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IZA DP No. 18288

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ABSTRACT

Gender Equality Through Marriage*

We revisit the economic effects of marriage, analysing its heterogeneous impact on the intra-household labour division following childbirth. Can marriage promote coordination of work and child activities between parents and a gender egalitarian division of labour? Using a marginal treatment effect framework, we find the average effect of marriage is to increase parental specialization and worsen the mother's child penalty. However, we find differences across couples with varying resistance to marriage. While traditional couples (low-resistance) exhibit increased specialization; in modern couples (high-resistance) fathers have an earnings penalty and take more paternity leave, suggesting more coordination and gender equality.

JEL Classification: J11, J12, J13, J18

Keywords: cohabitation, marriage, specialization, cooperation, child human capital

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1 Introduction

The arrival of a couple's first child consistently triggers a significant and widely documented shift in how labour is divided within the household.[1] Whether or not these couples are married at the time of the first birth directly influences the couples' decisions over labour supply choices. The traditional economic view of marriage, as outlined by Becker (1973, 1974), posits that couples specialize in either market or domestic work to maximize household efficiency. This division of labour, while economically efficient, reinforces traditional gender roles and contributes to significant gender inequality within the household - particularly following the birth of the first child where such household decisions are particularly salient.

However, many contemporary relationships no longer conform to this traditional model. In approximately one-third of US households and 40% of Norwegian households, partners contribute relatively equally to household income. Men remain the primary earners in 55% of US households and 48% of Norwegian households, while women contribute the largest share of income in the remaining cases.[2] In modern couples both partners have often invested significantly in their education and careers, making a strict division of labour less desirable, changing the basis of marital surplus from production complementarities to consumption and time complementarities (Lundberg and Pollak, 2007; Stevenson and Wolfers, 2007; Pollak, 2013; Lundberg et al., 2016; Calvo et al., 2024). This shift represents a fundamental change in the nature of marriage, moving away from a model of specialization toward one of coordination.

When estimating the causal effect of marriage on the division of household labour supply, the empirical literature concludes partial specialization, with a large marriage penalty to the woman (see e.g. Adamopoulou et al., 2025). However, this evidence largely focuses on the average effect of marriage, overlooking the fact that its effects may vary depending on the couples' characteristics. This paper aims to fill this gap, revising the classic economic question of the gains to marriage and asking whether marriage at childbirth in a contemporary setting facilitates gender equality within the household and whether there is a heterogeneous marriage effect consistent with the specialization in more traditional households and coordination in more modern households.

[1] See for examples Lundborg et al. (2017); Adda et al. (2017); Bertrand et al. (2010); Angelov et al. (2016); Kleven et al. (2019, 2021); Cortés and Pan (2023); Andresen and Nix (2022); Lundborg et al. (2024).

[2] Statistics for the US are from (Park et al., 2025) and for Norway from the authors' calculations.

The key econometric challenge to address is the selection bias inherent in studying marriage. The decision to marry is not random; it is correlated with a host of observable and unobservable factors, such as a couple's values, gender norms, and career aspirations. We identify a causal effect of marital status at birth (being married versus cohabiting) on the couple's labour outcomes by adopting an instrumental variable (IV) strategy whilst estimating treatment effect heterogeneity across a rich set of observed and unobserved variables, within a marginal treatment effect (MTE) framework.[3] Such MTE framework allows us to identify the causal effect of marriage on different types of couples and in particular across couples with a different level of resistance to marriage.

Borrowing from the partially overlapping peer approach, we construct an instrument based on traits of indirect peers - or the peers of one's own peers, instrumenting the parents' marriage decision using the marriage rate of peers of peers who gave birth before the focal parents.[4] Peers have been found to be strong predictors of the decision to marry (Moroni, 2019; Wozniak et al., 2024), by providing information on financial consequences or stigma from marriage or through imitation. We leverage administrative data covering the full population of Norway to identify two peer groups that individuals/households interact with in their every day lives - neighbours and workmates - and construct our instrumental variable using the marriage rate of the workmates' neighbours observed at the birth of their first child. An illustration of the strategy is where my workmate was weighing up the advantages and disadvantages of marrying and looked to their neighbours. This interaction affected the marriage decision of my workmate, and I either took information from my workmate about working hours or I imitated their behaviour.

The identification assumption is that the marriage rate of the workmates' neighbours drives the focal households' outcomes only through their marital decision. Section 4.2 defines and justifies the assumptions required for IV validity, explaining how we take account of potential biases caused by (1) correlated omitted variables, (2) reflection (reverse causality), (3) endogenous peer membership (see Manski 1993; Moffitt et al. 2001; Nicoletti et al. 2023). We control for the latter by "re-centering" our instrument following Borusyak and Hull (2023). Section 7.1 probes the key assumptions, testing for issues such as unobserved factors

[3] See, e.g., Heckman et al. (2006); Carneiro et al. (2011); Brinch et al. (2017).

[4] See e.g. Bramoullé et al. (2009), Lee et al. (2010), Lin (2010), De Giorgi et al. (2010), Nicoletti et al. (2018), Nicoletti and Rabe (2019), De Giorgi et al. (2020) and Nicoletti et al. (2023).

correlated with the workplace or the wider labor market, common shocks, and the potential confounding effect of peers' fertility.

Our first set of findings is that the Average Treatment Effect (ATE) of marriage versus cohabitation at the time of birth is consistent with specialization. On average, the marriage amplifies the women's child penalty and the men's premium. This finding of specialization through marriage is replicated in all (within our knowledge) studies of the effects of marriage on labour supply, most recently Adamopoulou et al. (2025).

A key contribution of our paper is to show that the ATE hides treatment heterogeneity across the unobserved "resistance to marriage". We label couples with low resistance to marry - with unobserved traits that predispose them to marriage - as traditional households, and high resistance households as modern.[5] This distinction is motivated by the fall in marriage rates across time in developed countries (see Lundberg and Pollak 2014 or Figure A1 for Norway) and is consistent with Bertrand et al. (2021) who argues that more modern couples are those less likely to marry. The MTE estimates show that the causal effect of marriage for low resistant traditional couples remains consistent with the economic predictions of specialization. However, for high resistant modern households, the evidence points towards coordination of labour market activities. In these couples, there is a reduction in the marriage penalty in the mother's labour market participation and hours relative to traditional couples. Concurrently, for modern fathers there is a marriage penalty - a reduction in his earnings through marriage and suggestion of a shift towards work-life balance through an increased uptake of paternity leave. The effect of marriage across unobserved resistance mirrors the effect we see when including measures of family gender norms of the grandmothers' labour supply. Low-resistance couples show patterns similar to those with traditional norms, and high-resistance couples to those with progressive norms.

We also look at the effect of marriage on the number of children and find that marriage increases fertility for "low resistance" traditional couples, but reduces fertility for the coordinating "high resistance" couples. Recent papers on declining fertility typically address the decision to have (more) children from an angle of mothers withholding childbearing if there is inadequate support from a partner or the state (Doepke and Kindermann, 2019; Goldin, 2025). However, for modern coordinating households, we cannot rule out in addition to this

[5]Note that the unobserved traits are uncorrelated with the rich set of observable traits included in our model, which capture parent SES, wealth, relationship quality, social and family norms around cohabitation.

that fathers who contribute more towards household activities through marriage stand to lose out from further fertility.[6]

Our final analysis addresses whether marriage for modern (high-resistance) coordinating couples harms or enhances household welfare relative to traditional (low-resistance) specializers. Despite the large changes in the labour supply of mothers and fathers through marriage, there is no effect of marriage versus cohabiting on child outcomes - for either coordinators or specializers. On the other hand, marriage reduces couple separation, with largest effects for more extreme resistance to marriage - i.e. either the most specialized or most coordinated couples.

This article contributes to several lines of research. First, we engage with the empirical research on marital specialization, which finds that marriage promotes the gendered division of labor among parents, especially for couples with traditional gender norms (Herold and Wallossek, 2023; Kearney, 2023; Kleven et al., 2025; Adamopoulou et al., 2025). We contribute to this literature by, for the first time identifying the causal effect of marriage across couples with different observed traits and across couples with different unobservables that predispose them to marriage (traditional couples) or make them resistant to marriage (modern couples). This innovation is meaningful as we are able to show that an increase in gender equality is possible through marriage.

More broadly, our paper contributes to the large literature on factors that could improve gender equality within households, such as flexibility of firms in their demand of work hours (two of such examples are Goldin, 2014; Goldin and Katz, 2016). We add to this literature by showing for the first time that marriage for modern couples can increase gender equality.

Third, a growing literature has identified a child penalty with a negative impact of childbirth on labour outcomes of mothers (Lundborg et al., 2017; Olivetti and Petrongolo, 2017; Adda et al., 2017; Kleven et al., 2019, 2025; Cortés and Pan, 2023; Lundborg et al., 2024; Kleven et al., 2024). We provide novel evidence that the marital contract amplifies the child penalty for traditional couples, whereas it reduces the child penalty for the modern couples, where it is the husband who experiences a marriage penalty.

The causal effect of marriage on children is mostly estimated using policy reforms that

[6]This is consistent with Farré and González (2019), who find that fathers contributing more childcare choose to have fewer children.

affect the marriage rate, adopting an IV or a difference in difference approach to identify the causal effect of marriage for compliers, i.e. for marginal marriages that would not have occurred in absence of the policy reform (e.g. Björklund et al. 2004, Ginther et al. 2010 and Persson 2020).[7] We go a step further by considering a MTE approach which allows us to i) infer the causal effect of marriage for the full population rather than just the compliers as well as for the subgroups of treated (married) and untreated (cohabiting) couples and ii) to estimate this causal effect across the distribution of the unobserved resistance to marriage.[8]

Finally, whilst there is a large literature examining the consequence of the historic rise in female labour supply on children (see Nicoletti et al., 2023; Agostinelli and Sorrenti, 2021, for recent examples) a change that has received less attention is the effect of the increase in time that fathers spend with their children (Smith, 2004). Most causal evidence comes from reforms to paternity leave, where the father can take around a month of leave in the first year of childbirth.[9] We are able to study the effects of marriage on children, asking whether children are better off in the high resistance households - characterized by fathers taking more paternity leave and earning less income across ages 2-8 - compared to the traditional households where married mothers work less and fathers more. We find that there is no effect of marriage on children and this is true in low and high resistance households. Children do not have worse outcomes when parents share labour and childcare more equally, suggesting that any potential negative effect on children of higher maternal work is fully offset by the increase in fathers' involvement in childcare in modern households.

2 Theoretical predictions and institutional background

2.1 Marital contract and the division of labour

According to the theoretical literature, the contract of marriage increases coordination of household and labour market activities, by increasing the commitment of partners (Matouschek and Rasul, 2008). Taking the division of labour as an example, Cigno (2012) explains that a spouse will be less likely to agree to give up work and take on home re-

[7] More descriptive studies of cohabitation and child outcomes include Brown (2004), Guetto and Panichella (2019) and Crawford et al. (2013).

[8] Frimmel et al. (2014) also emphasize that compliers, or marginal marriages, tend to differ in terms of characteristics but they do not apply a marginal treatment effect approach.

[9] See Wüst (2025) for a summary of the evidence.

sponsibilities without a commitment to compensation from their partner. Higher exit costs through marriage (see subsection 2.2) mean that compensating the partner who exits the labour market becomes beneficial to the main earner, increasing cooperation.

Lundberg et al. (2016) explains that as the exit costs from marriage are higher compared to cohabitation, a dynamic inconsistency or hold-up problem exists. For cohabiting couples it is easier to renegotiate the "contract" or agreement as to how partners will allocate their time between domestic and labour work and this possibility lowers the commitment to fulfill the promise in cohabiting relationships.

2.1.1 Cooperation through specialization versus coordination

In a traditional male breadwinner relationship, a gain from marriage comes from both partners cooperating with the specialization of tasks. Whilst one partner invests in their human capital through working in the labour market, the other partner invests in household duties and childcare activities. This specialization means that the productivity of labour and home work is higher than if both partners engaged in both dimensions of work. Lundberg et al. (2016) and Lafortune and Low (2017) describe how in the traditional nuclear family model, a marriage surplus is created through gains from specialization.

Now imagine a more modern couple who, before having their first child, promise to share childcare and labour participation. It is not possible to write a contract to specify future sharing of childcare at the start of a relationship (Lundberg et al., 2016; Gobbi, 2018; Pollak, 2019; Doepke et al., 2019). It is easier for the cohabiting couples to renegotiate the agreement after having a child, given the lower exit costs. The increased cooperation facilitated through the marital contract in this case leads to a coordination and a more equal sharing of labour and home responsibilities, which allows both partners to work and look after children.[10]

The gains from marriage in terms of coordination have been discussed in the literature, for example by Stevenson and Wolfers (2007), but to date there is no empirical evidence identifying a causal effect of marriage which is consistent with coordination. We close this

[10]The fact that both partners work in modern households does not necessarily imply inefficiency (Pollak, 2013). The lack of specialization can occur if the domestic work or childcare production exhibits decreasing returns to scale in the mother's and father's time or when there is more than a single household production activity (e.g., childcare, cooking, laundry, yard work, household repairs) and each partner specializes in a different subset of them.

gap, and ask whether the gains from marriage through coordination exist.

2.2 Exit costs

Historically, the exit costs from leaving a marriage were higher than when separating after cohabiting.[11] Whilst legislation has mostly removed differences in taxes on inheritance for children and child custody based on marital status, there remain some costs involved in ending a marriage which are higher than compared to cohabiting relationships. There are legal fees to be paid to end the contract and to lawyers and there is evidence that psychological costs from ending a relationship are higher after marriage than cohabiting (Gibson-Davis et al., 2005; Edin and Kefalas, 2011).

Indeed, Horowitz et al. (2019) find that couples perceive a higher level of commitment within a marriage than in cohabiting relationships. 63% of married couples reported that the reason they married was to make a formal commitment to each other. In contrast, 47% of cohabitors who had not married, reported that either their partner or they themselves were not ready for the commitment. According to the theoretical models, this increased commitment will help to coordinate labour and childcare across partners (Doepke and Kindermann, 2019; Lundberg et al., 2016; Gobbi, 2018; Matouschek and Rasul, 2008; Cigno, 2012).

2.3 Norwegian institutional settings

In the 1970s in Norway, transfers and taxes advantaged married couples compared to cohabitors. Since then, policy changes have to a large extent eradicated many of these sources of the surplus from marriage. In 1973 the institutionalization of cohabitation was enshrined in the Norwegian law with the consequence that from a legal point of view, cohabiting and married couples had equal rights regarding the law regulating marriage, child custody and economic compensation after divorce. This was followed by The Marriage Law of 1993, which allowed unilateral dissolution of marriages, reducing the cost of divorce. [12]

Our sample period reflects a context where legal differences between marriage and cohabitation in Norway are minimal for parents, except for asset division. The key distinction

[11] See details in subsection 2.3.

[12] In Norway registered partnerships are allowed only for same-sex couples (Noack et al., 2005). These are excluded from our sample.

is that assets acquired during marriage are divided equally upon divorce, a principle that does not automatically apply to cohabiting couples. The higher exit costs from marriage in Norway will stem from this legal difference, plus higher psychological or perceived costs for separation after marriage.

3 Data

Norwegian administrative data from various registers which are linked by Statistics Norway is used for our analysis. The population of births between 1997-2001, taken from the birth register, forms the estimation sample. Combining data from different registers provides details on the marital status at the time of birth, parent labour market trajectories as the children age, the presence of future children, child's school test scores and a wide range of measures of household socio-economic status, relationship quality along with data at the regional level to measure social norms.

Treatment

For each child we can measure the marital status of parents from the birth registry since 1986. We focus on the first child births, because the effect of marital status for higher birth order children may depend on the outcomes and the effect of marriage on the first child. The birth register categorizes parental marital status as married, cohabiting, lone parent, or divorced/separated/widowed. Figure A1 plots out the marital status at birth across the different categories, across time. Marriage and cohabitation account for the vast majority of households' marital status at birth and lone parents account for between 10-15%. At the birth of the first child, the other categories of divorce/separated or widowed are very rare.

We estimate the gain from marriage compared to cohabiting at birth and define marriage to take the value 1 if the couple is married at the time of birth and 0 if they are cohabiting. In the sample, 22627 (38%) of households are married at the birth of the first child, whilst the remaining 36248 (62%) of the sample are cohabiting (see Table A1).

Outcomes

Using administrative tax records and labour market registries, we construct our main outcome measures: the labour market earnings of each parent and mothers' labour supply when

their first child is between ages 2 and 8.[13] The earnings include annual income from self-employment and work related benefits such as government transfers of unemployment benefits and sickness leave. All income measures are deflated to 2020 Norwegian Kroner. At ages 2, 5 and 8, mother and father earnings are higher in married compared to cohabiting households (Table A2). 70% of mothers are working when the child is aged 2, increasing to 78% by age 8. Mothers' weekly hours worked are recorded as a discrete variable with indicators for working 0 hours, 1-19, 20-29 and 30+ and are observed in the November of each year. We take the midpoint value of each range, defining hours worked as 0, 10, 24.5 or 40. On average, at child age 5 the mothers work 23 hours per week.

Using birth records, we measure fertility as the number of children of the female partner when the couple's first child is aged 2, 5, and 8. On average, families have two children by the time the first child reaches age 8.(Table A2). Conflict between parents is measured with an indicator for couple separation. In each year it is possible to measure the individuals living in the same household, and we define a couple to have separated if they no longer live together. From Table A2, 12% of couples married - and 25% of couples cohabiting at child birth have separated by age 8.

Child human capital is measured through national school test scores taken at the age of 11 as children end primary education. Children are given a set of tests on Math and Reading and we calculate the total score across the examinations. These exams are not high stakes for the children, i.e. they are not used to determine future educational pathways. This means that the tests themselves are not affected by teacher incentives to "teach to the test". Mean test score outcomes are 49 and 45 across the sample of children in married and cohabiting households respectively (Table A2). Test score outcomes are slightly higher in married households, and this difference is statistically significant.

A rich set of covariates

We control for a wide set of covariates in our model to estimate the causal effect of marriage versus cohabitation at birth on parent and household outcomes. All covariates are predetermined with respect to the child's date of birth - when we measure treatment status.

The socio-economic status (SES) of households is operationalized through the education

[13] We omit age 1 outcomes owing to the parental leave policies which entitle the parents to up to 52 weeks of paid leave.

levels of the mother and father, each represented by a binary indicator for achieving a degree or more. Married parents tend to be from a higher level of education and Table A1 reports that 66% (43%) of mothers and 52% (28%) of fathers who are married (cohabiting) have a degree. Annual labour market registry data is used to calculate the mother and fathers' employment in the year before birth and we include as a control the father's earnings in the year before birth. 85-87% of mothers and 99% of fathers are working in the year before birth and fathers on average earn 278,000 NOK (2020 Norwegian Kroner) if cohabiting and 323,000 NOK if married.

Parental age at child's birth is obtained from the birth registry; mothers are, on average, three years younger than fathers. We draw data on child's gender (with boys comprising approximately 51% of births) and birth year from the same registry.

We consider a set of measures that previous papers suggest as predictors of the probability of marriage. Lundberg et al. (2016) and Lafortune and Low (2023) predict that selection into marriage and gains from marriage are likely to vary across household wealth which we measure as the sum across parents' gross taxable wealth (including business capital, housing stock and all assets and debts) in the year before the child's birth. The average parents' wealth is 246,088 NOK among married and 159,083 NOK among cohabiting parents. A proxy for the relationship quality is created by measuring the relationship duration through the number of years the parents live together before the arrival of the first child. The duration is higher in married than cohabiting households at 2.9 compared to 1.1 years (Table A1). We constructed two measures of the stigma associated with having a child out of wedlock. First, social stigma is proxied by the municipality-level share of electoral votes cast for the Christian Party in the year preceding the child's birth. As the Christian Party promotes pro-family values and policies supporting a traditional view of marriage, a higher vote share likely reflects social norms favourable toward marriage and less accepting of cohabitation. On average, the Christian Party vote share is approximately 9% for married couples and 8% for cohabiting couples. Second, family stigma associated with cohabitation is proxied with an indicator for grandparental divorce, equal to 1 if either the maternal or paternal grandparents of the focal child experienced a divorce, and 0 otherwise. This measure captures the idea that support for cohabitation may be higher in families with prior experience of marital dissolution. In our data, 24% of married couples and 40% of cohabiting couples had at least one grandparent with a history of divorce.

Instrumental Variable

Our instrument is the marriage rate among neighbours of the workmates of the focal household. Detailed postcode data allows us to define a set of neighbors for each household as all houses living in the same postcode. We know from previous research that individuals are influenced by "relevant peers", or individuals with similar characteristics to themselves (Mota et al., 2016). Given this, a neighborhood peer is a household living within the same neighborhood, who has the same education level (defined as the mother's degree status) who gave birth to their first child between 1 and 5 years before the focal household. Whilst on average there are 2,500 individuals as neighbors, on average there are 148 household peers.

