I Z A Institute of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17965

Career, Family, and IVF: The Impact of Involuntary Childlessness and Fertility Treatment

Fabio I. Martinenghi ®
Maryam Naghsh-Nejad ®

JUNE 2025

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17965

Career, Family, and IVF: The Impact of Involuntary Childlessness and Fertility Treatment

Fabio I. Martinenghi
University of Newcastle

Maryam Naghsh-Nejad
University of Technology Sydney and IZA

JUNE 2025

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Career, Family, and IVF: The Impact of Involuntary Childlessness and Fertility Treatment*

We use whole-population linked administrative data from Australia to examine the economic and mental health impacts of IVF treatment and involuntary childlessness. Leveraging detailed information on fertility treatment, income, and prescription drug use, we implement a dynamic triple-difference framework comparing women who remain childless five years after initiating IVF to those who successfully conceive. Results reveal large and persistent effects on both mental health and income. We further show that the IVF process itself leads to income declines among childless women, underscoring substantial unmeasured costs and suggesting downward bias in child penalty estimates that use unsuccessful IVF patients as controls.

JEL Classification: J13, J22, I14, I31, J16

Keywords: involuntary childlessness, IVF, mental health, labor market outcomes, fertility and career trade-offs

Corresponding author:
Maryam Naghsh Nejad
University of Technology Sydney
100 Broadway
Chippendale NSW 2008
Level 5, Building 20
Australia

E-mail: Maryam.Naghshnejad@uts.edu.au

* Certified random order of the authors (Ray and Robson, 2018). Naghsh-Nejad acknowledges that this project is supported by UTS Faculty of Health Seed Funding. The authors are grateful for comments received from Amanda Pallais and members of the SOLE Mentoring Program, the audience at the Australian Workshop on the Economics of Health and Wellbeing, Australia Health Economics Society meeting, Australian Gender Economics Workshop, American-European Health Economics Study Group, Melbourne Institute, and University of Queensland.

1 Introduction

The link between fertility and economic outcomes has been a central topic in economics (Aaronson et al., 2020; Adda et al., 2017; Cortés and Pan, 2023; Kleven et al., 2019c), highlighting its far-reaching implications for labor markets, household decision-making, and broader societal dynamics. While previous research has explored the economic and mental health consequences of fertility, relatively little is known about the impact of infertility and the use of Assisted Reproductive Technology (ART), such as In-Vitro Fertilization (IVF), on women's mental health and income. Given the increasing age at which individuals seek to have children (Beaujouan, 2023), the rising infertility (Levine et al., 2017), and the growing use of ART in developed economies (Kupka et al., 2024), understanding the potential impact of infertility treatments on women's outcomes is becoming a pressing issue.

IVF has enabled women to delay childbearing, providing them with greater flexibility to invest in their human capital, pursue higher education, and advance in their careers before pausing for family planning (Gershoni and Low, 2021b,a; Kroeger and La Mattina, 2017). For some women, IVF has provided a way to align their professional ambitions with their desire for motherhood, alleviating the traditional trade-off between career advancement and fertility.

However, IVF is not without significant physical, emotional, and financial costs. It is an invasive, time intensive, and demanding procedure, often requiring women to undergo multiple treatment cycles. Each cycle involves a complex regimen of hormone injections, egg retrieval, and/or embryo transfer, which can take a toll on both physical and mental well-being. Women who undergo IVF often face uncertainty, stress, and the emotional burden of possible failure (Gupta et al., 2024), as success rates for IVF are around 50% for women below the age of 30 and drop sharply with age, reaching lows of 7% for those aged 43 and higher[1].

Not all individuals who opt for IVF treatment will ultimately conceive and carry

[1] Information from IVF Australia, accessed on June 10, 2025: https://www.ivf.com.au/success-rates/ivf-success-rates

a pregnancy to term, leaving many women childless despite substantial time and financial investments in fertility treatments. In our sample of Australian women receiving IVF treatment from 2011 to 2021, we observe that 22% remain childless 5 years following initiating treatment. It is plausible to assume that the experience of this invasive treatment would impact one's mental health and labor market outcomes. The medical literature provides evidence on the mental health impacts of fertility treatments (Purewal et al., 2018; Gameiro et al., 2016; Hjelmstedt et al., 2003; Huang et al., 2019), however, there remains a gap in our understanding of labor market impacts.

