros) of the mother is measured the year before the birth of the child and is only available for employed mothers. [d]) birth weight is measured in dekagram, the set of covariates excludes birth weight; [e]) low birth weight is a binary indicator with value 1 if birth weight is below 250 dekagram. [f]) gestation length is measured in weeks [g]) premature birth is a binary indicator with value 1 if gestation length is shorter than 37 weeks.

Table 3: The effect of parental divorce on college attendance

	(Ia)	(Ib)	(IIa)	(IIb)	(IIIa)	(IIIb)
	Naïve Logit		**2SRI: First stage**		**2SRI: Second stage**	
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
Divorce until age of 18	−0.063***	−0.054***			−0.099***	−0.087***
	(0.003)	(0.003)			(0.013)	(0.015)
Instrumental variable:						
Age-specific share of females			0.017***	0.020***		
			(0.004)	(0.005)		
First-stage residual:						
Pearson residual					0.012***	0.011**
					(0.004)	(0.005)
Characteristics of children:						
First born child	0.068***	0.084***	0.010***	0.011***	0.068***	0.084***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Twin	0.017*	0.003	−0.006	−0.006	0.016*	0.003
	(0.009)	(0.010)	(0.008)	(0.008)	(0.009)	(0.010)
Birth weight (in dekagrams)	0.000***	0.000***	−0.000***	−0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's age at birth (Base group: Age 15-19):						
Age 20-24	0.079***	0.149***	−0.062***	−0.095***	0.076***	0.144***
	(0.022)	(0.025)	(0.010)	(0.011)	(0.022)	(0.025)
Age 25-29	0.145***	0.218***	−0.116***	−0.151***	0.140***	0.211***
	(0.022)	(0.025)	(0.010)	(0.011)	(0.022)	(0.025)
Age 30-34	0.192***	0.270***	−0.148***	−0.187***	0.186***	0.262***
	(0.022)	(0.025)	(0.010)	(0.011)	(0.022)	(0.025)
Age 35-39	0.219***	0.289***	−0.172***	−0.213***	0.212***	0.280***
	(0.022)	(0.025)	(0.011)	(0.012)	(0.022)	(0.025)
Age 40+	0.248***	0.307***	−0.208***	−0.257***	0.240***	0.297***
	(0.022)	(0.026)	(0.012)	(0.013)	(0.023)	(0.026)
Age Difference of Partners	−0.007***	−0.008***	0.006***	0.006***	−0.007***	−0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distribution of parent's religious denomination (Base group: Both catholic):						
Both undenominational	−0.000	−0.006	0.058***	0.072***	0.001	−0.004
	(0.007)	(0.008)	(0.006)	(0.006)	(0.007)	(0.009)
Both other denomination	0.008	0.005	−0.032***	−0.029***	0.006	0.004
	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Catholic, undenominational	−0.004	0.002	0.084***	0.088***	−0.001	0.005
	(0.005)	(0.006)	(0.004)	(0.004)	(0.005)	(0.006)
Catholic, other denomination	0.019***	0.019***	0.046***	0.050***	0.020***	0.020***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Other, undenominational	0.016	−0.000	0.088***	0.079***	0.020*	0.003
	(0.011)	(0.014)	(0.009)	(0.010)	(0.012)	(0.014)
Distribution of parent's citizenship (Base group: Both Austrian):						
Father Austrian, Mother Foreign	0.003	0.001	0.015***	0.014**	0.003	0.001
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Father Foreign, Mother Austrian	0.052***	0.056***	0.035***	0.048***	0.053***	0.058***
	(0.008)	(0.009)	(0.007)	(0.007)	(0.008)	(0.009)
Both foreign citizens	0.027***	0.045***	0.177***	0.181***	0.037***	0.056***
	(0.009)	(0.010)	(0.006)	(0.007)	(0.010)	(0.011)
Father's employment and firm characteristics at child's birth						
Blue Collar Worker	−0.174***	−0.182***	−0.009***	−0.011***	−0.175***	−0.182***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Daily wage	0.004***	0.004***	−0.001***	−0.001***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tenure in firm (in years)	−0.004***	−0.003***	−0.007***	−0.006***	−0.004***	−0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother employed in same firm	−0.003	−0.006	0.003	−0.009**	−0.003	−0.006
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
Firmsize	0.000***	0.000***	0.000	−0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of blue-collar workers	−0.032***	−0.038***	−0.020***	−0.024***	−0.033***	−0.039***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
Share of females	0.028***	0.030***	0.026***	0.026***	0.030***	0.031***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Regional & industry FE	yes		yes		yes	
Quarter of birth FE	yes		yes		yes	
Marriage & child cohort trend	yes		yes		yes	
No. of observations	183,547	172,828	183,547	172,828	183,547	172,828
F-Statistic of IV					18.06	16.00