A workmate represents a work colleague employed by the same employer and working in the same location. Again these are relevant peers, defined as a work colleague with the same education as the focal parents (defined by degree status) who gave birth 1-5 years before the focal household. The average number of workmate peers is 33.

The instrument measures the marriage rate among workmates' neighbours - which is on average 63% and 58% for married and cohabiting couples respectively. Note that this is the average across the mother and the father's workmates (when both partners work) or just the average across the workmates of the working parent (when only one parent works).

4 Empirical Strategy

In Section 4.1 we define the econometric model we use to estimate the effect of marriage versus cohabitation at the first child birth on parent labour supply, fertility, child test score achievements, and couple separation. Our aim is to assess how the effect of marriage varies with both observed and unobserved characteristics by adopting the Marginal Treatment Effect (MTE) framework and the local instrumental variable (local IV) method. We provide details on how we estimate the MTE in Appendix A, while we discuss our instrument for marriage and define the assumptions that such instrument must satisfies in Section 4.2.

4.1 The econometric model

Let M be the treatment dummy variable which is observed at the first child birth and takes value 1 for married parents and 0 for cohabiting parents.[14] Let Y_1 be the potential outcome if treated, i.e. if married, and Y_0 be the potential outcome if untreated, i.e. if cohabiting. As we observe only one of the two potential outcomes for each couple, the measured outcome is given by

$$Y = Y_1 M + Y_0(1 - M). \tag{1}$$

We model the potential outcomes Y_0 and Y_1 as a function of a set of observable variables as follows

$$Y_j = X\beta_j + \epsilon_j, \tag{2}$$

where the subscript j takes value 1 for married (treated) couples and 0 for cohabiting (untreated) ones, X is a set of explanatory variables which include the constant, predetermined parent socio-economic status (whether has a degree, a quadratic in age at birth and pre-birth employment status for each parent, and pre-birth fathers' earnings), child gender, parents' wealth, variables characterizing the parents' relationship quality, social and family stigma, and year of birth. Three additional variables are also included to ensure the validity of the instrument we use in our estimation which we explain in subsection 4.2. β_0 and β_1 are the vectors of coefficients for the untreated and treated couples and ϵ_0 and ϵ_1 are error terms with $E(\epsilon_1|X = x) = 0$ and $E(\epsilon_0|X = x) = 0$.

Replacing Y_1 and Y_0 in Equation 1 with the right hand size of Equation 2 we obtain

$$Y = X\beta_0 + M[X(\beta_1 - \beta_0) + \epsilon_1 - \epsilon_0] + \epsilon_0, \tag{3}$$

where the coefficient of M, $\Delta = X(\beta_1 - \beta_0) + \epsilon_1 - \epsilon_0 = Y_1 - Y_0$, is effect of the treatment on Y and is heterogeneous because it varies with X and $(\epsilon_1 - \epsilon_0)$.

For the selection into marriage we consider the following latent index model

$$M^* = Z\gamma - V, \quad M = \mathbf{I}(M^* > 0), \tag{4}$$

[14] We focus only on families where both parents are present at the birth of the first child, so single parents and parents not living together are not part of the analysis.

where M^* is the latent propensity to marriage, $\mathbf{I}(.)$ is an indicator function assigning $M = 1$ if $M^* > 0$ and 0 otherwise, $Z = (X, W)$, W is the instrumental variable, γ is a vector of coefficients and V is the error term normally distributed with mean zero and unit variance, which is termed **resistance to treatment** and $(\epsilon_0, \epsilon_1, V)$ are independent of the instrument W conditional on X.

The MTE is usually defined as a function of the quantile of the distribution of the resistance V. Let F be the cumulative density function of the resistance V, then the quantile of V, i.e. $U_M = F(V)$, is by definition distributed as an uniform (0,1) and can be used to define the conditional probability of marriage $Pr(M = 1|Z) = p(Z)$ as $Pr(U_M \leq p(Z))$.

We define the MTE as in Heckman and Vytlacil (1999, 2001, 2005, 2007) and Brinch et al. (2017) as the average treatment effect at a specific value u of the resistance

$$\text{MTE}(X = x, U_M = u) = E(Y_1 - Y_0|X = x, U_M = u). \tag{5}$$

In our empirical application we explore the heterogeneity of the marginal marriage effect across observed variables X and across unobserved resistance to treatment. The resistance to marriage captures factors that we cannot observe but that the couples may consider when forming expectations about potential outcomes (Y_0 and Y_1) and deciding between marriage and cohabitation. We label the couples with low resistance to marriage as traditional and high resistant couples as modern. In our empirical application we will assess if parents who are more traditional are more likely to use marriage as a commitment device for specialization, whereas more modern couples might decide to marry only if the marriage can be used as a commitment device for more coordination of childcare between the two parents. We will do this by examining the heterogeneity of the MTE across the resistance and focusing on outcomes that measure the allocation of labour and childcare between parents.

4.2 Using peers of peers decisions as instrumental variable

As shown in Bramoullé et al. (2009), Lee et al. (2010), Lin (2010), De Giorgi et al. (2010), and the recent review article by Bramoullé et al. (2020), it is possible to use decisions of peers of peers to identify the causal peer effect of peers' behaviour on the focal individual behavior if the following conditions hold

A1. there is no reverse causality going the focal individual to the peers (no reflection issue),
A2. some of the peers of peers are not direct peers (intransitivity condition),
A3. there is no endogenous sorting into peers groups (random peers condition),
A4. the peers of peers' average decisions are relevant to explain the peers' behavior conditional on X (relevance condition),
A5. the peers of peers' average decisions do not directly explain the focal individual behaviour, conditional on X (exclusion restriction).

In our case, we exploit partially overlapping peers to identify the effect of the focal household marriage decision on future outcomes Y, using the peers' of peers average decisions as instrument for the household marriage decision. This is similar in spirit to what Nicoletti et al. (2023) did to study the effect of mother's labour decisions on children's school achievements. Validity of this IV estimator requires two additional conditions

A6. the peers of peers decisions are relevant to explain, through the marriage incidence of direct peers, the focal own household decision conditional on X (new relevance condition),
A7. the peers of peers' decisions have no direct effect on the focal potential household outcomes Y_0 and Y_1 except through its marriage decision, conditional on X (new exclusion restriction).

We now explain how our model specification allow us to satisfy conditions (A1)-(A7). We define two groups of parents' peers as parents living in the same neighborhood and parents working in the same plant as the parents. Let $\overline{M}_W$ and $\overline{M}_N$ be an indicator for being married at the birth of the first child averaged across the workmates and across neighbors respectively with the same level of education (defined as degree status).[15] We define our instrument as the average incidence of marriage at birth of the neighbours of the focal households' workmates' which we denote as $\overline{M}_{W,N}$.

A1. No reverse causation from $\overline{M}_{W,N}$ to M. We define as peers parents who gave birth to their first child between 1 and 5 years *before* the focal parents, which implies that $\overline{M}_{W,N}$ is predetermined with respect to M. In other words we use the lagged marriage

[15] We compute the peers' average always considering the leave-one-out mean, i.e. the average across all peers excluding the focal parents.

rate of workmates' neighbors as predictors for the average marriage of workmates' neighbors observed at the same time as the focal parents marital status M. This is similar in spirit to the partially overlapping peer approach used by De Giorgi et al. (2010), Nicoletti and Rabe (2019), Nicoletti et al. (2018) and Nicoletti et al. (2023) who predict individual behaviour using lagged values of that same variable averaged across peers of peers.

A2. Intransitivity of the network. Combining work and neighborhood connections helps ensure intransitivity because an individual's coworkers tend to live in different neighborhoods, leading them to interact with different neighbours than the individual themselves. Even for co-workers living in the same neighborhood there are differences in the relevant direct neighbours because we define as direct peers only the ones who are observed to give birth to a child between 1 and 5 years before the focal individual. In our empirical application only 11% of the workmates' neighbours are direct neighbours of the focal household.[16]

A3. No endogenous peer group membership. Unobserved individual characteristics can simultaneously drive the formation of connections and the outcome we observe. For example people who work in the same workplace may sort into neighborhoods with similar unobserved characteristics as the focal household, creating a correlation between our instrument $\overline{M}_{W,N}$ and $\overline{M}_N$, which can drive the marriage decision of the focal household invalidating conditions A5 and A7.

We address the endogeneity of peer exposure using the method proposed by Borusyak and Hull (2023), which accounts for non-random exposure to exogenous shocks. Non-random sorting arises because individuals select into workplaces based on perceived traits (e.g., gender norms, productivity), which may correlate with our instrument: the marital status of workmates' neighbours ($\overline{M}_{W,N}$). This correlation would violate the exclusion restrictions A5 and A7. Our solution involves controlling for the "expected" value of the instrument to net out the part explained by this non-random sorting. We calculate this expected IV by permuting true workmates with fictitious workmates from different years regardless of their education level (simulated 500 times) and averaging the marriage incidence of these fictitious workmates' neighbours across all simulations.

Including this expected IV isolates the idiosyncratic variation in peer composition across

[16] In a sensitivity analysis we excluded these few direct neighbours from the definition of workmates' neighbours and results do not change.

years within the same firms, effectively achieving identification through a structure equivalent to random assignment across time. This powerful control purges the influence of unobserved workplace culture and neighborhood traits.[17]

Furthermore, controlling for this expected IV is equivalent to using random assignment of peers, which, combined with the intransitivity of the network, allows us to use peers' of peers' characteristics for identification of peer effects (Bramoullé et al., 2020). Once the expected IV is controlled for, the marriage incidence among indirect peers ($\overline{M}_{W,N}$) is uncorrelated with individual observed and unobserved characteristics.

A4. The peers of peers' decisions explain the direct peers' decisions (relevance condition). Moroni (2019) provides strong evidence that our instrument predicts workmates' marriage decisions. Using the same Norwegian data and an identical instrumental variable to estimate the spillover effect of workmates on parental marriage decisions, the study confirms the relevance of our instrument. For 10 percentage points increase in the instrument, the workmates marriage rate increases by 3.3 percentage points with an F-test for the relevance of the instrument equal to 565.760.

A5. The peers of peers' decisions do not directly explain the focal household decision (exclusion restriction). The exclusion restriction imposes that the instrument $\overline{M}_{W,N}$ has no direct influence on M except through the workmates marriage decisions $\overline{M}_{W}$. Intuitively, imagine a situation where the focal parents visit a party at their workmates house and interact with the neighbours of this workmate. This is not a problem within our strategy, as long as the workmates' neighbours do not influence directly the marriage decision of the focal household. We probe the exclusion restriction in a set of sensitivity analyses, by including a full set of the predetermined controls X measured at the level of the workplace and by controlling larger area fixed effects.

A6. The peers of peers decisions explain - through the decisions of the direct peers - the focal household own decision (additional relevance condition). As already emphasized, the instrument is a strong predictor of the workmates' marriage decisions and the empirical section provides evidence that the instrument strongly predicts the marriage of the focal parents.

[17] Such strategy is similar to using variation in peers composition across cohorts within school as used by Hoxby (2000) and Hanushek et al. (2003).

A7. The peers of peers' decisions have no direct effect on the focal household outcome Y except through its marriage decision (new exclusion restriction). While it is credible that the workmates' neighbours' marriage decisions affect the focal household marriage decision only through the workmates' decision (condition A5), it is not necessarily true that the peers of peers' decisions have no effect on the focal household outcome Y except through its marriage decision.

If a marriage decision drives the outcome Y for the focal household, the same is likely to be true for the peers whereby the workmates' marriage decisions drive the workmates' own values of the outcomes $\overline{Y}_W$. This implies that our IV, $\overline{M}_{W,N}$, can affect the focal household outcome Y through the effect of the workmates' decisions $\overline{M}_W$ on the focal household decision M, but also through the workmates average outcome $\overline{Y}_W$. To address this issue we include the average outcome of the workmates $\overline{Y}_W$ in our benchmark estimation. We make sure that this control is always predetermined with respect to the marriage decision of the family by controlling for the average outcome of workmates when their child was aged 2, measured across the relevant workmates (with the same education) who gave birth 3-5 years before the focal household.

$\overline{Y}_W$ may introduce a bad control bias, if it is correlated with unobserved characteristics of the focal households and of their peers that can explain Y. We address this issue by controlling additionally for the expected value of the workmates' outcome within firm following again Borusyak and Hull (2023).[18] As above, including the expected value of $\overline{Y}_W$ as a control ensures we use idiosyncratic variation in $\overline{Y}_W$ caused by changes in peers' composition across years within the same firm - equivalent to a random assignment of workmates across time within firms. Notice that the effect of $\overline{Y}_W$ net of its expected value may still capture the effect of other unobserved workmates' characteristics, so we interpret this effect as an aggregate of contextual and endogenous peer effects.[19]

In summary, to ensure our identification assumptions are valid, we add three controls to

[18] We compute the expected value of $\overline{Y}_W$ by using a simulation-based approach, replacing actual workmates with a randomly selected group of workmates from the same workplace but from different years, regardless of their education level. For each simulation, we calculate the average outcome $\overline{Y}_W$ using these simulated fictitious workmates and repeat 500 times, taking the average across all simulations to derive the expected value of $\overline{Y}_W$.

[19] Borusyak and Hull (2023) is becoming much more widespread, and used for example in Cattan et al. (2025) to control for endogenous selection into schools with a high proportion of elite peers.

X - the expected IV, $\overline{Y}_W$ and the expected value of $\overline{Y}_W$.

5 The effect of marriage on the division of labour

5.1 ATE of marriage on parental labour supply

We start by asking what is the causal effect of marriage versus cohabiting at childbirth on labour market decisions of the mother and father in the early to middle years of childhood.[20] Panels a) and e) of Figure 1 and panel a) of Figure 2 plot the estimated Average Treatment Effect (ATE) of marriage on different measures of parents' labour market choices across child age 2-8. The estimates relating to these figures are provided in Table 1.[21,22]

The ATE of marriage versus cohabitation on parents' labour market choices is generally consistent with the predictions of classic economic models, with marriage causally leading to specialization within the household. Married fathers earn up to 10% more (Figure 1, panel a)), whilst mothers are up to 15 percentage points (ppts) less likely to work (Figure 1, panel e)) and work up to 6 fewer hours per week (Figure 2, panel a)) compared to cohabitors. The ATE on mothers' earnings is positive at age 2 but then declines across child age to imply a 10% reduction in earnings at age 7 and 8 which is statistically significant (Figure A2, panel a)). For the mothers' labour decisions, the magnitude of the specialization becomes larger once the children start school at age 6. Finally, panel e) of Figure 2 suggests that marriage leads to an increase in fertility which is statistically significant from age 5.

5.2 Treatment effect heterogeneity across unobservables

The effect of marriage may be heterogeneous across household types. Whilst for the more traditional couples, specialization may increase with marriage, for more modern households the benefits of marriage can be a higher coordination in the labour supply of wife and husband which allows both partners to work and share domestic and child care responsibilities.

We explore this question using the MTE methodology which evaluates heterogeneous

[20] The first stage estimation equations are reported and discussed fully in Appendix B.

[21] Section B.1 discusses the Average Treatment on the Treated (ATT), Average Treatment on the Untreated (ATUT) and the Local Average Treatment Effect (LATE) parameter estimates.

[22] We compute the ATE by averaging the the marginal treatment effect (MTE) with appropriate weights as shown by Heckman and Vytlacil (2007).

treatment effects across the unobserved resistance to marriage.[23] In our setting, we label couples who exhibit a low resistance to marriage (i.e. higher unobserved propensity to marry conditional on the control variables as defined in Equation 4) as more traditional and couples with a high resistance to marriage as modern. This distinction reflects a societal shift where marriage was once the norm at childbirth, but cohabitation is now predominant. The hypothesis that marriage leads to more specialization in traditional couples, and more coordination in modern couples is assessed by the slope of the MTE on fathers versus mothers' labour outcomes across the unobserved resistance. Specifically, supporting evidence would imply one of the following patterns: i) divergent MTE slopes for mothers and fathers: the MTE for fathers' earnings slopes downward, indicating that modern households experience the largest earnings penalty for fathers, while the MTE for mothers' labour supply slopes upward, implying that the largest increase in labour supply occurs among modern couples; ii) maternal-driven change: the MTE for fathers' earnings is flat across resistance, while the MTE for mothers' labor supply is increasing across resistance; iii) paternal-driven change: the MTE for mothers' labour supply is flat across resistance, while the MTE for fathers' earnings is decreasing across resistance.

Panels b)-d) and f)-h) of Figure 1 and b)-d) of Figure 2 plot the MTE of marriage at birth on parental labour supply, across the unobserved resistance to treatment. We report the MTE figures in very early childhood (age 2), just before the child transitions to school (age 5) and once the child has been at school for 2 years - age 8. The MTE figures plot also the ATE (dotted line), and report the p-value for the test of unobserved (or essential) heterogeneity. A p-value greater than 0.05 suggests that there is statistically significant unobserved heterogeneity at the 5% level.

Starting with fathers earnings in Figure 1 panels b)-d) we see evidence of substantial heterogeneity in the gain from marriage. At each child age between 2-8 the effect of marriage for the low resistance to marriage, traditional couples is consistent with specialization. For households with unobserved resistance as low as 0.2, fathers earnings are 20-30% higher than cohabiting fathers' earnings. Moving along the x-axis to the high resistant more modern couples, the gain from marriage instead changes to be a marriage penalty for fathers, whereby

[23] To derive the MTE, we use a local (instrumental variable) IV method with a third-order polynomial in the propensity score for marriage and compute Equation 11 in Appendix A at mean values of the explanatory variables.

for couples with a high resistance of 0.7 the effect of marriage reduces fathers' earnings by up to 10% - a result which is statistically significant at the 5% level from age 4 onward. Note that at all child ages, the p-value suggests that there is statistically significant unobserved heterogeneity.

When considering mothers' labour market participation (Figure 1 panels f)-h)) and mothers' hours of work (Figure 2 panels b)-d)), the results suggest that there is statistically significant unobserved heterogeneity only at ages 5 and 8 - but not in the early years of childhood. At age 2, where the unobserved heterogeneity is not statistically significant, we find indeed that the marginal treatment effect does not differ from the ATE which showed no effect of being married versus cohabiting on mothers' labour choices.

At age 5 and 8, the marriage reduces the mothers' participation and hours significantly more for households with low than high resistance, suggesting that modern couples specialize less. We do not discuss the marginal treatment effect for mothers' earnings because we do not reject the absence of unobserved heterogeneity, however for transparency we still plot the MTEs for mother's earnings in Figure A2 panels b)-d).

Finally, can the marriage contract, through increased commitment to cooperate, drive fertility patterns? Panels f)-h) of Figure 2 suggest that the positive effect of marriage in the ATE is driven by the traditional low resistance households. At age 5 and 8, marriage leads to an increase in the number of children by 0.5-0.7 for the most resistant couples. Moving across the unobserved resistance to treatment on the x-axis, the effect of marriage on fertility declines and becomes negative such that at age 5, the effect of marriage for couples with a resistance of 0.65 is to reduce fertility by 0.2 children relative to cohabiting couples. By the age of 8, the decline in fertility for the modern households has become statistically indistinguishable from zero.

Overall is there evidence that gender equality is possible through marriage? Our findings reveal distinct patterns in marriage and intra-household dynamics between traditional and modern couples. For low resistance more traditional couples the answer is no, as marriage leads to increased specialization and increased fertility. Instead, for the more modern high resistance couples, the predictions from the economic model that couples marry to gain a surplus through specialization are less salient. These couples who are less likely to marry, when they do marry, they use marriage as a commitment device to coordinate, indicating a

reverse selection on coordination. The most modern fathers experience an earnings penalty relative to the modern cohabitors and married mothers experience less of a decline in labour supply compared to the traditional married mothers. In these households, fertility is lower - either due to modern men withholding further fertility as they saw their earnings fall through marriage, or through women reducing fertility to invest in their career without reducing their labour supply further.[24]

5.2.1 Unpacking the MTE on father's earnings

Our evidence suggests that for low resistance couples, the effect of marriage leads fathers to increase their earnings, but for high resistance couples leads to a father earnings penalty. We now unpack the effect on fathers' earnings, asking whether marriage causes fathers to take more or less paternity leave, change their work hours, or to change the environment in which they work - all of which will have consequences on their earned income.

The first human capital investment decisions fathers can take is whether and how much paid leave to take after childbirth.[25] Panel a) of Figure 3 shows the marginal treatment effect of marriage on number of days of paternity leave taken by the father, suggesting that marriage causes the low resistance traditional fathers to reduce leave compared to cohabitors by 10 days. This aligns with the earlier findings that these traditional fathers specialize in labour market activities. Moving across the unobserved resistance to marriage, for the modern households, marriage causes fathers to take nearly 20 more days of leave compared to cohabitors suggesting the effect of marriage for modern fathers is not just to reduce their earnings, but to contribute more towards childcare.[26]

Next, examining the change in fathers' labour market patterns across the subsequent 8 years, there is little evidence that fathers hours change in response to marriage (see panel b) of Figure 3 for the MTE at age 2 or at all ages in panels a)-d) of Figure A3). Instead,

[24]There is an effect on total household income from marriage, shown in panels e)-h) of Figure A2 by a positive ATE at any child's age, driven by an increase in household income for the low resistant couples who tend to specialize. On the contrary, the effect of marriage on total earnings tend to be negative for high resistant couples especially at age 5 and 8.