The empirical economic literature on the causal impacts of infertility and ART treatments remains in its early stages. This underdevelopment stems from both the limitations in the available data and the inherent difficulties in identifying and isolating the relevant treatment effects. A primary challenge lies in observing key variables, particularly the intention to conceive. Intention is a subjective measure that is difficult to capture accurately, especially in administrative datasets, but even survey data often fail to provide a precise account of individuals' reproductive goals and efforts. Hence, distinguishing between voluntarily childless individuals and those experiencing involuntary childlessness presents a significant challenge.

This paper begins to fill this gap. We examine the impact of involuntary childlessness on women's mental health and income, focusing specifically on those who underwent IVF treatment. By observing the decision to pursue fertility treatments and the timing of these interventions, we are able to infer their intention to conceive. Using individual-level administrative data from the full population of Australia, and a dynamic triple difference-in-differences (DID) approach, we find that involuntary childlessness has a large and persistent impact on women, compared to having a successful pregnancy. First, it negatively affects their mental health for up to 5 years, as measured by their prescription records and their use of services related to mental health. Second, it positively affects their income via a lack of child penalty.

However, we find that initiating IVF is associated with a substantial income decline during the treatment period, even for women who ultimately remain childless.

Using a later-treated dynamic DID design—comparing women who remain childless five years after their first IVF transfer with those who also remain childless but initiate treatment later—we estimate that early initiators experience an annual income shortfall of approximately 14% relative to their pre-IVF baseline. In other words, had these women delayed IVF, their counterfactual income would have been about 14% higher annually during our observation period. A parallel analysis among women who eventually conceive after years of treatment reveals a similar pattern: in the years between treatment start and successful conception (around years 4–5), income falls significantly relative to their pre-IVF trend. This suggests that the preconception phase of IVF carries a measurable earnings cost, regardless of eventual fertility outcome. We interpret these findings in light of several plausible mechanisms: the emotional and mental-health burdens of prolonged treatment (as evidenced by increased prescription drug use and mental health service utilization), anticipatory labor market behavior in preparation for an impending pregnancy, or it is simply a time use issue, women who are spending their time on fertility treatments are unable to apply for promotions, work overtime, improve their skills, or have to rely on unpaid leave.

This paper contributes to multiple strands of economic research. First, we add to the emerging literature on the economic and psychological costs of infertility and IVF. Prior work has largely focused on ART access and utilization (e.g., Bitler and Schmidt, 2011; Hamilton and McManus, 2012), while the broader consequences of infertility—particularly for those who remain involuntarily childless—have received less attention in economics. An exception is a contemporaneous paper to ours, Bögl et al. (2024) that uses administrative data from Sweden and finds similar results to ours on the impact of involuntary childlessness on mental health and income[2]. However, we go further by showing that the IVF process itself depresses earnings—even when not followed by parenthood, providing the first evidence on the impact of going through infertility treatment on women's labor market outcomes.

[2]Bögl et al. (2024) also exploits a policy discontinuity in Sweden's public IVF funding to examine the role of insurance coverage and willingness to pay.

Second, our study contributes to the literature on the child penalty and the long-term labor market effects of parenthood. A robust body of research has documented the persistent earnings losses women face after having children, in contrast to minimal effects on men (Angelov et al., 2016; Kleven et al., 2019b,a; Ilyana et al., 2018). We specifically relate to the strand of this literature where the child penalty is measured by comparing unsuccessful and successful IVF patients in measuring the child penalty (Lundborg et al., 2017, 2024; Ilciukas, 2025; Bensnes et al., 2023; Gallen et al., 2023). Our findings raise caution to this approach by showing that IVF imposes its own economic burden, particularly among women who remain childless. This complicates the use of unsuccessful IVF patients as a clean counterfactual and underscores the importance of considering the IVF treatment effects separately from parenting effects.

Third, we expand on work examining the links between mental health and economic outcomes. A large literature shows that poor mental health reduces employment and income potential over the life course (Currie and Stabile, 2006; Evensen et al., 2017). We contribute to this literature by focusing on infertility and IVF treatment—stressful experiences that can induce substantial emotional distress, even in the absence of a formal diagnosis. Using administrative prescription data, we provide longitudinal evidence on the mental health consequences of prolonged, unsuccessful attempts to conceive, highlighting how reproductive health events shape women's well-being and economic trajectories.