Notes: Estimation method: Logistic regressions. We use the first-stage Pearson residual in the 2SRI-estimation. Average marginal effects with standard errors clustered on families in parentheses. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively.

Table 4: The effect of parental divorce on demographic outcomes

	(I)	(II)	(III)	(IV)
	Fertility		**Marriage**	**Mortality**
	Before 20 years of age[a]	Before 25 years of age	Before 20 years of age[b]	Before 25 years of age
Boys				
2SRI	0.008*	0.014*	−0.001	0.006**
	(0.004)	(0.009)	(0.001)	(0.002)
Naïve logit	0.009***	0.023***	0.002***	0.002***
	(0.001)	(0.002)	(0.000)	(0.000)
F-statistic of IV	18.06	18.06	18.06	18.06
Control variables	yes	yes	yes	yes
No. of observations	183,482	183,482	181,432	182,293
Girls				
2SRI	0.027***	0.056***	0.006*	0.000
	(0.005)	(0.012)	(0.003)	(0.001)
Naïve logit	0.025***	0.055***	0.006***	0.000
	(0.001)	(0.003)	(0.001)	(0.000)
F-statistic of IV	16.00	16.00	16.00	16.00
Control variables	yes	yes	yes	yes
No. of observations	172,643	172,796	172,120	168,921