[25]For these birth cohorts, parents are entitled to share 42 weeks of fully paid parental leave (or up to 52 weeks of partially paid leave), with 4 weeks reserved exclusively for fathers and 4 weeks before and 6 weeks after birth reserved exclusively for mothers.

[26]Descriptive statistics of paternity leave are reported in Table A3 and show that 21.5% (29%) of married (cohabiting) fathers take leave and take on average 12.8 (18.1) days of leave.

evidence suggests that fathers change the way in which they work. The ATE of marriage increases the probability the father commutes to work outside of his municipality of residence (see the dotted line in panel c) of Figure 3 and in panel e) of Figure A3) and increases the likelihood that he works in a competitive occupation (see panels c) of Figure 3 or a)-d) of Figure A4). This is driven by the low resistant, traditional fathers, who are up to 20ppts more likely to commute for work and 40% more likely to work in competitive occupations than cohabiting low resistant fathers. However, this is not true for the high resistant, modern fathers. This suggests that the more modern fathers forego the earnings premium from marriage by choosing a better work life balance, over jobs involving commuting and in more competitive firms - although note that the assumption of no essential heterogeneity for the competitive occupation outcome is statistically significant only at the 10% level.[27,28]

5.3 Treatment effect heterogeneity by observable traits

We assess which explanatory variables are consistent with two competing outcomes of marriage: an increase in gender equality, characterized by higher maternal labor supply, versus heightened specialization, characterized by increased paternal work and reduced maternal labor supply.

Table 2 reports results of treatment effect heterogeneity across observables at age 8, whilst results at ages 2 and 5 are reported in Table A4 and Table A5 respectively. Heterogeneity can be defined by the differential influence of the covariates between married individuals and cohabitors ($\beta_1 - \beta_0$), which measures the differential effect of marriage for 1 unit increase in the corresponding covariates.[29] Fathers' earnings are increasing through marriage more as his socio-economic status (his education and pre-birth earnings) increases; whereas mothers' labour supply increases more through marriage when her socio-economic status (her education and age) increases.[30] The magnitudes suggest that an increase in fathers' earnings pre-birth

[27] Descriptive statistics of father's work hours, commuting and job competitiveness are reported in Table A3.

[28] We define an index for competitiveness of an occupation by merging the answer to a question from the O*NET data, "To what extent does this job require the worker to compete or to be aware of competitive pressures?", to the occupation of the father.

[29] The baseline effect of the covariates for cohabiting couples (β_0) is reported in Table A6.

[30] The exception is fathers' working pre-birth, but as nearly all fathers are reported as working there is little variation.

by 1% increases his earnings gain from marriage at ages 2, 5 and 8 by 0.8% 0.9% and 0.6% respectively. The effect of marriage increases mothers hours by 0.3 per week at age 8 more for mothers with a degree compared to mothers with no degree and increases mothers' hours by 2.6 hours per week more for mothers who worked in the year before birth compared to those who did not work and these effects are even larger at age 2 and 5. Conversely, the specialization effect is amplified by paternal income: marriage reduces mothers' labor supply (measured at the child's age of 8) more in households with a 10% increase in fathers' earnings compared to households without such an increase. This larger reduction amounts to an additional 0.3 percentage points in participation, 0.2 work hours per week, and 0.4% in earnings.[31]

There are two covariates which mirror the patterns of unobserved resistance to marriage. From Table 2, mothers' working before pregnancy are less likely to marry; however, when they do marry, their labour supply increases (fathers' earnings decreases) more than among mothers who were not working prior to childbirth. Similar to the interpretation of unobserved resistance, mothers working before pregnancy may be more "modern", plan to continue working after birth and be more prone to coordinating work and childcare responsibilities with the father.

Wealth exhibits a pattern similar to that associated with unobserved propensity to marry. Couples with higher wealth are more likely to marry, consistent with lower resistance to marriage, and increases in wealth are associated with higher fathers' earnings but lower mothers' labour supply. As wealth in our data primarily reflects housing ownership, it may act as a form of financial insurance for the lower-earning partner, thereby encouraging greater specialization within the household (Lafortune and Low, 2023). This form of insurance is stronger for married than cohabiting couples, given that assets acquired during marriage are typically divided equally upon divorce, a principle that does not automatically apply to cohabiting couples.

[31] Kearney and Levine (2017) found similarly that returns to marriage compared to single motherhood tended to increase across mothers' age and education.

5.4 Interpreting the unobserved resistance to treatment

Thus far in the paper we have refrained from taking a stance on what the unobserved resistance to treatment captures, instead referring to low- and high-resistance couples as traditional and modern. We now explore its interpretation in greater depth, examining whether this resistance reflects underlying gender norms or patterns of assortative mating.

Couples with high or low resistance to marriage may differ in their underlying gender norms, with more progressive couples tending toward greater coordination of labour supply following marriage, and more traditional couples tending toward increased specialization. Leveraging evidence on the intergenerational transmission of gender norms and labor outcomes (Haaland et al. 2018; Fernández et al. 2004), we proxy for modernism with indicators for whether the paternal and maternal grandmother (i.e. the mothers of the focal parents) worked when the father and mother were age 15. Around 75% of grandmothers in our sample exhibit "modern" behavior by working when their child was age 15. When we include the two measures of family gender norms as additional covariates in the benchmark model - an indicator for the paternal and maternal grandmother working - panel a) of Table A7 shows that indeed the variable measuring family gender norms behave similarly to the unobserved resistance to treatment. Specifically, individuals whose mothers or mothers-in-law worked during adolescence are less likely to marry; however, when they do marry, they exhibit greater coordination within the household following marriage. This evidence is consistent with the idea that the unobserved resistance is picking up preferences or gender norms surrounding the household division of labour.

A second possibility we consider is whether the unobserved resistance behaves similarly to measures of assortative mating in education. Modern couples may match more closely on education compared to traditional couples. Upon marriage, the couples matching on education may prefer more coordination from marriage compared to the more traditional couples. However, augmenting our benchmark model with an indicator for assortative mating - which takes the value of one if the couples have the same level of education defined by degree status - panel b) of Table A7 suggests that assortative mating does not behave similarly to the unobserved resistance to treatment. While parents who both have higher education are less likely to marry (consistent with more modern attitudes), once married, they do not appear to coordinate their labour supply more effectively. Indeed, marriage for these couples has no

statistically significant effect on fathers' earnings or mothers' labour force participation.[32]

In summary, the patterns observed across unobserved resistance to marriage are also mirrored in measures related to family gender norms, suggesting that this resistance may reflect differences in underlying attitudes toward gender roles and household division of labour.

6 Who bears the cost of a modern marriage?

The heterogeneity in treatment effects across unobservable traits suggests the presence of two broad types of households. For one group, marriage increases specialization, while for the other, marriage partially increase coordination, as fathers tend to earn less and mothers work at similar or higher rates compared to cohabiting couples. The next natural question is to ask whether welfare of children and couples is higher in specializing compared to coordinator households.

Figure 3 panel e) shows the ATE of marriage on child school test scores at age 11 with the full parameter estimates in column (1) of Table A8. The effect is near zero and statistically insignificant, consistent with previous research, which generally reports a null effect of marriage versus cohabitation on children's outcomes (see Björklund et al. 2004; Ginther et al. 2010; Persson 2020; Goodman and Graves 2010).

We may therefore expect treatment effect heterogeneity when comparing low-resistance, specialising households—where reduced maternal labour supply may free up time for greater investment in children—with high-resistance, coordinating couples, for whom such reallocations of time for mothers are less pronounced. However, there is no evidence that the effect of marriage changes across the resistance to marriage. This is shown through the MTE in panel e) of Figure 3 and supported by the p-values for the test of essential heterogeneity (see column (1) or Table A8 - which also shows that the ATE, ATU and ATUT are practically identical). Any gender equality achieved through a more equal allocation of labour supply (i.e. moving across the unobserved resistance) does not change the child outcomes - potentially because modern fathers may be compensating for any reduction in mothers' time. Similarly, Hufe (2024) found that increased gender equality resulting from a narrowed

[32]This is true even when we measure assortative mating in the years of schooling - whereby the variable takes higher values when partners have similar years of education, whether low or high.

parental pay gap did not affect children outcomes.

Are couples happier in the low resistance, traditional marriages, or in the high resistance more egalitarian marriages? Couple contentedness is measured with an indicator for the couple separation up to age 8. Results suggest a reduction in separation at age 8 through marriage on average - as shown by the ATE in panel f) of Figure 3 - with full parameter estimates in column (2) of Table A8.[33] The effect of marriage on separation is heterogeneous across the unobserved resistance and exhibit an inverse U-shaped pattern - the reduced separation due to marriage is stronger for the low resistance (more traditional) couples who specialize and the high resistance couples who coordinate through marriage, compared to those with less extreme values. This is consistent with Park et al. (2025), who found that relationship satisfaction was higher with extreme gender norm attitudes - whether strongly traditional or strongly egalitarian - due to agreement on division of household and family responsibilities.

7 Robustness and Sensitivity analysis

7.1 Validity of IV strategy

Assumption A5 is satisfied if the instrument drives the outcome of interest only through the marriage rate of the focal family M, conditional on the covariates included in the model.

An important control is the expected IV, which helps to ensure that A5 is satisfied. To see why, imagine that workmates select into firms based on gender norms relating to female labour supply expectations, which correlate with marriage patterns and labour supply after childbirth. This will not cause a bias in our estimation because we control for any traits that are fixed within the workplace, such as persistent gender norms meaning that A5 remains valid.

However, to reassure that there are no omitted traits of workmates or neighbours that are not captured by the idiosyncratic variation of peers within the workplace, across time, we extend the model to include the leave-one-out mean averaged across workmates of *all* covariates X included in our model (which are described in Table A1). Figure A5 reports the results for two outcomes of father earnings and mother labour participation.[34] Including

[33] Descriptive statistics on separation are in Table A2.

[34] The conclusions are very similar across all outcomes; thus, for conciseness, we report all robustness and

the mean covariates of workmates leads to very similar ATE and MTE estimates.

Second, there is a possibility that our benchmark strategy does not effectively control for unobserved traits at a wide geographical area that includes both workplaces and neighbourhoods. In Norway the wider area is described by labour markets (there are 90 in total) which count as travel-to-work areas - for example including Oslo and all nearby municipalities that can commute into Oslo. The sources of potential bias could include i) common shocks at the wider labour market level that affect jointly all neighbourhoods and workplaces; ii) general equilibrium effects in which a neighbour or workmate peer is in competition for the same employment as the focal parents; iii) amenities at the wider labour market area such as child-care facilities which facilitate employment of parents across neighbourhoods and workplaces. Such area effects would invalidate our exclusion restriction. We show in Figure A6 that the results are very similar once we include the labour market fixed effects, reassuring that our IV strategy is valid.

In a third test to confront the potential concern that some unobservable traits attract workers to workplaces (couples to neighbourhoods) and are correlated with our outcomes, we run placebo tests by assigning fictitious peers. For example, if progressive people like neighbourhoods where few people marry and most women work, but more conventional people like conventional neighbourhoods where most people marry and few women work then our instrument may be correlated with such unobservables and with outcomes. Given this concern, the placebo tests match fictitious peers to neighbourhoods or workplaces with the same traits as the real peers, based on mother's education (having a degree), mother's age (above and below the mean) and mother's working one year before birth. If our strategy is valid (and our first stage is not driven by shared unobservable traits which correlate with outcomes), then the first stage Chi-squared statistics for the null hypothesis of a zero effect of the IV on the marriage probability should reveal that we cannot reject the null.

We generate 1,000 random assignments of fictitious peers and, for each draw, compute the chi-squared statistic testing the null that the instrument has no effect on the probability of marriage at the child's birth. Figure A7 plots the resulting empirical distributions: panel (a) for fictitious neighbours and panel (b) for fictitious workmates. The figures indicate that the instrument does not significantly predict the probability of marriage. The chi-squared

sensitivity checks using only these two representative outcomes.

statistic exceeds the 5% critical value (3.84) in only 5.10% of the placebo draws for fictitious workmates and 4.10% for fictitious neighbours.

Moreover, there may be a direct correlation between the instrument and outcomes of parental labour supply through fertility. Peers are defined as those workmates or neighbours who have given birth recently, but the focal parents may decide to have a first child following decisions of these peers and it may be this fertility decision of focal families that drives labour outcomes. We rule out this indirect relationship, by augmenting the benchmark regression model with a control for workmates' fertility (the average number of children of workmates), predetermined with respect to the marriage decision of the family.[35] Figure A8 presents the ATE and MTE results that are fully robust to the control for the workmates' fertility.

Finally, to guarantee the intransitivity of the network we run a sensitivity analysis excluding from the estimation sample individuals whose workmates are also direct and relevant neighbours (11% of the estimation sample). As shown in Figure A9 the results for the ATE and MTE are nearly identical to our benchmark findings.

7.2 Sensitivity to Model Specification

Our benchmark specification of Equation 10 estimated the MTE using a polynomial of order 3 in the marriage propensity score. We test now for the sensitivity of the MTE estimates to different specifications, again restricting the sensitivity analyses to two outcomes - father earnings and mother labour participation. The results in Figure A10 suggest that our results are not sensitive to the model choice, as the MTE is very similar when estimating using a normal, a polynomial of order 2 or a semiparametric model with a polynomial of order 3.

We also conduct a robustness check by relaxing the linearity assumption of the latent marriage propensity (M^*) in the instrument (W). Specifically, we include a quadratic polynomial in the instrument (W and W^2) in the first-stage probit model. Borusyak and Hull (2023) guarantees that the instrumental variable is independent from the error term in a linear outcome model and indeed in the benchmark model the latent propensity to marriage is assumed linear in Z. Because in this sensitivity the instrument enters non-linearly in the

[35] This control is predetermined because it measure the average cumulative fertility of workmates when their child was aged 2, measured across the relevant workmates (with the same education) who gave birth 3-5 years before the focal household.

marriage model, we modify the method proposed by Borusyak and Hull (2023) by including both the expected value of the instrument and the expected value of the instrument squared as control variables in both the marriage probability model and the outcome equations. The results of this sensitivity analysis, reported in Figure A11, confirm our main findings.

Finally, Figure A12 considers different different restrictions for the common support. Here we remove 1 rather than 5 percent of observations with the most extreme predicted propensity scores from both the treated and untreated groups. The figures suggest that our results are not sensitive to the common support restrictions despite showing larger noise especially at the high resistance extreme. This further motivates our choice of restricting the common support to avoid imprecise estimates at the extremes of the propensity score distribution.

7.3 Heterogeneity analysis across sample subgroups

Our findings, presented in the Appendix C remain consistent when we account for potential mechanisms confounding the effect of marriage by excluding cohabiting couples who later marry, couples who later separate, or cases of unplanned pregnancies.

8 Conclusions

In our paper we use the MTE method to identify the causal effect of parents marital status at birth on their subsequent labour supply, fertility and household welfare. The method is innovative within this research question and allows us to uncover novel understanding of the heterogeneous effects of marriage compared to cohabitation at the time of the first birth. While the average treatment effect of marriage compared to cohabitation aligns with much of the existing literature—indicating that marriage causally leads to greater specialization following childbirth—the heterogeneity across unobservable traits reveals that this pattern is driven primarily by couples with low resistance to marriage. For these couples, marriage increases specialization, whereas this effect is not observed among those with higher resistance. For the higher resistant couples, those less likely to marry who we label as the more modern households, marriage increases the mothers labour supply relative to the traditional households and leads to a father marriage penalty - reducing his earnings. For these modern couples, there is evidence that the father not only reduces labour earnings but increases

household time, as the effect of marriage is to increase his paternity leave.

Given these heterogeneous effects of marriage versus cohabitation at birth, a natural next question is whether marriage increases or decreases household welfare, and for which types of couples. We find that among more modern households, marriage lowers total fertility, a pattern that may help explain how these couples maintain a more coordinating arrangement between partners. We find no average effect of marriage on children's test score outcomes and, importantly, no evidence of heterogeneous effects between households that specialise and those that do not. In other words, children's outcomes do not appear to differ depending on whether households allocate labour through paternal specialisation or through a more equal sharing of work between parents. Finally, we find evidence of a negative effect of marriage on later separation; however, this effect is concentrated among households at the extremes of resistance to treatment—that is, those that are either highly specialized or highly coordinated.

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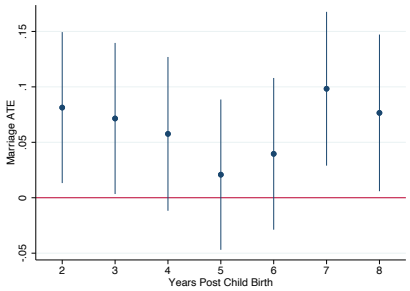
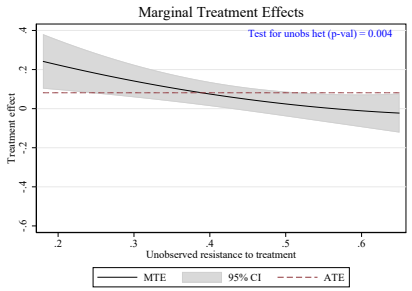
Figure 1: Marginal Treatment Effect of marriage on father earnings and mother participation.

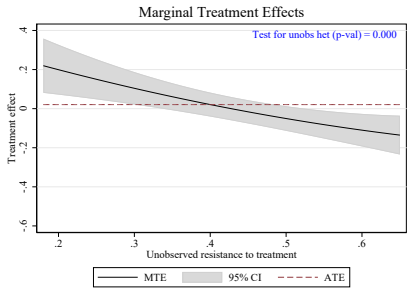
(a) Father earnings: ATE



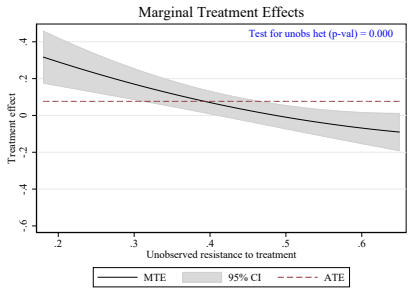
(b) Father earnings: Age 2



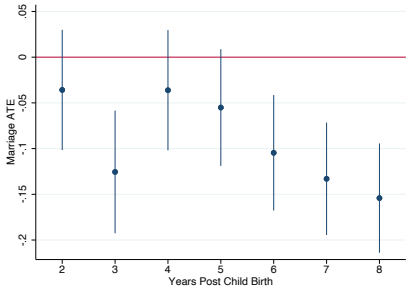
(c) Father earnings: Age 5



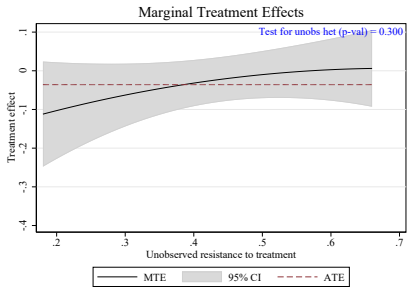
(d) Father earnings: Age 8



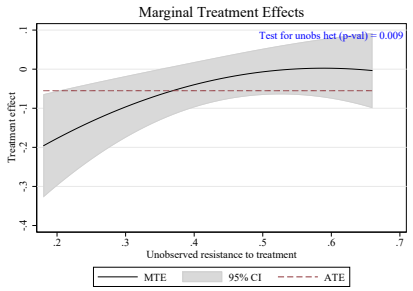
(e) Mother participation: ATE



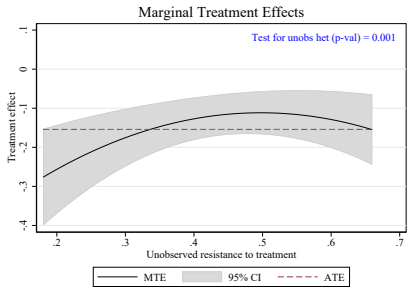
(f) Mother participation: Age 2



(g) Mother participation: Age 5

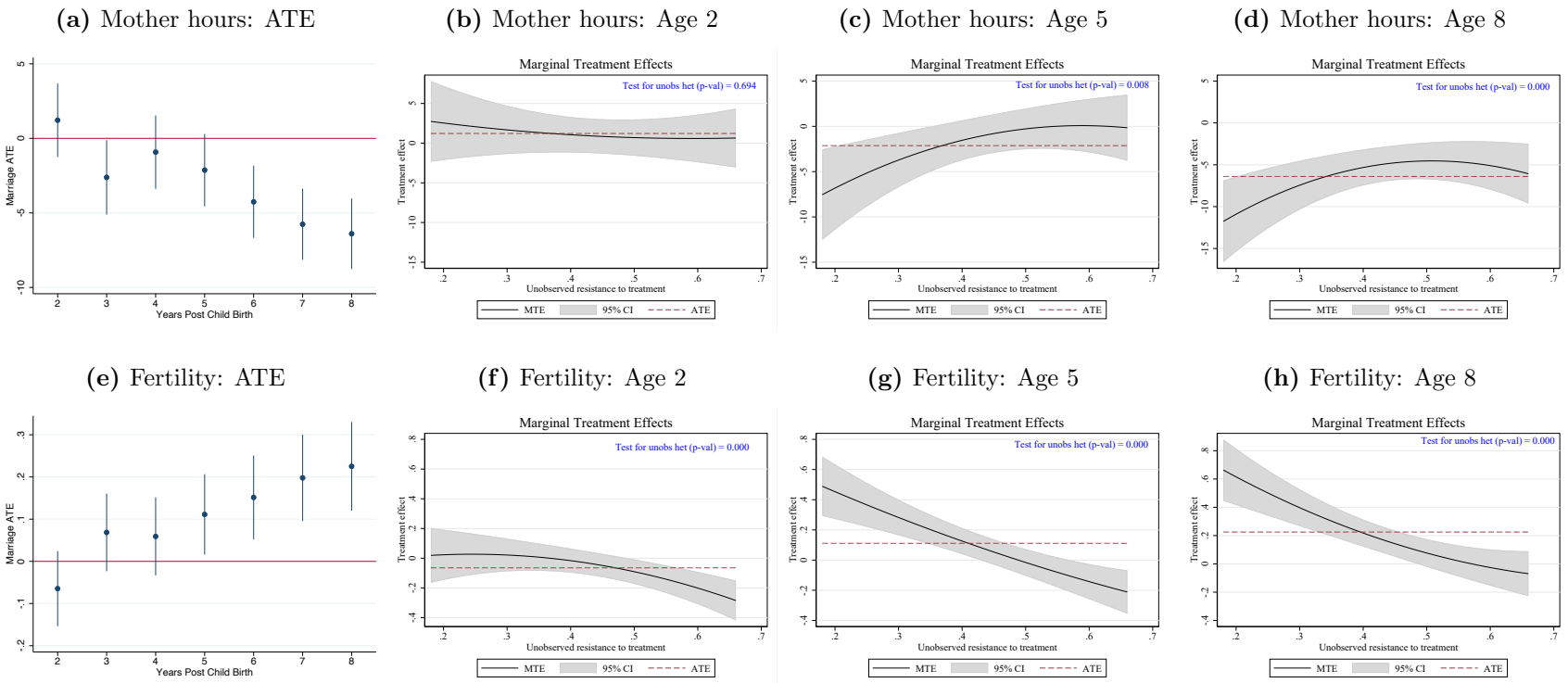


(h) Mother participation: Age 8



Notes: Population of Norway having a first child between 1997-2001. Fathers earnings are measured in logs; mother participation takes the value of 1 if the mother works and 0 otherwise. The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. ATE denotes the Average Treatment Effect and the Marginal Treatment Effect (MTE) is shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions).