Fourth, we contribute to the economics of healthcare and medical innovation, particularly in the context of reproductive technologies. While much attention has been paid to the direct costs and insurance design of ART (Bitler and Schmidt, 2011; Schmidt et al., 2012), little is known about the long-term economic effects of undergoing treatment. Our findings reveal that IVF can have substantial hidden costs, suggesting the true burden of fertility care extends far beyond its ticket price and may warrant broader public policy consideration.

Finally, we extend the health shock literature by analyzing the economic impact of a non-life-threatening, but consequential health condition: infertility. Existing studies focus primarily on acute and diagnosable events—such as cancer, cardiovascular episodes, or mental illness—that disrupt labor market participation and income (Jones et al., 2020; Dobkin et al., 2018; García-Gómez et al., 2013). While infertility and IVF treatment involve prolonged uncertainty, emotional toll, and identity stress, yet it has been largely absent from economic analyses of health shocks. By documenting persistent income and mental health effects among women who undergo IVF, our study brings attention to a broader class of health shocks—those with gradual onset, unpredictable outcomes, and substantial life-course consequences.

Together, these contributions offer a more comprehensive picture of how reproductive health challenges affect women's economic and emotional well-being. Our results suggest that the journey through IVF—even when it does not result in motherhood—has long-lasting economic and psychological implications. In doing so, we show how treatment processes themselves can generate significant unintended consequences that deserve greater attention in economic models of health, fertility, and labor supply.

The rest of the paper is organized as follows. Section 2 describes the institutional background around funding and use of IVF in Australia. Section 3 presents the data sources and samples used in the analysis. Section 4 briefly introduces the econometric methods used. Section 5 shows the baseline results, on the effect of childlessness on mental health and income. Section 6 shows our results on the effect of "going through IVF" on mental health and income. And section 7 concludes.

2 Institutional background

Australia's institutional environment is particularly useful for studying the economic and mental health impacts of ART and IVF—especially in the context of involuntary childlessness. IVF is widely accessible in Australia through a hybrid system of public insurance and private service provision, and the country maintains some of the most comprehensive data infrastructure for reproductive healthcare in the world.

2.1 ART in Australia: Access and Financing

Under Australia's universal health insurance scheme, Medicare, individuals are entitled to government-subsidized ART services, including in-vitro fertilization (IVF). The coverage started in 2000 and offers a partial reimbursement of all "medically necessary"[3]. ART procedures—such as consultations, ovarian stimulation, egg retrieval, embryo transfer, and laboratory services—are subsidized for all women, regardless of age, number of previous cycles, or existing children (Chambers et al., 2012). However, patients are typically responsible for out-of-pocket costs that vary by clinic. In the period of our study between 2012-2023 the average out-of-pocket costs per IVF cycle fluctuate between AUD 2,289-1,994[4] (Figure 7 in the appendix).

Importantly, there are no nationally-mandated caps on the number of ART cycles a woman may pursue with Medicare subsidies. This is in contrast to several European countries, such as Sweden or the UK, where access to publicly-funded ART is limited by age, parity, or the number of previous attempts. The lack of binding public rationing allows Australian women to pursue multiple cycles based on individual preferences and clinical advice, generating rich variation in treatment exposure. While in other systems the presence of hard thresholds likely shape the incentives at play and the impact on women of a failed cycle, in Australia, each cycle has a similar (reduced) cost to the consumer[5]. In our data, an individual undergoes an average of 6 transfers across the samples of those who remain childless or succeed in conceiving a child (2 and 3). Figure 1 shows that the average number of cycles per year since the start of one's IVF treatment has remained stable over the time span

[3] A general practitioner (GP) needs to make a referral to a fertility specialist who will then determine whether the patient meets the clinical criteria for ART treatment. This GP will make the referral if a couple has been unsuccessful in conceiving a child after one year of unprotected sex and after undergoing basic medical tests to rule out other underlying issues. Hence, IVF treatment is often not the first step in this process.

[4] The dollar amounts throughout the paper are corrected for CPI and pegged to 2012 dollars.

[5] This is in contracts with, for instance, Sweden, where IVF is fully subsidized (free of charge to the consumer) for up to three cycles (see Lind, 2020, citing regulations set by the Swedish Association of Local Authorities and Regions, SALAR). After the third cycle, the subsidies drop to zero. In this setting, the failure of even the first cycle could have a significant impact on the woman's well-being.

of our study.