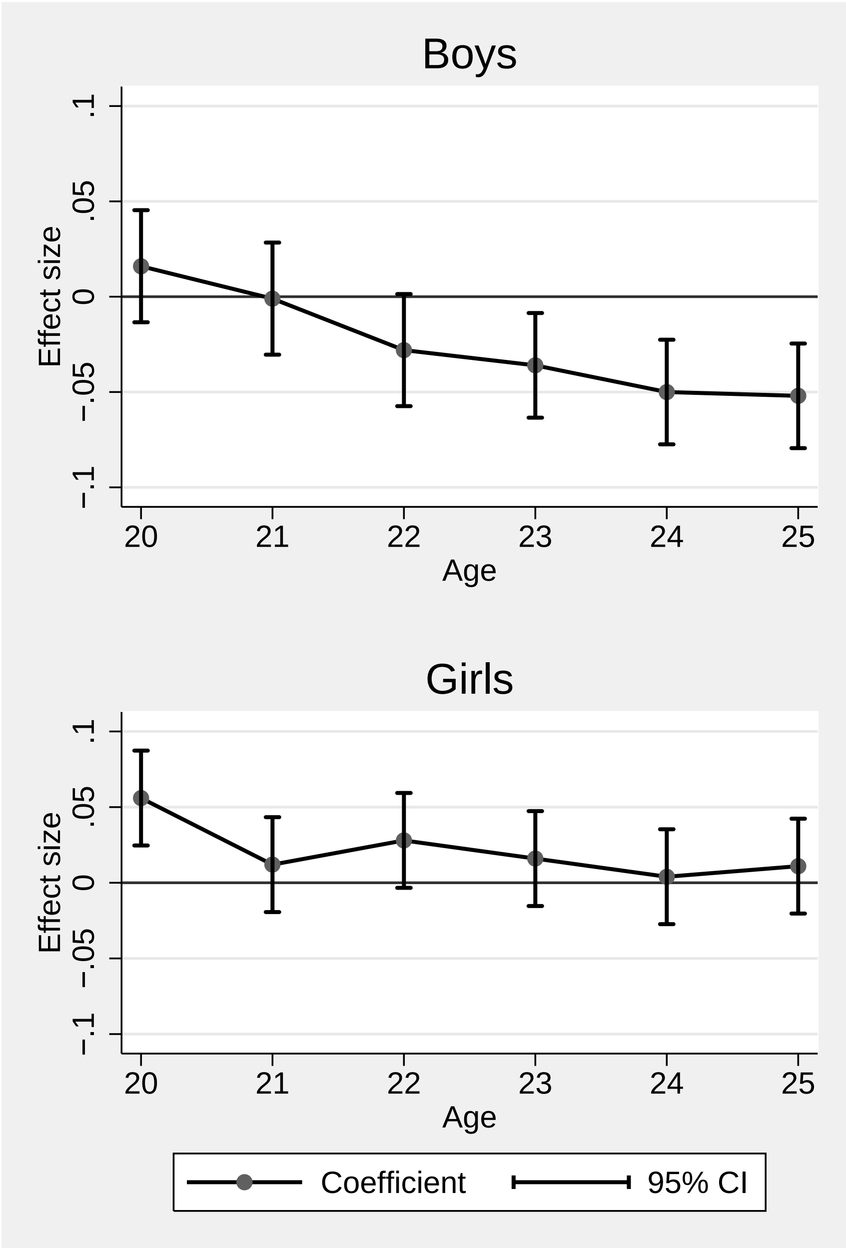
Notes: This table summarizes estimation results of the effect parental divorce on demographic outcomes for boys (upper panel) and girls (lower panel) separately. Two estimation methods are used. Within each panel the first row reports estimates from a naïve logit estimation, and the second row reports estimates from a 2SRI procedure. The latter uses the extent of sexual integration in fathers' workplaces as an instrumental variable. Thus each reported estimation result is from a separate estimation. Reported estimates are average marginal effects for divorce until age of 18, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. The number of observations varies due to availability of outcome variables and/or underidentification of the logistic models. Control variables comprise child characteristics measured at birth (parity, multiple birth, and birth weight), parental characteristics of assortative mating measured the time of marriage (father's age, the spouses' age difference, religious denominations, and citizenship), father's employment characteristics measured at the time of the child's birth (broad occupation, daily wage, job tenure, same firm with mother), father's firm characteristics measured at the time of the establishment of the firm (firm size, share of blue-collar workers, share of females, and industry affiliation), regional fixed-effects, quarter of birth fixed-effects, a child birth cohort trend and parental marriage cohort trend. [a] Teenage parenthood takes the value one if the child becomes mother/father until age 20, and zero otherwise; children with births before parental divorce are excluded; [b] Early marriage takes the value one if the child marries until age 20, and zero otherwise; children marrying before parental divorce are excluded.

Table 5: The effect of parental divorce on human capital outcomes

	(I)	(II)	(III)	(IV)	(V)	(VI)
	Education	**Labor market status at 25 years of age**				
	College attendance	Employed	Marginal employed	Unemployed	Parental leave	Out of labor force
Boys						
2SRI	−0.099***	−0.053***	−0.017**	0.027***	0.000	0.026**
	(0.013)	(0.014)	(0.007)	(0.006)	(0.001)	(0.012)
Naïve logit	−0.063***	−0.041***	−0.002	0.026***	0.000	0.012***
	(0.003)	(0.003)	(0.002)	(0.001)	(0.000)	(0.003)
F-statistic of IV	18.06	18.06	18.06	18.06	18.06	18.06
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	183,547	183,547	183,515	183,542	162,417	183,547
Girls						
2SRI	−0.087***	0.011	−0.014*	0.026***	−0.012	−0.021*
	(0.015)	(0.016)	(0.008)	(0.006)	(0.009)	(0.012)
Naïve logit	−0.054***	−0.046***	0.004**	0.020***	0.009***	0.010***
	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)	(0.003)
F-statistic of IV	16.00	16.00	16.00	16.00	16.00	16.00
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	172,828	172,828	172,817	172,743	172,765	172,828