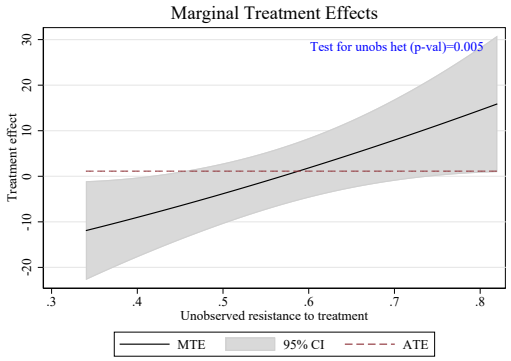
Figure 2: Marginal Treatment Effect of marriage on mother hours and fertility.



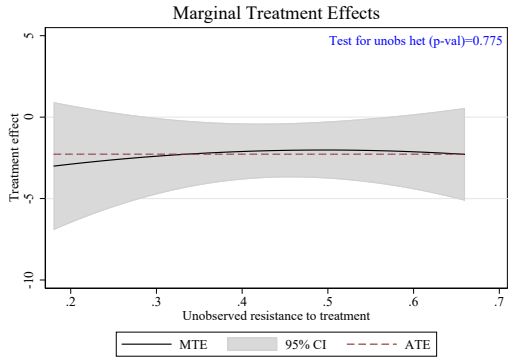
Notes: Population of Norway having a first child between 1997-2001. Mother earnings measured in logs. The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. ATE denotes the Average Treatment Effect and the Marginal Treatment Effect (MTE) is shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions).

Figure 3: Marginal Treatment Effect of marriage on father work patterns, child test scores and couple separation.

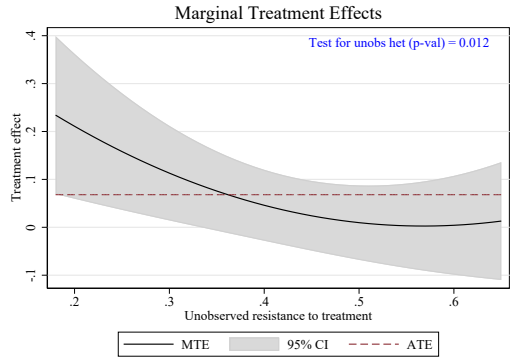
(a) Father days leave



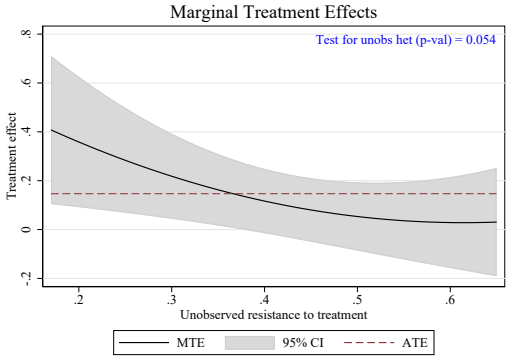
(b) Father hours work: Age 2



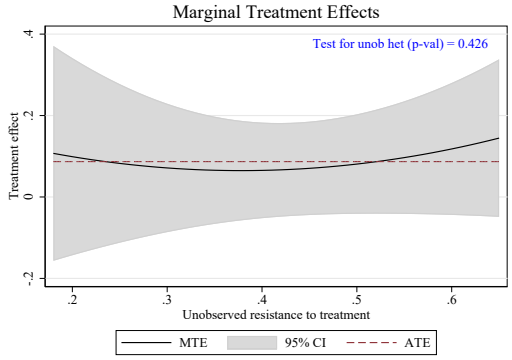
(c) Father commuting: Age 2



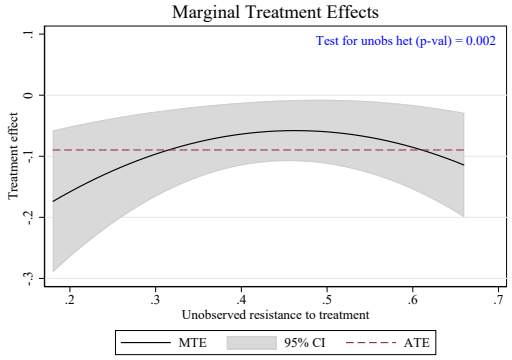
(d) Father competitive occupation: Age 2



(e) Test score Age 11



(f) Separation: Age 8



Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. ATE denotes the Average Treatment Effect and the Marginal Treatment Effect (MTE) is shown across the unobserved resistance to treatment (marriage). Father days of leave measure the number of days of paternity leave. Commuting as taking value 1 if the father works in a municipality that is different from municipality of residence, and zero otherwise. We define an index for competitiveness based on the O'Net question "To what extent does this job require the worker to compete or to be aware of competitive pressures?". Bootstrap standard errors (200 repetitions).

Table 1: Estimated treatment effects of marriage versus cohabiting

	(1) Father earnings	(2) Mother participation	(3) Mother hours	(4) Mother earnings	(5) Fertility
Panel A: Age 2 of the child					
ATE	0.081**	-0.036	1.218	0.284***	-0.065
	(0.035)	(0.034)	(1.256)	(0.069)	(0.045)
ATT	0.152***	-0.072*	1.395	0.325***	0.023
	(0.042)	(0.041)	(1.526)	(0.082)	(0.055)
ATUT	0.034	-0.012	1.085	0.258***	-0.123**
	(0.036)	(0.035)	(1.319)	(0.074)	(0.048)
LATE	0.043	-0.069*	0.399	0.169**	-0.081
	(0.041)	(0.039)	(1.436)	(0.079)	(0.051)
Test for obs het (p-val)	0.000	0.000	0.000	0.000	0.000
Test for unobs het (p-val)	0.004	0.300	0.694	0.369	0.000
Observations	58140	58875	58874	55088	58874
Panel B: Age 5 of the child					
ATE	0.021	-0.055*	-2.131*	0.012	0.111**
	(0.035)	(0.033)	(1.236)	(0.059)	(0.049)
ATT	0.124***	-0.115***	-4.297***	0.029	0.274***
	(0.042)	(0.040)	(1.502)	(0.071)	(0.059)
ATUT	-0.048	-0.016	-0.698	0.003	0.002
	(0.036)	(0.034)	(1.298)	(0.063)	(0.051)
LATE	-0.030	-0.078**	-3.132**	-0.069	0.115**
	(0.041)	(0.037)	(1.413)	(0.068)	(0.055)
Test for obs het (p-val)	0.000	0.000	0.000	0.000	0.000
Test for unobs het (p-val)	0.000	0.009	0.008	0.558	0.000
Observations	57777	58875	58874	55516	58874
Panel C: Age 8 of the child					
ATE	0.077**	-0.154***	-6.398***	-0.101*	0.225***
	(0.036)	(0.031)	(1.206)	(0.052)	(0.054)
ATT	0.197***	-0.182***	-7.876***	-0.125*	0.371***
	(0.043)	(0.037)	(1.465)	(0.064)	(0.065)
ATUT	-0.003	-0.135***	-5.411***	-0.084	0.126**
	(0.038)	(0.032)	(1.266)	(0.055)	(0.056)
LATE	0.014	-0.184***	-7.168***	-0.131**	0.272***
	(0.042)	(0.035)	(1.378)	(0.060)	(0.060)
Test for obs het (p-val)	0.000	0.000	0.000	0.000	0.000
Test for unobs het (p-val)	0.000	0.001	0.000	0.131	0.000
Observations	57522	58875	58874	56207	58874

Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed in Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. ATE denotes the Average Treatment Effect, ATT the Average Treatment on the Treated, ATUT the Average Treatment on the Untreated and LATE the Local Average Treatment Effect. The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Heterogeneity across observables: Treatment effects of marriage at birth on outcomes at age 8

	(1) First stage y1	(2) Father log earnings ($\beta_1 - \beta_0$)	(3) Mother participation ($\beta_1 - \beta_0$)	(4) Mother hours ($\beta_1 - \beta_0$)	(5) Mother log earnings ($\beta_1 - \beta_0$)	(6) Fertility ($\beta_1 - \beta_0$)
Workmates' neighbours marriage rate	0.214***					
	(0.025)					
Mother degree	0.100***	0.010	0.005	0.289	0.037	0.206***
	(0.004)	(0.018)	(0.015)	(0.607)	(0.026)	(0.027)
Father degree	0.124***	0.050**	-0.016	-1.255*	-0.071**	0.001
	(0.003)	(0.020)	(0.017)	(0.678)	(0.029)	(0.030)
Mother's employment	-0.058***	-0.050**	0.073***	2.574***	0.124***	0.091***
	(0.005)	(0.020)	(0.018)	(0.691)	(0.031)	(0.030)
Father log earnings	-0.027***	0.056***	-0.030***	-1.054**	-0.045**	-0.031
	(0.003)	(0.014)	(0.011)	(0.442)	(0.019)	(0.020)
Father's employment	0.143***	-0.845***	0.349**	13.809**	0.715***	0.440
	(0.041)	(0.193)	(0.156)	(6.121)	(0.270)	(0.274)
Father age	0.012***	0.024*	-0.013	-0.289	0.015	-0.078***
	(0.003)	(0.013)	(0.010)	(0.408)	(0.018)	(0.018)
Father age squared	-0.000***	-0.000*	0.000	0.007	-0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
Mother age	0.081***	0.013	0.025	1.675***	0.061**	-0.241***
	(0.004)	(0.018)	(0.016)	(0.614)	(0.027)	(0.027)
Mother age squared	-0.001***	-0.000	-0.000*	-0.031***	-0.001**	0.003***
	(0.000)	(0.000)	(0.000)	(0.010)	(0.000)	(0.000)
Boy	-0.004	-0.021	-0.003	0.003	-0.001	-0.037*
	(0.003)	(0.013)	(0.012)	(0.455)	(0.020)	(0.020)
Parents' wealth	0.011***	0.015**	-0.017***	-0.999***	-0.019**	0.031***
	(0.001)	(0.006)	(0.005)	(0.196)	(0.009)	(0.009)
Relationship quality: Duration	0.082***	0.022***	-0.011*	-0.546**	-0.024**	0.088***
	(0.001)	(0.007)	(0.006)	(0.228)	(0.010)	(0.010)
Social stigma: Christian party share	-0.007	-0.339**	-0.073	-7.019	-0.216	-0.104
	(0.032)	(0.135)	(0.115)	(4.619)	(0.205)	(0.206)
Family stigma: Grandparents divorce	-0.104***	-0.005	-0.010	0.224	0.003	-0.066**
	(0.003)	(0.017)	(0.015)	(0.584)	(0.025)	(0.026)
$\chi^2(1)$ for H_0: IV is irrelevant	73,4	64,9	73,4	80,6	81,6	90,8
Observations	58,875	57,522	58,875	58,874	56,207	58,874

Notes: Population of Norway who had a first child between 1997-2001. All models control for the covariates observed before childbirth listed in the table, as well as the expected value of our instrumental variable (IV) for peers working in the same workplace but in different years, the average outcome of workmates, and its corresponding expected value. The IV for parental marriage is the workmates' neighbors' marriage rate. Column (1) reports average marginal effects from the probit model for marriage (first stage), where the outcome is mother's participation. These effects remain largely consistent across different outcomes of interest. Columns (2)-(6) report the differential effect between married and cohabiting couples ($\beta_1 - \beta_0$) for each variable, with bootstrap standard errors (200 repetitions) in parentheses. The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Online Appendix

A MTE

A.1 MTE detailed definition

Let us consider the MTE defined in equation 7, $E(Y_1 - Y_0|X = x, U_M = u)$. Similarly to Carneiro and Lee (2009), Carneiro et al. (2011), Brinch et al. (2017), Cornelissen et al. (2017) and Felfe and Lalive (2018), we assume that $E(\epsilon_j|X = x, U_M = u) = E(\epsilon_j|U_M = u)$ so that MTE can be separated in the following two additive components

$$\text{MTE}(X = x, U_M = u) = x(\beta_1 - \beta_0) + E(\epsilon_1 - \epsilon_0|U_M = u). \tag{6}$$

As proved by Carneiro et al. (2011) and Heckman et al. (2006), the MTE can be computed as

$$\text{MTE}(X = x, U_M = p) = E(Y_1 - Y_0|X = x, U_M = p) = \frac{\partial E(Y|X = x, p(Z) = p)}{\partial p}, \tag{7}$$

where $p = p(Z)$ is the propensity score. The intuition for this can be explained by considering a couple with propensity score $p(Z) = p$ and resistance $U_M > p$, hence cohabiting. A change in the instrument such that the propensity score increases to $p(Z') = p' \geq U_M$ would then induce the couple to marry. More in general for couples with $p(Z) < U_M \leq p(Z')$ a change from Z to Z' induces them to move from cohabitation to marriage, so that

$$\frac{E(Y|X, p') - E(Y|X, p)}{p' - p} \tag{8}$$

can be interpreted as the average MTE for couples with resistance $U_M \in [p, p']$. Taking the limit of Equation 8 for $p' \to p$ provides the average treatment effect at $U_M = p$, $\text{MTE}(X = x, U_M = p)$.

Given Equation 3,

$$E(Y|X = x, p(Z) = p) = x\beta_0 + px(\beta_1 - \beta_0) + K(x, p), \tag{9}$$

where $K(x, p) = pE(\epsilon_1 - \epsilon_0|X = x, U_M = p) = \int_0^p E(\epsilon_1 - \epsilon_0|X = x, U_M = u)du$ and thanks to

the separability assumption $K(x,p) = \int_0^p E(\epsilon_1 - \epsilon_0 | U_M = u)du = K(p)$ (see for details on the proof Brinch et al. 2017). We can then compute MTE$(X = x, U_M = p)$ as the derivative of Equation 9 with respect to p.

A.2 Details on our estimation procedure

We estimate the MTE by adopting the local IV estimator following the below procedure. First, we estimate the propensity score $\hat{p}$ using a probit model. Second we estimate the outcome equation

$$Y = x\beta_0 + \hat{p}x(\beta_1 - \beta_0) + K(p) + \nu, \tag{10}$$

by approximating $K(\hat{p})$ with a polynomial of order 3 in $\hat{p}$. Finally, the MTE is computed considering the derivative of Equation 10 with respect to $\hat{p}$,

$$x(\beta_1 - \beta_0) + k(\hat{p}), \tag{11}$$

where $k(\hat{p}) = K'(\hat{p}) = E(\epsilon_1 - \epsilon_0 | U_M = \hat{p})$.

While in our benchmark estimation we approximate $K(p)$ by a polynomial of order 3 in p (parametric polynomial model), in our sensitivity analyses we consider two alternative models which impose different specifications for $K(p)$. First the normal parametric model, i.e. a model where ϵ_1, ϵ_0 and V are assumed to follow a joint normal distribution (see Heckman 1976 selection model) and next the semiparametric selection model where no parametric restrictions are imposed on $K(p)$ (see Heckman et al. (2006)).

After the estimation of the MTE we compute the ATE, ATT and ATU by averaging the MTE with appropriate weights as shown by Heckman and Vytlacil (2007).[1] We also compute the local average treatment effect (LATE), which, as shown by Heckman et al. (2006), Heckman and Vytlacil (2007) and Brinch et al. (2017) can be also computed as a weighted average of MTE.

[1] For examples of applications of this approach see e.g. Carneiro et al. (2011),Maestas et al. (2013), Cornelissen et al. (2017) and Felfe and Lalive (2018).

B Selection into marriage: first stage

In this section we discuss the results for the probit model for the selection into marriage observed at the birth of the first child (see Equation 4). The model includes the set of characteristics X,[2] and the workmates' neighbours marriage rate which is our IV. Furthermore, to make sure to use idiosyncratic variation in our IV caused by changes in peers' composition across years within the same workplace, we control also for the expected value of the IV computed using randomly drawn workmates from the same workplace but from different years following the procedure suggested by Borusyak and Hull (2023) (see subsection 4.2 condition A3). Finally, to ensure that our IV has no direct effect on the focal household outcome of interest Y except through its marriage decision (see condition A7), we control for the average outcome of the workmates $\overline{Y}_W$ and its expected value computed again considering randomly drawn workmates from different years and both measured before the focal childbirth and household outcome.

Because the last two control variables, $\overline{Y}_W$ and its expected value, change with the outcome of interest Y, our probit model's specification varies accordingly.[3] Table A9 columns (1)-(5) report the probit model results (marginal effects) for each of our main outcomes: mother's participation, work hours and log earnings, father's log earnings, and fertility.[4] Varying the outcome of interest has little impact on the probit model results. The instrumental variable - the workmates' neighbours marriage rate - strongly predicts cohabitation at birth. The chi-squared tests for the strength of our instrumental variable, with one degree of freedom, yields values between 70 and 91, which are well above the conventional threshold, providing strong evidence for the statistical significance and relevance of our IV. The coefficient of the IV can be interpreted as an increase in the proportion of the workmates' neighbours who are married from 0 to 1 raising the marriage of the focal household

[2] A dummy for degree and a quadratic in age at birth for each parent, fathers' earnings and employment, child gender, parents' wealth, duration of the relationship up to the first child birth, the Christian party share and quality, an indicator for grandparental divorce, year of birth dummies

[3] On the contrary, $\overline{Y}_W$ and its expected value do not change across child's age at which the outcome Y is observed. These two variables are computed averaging Y across workmates that gave birth to their first child between 3 and 5 years before the focal parents and when the child's of these peers is 2 years old irrelevant of the child's age at which Y is observed.

[4] The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments.

by between 21 and 24 percentage points.

Mothers with a university degree have about 9-10 percentage point higher probability of marriage than those without a degree, and similar effects are found for fathers with a degree (between 11 and 12 percentage points). Pre-birth employment has contrasting effects: a mother's employment decreases the likelihood of marriage, while a father's employment increases it. Furthermore, a 1% increase in the father's earnings in the year before childbirth is associated with between 0.024 and 0.035 percentage points decrease in marriage probability.

The likelihood of marriage also increases with the age of both the mother and father, though at a slightly decreasing rate, whereas we find no relationship between marriage and the gender of the first child.