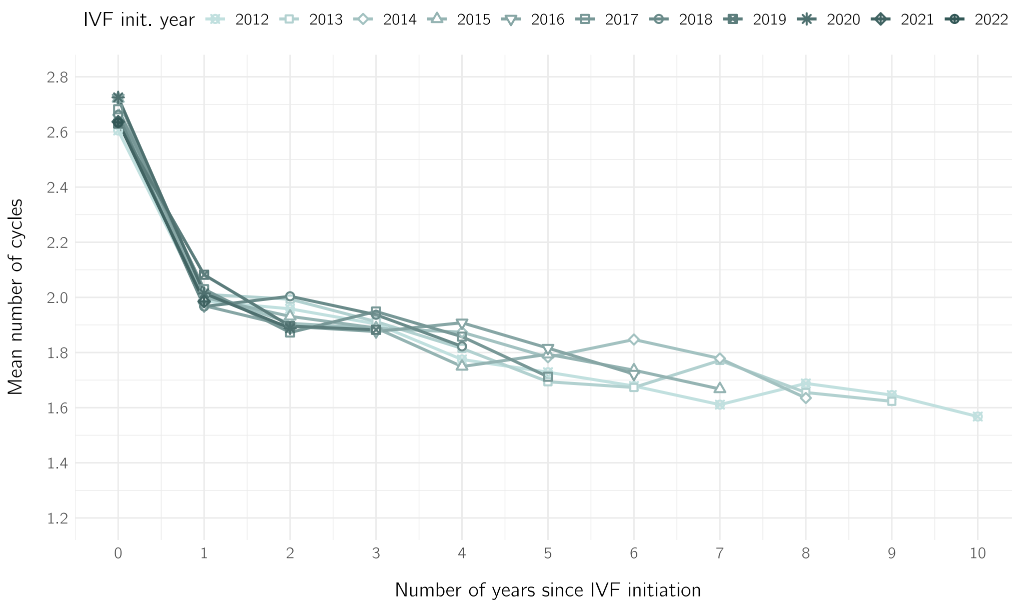


Figure 1. Mean number of cycles since IVF initiation

Notes. This figure groups women by the year in which they initiated IVF treatment. It plots their mean number of IVF cycles for each year since initiation that we can observe. We stop counting in 2022, so that we can observe a full year of data for women who started in 2021, two years for those started in 2020, etc. For each woman, we start counting one year (365 days) since the exact date in which we observe IVF initiation. This is different from our analysis, where the calendar year in which IVF was initiated is counted as Year "zero". Calculations based on population-level Medicare data.

ART services in Australia are delivered almost entirely through private fertility clinics, which operate under federal regulation by the National Health and Medical Research Council (NHMRC). These clinics are required to report all procedures and outcomes to the Australian and New Zealand Assisted Reproduction Database (ANZARD), ensuring comprehensive monitoring and accountability. Regulatory oversight is robust, with an emphasis on maintaining ethical standards, ensuring clinical quality, and protecting patient welfare. A key example is the NHMRC's recommendation to prioritize single embryo transfers (SET) over multiple embryo transfers, in order to reduce the health risks associated with multiple births (National Health and

Medical Research Council, 2017). This guidance is reflected in clinical practice: in 2022, 94.2% of all embryo transfers in Australia were SET, and only 2.7% of ART births resulted in multiple births (Newman et al., 2024).