Notes: This table summarizes estimation results of the effect parental divorce on human capital outcomes for boys (upper panel) and girls (lower panel) separately. Two estimation methods are used. Within each panel the first row reports estimates from a naïve logit estimation, and the second row reports estimates from a 2SRI procedure. The latter uses the extent of sexual integration in fathers' workplaces as an instrumental variable. Thus each reported estimation result is from a separate estimation. Reported estimates are average marginal effects for divorce until age of 18, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. The number of observations varies due to availability of outcome variables and/or underidentification of the logistic models. Control variables comprise child characteristics measured at birth (parity, multiple birth, and birth weight), parental characteristics of assortative mating measured the time of marriage (father's age, the spouses' age difference, religious denominations, and citizenship), father's employment characteristics measured at the time of the child's birth (broad occupation, daily wage, job tenure, same firm with mother), father's firm characteristics measured at the time of the establishment of the firm (firm size, share of blue-collar workers, share of females, and industry affiliation), regional fixed-effects, quarter of birth fixed-effects, a child birth cohort trend and parental marriage cohort trend.

Figure 3: The effect of parental divorce on employment over time



Notes: Figure summarizes employment effects due to parental divorce for boys (upper panel) and girls (lower panel), estimated at different ages of the child separately. The empirical specification is equivalent to those of our standard empirical model presented in Tables 3 to 5.

Table 6: Alternative estimation method: Outcome college attendance

	(Ia)	(Ib)	(II)
	2SRI using		Bivariate
	Pearson residual	Anscombe residual	probit model
Boys			
Parental divorce	-0.099***	-0.142***	-0.097***
	(0.013)	(0.037)	(0.017)
Control variables	yes	yes	yes
Number of obs.	183,547	183,547	183,547
Girls			
Parental divorce	-0.088***	-0.137***	-0.101***
	(0.015)	(0.014)	(0.021)
Control variables	yes	yes	yes
Number of obs.	172,828	172,828	172,828

Notes: Standard errors clustered on families in parentheses; *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend.

Web Appendix

This Web Appendix (not for publication) provides additional material discussed in the unpublished manuscript 'How Does Parental Divorce Affect Children's Long-term Outcomes?' by Wolfgang Frimmel, Martin Halla, and Rudolf Winter-Ebmer.

Table A.1: Characteristics of divorcing and non-divorcing parents families by child sex