The household wealth and relationship duration have positive effects on the marriage probability. Both these variables may be related to higher investments in housing that can offer a form of insurance to the lower-earning partner, potentially encouraging the use of marriage as a commitment device for greater specialization (Lafortune and Low, 2017) as confirmed by our findings.

While the effect of the Christian party share on the marriage probability is positive when statistically significant, couples with parents who divorced are about 10 percentage points less likely to marry.

The propensity score predicted from column (1) of Table A9 is plotted in Figure A13 for the treated group of married households and the untreated cohabiting households. We trim 5% of the observations with the most extreme predicted propensity scores from both the treated and untreated groups. This results in a common support with values between 0.16 and 0.65 and this range remains similar across different outcomes.[5] For a sensitivity analysis, we also ran the model after trimming only 1% of the most extreme observations. This expanded the common support to a range of 0.1 to 0.85, but the results remained qualitatively similar.[6]

[5]The treated group's distribution has a thin tail at the low end, while the untreated group's has a thinner tail at the high end. This asymmetry makes our trimming approach similar to the Stürmer trimming method, which removes observations below the 5th percentile for the treated group and above the 95th percentile for the untreated group. The Stürmer method has been found to perform better than other methods in presence of endogeneity (Stürmer et al., 2021).

[6]See the results for father's earnings and mother's participation reported in Figure 1 for the benchmark 5% trimming and in Figure A12 for the 1% trimming.

B.1 Treatment effect parameters: ATT, ATUT, LATE

For completeness, we report in Table 1 the treatment effect parameters of the ATT, ATUT and LATE of the marriage on the couple's labour outcomes, which are computed averaging the MTE using appropriate weights. The tests reported at the bottom of the table suggest that there is observed heterogeneity across all outcomes and across all child ages and unobserved heterogeneity for all outcomes except for mothers participation and hours at age 2 and for mothers earnings across all child's age.

For fathers' earnings, marriage leads to a positive ATT and a statistically insignificant ATUT. The ATT of marriage on the mothers' labour supply becomes more negative as the child ages, again confirming the increased specialization once children start school. Once specialization emerges, the ATT is generally more negative than the ATUT which in some cases is indistinguishable from zero. These results are consistent with the patterns described above, that marriage leads to more specialization for those with a low resistance, but more cooperation for those with a high resistance to marry.

The LATE reported in Table 1 tends to be lower in absolute value than the ATE. Following Andresen (2018) and Andresen and Nix (2022), in Figure A14, we investigate the reasons for this difference by looking at the LATE weights and the MTE(LATE) curve, which is the weighted average over the MTE curve for compliers. The LATE is generally below the ATE because (i) the compliers have different averages for the explanatory variables which cause a shift in the MTE(LATE) to a lower level with respect of the MTE at the mean and (ii) the compliers tend to have a lower level of unobserved resistance as shown by the negative slope in LATE weights. This leads to a decrease of the LATE relative to the ATE if the MTE curve is increasing in the resistance but to an increase in the opposite case.

C Heterogeneity analysis across sample subgroups

We consider heterogeneity analysis in order to tease out the mechanisms behind the estimated effects of marriage versus cohabitation on labour market trajectories. We ask first whether the effects are driven by the contract of marriage at the time of birth and next whether the high unobserved resistance to marriage measures a higher incidence of partner separation and low resistance to marriage picks up unplanned pregnancies.

C.1 Heterogeneity by later marriage of cohabitors

One area of potential treatment effect heterogeneity that we have so far not considered is the marital status of parents in the years after childbirth. We have seen that cohabitation for the first birth in Norway is extremely common - the norm in fact - but as pointed out by Blasutto et al. (2020) many of these parents will eventually marry. Figure A15 shows that by the time the child is age 9, over 40% of the original cohabitors have married - and by age 15 this is nearly 50%.

Do these households who later marry behave more like the treated families who were married at the time of childbirth? Understanding the answer to this question is informative about the underlying mechanisms for the causal effect of marriage on labour supply. If the marriage contract induces different behaviours through higher exit costs, the effects of marriage at childbirth should be similar irrespective of later marriage of cohabitors.

We plot the ATE and MTE of marriage on fathers earnings (panels a)-d) of Figure A16) and mothers' labour participation (panels e-h of Figure A16), excluding the sample of cohabitors who later marry. The effects estimated are remarkably similar to our benchmark which provides some evidence that it is the marriage contract itself which induces different labour market trajectories.

C.2 Separation after childbirth

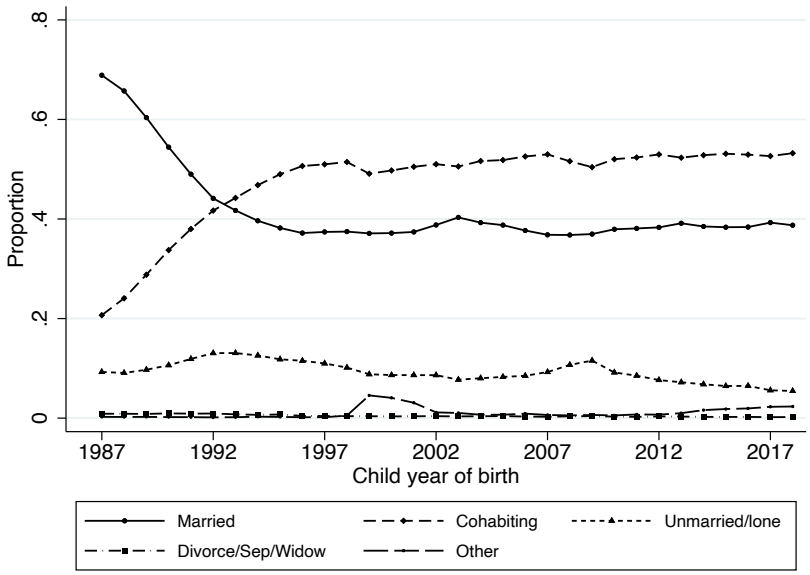
We have labeled the unobserved resistance to treatment as reflecting traditional or modern households. However, it is possible that the resistance to marriage picks up relationship quality. Our benchmark modern controls for a measure of relationship quality through the relationship duration before pregnancy. In this case, our results for high resistance couples may be driven by both parties being single parents with child responsibilities. However, when dropping couples who later separate, our ATE and MTE estimates in Figure A17 are very similar to the benchmark estimates.

C.3 Unplanned pregnancies

In our setting, the gains from marriage through increased exit costs may be more salient in the event of an unplanned pregnancy. If this is the case, the findings that marriage for low resistance to marriage couples is consistent with specialization may be driven solely by the event of an unplanned pregnancy. We cannot directly observe whether a shotgun marriage occurred, but instead exclude couples where an unplanned pregnancy is more likely to have occurred, defined as the couples with teen mothers. Reassuringly, excluding the 2% of the sample who are teen parents from the analysis does not lead to a change in the results or the conclusions of our paper, as seen in Figure A18.

Appendix Figures

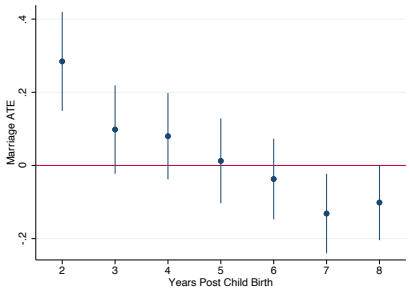
Figure A1: Evolution of marital status over time



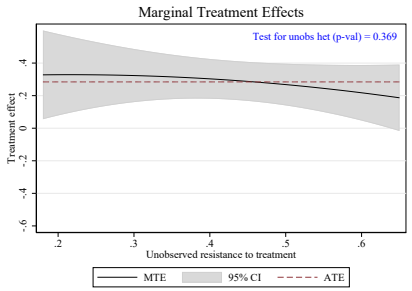
Notes: Figure plots family formation in the year of childbirth for the population of Norwegian first born children between 1987-2018.

Figure A2: Marginal Treatment Effect of marriage on mother and household earnings.

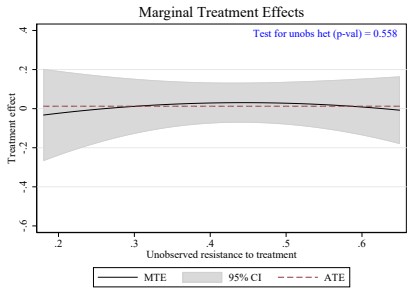
(a) Mother earnings: ATE



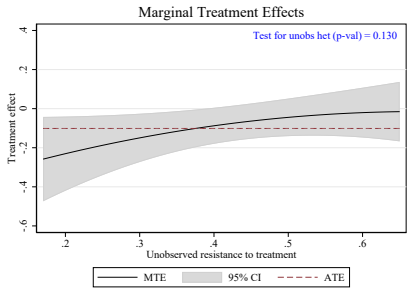
(b) Mother earnings: Age 2



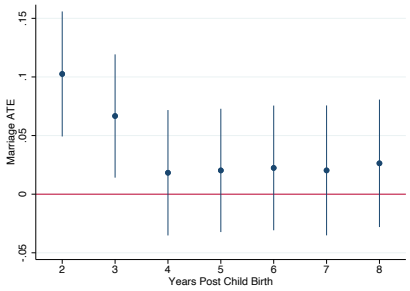
(c) Mother earnings: Age 5



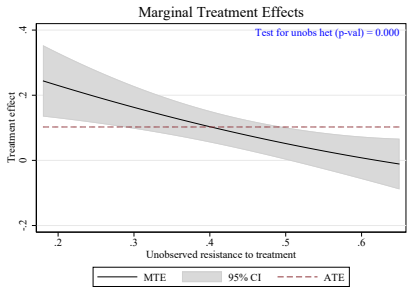
(d) Mother earnings: Age 8



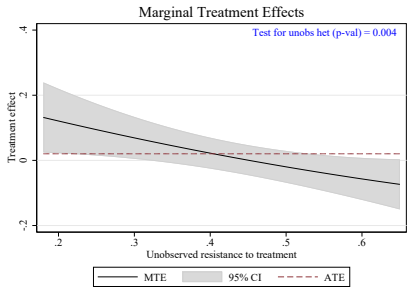
(e) Household earnings: ATE



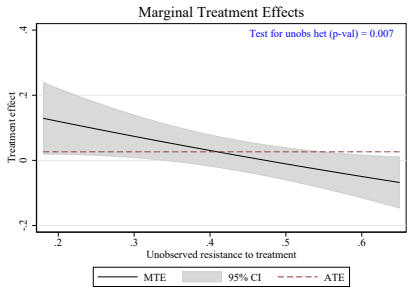
(f) Household earnings: Age 2



(g) Household earnings: Age 5

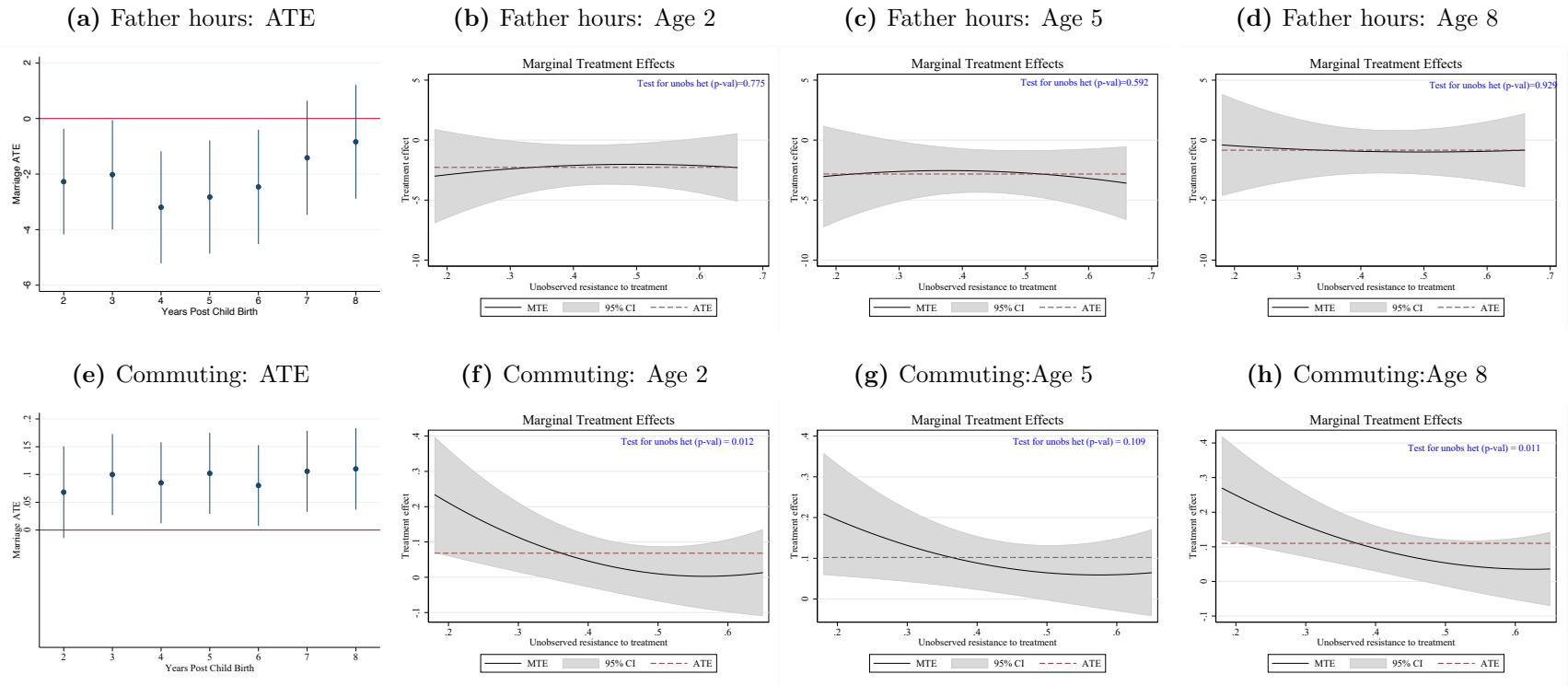


(h) Household earnings: Age 8



Notes: Population of Norway having a first child between 1997-2001. Fertility measures the number of children of the mother of the focal child. Household earnings are the log of the sum of mother and father earnings and mother earnings are in logs. The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

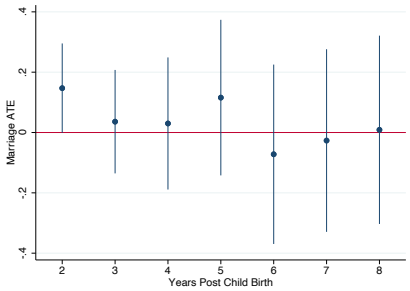
Figure A3: Marginal Treatment Effect of marriage on father's hours of work and probability of working in the same municipality of residence



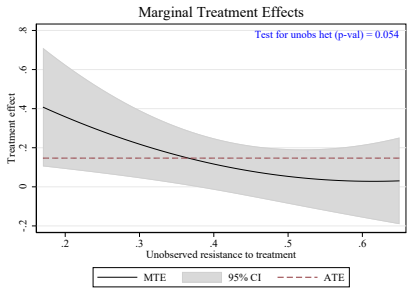
Notes: Population of Norway having a first child between 1997-2001. Father hours is the number of hours of work per week. Commuting takes value 1 if the father works in a municipality that is different from the municipality of residence and zero otherwise. The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. MTE shown across the unobserved resistance to treatment (marriage). We define a variable for not commuting as taking value 1 if the father works in the same municipality of residence, and zero otherwise. Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A4: Marginal Treatment Effect of marriage on father working in a competitive occupation

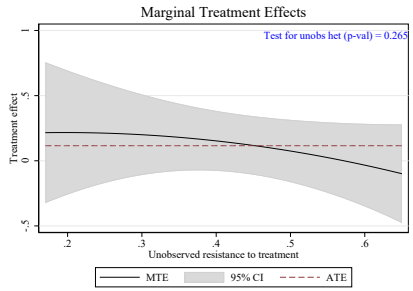
(a) Competitive: ATE



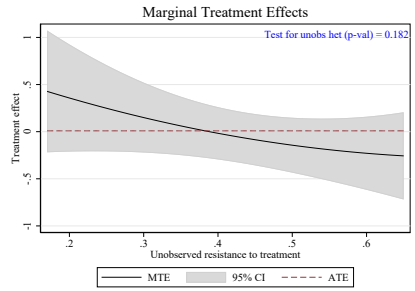
(b) Competitive: Age 2



(c) Competitive: Age 5



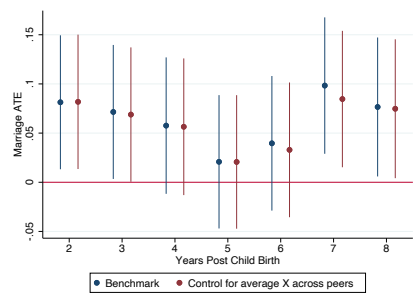
(d) Competitive: Age 8



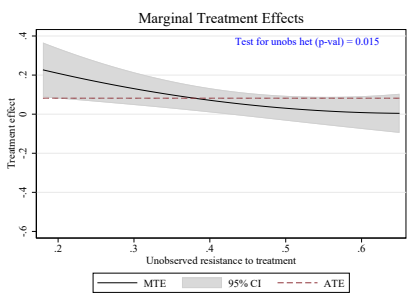
Notes: Population of Norway having a first child between 1997-2001. The variable competitive is an index based on the O'Net question "To what extent does this job require the worker to compete or to be aware of competitive pressures?". The model controls for all covariates listed Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. MTE shown across the unobserved resistance to treatment (marriage).

Figure A5: Controlling for mean covariates of workmate peers: MTE of marriage on father earnings and mother participation.

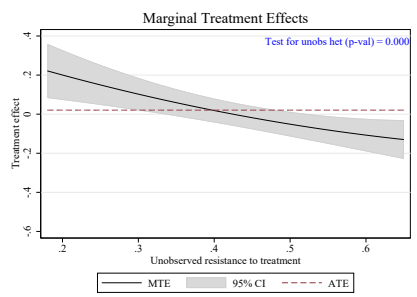
(a) Father earnings: ATE



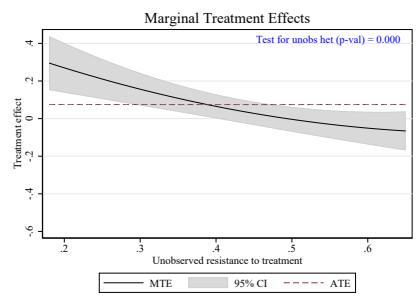
(b) Father earnings: Age 2



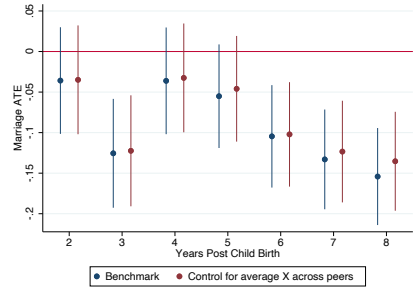
(c) Father earnings: Age 5



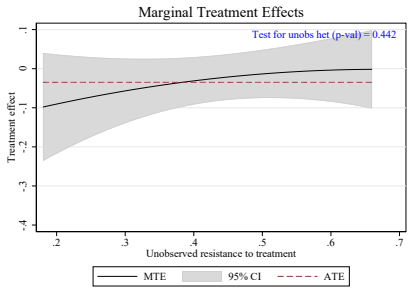
(d) Father earnings: Age 8



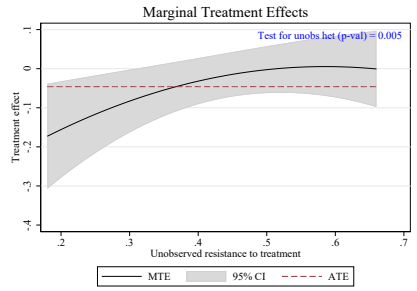
(e) Mother participation: ATE



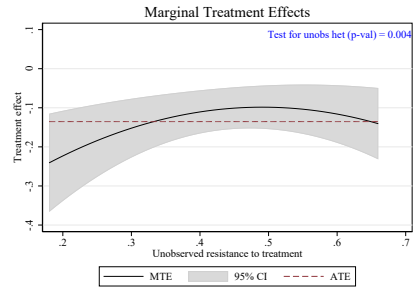
(f) Mother participation: Age 2



(g) Mother participation: Age 5



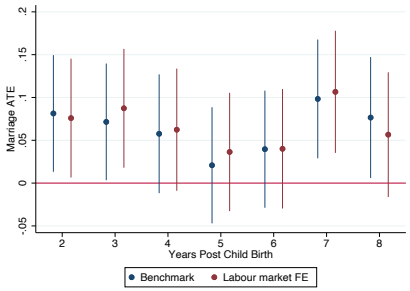
(h) Mother participation: Age 8



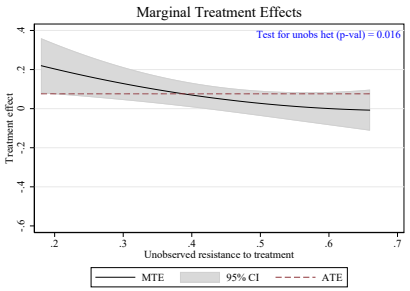
Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed Table A1 and is augmented by including each the leave-one-out mean of each covariate across workmates. The IV for parental marriage is workmates' neighbors marriage rate. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A6: Including labour market fixed effects: MTE of marriage on father earnings and mother participation.