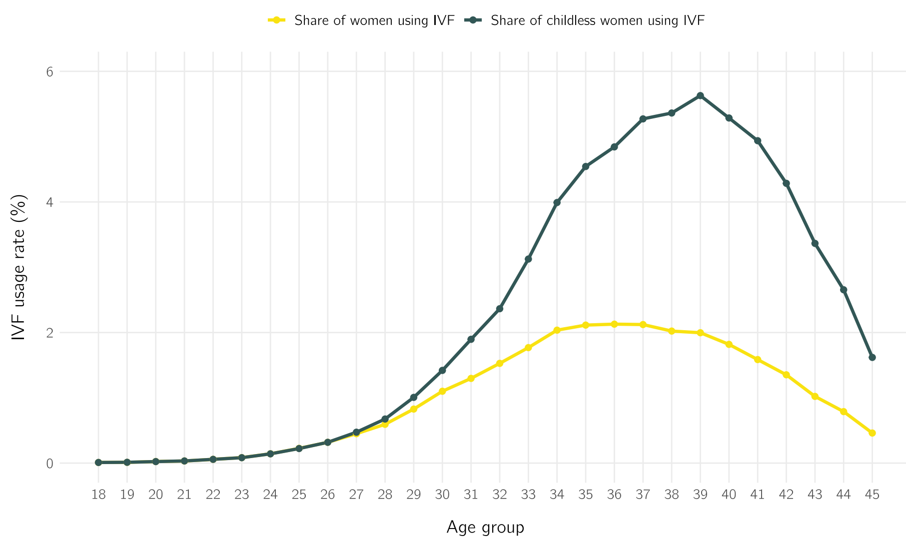


Figure 2. Share of women using IVF in 2021

Notes. This figure plots the incidence of IVF use among women (regardless of prior birth) and among women who are childless in 2021. The plot uses a sample that includes all women linkable to both Medicare and 2021 Census. Information on women aged 16 and 17 was censored as their counts were lower than 10, following ABS statistical disclosure policy.

ART has become a widely utilized option for Australians facing fertility challenges. According to recent data, around 17,963 ART babies were born in 2022 in Australia (Newman et al., 2024), accounting for about 6% of all live births[6]. This high rate of utilization is attributed to growing awareness and acceptance of ART, coupled with its widespread availability and affordability. In our sample over the years 2012-2021, we find that the share of women using IVF reaches a high of 2.13 percent at age 36 while the share of childless women using IVF peaks at 5.8 percent at the age of 39 (Figure 2). We also find that the incidence of IVF use among

[6]There were 300,684 live births in Australia in 2022. Data accessed at `https://www.abs.gov.au/statistics/people/population/births-australia/2022`

Australian women has slowly increased over the years[7] (Figure 8 , Panel 1 in the appendix)

The age of women undergoing IVF in Australia has remained predominantly stable over our study period (Figure 9 in the appendix). While IVF usage spans a range of age groups, the highest demand is among women aged 34–39, reflecting the impact of maternal age on fertility.

2.2 *The IVF Process*

IVF encompasses a range of fertility treatments in which eggs and sperm or embryos are handled outside the human body. The most common form is in-vitro fertilization (IVF), which involves multiple stages.

A typical IVF cycle begins with controlled ovarian hyperstimulation, during which the patient receives hormone injections—follicle-stimulating hormone (FSH) or gonadotropins—to induce the production of multiple eggs. These eggs are then retrieved via a surgical procedure—oocyte pick-up—and fertilized in the laboratory with sperm. Resulting embryos are cultured for several days, and one or more are then transferred into the uterus, with the remainder being potentially frozen for future use. Each transfer is followed by a waiting period to assess implantation success, and multiple cycles are often required before a pregnancy is achieved. Treatment may be halted at any stage due to various factors, such as inadequate response to ovarian stimulation, unsuccessful egg retrieval, failed fertilization, poor embryo development, or personal choice. In Australia, the average success rate for first complete egg retrieval cycle for a 35 years old woman is around 38%[8], and it declines rapidly with age. Many women undergo multiple cycles over several years, with no guaranteed outcome. In our sample, 22.17% remain childless 5 years after starting their IVF

[7] That is based on our sample, using population-level data that links IVF-use (via Medicare data) to demographic information (via ABS *Combined Demographics*),

[8] This estimate is from the government provided website `https://yourivfsuccess.com.au` for a woman aged 35 with a similar age partner and using own egg and with unexplained infertility. The estimate was gathered on May 29, 2025.

treatment while 18.89% are still childless 11 years after, the longest span of time we can observe in our data Figure 3.