	Divorcing parents				Non-divorcing parents			
	Boys		*Girls*		*Boys*		*Girls*	
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.
Child outcomes:								
College attendance	0.174	(0.379)	0.251	(0.434)	0.244	(0.429)	0.310	(0.463)
Employed at age 25	0.658	(0.474)	0.580	(0.494)	0.703	(0.457)	0.630	(0.482)
Marginal employed at age 25	0.046	(0.210)	0.070	(0.256)	0.047	(0.212)	0.065	(0.246)
Unemployed at age 25	0.087	(0.282)	0.066	(0.248)	0.049	(0.266)	0.037	(0.189)
Out of labor force at age 25	0.207	(0.405)	0.178	(0.382)	0.200	(0.400)	0.172	(0.378)
Maternity leave at age 25	0.001	(0.033)	0.106	(0.308)	0.001	(0.028)	0.096	(0.294)
Teenage parenthood[a]	0.029	(0.167)	0.066	(0.249)	0.018	(0.133)	0.033	(0.178)
Being a parent by age 25	0.115	(0.320)	0.234	(0.423)	0.089	(0.285)	0.169	(0.374)
Being ever married by age 20[b]	0.006	(0.080)	0.024	(0.152)	0.003	(0.057)	0.013	(0.114)
Mortality by age 25	0.008	(0.089)	0.002	(0.046)	0.005	(0.074)	0.002	(0.042)
Child characteristics:[c]								
First born child	0.562	(0.496)	0.562	(0.496)	0.459	(0.498)	0.457	(0.498)
Twin	0.014	(0.119)	0.016	(0.125)	0.015	(0.120)	0.017	(0.128)
Birth weight (in dekagrams)	333.32	(51.05)	320.05	(48.11)	3373.4	(500.1)	3233.2	(476.5)
Father's age at birth and parents' age difference:[c]								
Age 15-19	0.009	(0.094)	0.009	(0.096)	0.003	(0.056)	0.003	(0.051)
Age 20-24	0.293	(0.455)	0.294	(0.456)	0.183	(0.386)	0.182	(0.386)
Age 25-29	0.406	(0.491)	0.408	(0.491)	0.420	(0.494)	0.421	(0.494)
Age 30-34	0.199	(0.399)	0.196	(0.397)	0.261	(0.439)	0.259	(0.438)
Age 35-39	0.066	(0.249)	0.067	(0.250)	0.095	(0.293)	0.096	(0.295)
Age 40+	0.027	(0.162)	0.025	(0.157)	0.038	(0.192)	0.039	(0.194)
Age difference	3.064	(4.060)	3.041	(3.980)	3.136	(3.742)	3.127	(3.736)
Distribution of parent's religious denomination:[d]								
Both catholic	0.785	(0.411)	0.781	(0.414)	0.865	(0.342)	0.866	(0.341)
Both undenominational	0.025	(0.156)	0.027	(0.161)	0.014	(0.117)	0.013	(0.114)
Both other denomination	0.028	(0.165)	0.028	(0.166)	0.024	(0.152)	0.024	(0.152)
Catholic, undenominational	0.055	(0.227)	0.056	(0.231)	0.027	(0.163)	0.028	(0.165)
Catholic, other denomination	0.097	(0.295)	0.098	(0.298)	0.065	(0.247)	0.064	(0.245)
Other, undenominational	0.010	(0.100)	0.010	(0.098)	0.005	(0.070)	0.005	(0.071)
Distribution of parent's ethnic background:[d]								
Both Austrian citizen	0.912	(0.284)	0.913	(0.283)	0.956	(0.205)	0.957	(0.203)
Father Austrian, mother non-Austrian	0.026	(0.160)	0.026	(0.158)	0.024	(0.153)	0.023	(0.151)
Father non-Austrian, mother Austrian	0.017	(0.129)	0.019	(0.137)	0.011	(0.106)	0.011	(0.106)
Both non-Austrian citizen	0.045	(0.207)	0.043	(0.202)	0.009	(0.092)	0.008	(0.090)
Father's employment characteristics at child's birth and firm characteristics[e]								
Blue collar worker	0.547	(0.498)	0.544	(0.498)	0.562	(0.496)	0.561	(0.496)
Daily wage	38.79	(14.13)	38.84	(13.96)	39.07	(13.47)	39.18	(13.47)
Tenure in firm	3.088	(2.974)	3.129	(3.005)	3.917	(3.248)	3.920	(3.266)
Mother employed in same firm	0.049	(0.217)	0.047	(0.211)	0.047	(0.212)	0.048	(0.214)
Firm size	1,632.9	(4,468.2)	1,570.1	(4,418.8)	1,539.4	(4,363.7)	1,525.0	(4,349.9)
Firm's share of blue-collar workers	0.536	(0.342)	0.534	(0.343)	0.562	(0.331)	0.561	(0.332)
Firm's share of females	0.306	(0.254)	0.304	(0.255)	0.271	(0.244)	0.270	(0.244)
No. of observations	24,528		23,532		159,019		149,296	

Notes: [a] 69 cases where the birth took place before parental divorce are excluded. [b] 69 cases, where the marriage took place before parental divorce are excluded. [c] Characteristics are measured at the time of birth based on information from the *Austrian Birth Register*. [d] Characteristics are measured at the time of marriage based on information from the *Austrian Marriage Register*. [e] Characteristics are measured at birth (father characteristics) and firm establishment (firm characteristics) and based on information from the *Austrian Social Security Database*.