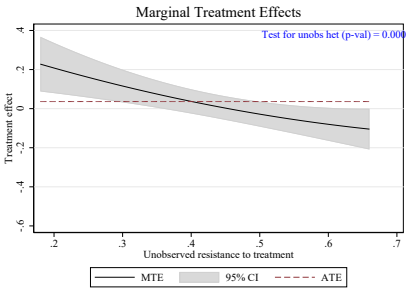
(a) Father earnings: ATE



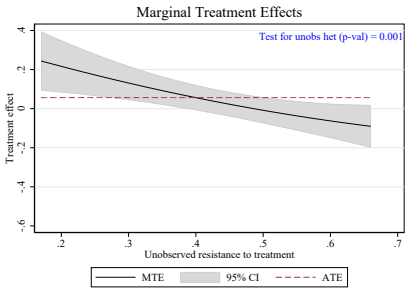
(b) Father earnings: Age 2



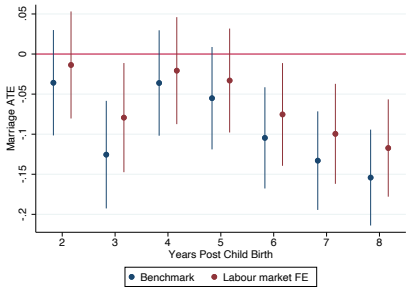
(c) Father earnings: Age 5



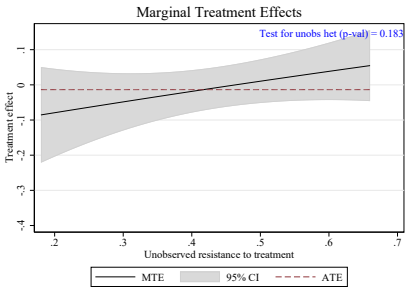
(d) Father earnings: Age 8



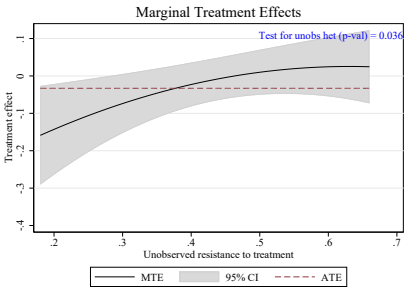
(e) Mother participation: ATE



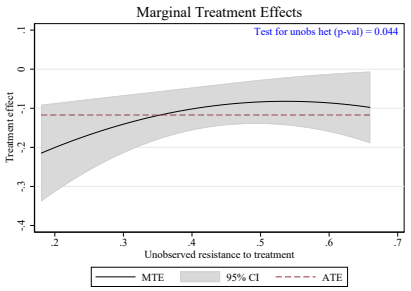
(f) Mother participation: Age 2



(g) Mother participation: Age 5

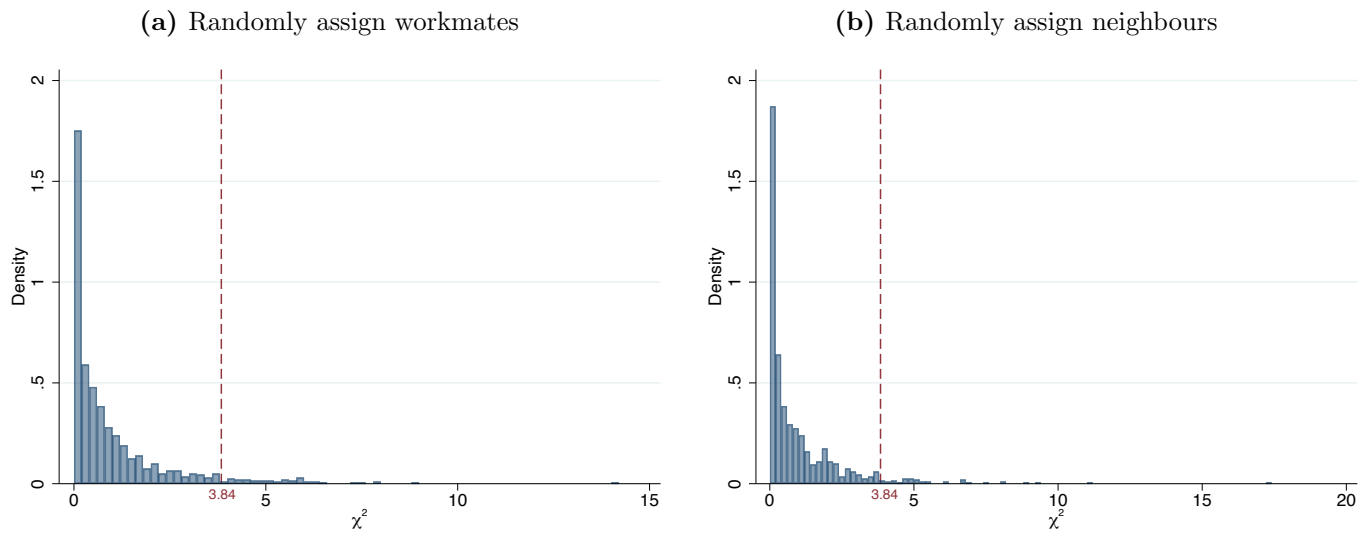


(h) Mother participation: Age 8



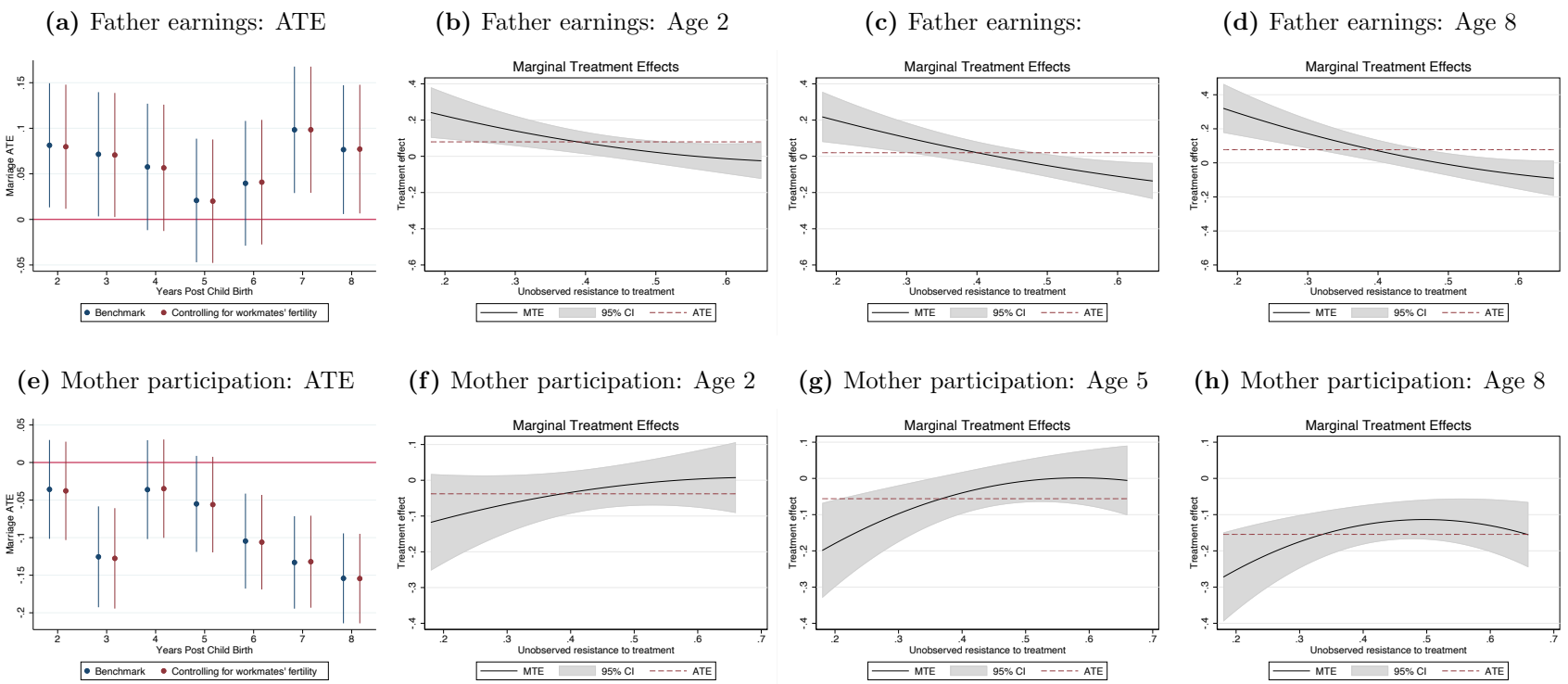
Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed Table A1 and is augmented by including fixed effect for the labour market. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A7: Placebo tests for the null of zero instrumental effect: Random allocation of peers with similar characteristics.



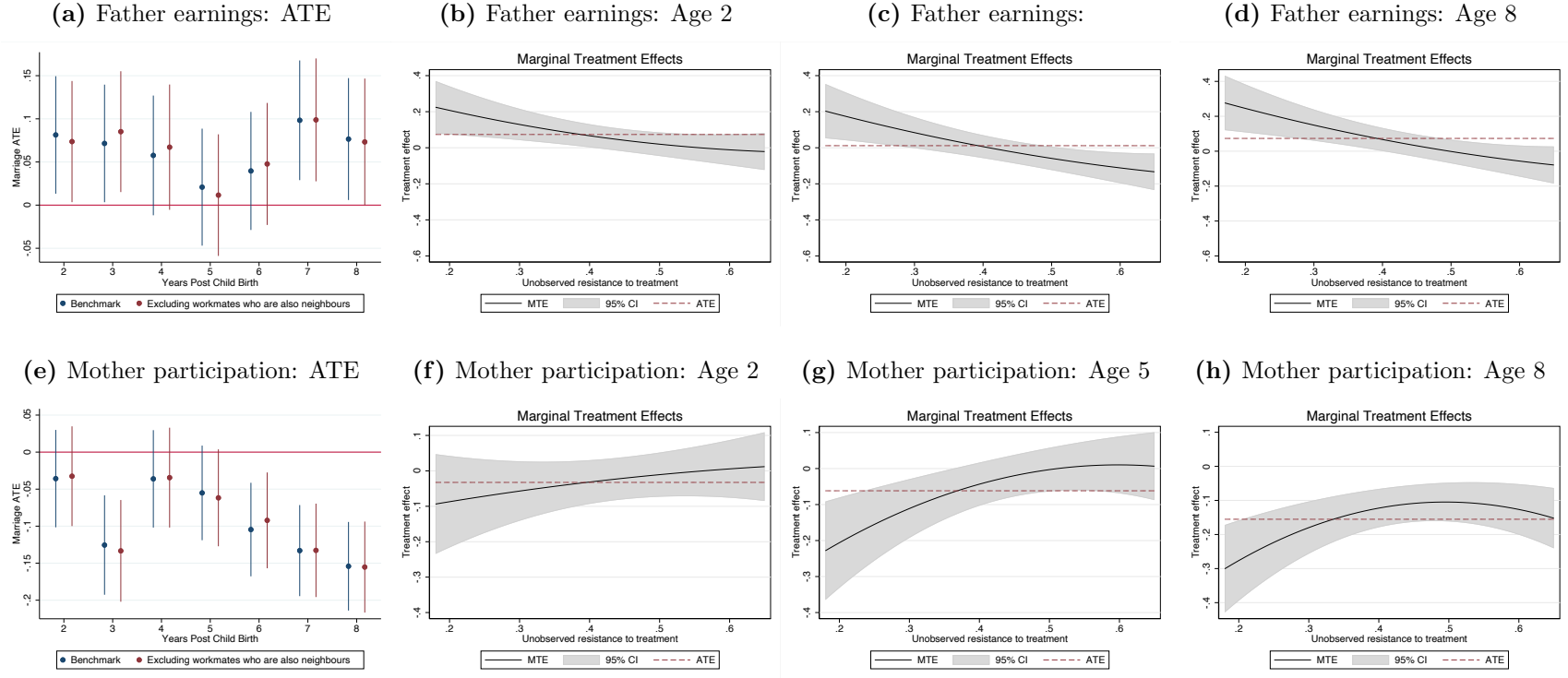
Notes: The placebo tests reassign each individual to fictitious peers drawn from neighbourhoods (panel a) or workplaces (panel b) that match the characteristics of their actual peers along three dimensions: maternal education (degree vs. no degree), maternal age (above vs. below the sample mean), and maternal employment one year before birth. Across 1,000 such random assignments, the figure plots the empirical distribution of the chi-squared statistic (1 d.f.) testing the null that the instrument has no effect on the probability of being married at the child's birth. A chi-squared value below 3.84 corresponds to a failure to reject instrument relevance.

Figure A8: Controlling for workmates' fertility: MTE of marriage on father earnings and mother participation.



Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed Table A1 and additionally controls for the predetermined average workmates' fertility. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

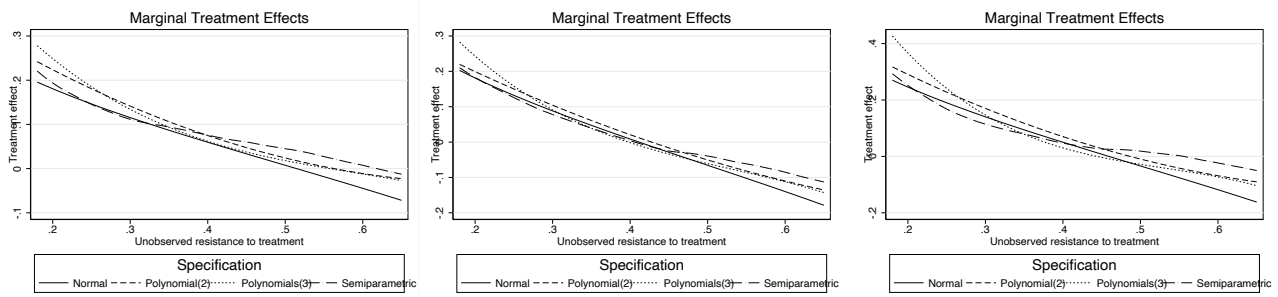
Figure A9: Excluding workmates who are also neighbours: MTE of marriage on father earnings and mother participation.



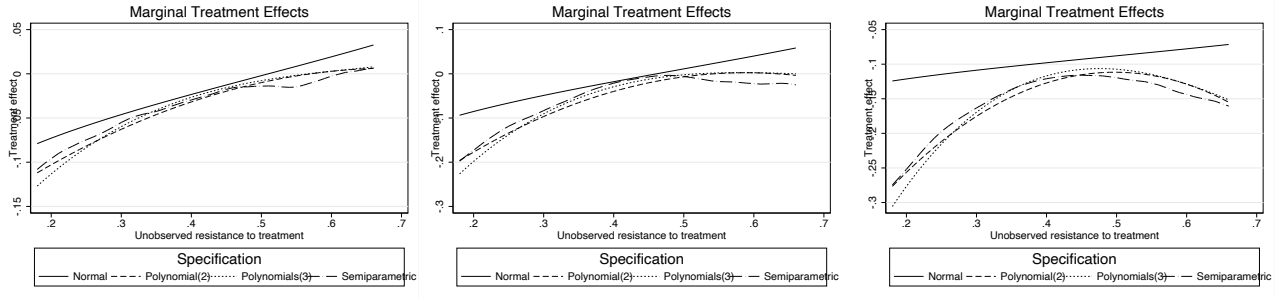
Notes: Population of Norway having a first child between 1997-2001, excluding fathers and mothers workmates who are also neighbours (11% of the estimation sample). The model controls for all covariates listed Table A1 and additionally controls for the predetermined average workmates' fertility. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A10: Functional form robustness checks: MTE of marriage on father earnings and mother participation.

(a) Father earnings: Age 2 **(b)** Father earnings: Age 5 **(c)** Father earnings: Age 8

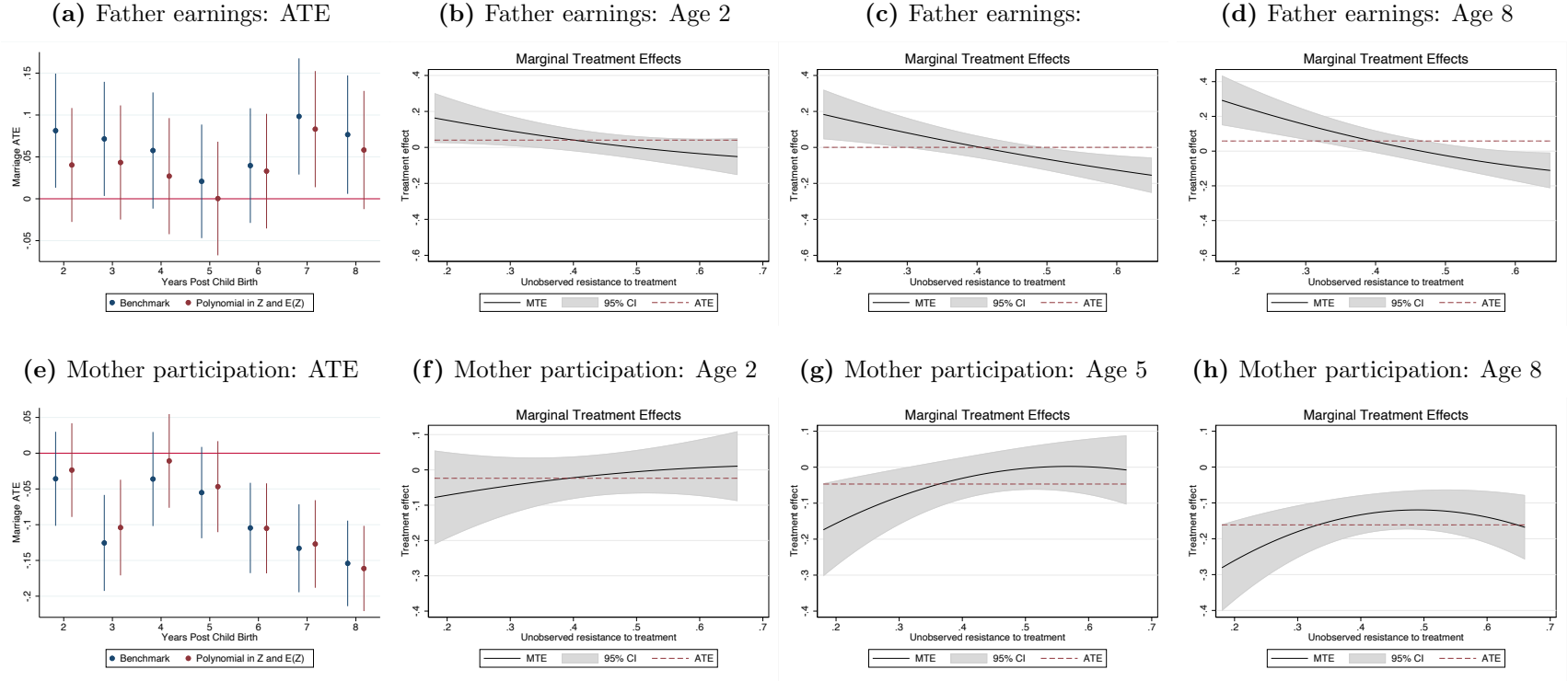


(d) Mother participation: Age 2 **(e)** Mother participation: Age 5 **(f)** Mother participation: Age 8



Notes: Population of Norway having a first child between 1997-2001. Figures compare different model specification, normal, polynomial of order 2, polynomial of order 3 (our benchmark) and a semiparametric specification (with a polynomial of order 3). The model controls for all covariates listed Table A1. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

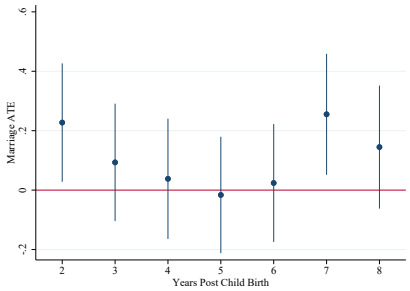
Figure A11: Considering a quadratic polynomial in the instrument: MTE of marriage on father earnings and mother participation.



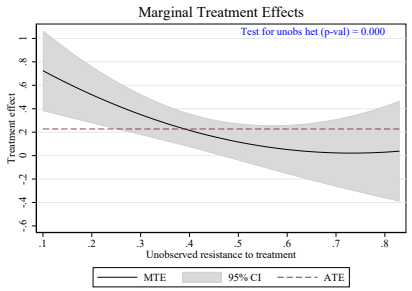
Notes: Population of Norway having a first child between 1997-2001, considering a quadratic polynomial in the instrument W and controlling for the expected W and the expected W^2. The model controls also for all covariates listed Table A1 and additionally controls for the predetermined average workmates' fertility. The instrument W for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A12: Changing common support restrictions: MTE of marriage on father earnings and mother participation.