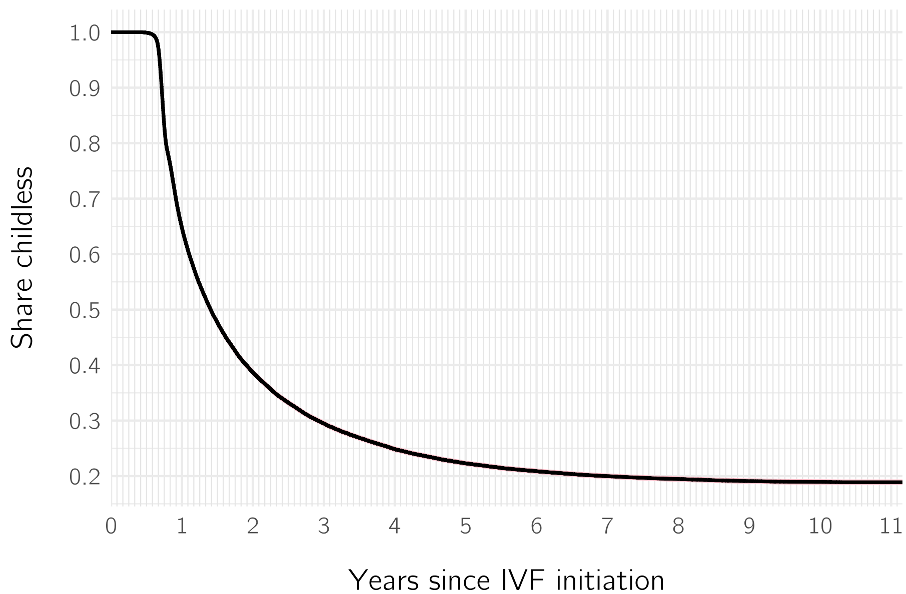


Figure 3. Proportion of childless women since IVF initiation - Kaplan-Meier plot

Notes. This figure plots the (nonparametric) Kaplan-Meier estimate of the survival function, where the event is "having a live birth", using of the Kaplan-Meier estimator. In other words, it tracks women starting from their IVF initiation until they are last observed. It displays the probability of a woman being childless at each given day since initiation. It was estimated on a sample including all women with IVF records (in MBS) linkable to 2021 Census data.

The outcome—conception—is rather stochastic in nature, and this extends to conception via IVF. Indeed, while factors such as age and reproductive health influence the probability of conception, chance (idiosyncratic factors) plays an important role. Fertile couples in their 20s have a 25% chance of conceiving spontaneously in each menstrual cycle (ACOG, 2023), and a $41 - 47\%$ probability of conceiving via IVF per IVF cycle[9]. In either case, the residual variation in conception remains large

[9]Estimates computed on 10 May 2025 via the online government-funded IVF prediction tools: `YourIVFSuccess.com.au`, based on Australian data, `https://www.cdc.gov/art/ivf-success-estimator/index.html`, based on US data, and `https://w3.abdn.ac.uk/clsm/opis/tool/ivf1`, based on UK data. The parameters set for the first prediction tool were: "Age of

and is plausibly idiosyncratic. The persistently low precision of clinical prediction models for IVF pregnancies, even the most recent ones (C-indices between 0.6-0.7 McLernon and Bhattacharya, 2023), is also consistent with some variation in IVF success being idiosyncratic. This could help make sense of the "nice properties" exhibited by the sample and shown in Section 4: overlapping pretrends and good balance across treatment groups.

Finally, IVF cycles are physically, emotionally, and financially taxing. The side effects of hormonal stimulation, the uncertainty of success, and repeated failures contribute to elevated psychological stress, particularly for patients who do not ultimately achieve a live birth. These experiences are often compounded by social pressures and the stigma associated with infertility.

2.3 Relevance for Identification

Australia's institutional setting provides an especially strong foundation for identifying the long-term effects of fertility treatment and involuntary childlessness. IVF (and ART more in general) is broadly accessible under Medicare, with subsidies that reduce financial barriers and allow for extensive use across socioeconomic groups. This stands in contrast to more restrictive or market-based systems in other countries, where access is often limited by income, insurance status, age, or marital status. In Australia, IVF is available regardless of marital status or sexual orientation, mak-

person intending to carry the pregnancy: 22", "Sperm provider's age: 22", "Previous pregnancy: No", "Main infertility diagnosis: I have not had any tests carried out, or I do not have medical infertility", "Previous IVF treatment: No". The outcome was "having a baby in the 1st complete egg retrieval cycle" For the second tool the parameters were: "Age: 22 years", "Weight: 110 lbs", "Height: 5 feet", "Number of IVF cycles used: I've never used IVF", "Number of prior pregnancies: None ", "Number of prior births: None", "Egg source: My own eggs", "Diagnosis: I don't know/no reason". The outcome was "cumulative chance of live birth after 1 retrieval and all transfers within 12 months." For the third tool, the parameters were: "What is your age? 22", "How many years have you been trying to conceive? 0", "Have you been pregnant before? No", "Do you have a problem with your tubes? No", "Do you have an ovulation problem? No", "Do you have a male factor fertility problem? No", "Do you have an unexplained fertility problem? No", "Do you plan to have IVF or ICSI? IVF" The outcome was "chance of having your first baby after 1 complete cycle of treatment."

ing the treated population more diverse and representative of individuals with a revealed intent to conceive.