Table A.2: The effect on demographic outcomes — treatment is defined as divorce until the age of 10 years

	(I)	(II)	(III)	(IV)
	Fertility		**Marriage**	**Mortality**
	Before 20 years of age[a]	Before 25 years of age	Before 20 years of age[b]	Before 25 years of age
Boys				
Parental divorce	0.007**	0.024***	−0.001	0.005**
	(0.003)	(0.008)	(0.001)	(0.002)
Control variables	yes	yes	yes	yes
No. of observations	171,728	171,728	169,825	170,564
Girls				
Parental divorce	0.025***	0.054***	0.004	−0.000
	(0.005)	(0.011)	(0.003)	(0.001)
Control variables	yes	yes	yes	yes
No. of observations	160,972	161,114	160,475	157,509

Notes: The estimations summarized in this table are equivalent to those presented in Table 4, however, use an alternative definition of the treatment (divorce until age of 10). Reported coefficients are average marginal effects for divorce until age of 10, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables and/or underidentification of the logistic model. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend. [a],teenage parenthood takes the value one if the child becomes mother/father until age 20, and zero otherwise; children with births before parental divorce are excluded; [b],early marriage takes the value one if the child marries until age 20, and zero otherwise; children marrying before parental divorce are excluded.

Table A.3: The effect on human capital outcomes — treatment is defined as divorce until the age of 10 years

	(I)	(II)	(III)	(IV)	(V)	(VI)
	Education	**Labor market status at 25 years of age**				
	College attendance	Employed	Marginal employed	Unemployed	Parental leave	Out of labor force
Boys						
Parental divorce	−0.100***	−0.062***	−0.014***	0.027***	−0.001	0.033**
	(0.014)	(0.014)	(0.007)	(0.006)	(0.001)	(0.012)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	171,761	171,761	171,733	171,746	151,585	171,761
Girls						
Parental divorce	−0.076***	−0.011	−0.009	0.027***	−0.011	−0.009
	(0.015)	(0.015)	(0.007)	(0.005)	(0.009)	(0.012)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	161,126	161,126	161,116	161,035	161,066	161,126

Notes: The estimations summarized in this table are equivalent to those presented in Table 5, however, use an alternative definition of the treatment (divorce until age of 10). Reported coefficients are average marginal effects for divorce until age of 10, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables and/or underidentification of the logistic model. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend.

Table A.4: The effect on demographic outcomes — using an alternative control group

	(I)	(II)	(III)	(IV)
	Fertility		**Marriage**	**Mortality**
	Before 20 years of age[a]	Before 25 years of age	Before 20 years of age[b]	Before 25 years of age
Boys				
Parental divorce	0.010***	0.019**	−0.000	0.006**
	(0.004)	(0.008)	(0.001)	(0.002)
Control variables	yes	yes	yes	yes
No. of observations	192,538	192,538	190,666	191,802
Girls				
Parental divorce	0.032***	0.061***	0.008**	0.000
	(0.005)	(0.011)	(0.003)	(0.001)
Control variables	yes	yes	yes	yes
No. of observations	180,782	180,951	180,586	177,712

Notes: The 2SRI estimations summarized in this table are equivalent to those presented in Table 4, however, use an alternative definition of the control group. Here, the control group comprises families in which the parents either never divorced, or divorced after index child's 18th birthday. Reported coefficients are average marginal effects for divorce until age of 10, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables and/or underidentification of the logistic model. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend. [a] teenage parenthood takes the value one if the child becomes mother/father until age 20, and zero otherwise; children with births before parental divorce are excluded; [b] early marriage takes the value one if the child marries until age 20, and zero otherwise; children marrying before parental divorce are excluded.