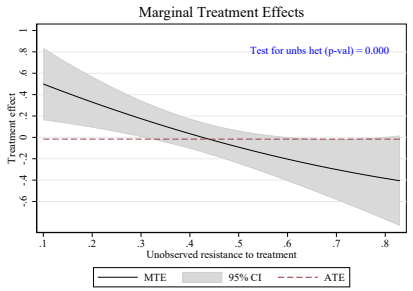
(a) Father earnings: ATE



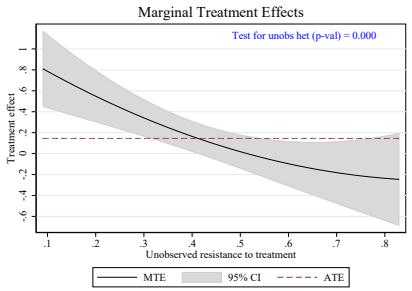
(b) Father earnings: Age 2



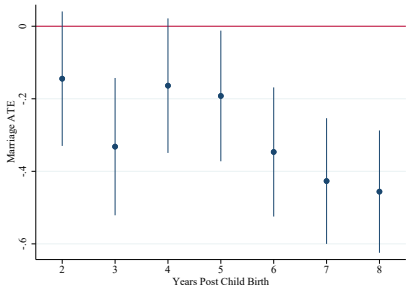
(c) Father earnings: Age 5



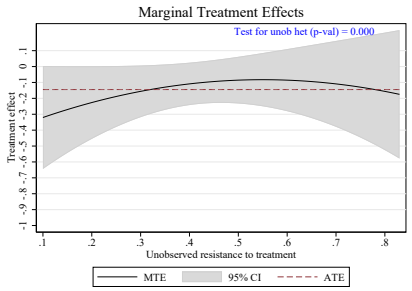
(d) Father earnings: Age 8



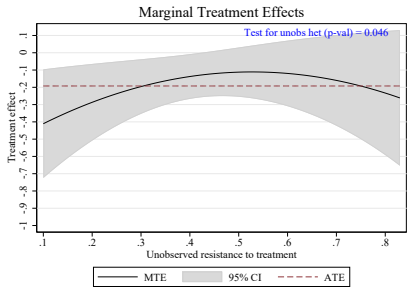
(e) Mother participation: ATE



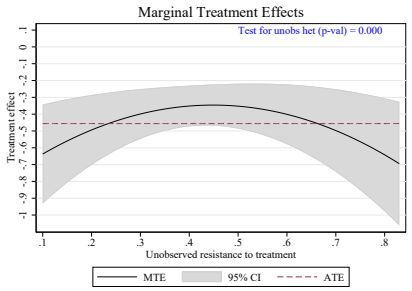
(f) Mother participation: Age 2



(g) Mother participation: Age 5

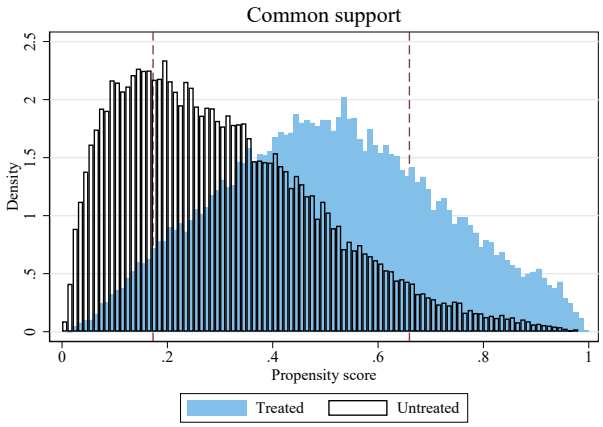


(h) Mother participation: Age 8



Notes: Population of Norway having a first child between 1997-2001. Figures show the ATE and MTE results when estimating the model with a trim of 1% of the common support, instead of 5% trim of the benchmark model. The model controls for all covariates listed Table A1. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

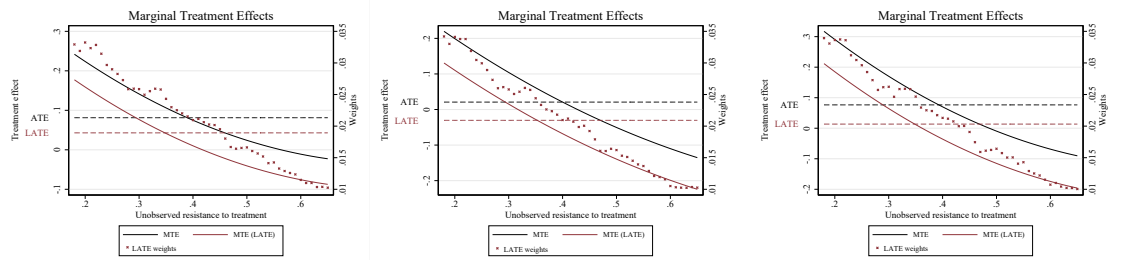
Figure A13: Common support



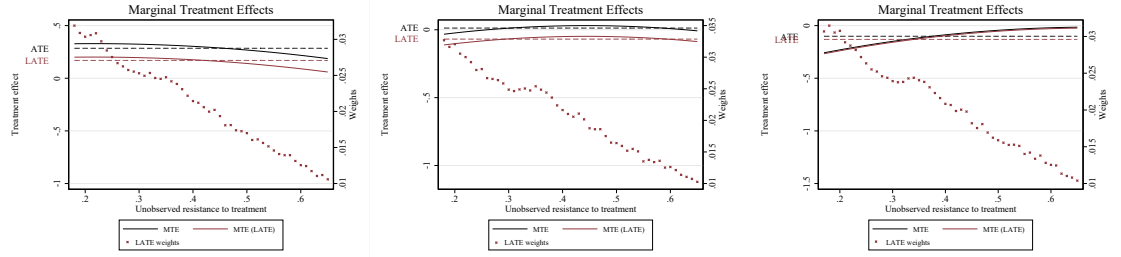
Notes: Figures shows the propensity score distribution across treated and untreated. Bars indicate common support with 5% trim of the tails.

Figure A14: LATE weights: MTE of marriage.

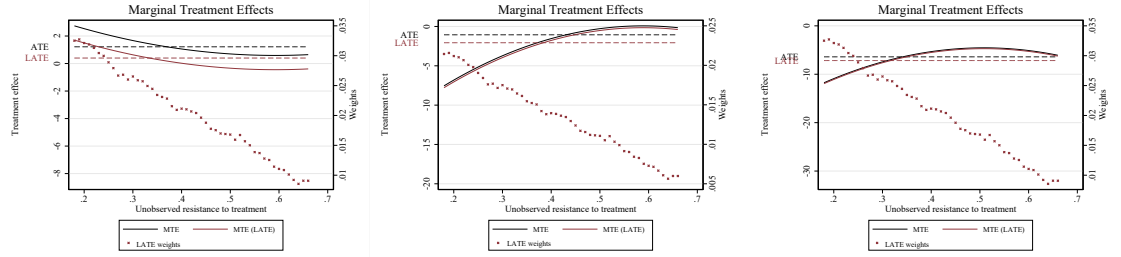
(a) Father earnings: Age 2 **(b)** Father earnings: Age 5 **(c)** Father earnings: Age 8



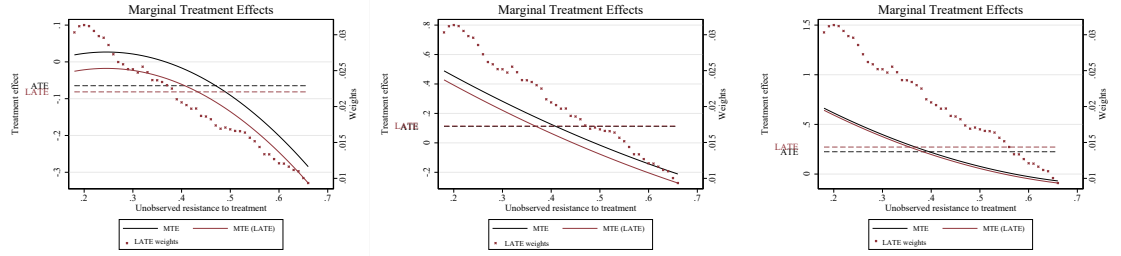
(d) Mother earnings: Age 2 **(e)** Mother earnings: Age 5 **(f)** Mother earnings: Age 8



(g) Mother hours: Age 2 **(h)** Mother hours: Age 5 **(i)** Mother hours: Age 8

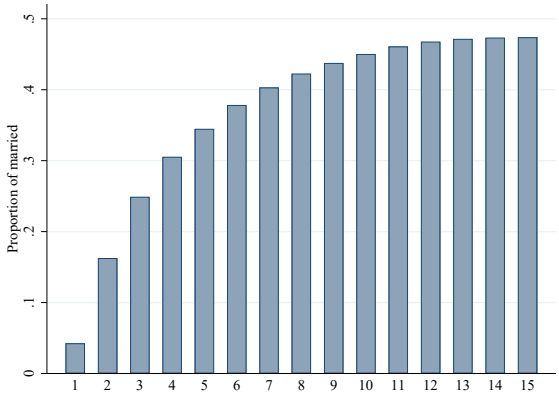


(j) Fertility: Age 2 **(k)** Fertility: Age 5 **(l)** Fertility: Age 8



Notes: The figures plot the LATE weights, the MTE curve, ATE curve and MTE (LATE) which is the weighted average of the MTE for compliers. The model includes all controls from the benchmark model.

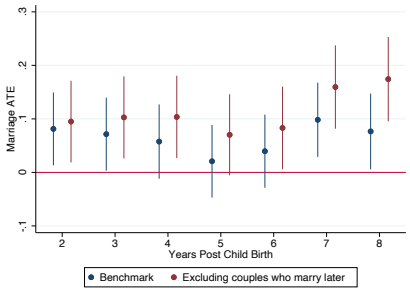
Figure A15: Marital status after birth for parents cohabiting at birth



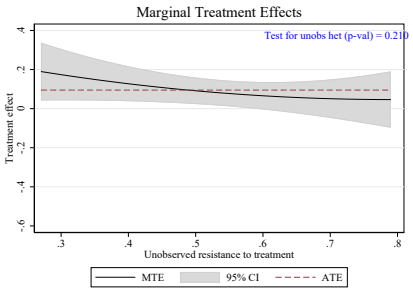
Notes: Norwegian administrative data. The figure plots the proportion of parents who marry across child age, among the sample of parents who cohabit at the first child's birth.

Figure A16: Exclude cohabitors who later marry: MTE of marriage on father earnings and mother participation.

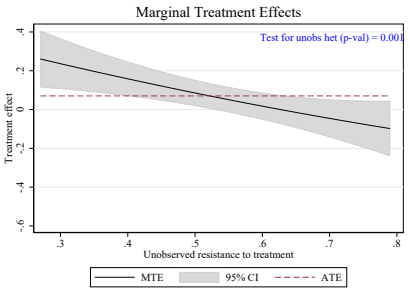
(a) Father earnings: ATE



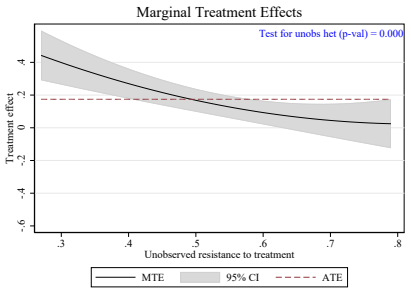
(b) Father earnings: Age 2



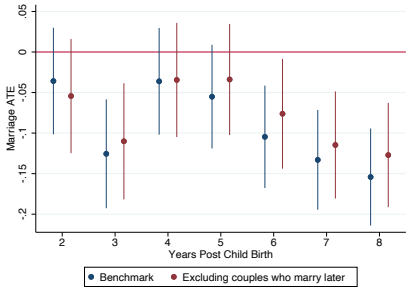
(c) Father earnings: Age 5



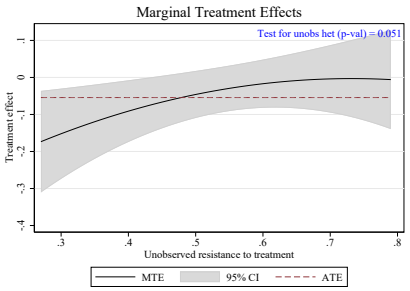
(d) Father earnings: Age 8



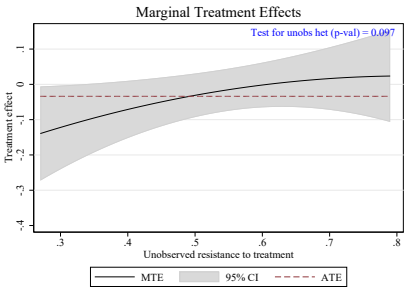
(e) Mother participation: ATE



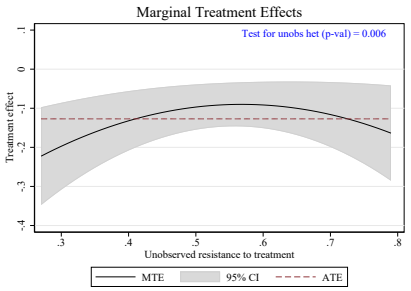
(f) Mother participation: Age 2



(g) Mother participation: Age 5

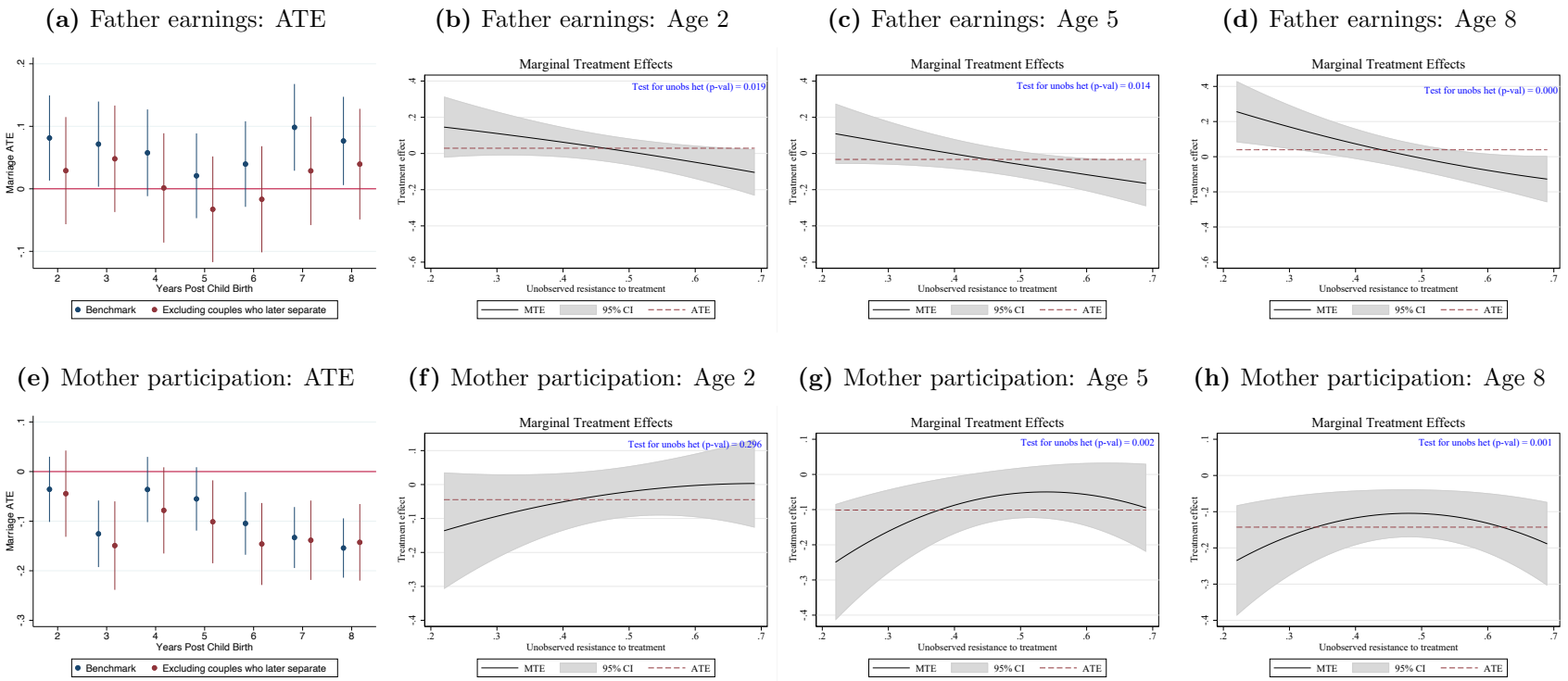


(h) Mother participation: Age 8



Notes: Population of Norway having a first child between 1997-2001, excluding couples that cohabited at birth but later married up to age 8. The model controls for all covariates listed Table A1. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

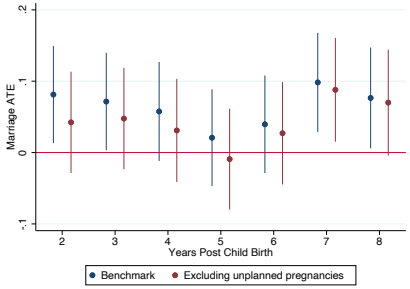
Figure A17: Exclude couples who later separate: MTE of marriage on father earnings and mother participation.



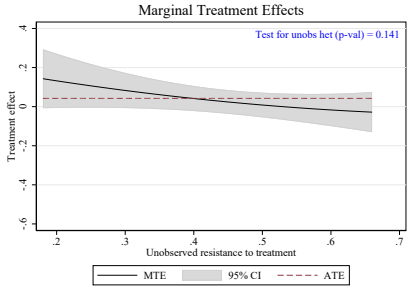
Notes: Population of Norway having a first child between 1997-2001, excluding couples that separated in between birth and age 8. The model controls for all covariates listed Table A1. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A18: Exclude unplanned pregnancies: MTE of marriage on father earnings and mother participation.

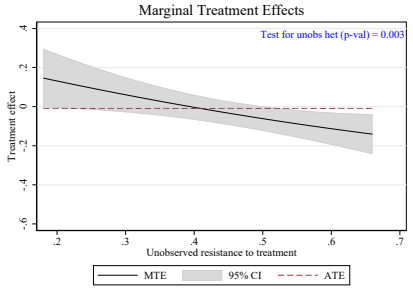
(a) Father earnings: ATE



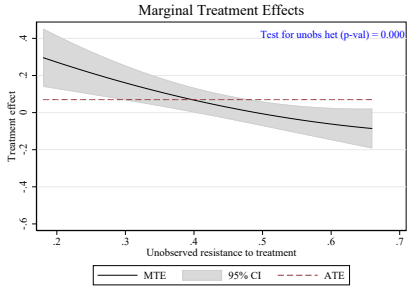
(b) Father earnings: Age 2



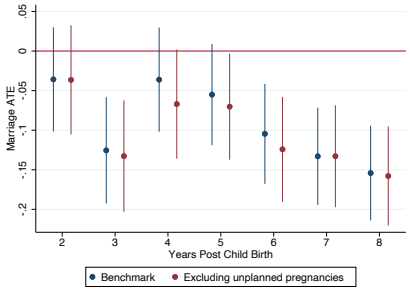
(c) Father earnings:



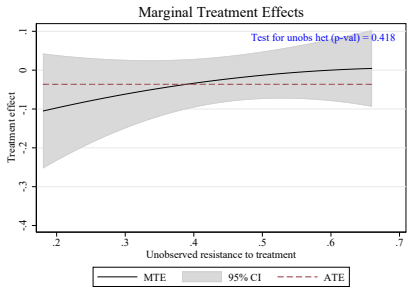
(d) Father earnings: Age 8



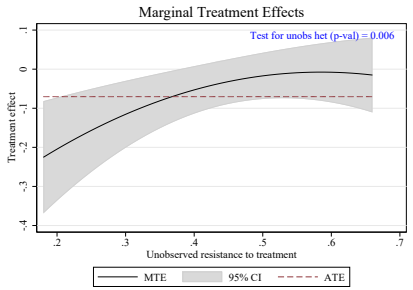
(e) Mother participation: ATE



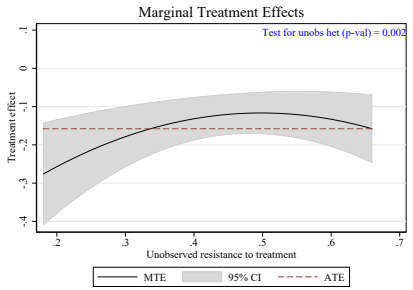
(f) Mother participation: Age 2



(g) Mother participation: Age 5



(h) Mother participation: Age 8



Notes: Population of Norway having a first child between 1997-2001, excluding both teen pregnancies and households where couples moved in together in the year before birth. The model controls for all covariates listed Table A1. The IV for parental marriage is workmates' neighbors marriage rate. Earnings are in logs. MTE shown across the unobserved resistance to treatment (marriage). Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Tables

Table A1: Descriptives of demographic characteristics and outcomes by marital status

	(1) Married		(2) Cohabiting		(3)
	Mean	sd	Mean	sd	Difference
Demographics (pre-birth)					
Mother degree	0.655	0.475	0.429	0.495	-0.226***
Father degree	0.515	0.500	0.279	0.448	-0.236***
Mother's employment	0.871	0.335	0.850	0.357	-0.021***
Father earnings	323108.057	192392.525	277666.621	147603.505	-45441.437***
Father's employment	0.992	0.091	0.994	0.075	0.003***
Father age	32.301	5.163	30.111	5.328	-2.190***
Mother age	29.236	4.119	26.904	4.689	-2.332***
Boy	0.512	0.500	0.512	0.500	-0.000
Child year of birth	1998.992	1.408	1999.030	1.397	0.038**
Parent's wealth	254074.244	1350177.039	165884.119	804595.566	-88190.125***
Relationship quality: Duration	2.881	2.691	1.003	1.483	-1.878***
Social stigma: Christian party share	0.093	0.064	0.084	0.057	-0.008***
Family stigma: Grandparents divorce	0.239	0.426	0.402	0.490	0.163***
IV					
Workmates' neighbors marriage rate	0.633	0.103	0.578	0.115	-0.055***
Observations	22627		36248		58875

Notes: Population of Norway having a first child between 1997-2001. Mothers' and fathers' employment are indicator variables which take the value of 1 if the mother/father worked in the year before childbirth. Duration measures the number of years the couple lived together before childbirth. The Christian party share measures the proportion of the local municipality level electorate voting for the Christian party in the year before birth. Grandparents divorce is an indicator which takes the value of 1 if the focal grandparents were ever divorced and 0 otherwise. Parents' wealth is the sum of assets of the mother and father in the year before birth.

Table A2: Descriptives of parent labour supply, fertility and separation by marital status

	(1) Married		(2) Cohabiting		(3)
	Mean	sd	Mean	sd	Difference
Outcomes (age 2 of the child)					
Mother earnings	203322.159	129827.901	171664.713	108421.888	-31657.446***
Father earnings	393029.252	1698492.252	325130.586	160329.734	-67898.666***
Total earnings	596425.252	1706513.935	496896.638	209206.327	-99528.613***
Mother participation	0.695	0.460	0.695	0.461	-0.000
Mother hours	22.803	17.788	21.584	17.480	-1.219***
Fertility	1.507	0.645	1.415	0.608	-0.092***
Separation	0.018	0.135	0.144	0.351	0.125***
Outcomes (age 5 of the child)					
Mother earnings	229947.357	152943.690	201186.068	117995.160	-28761.288***
Father earnings	429710.618	287583.512	362751.789	203210.951	-66958.829***
Total earnings	659979.033	341146.194	564234.174	248295.772	-95744.859***
Mother participation	0.727	0.446	0.732	0.443	0.005
Mother hours	23.326	17.317	22.833	17.122	-0.493***
Fertility	2.018	0.670	1.901	0.648	-0.117***
Separation	0.073	0.260	0.187	0.390	0.114***
Outcomes (age 8 of the child)					
Mother earnings	274632.832	180663.126	243852.958	135153.094	-30779.874***
Father earnings	500710.664	380929.514	417078.078	276360.481	-83632.586***
Total earnings	775818.896	438525.567	661645.386	322145.396	-114173.511***
Mother participation	0.776	0.417	0.785	0.411	0.009*
Mother hours	25.355	16.753	25.339	16.566	-0.016
Fertility	2.219	0.759	2.121	0.719	-0.098***
Separation	0.122	0.327	0.248	0.432	0.126***
Children outcomes					
Test score age 11	49.174	15.444	44.676	15.806	-4.498***
Observations	22627		36248		58875

Notes: Population of Norway having a first child between 1997-2001. Fertility measures the total number of children across the age of the first child being 2, 5 or 8. Separation is an indicator taking the value of 1 if the parents of the first born no longer live together when the child is age 2, 5 and 8. Child test score outcomes at ages 11 and 15 are the sum of maths and reading in national school tests.

Table A3: Descriptives of father's paternity leave, work hours and occupational competitiveness by marital status

	(1) Married		(2) Cohabiting		(3)
	Mean	sd	Mean	sd	Difference
Father takes paternity leave	0.215	0.411	0.290	0.454	0.075***
Father days of paternity leave	12.812	43.033	18.112	50.183	5.300***
Father work hours: Age 2	34.890	12.853	34.330	13.492	-0.560***
Father work hours: Age 5	34.052	13.812	33.433	14.456	-0.619***
Father work hours: Age 8	33.879	13.989	33.584	14.317	-0.295*
Father commuting: Age 2	0.423	0.494	0.388	0.487	-0.035***
Father commuting: Age 5	0.425	0.494	0.389	0.487	-0.036***
Father commuting: Age 8	0.427	0.495	0.392	0.488	-0.035***
Father competitive job: Age 2	0.111	0.979	0.070	0.854	-0.040***
Father competitive job: Age 5	0.837	1.963	0.641	1.766	-0.196***
Father competitive job: Age 8	0.912	2.074	0.695	1.864	-0.217***

Notes: Population of Norway having a first child between 1997-2001. Commuting takes value 1 if the father works in a municipality that is different form the municipality of residence, and zero otherwise. Competitive job is an index for competitiveness by merging a question from the O'Net data "To what extent does this job require the worker to compete or to be aware of competitive pressures?", to the occupation of the father.

Table A4: Heterogeneity in treatment effect across observables at age 2

	(1) First stage y1	(2) Father log earnings $(\beta_1 - \beta_0)$	(3) Mother participation $(\beta_1 - \beta_0)$	(4) Mother hours $(\beta_1 - \beta_0)$	(5) Mother log earnings $(\beta_1 - \beta_0)$	(6) Fertility $(\beta_1 - \beta_0)$
Workmates' neighbours marriage rate	0.214***					
	(0.025)					
Mother degree	0.100***	-0.006	0.049***	2.569***	0.280***	0.127***
	(0.004)	(0.017)	(0.017)	(0.633)	(0.035)	(0.023)
Father degree	0.124***	0.085***	-0.001	0.145	0.088**	0.055**
	(0.003)	(0.019)	(0.019)	(0.706)	(0.038)	(0.025)
Mother's employment	-0.058***	-0.008	0.097***	3.407***	0.003	0.060**
	(0.005)	(0.019)	(0.019)	(0.720)	(0.043)	(0.026)
Father log earnings	-0.027***	0.079***	-0.030**	-0.899*	-0.049*	0.001
	(0.003)	(0.013)	(0.012)	(0.460)	(0.025)	(0.017)
Father's employment	0.143***	-1.448***	0.437**	13.801**	0.658*	-0.180
	(0.041)	(0.189)	(0.171)	(6.377)	(0.354)	(0.232)
Father age	0.012***	0.035***	-0.003	-0.646	-0.049**	-0.034**
	(0.003)	(0.012)	(0.011)	(0.426)	(0.023)	(0.015)
Father age squared	-0.000***	-0.001***	0.000	0.010*	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
Mother age	0.081***	-0.024	-0.013	1.608**	-0.025	-0.230***
	(0.004)	(0.018)	(0.017)	(0.639)	(0.036)	(0.023)
Mother age squared	-0.001***	0.000	0.000	-0.028***	0.000	0.003***
	(0.000)	(0.000)	(0.000)	(0.010)	(0.001)	(0.000)
Boy	-0.004	-0.011	-0.003	-0.303	-0.017	-0.038**
	(0.003)	(0.013)	(0.013)	(0.474)	(0.026)	(0.017)
Parents' wealth	0.011***	0.013**	-0.026***	-0.570***	-0.012	0.013*
	(0.001)	(0.006)	(0.005)	(0.205)	(0.012)	(0.007)
Relationship quality: Duration	0.082***	0.008	-0.009	-0.177	-0.018	0.066***
	(0.001)	(0.007)	(0.006)	(0.237)	(0.013)	(0.009)
Social stigma: Christian party share	-0.007	-0.123	0.290**	7.881	0.034	0.232
	(0.032)	(0.131)	(0.126)	(4.813)	(0.269)	(0.175)
Family stigma: Grandparents divorce	-0.104***	0.006	0.041**	1.240**	0.074**	-0.076***
	(0.003)	(0.017)	(0.016)	(0.609)	(0.033)	(0.022)
Chi-square	73,4	69,8	73,4	80,6	72,3	90,8
Observations	58,875	58,140	58,875	58,874	55,088	58,874

Notes: Population of Norway who had a first child between 1997-2001. All models control for the covariates listed in the table, as well as the expected value of our instrumental variable (IV) for peers working in the same workplace but in different years, the average outcome of workmates, and its corresponding expected value. The IV for parental marriage is the workmates' neighbors' marriage rate. Column (1) reports average marginal effects from the probit model for marriage (first stage), where the outcome is mother's participation. These effects remain largely consistent across different outcomes of interest. Columns (2)-(6) report the differential effect between married and cohabiting couples $(\beta_1 - \beta_0)$ for each variable, with bootstrap standard errors (200 repetitions) in parentheses. The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Heterogeneity across observables: Treatment effects of marriage at birth on outcomes at age 5

	(1) First stage y1	(2) Father log earnings $(\beta_1 - \beta_0)$	(3) Mother participation $(\beta_1 - \beta_0)$	(4) Mother hours $(\beta_1 - \beta_0)$	(5) Mother log earnings $(\beta_1 - \beta_0)$	(6) Fertility $(\beta_1 - \beta_0)$
Workmates' neighbours marriage rate	0.214***					
	(0.025)					
Mother degree	0.100***	0.013	0.006	0.618	0.157***	0.220***
	(0.004)	(0.017)	(0.016)	(0.623)	(0.030)	(0.024)
Father degree	0.124***	0.076***	-0.013	-0.540	-0.001	0.035
	(0.003)	(0.019)	(0.018)	(0.695)	(0.033)	(0.027)
Mother's employment	-0.058***	-0.044**	0.092***	3.594***	0.009	0.088***
	(0.005)	(0.019)	(0.019)	(0.709)	(0.036)	(0.028)
Father log earnings	-0.027***	0.089***	-0.016	-0.662	-0.023	-0.031*
	(0.003)	(0.013)	(0.012)	(0.453)	(0.022)	(0.018)
Father's employment	0.143***	-1.396***	0.269	11.248*	0.323	0.350
	(0.041)	(0.186)	(0.166)	(6.276)	(0.307)	(0.248)
Father age	0.012***	0.000	-0.010	-0.221	-0.029	-0.071***
	(0.003)	(0.012)	(0.011)	(0.419)	(0.020)	(0.016)
Father age squared	-0.000***	-0.000	0.000	0.005	0.000*	0.001***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
Mother age	0.081***	0.011	-0.041**	-0.057	0.050	-0.196***
	(0.004)	(0.017)	(0.017)	(0.629)	(0.031)	(0.025)
Mother age squared	-0.001***	-0.000	0.001**	-0.003	-0.001	0.003***
	(0.000)	(0.000)	(0.000)	(0.010)	(0.000)	(0.000)
Boy	-0.004	0.013	-0.003	-0.380	-0.030	-0.035*
	(0.003)	(0.013)	(0.012)	(0.466)	(0.022)	(0.018)
Parents' wealth	0.011***	0.010*	-0.017***	-0.911***	-0.011	0.033***
	(0.001)	(0.006)	(0.005)	(0.201)	(0.010)	(0.008)
Relationship quality: Duration	0.082***	0.022***	-0.014**	-0.715***	-0.030***	0.078***
	(0.001)	(0.006)	(0.006)	(0.233)	(0.011)	(0.009)
Social stigma: Christian party share	-0.007	-0.206	0.182	4.693	0.493**	0.002
	(0.032)	(0.130)	(0.123)	(4.736)	(0.232)	(0.187)
Family stigma: Grandparents divorce	-0.104***	-0.001	0.008	0.482	0.013	-0.080***
	(0.003)	(0.017)	(0.016)	(0.599)	(0.029)	(0.024)
Chi-square	73,4	66,4	73,4	80,6	76,8	90,8
Observations	58,875	57,777	58,875	58,874	55,516	58,874

Notes: Population of Norway who had a first child between 1997-2001. All models control for the covariates listed in the table, as well as the expected value of our instrumental variable (IV) for peers working in the same workplace but in different years, the average outcome of workmates, and its corresponding expected value. The IV for parental marriage is the workmates' neighbors' marriage rate. Column (1) reports average marginal effects from the probit model for marriage (first stage), where the outcome is mother's participation. These effects remain largely consistent across different outcomes of interest. Columns (2)-(6) report the differential effect between married and cohabiting couples $(\beta_1 - \beta_0)$ for each variable, with bootstrap standard errors (200 repetitions) in parentheses. The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Heterogeneity across observables: Treatment effects of marriage at birth on outcomes at age 5 for the untreated cohabiting couples

	(1) First stage y1	(2) Father earnings (β_0)	(3) Mother participation (β_0)	(4) Mother hours (β_0)	(5) Mother earnings (β_0)	(6) Fertility (β_0)
Workmates' neighbours marriage rate	0.214***					
	(0.025)					
Mother degree	0.100***	0.004	0.050***	2.997***	0.134***	-0.088***
	(0.004)	(0.009)	(0.009)	(0.325)	(0.015)	(0.013)
Father degree	0.124***	0.099***	0.001	0.338	0.006	0.031*
	(0.003)	(0.011)	(0.011)	(0.409)	(0.019)	(0.016)
Mother's employment	-0.058***	0.026***	0.108***	3.966***	0.240***	-0.096***
	(0.005)	(0.009)	(0.009)	(0.338)	(0.016)	(0.013)
Father earnings	-0.027***	0.217***	0.008	0.396*	0.019*	0.011
	(0.003)	(0.007)	(0.006)	(0.227)	(0.011)	(0.009)
Father's employment	0.143***	-2.125***	-0.055	-3.527	-0.231	-0.103
	(0.041)	(0.095)	(0.084)	(3.180)	(0.154)	(0.125)
Father age	0.012***	-0.008	-0.001	0.020	0.024***	0.044***
	(0.003)	(0.005)	(0.005)	(0.182)	(0.009)	(0.007)
Father age squared	-0.000***	0.000	-0.000	-0.002	-0.000***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
Mother age	0.081***	0.020***	0.039***	1.731***	0.110***	0.058***
	(0.004)	(0.007)	(0.007)	(0.253)	(0.012)	(0.010)
Mother age squared	-0.001***	-0.000***	-0.001***	-0.024***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Boy	-0.004	-0.008	0.000	0.005	0.009	0.022**
	(0.003)	(0.006)	(0.006)	(0.224)	(0.011)	(0.009)
Parent's wealth	0.011***	0.020***	0.010***	0.351***	0.017***	0.014***
	(0.001)	(0.002)	(0.002)	(0.068)	(0.003)	(0.003)
Relationship quality: Duration	0.082***	-0.010*	0.023***	0.982***	0.024***	-0.045***
	(0.001)	(0.005)	(0.005)	(0.189)	(0.009)	(0.007)
Social stigma: Christian party share	-0.007	0.207***	-0.080	-6.860***	-0.432***	0.468***
	(0.032)	(0.063)	(0.060)	(2.284)	(0.112)	(0.090)
Family stigma: Grandparents divorce	-0.104***	-0.004	-0.019**	-0.319	0.011	0.007
	(0.003)	(0.008)	(0.008)	(0.296)	(0.014)	(0.012)
Observations	58,875	57,777	58,875	58,874	55,516	58,874

Notes: Population of Norway who had a first child between 1997-2001. All models control for the covariates listed in the table, as well as the expected value of our instrumental variable (IV) for peers working in the same workplace but in different years, the average outcome of workmates, and its corresponding expected value. The IV for parental marriage is the workmates' neighbors' marriage rate. Column (1) reports average marginal effects from the probit model for marriage (first stage), where the outcome is mother's participation. These effects remain largely consistent across different outcomes of interest. Columns (2)-(6) report the effect for cohabiting couples $beta_0$ for each variable, with bootstrap standard errors (200 repetitions) in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Heterogeneity across observables: Proxy for gender norms

	(1) First stage	(2) Father log earnings ($\beta_1 - \beta_0$)	(3) Mother participation ($\beta_1 - \beta_0$)
a) Gender norms			
Workmates' neighbours marriage rate	0.209***		
	(0.025)		
Paternal grandmother participation	-0.072***	-0.054***	-0.022
	(0.004)	(0.018)	(0.016)
Maternal grandmother participation	-0.104***	-3.951***	-0.172
	(0.004)	(0.550)	(0.255)
$\chi^2(1)$ for H_0: IV is irrelevant	71.2	58.2	71.2
Observations	58,874	57,522	58,874
b) Assortative mating			
Workmates' neighbours marriage rate	0.215***		
	(0.025)		
Parents same education	-0.008**	-0.005	-0.003
	(0.004)	(0.017)	(0.015)
$\chi^2(1)$ for H_0: IV is irrelevant	74.3	66.7	74.3
Observations	58,874	57,522	58,874

Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed in Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV and additionally in panel a) for two proxies for the gender norms of the parents, i.e. the grandmother from father participation and grandmother from mother participation (measured when the parent is age 15) and in panel b) assortative mating (an indicator for parents having the same level of education). Bootstrap standard errors (200 repetitions). The sample size is smaller when we consider either the father or the mother earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Estimated treatment effects of marriage versus cohabiting on child test scores and parents' separation

	(1) Test score age 11	(2) Separation by age 8
ATE	0.087	-0.090***
	(0.066)	(0.029)
ATT	0.039	-0.036
	(0.079)	(0.035)
ATUT	0.117*	-0.123***
	(0.070)	(0.030)
LATE	0.111	-0.078**
	(0.074)	(0.033)
Test for observed het (p-value)	0.000	0.000
Test for unobserved het (p-value)	0.425	0.002
Observations	57308	58874

Notes: Population of Norway having a first child between 1997-2001. The outcome in column (1) is the child's test scores at age 11 from national school exams and in column (2) is an indicator for the parents having separated by the child's age of 8. The model controls for all covariates listed in Table A1 and additionally for the workmates' average outcome and its expected value and the expected value of the IV. The IV for parental marriage is workmates' neighbors marriage rate. Bootstrap standard errors (200 repetitions). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Probit model for marriage: estimated marginal effects

	(1) Mother participation	(2) Mother hours	(3) Mother log earnings	(4) Father log earnings	(5) Fertility
Workmates' neighbours marriage rate (IV)	0.214***	0.224***	0.219***	0.210***	0.238***
	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)
Mother degree	0.100***	0.098***	0.095***	0.094***	0.095***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Father degree	0.124***	0.123***	0.113***	0.111***	0.121***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
Mother's employment	-0.058***	-0.065***	-0.040***	-0.067***	-0.068***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Father log earnings	-0.027***	-0.025***	-0.027***	-0.035***	-0.024***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Father's employment	0.143***	0.130***	0.150***	0.247***	0.115***
	(0.041)	(0.041)	(0.042)	(0.044)	(0.041)
Father age	0.012***	0.011***	0.011***	0.013***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Father age squared	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mother age	0.081***	0.081***	0.081***	0.079***	0.080***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Mother age squared	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Boy	-0.004	-0.003	-0.004	-0.003	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Parents' wealth	0.011***	0.011***	0.014***	0.010***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Duration (pre-birth)	0.082***	0.082***	0.082***	0.082***	0.082***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Christian party (share)	-0.007	0.001	0.133***	0.124***	0.007
	(0.032)	(0.033)	(0.035)	(0.033)	(0.033)
Grandparents divorce	-0.104***	-0.104***	-0.099***	-0.105***	-0.103***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Average workmates' outcome (predetermined)	-0.016**	-0.000	-0.002**	-0.004*	-0.020***
	(0.008)	(0.000)	(0.001)	(0.002)	(0.004)
Expected Average workmates' outcome (simulated)	-0.154***	-0.002***	0.055***	0.094***	0.045***
	(0.016)	(0.000)	(0.007)	(0.008)	(0.008)
Expected workmates' neighbours marriage (Expected IV)	-1.117***	-1.112***	-1.100***	-1.052***	-1.099***
	(0.029)	(0.029)	(0.030)	(0.029)	(0.029)
$\chi^2(1)$ for H_0: IV is irrelevant	73,4	80,6	72,3	69,8	90,8
Observations	58,875	58,874	55,088	58,140	58,874

Notes: Population of Norway having a first child between 1997-2001. The model controls for all covariates listed in the table. Bootstrap standard errors (200 repetitions). The sample size is smaller when we consider either the father earnings as outcome, because we exclude individuals with zero labor-related earnings. These excluded individuals have neither income from work nor work-related benefits such as unemployment, sick leave, or parental leave payments. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.