Table A.5: The effect on human capital outcomes — using an alternative control group

	(I)	(II)	(III)	(IV)	(V)	(VI)
	Education	**Labor market status at 25 years of age**				
	College attendance	Employed	Marginal employed	Unemployed	Parental leave	Out of labor force
Boys						
Parental divorce	−0.090***	−0.050***	−0.015**	0.023***	0.001	0.025**
	(0.013)	(0.014)	(0.007)	(0.006)	(0.001)	(0.012)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	193,164	193,164	193,131	193,159	170,902	193,164
Girls						
Parental divorce	−0.080***	0.012	−0.014*	0.024***	−0.016*	−0.017
	(0.015)	(0.016)	(0.008)	(0.006)	(0.009)	(0.012)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	181,866	181,866	181,853	181,778	181,808	181,866

Notes: The estimations summarized in this table are equivalent to those presented in Table 5, however, use an alternative definition of the control group. Here, the control group comprises families in which the parents either never divorced, or divorced after index child's 18th birthday. Reported coefficients are average marginal effects for divorce until age of 10, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables and/or underidentification of the logistic model. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend.

Table A.6: The effect on demographic outcomes — using a bivariate probit model

	(I)	(II)	(III)	(IV)
	Fertility		**Marriage**	**Mortality**
	Before 20 years of age[a]	Before 25 years of age	Before 20 years of age[b]	Before 25 years of age
Boys				
Parental divorce	0.009	0.009	−0.002	0.014**
	(0.008)	(0.019)	(0.002)	(0.006)
Control variables	yes	yes	yes	yes
No. of observations	183,499	183,499	183,546	183,544
Girls				
Parental divorce	0.035***	0.080***	0.005	0.000
	(0.010)	(0.024)	(0.006)	(0.002)
Control variables	yes	yes	yes	yes
No. of observations	172,807	172,807	172,827	172,827

Notes: Reported coefficients are average marginal effects for divorce until age of 18, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend. [a] teenage parenthood takes the value one if the child becomes mother/father until age 20, and zero otherwise; children with births before parental divorce are excluded; [b] early marriage takes the value one if the child marries until age 20, and zero otherwise; children marrying before parental divorce are excluded.

Table A.7: The effect on human capital outcomes — using a bivariate probit model

	(I)	(II)	(III)	(IV)	(V)	(VI)
	Education	**Labor market status at the 25 years of age**				
	College attendance	Employed	Marginal employed	Unemployed	Parental leave	Out of labor force
Boys						
Parental divorce	−0.097***	−0.061***	−0.024*	0.031**	0.001	0.035*
	(0.017)	(0.022)	(0.013)	(0.014)	(0.002)	(0.020)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	183,547	183,547	183,547	183,547	183,547	183,547
Girls						
Parental divorce	−0.101***	0.093***	−0.039*	0.040***	−0.014	−0.066***
	(0.021)	(0.035)	(0.021)	(0.014)	(0.019)	(0.023)
Control variables	yes	yes	yes	yes	yes	yes
No. of observations	172,828	172,828	172,828	172,828	172,828	172,828

Notes: Reported coefficients are average marginal effects for divorce until age of 18, with standard errors clustered on families in parentheses below. *, ** and *** indicate statistical significance at the 10-percent, 5-percent and 1-percent level respectively. Number of observations varies due to availability of outcome variables. Control variables include children characteristics, father's age, education and employment characteristics at birth, ethnic and religious background of parents, regional fixed-effects, industry fixed-effects, quarter of birth fixed-effects, child birth cohort trend and parental marriage cohort trend.