The affordability of IVF not only mitigates equity concerns, but in doing so it also mitigates selection-bias when comparing successful and unsuccesful IVF patients. In other words, the more affordable an IVF cycle is, the less the number of (potential) attempted cycles—and cumulative chance of success—will depend on the household's income[10]. Moreover, the absence of rigid national rationing rules—such as caps on the number of cycles or strict age limits—permits a wider range of treatment trajectories, including prolonged and repeated IVF use. This variation is essential to studying the cumulative effects of treatment, including outcomes for those who remain childless after multiple attempts.

3 Data & Study samples

Our analysis draws on the Person Level Integrated Data Asset (PLIDA), a comprehensive, population-wide longitudinal dataset curated by the Australian Bureau of Statistics (ABS). PLIDA integrates de-identified administrative records from multiple government agencies, enabling detailed tracking of individuals across a wide range of domains, including employment, income, healthcare utilization, and demographic characteristics. Crucially, the dataset encompasses nearly the entire Australian resident population, allowing for a granular and longitudinal analysis of life-course outcomes.

We started with the full population of all women initiating IVF treatment (gathered from Medicare records) from 2011 onward, which accounts for 272,648 women after dropping duplicates and women who do not have a cross-dataset identifier (*SPINE_ID*). We link their data to prescription drugs use (from Pharmaceutical Benefits Scheme (PBS)), health services use (from Medicare Benefits Schedule (MBS)), their income (from Australian Taxation Office (ATO)), and their 2021 Census responses. Then, we restrict the sample to those aged 25-56 at the time of starting

[10] A regression of income on remaining childless 5 years following start of IVF in our sample supports this argument (the coefficient is insignificant).

their IVF treatment, who do not have any child and initiate their treatment for the first time in our sample[11]. To ensure we are observing the first treatment we removed those who started their treatment in 2011. This leaves us with 121,247 women. As we are interested in birth outcomes after 3, 4, 5, or 6 years after the start of their IVF journey—for instance—when we allow for a 3-years follow up, we further restrict our sample by dropping women whose first IVF cycle occurred after 2018. If the follow-up period is longer, we also drop women whose first cycle occurred earlier—namely, in 2017, 2016, 2015 for 4-, 5-, and 6-year follow-ups, respectively.

In addition to identifying IVF users in the population, Medicare data also allows us to follow mental health prescription medication use (including anti-psychotics, anti-psychotics, anti-depressants, or psycho-stimulants) and psychological therapy sessions (including GP mental health visit, psychiatrist visits, etc.) to examine potential mental health impact of IVF treatments[12].

Economic and employment information is sourced from Australian Taxation Office (ATO) records, which offer comprehensive data on income from employment, business, investments, and other sources. These records span the 2009 to 2022 financial years, with each year running from July 1 to June 30[13]. Employment-related income—such as wages, salaries, bonuses, and commissions—is reported directly to the ATO by employers, significantly reducing measurement error associated with self-reported earnings. In evaluating the income effects, we further narrow the sample to those who had greater than the equivalent of a full-time minimum-wage job two and three prior to their first IVF cycle. This employment restriction reflects our focus on assessing the labour market impact of IVF among women with prior attachment to the labor market.

[11]We further remove anyone that has passed away during the timeline of our study.

[12]Mental health variables here are binary variables that indicate 1 if there was any use of mental health prescription drug or mental health services use within a calendar year.

[13]Because our other data follows the calendar year, we make the choice to count, for instance, 2015/16 income as 2016 income. We follow this rule for each year. Following our 2015/16 example, it implies that income changes in the second half of 2015 are recorded as 2016 changes.

4 Empirical strategies

In this section, we present the two methods used in our analysis: dynamic triple difference-in-differences (DTDiD), and later-treated dynamic difference-in-differences (LTDDiD). Both these methods take a model-based approach to identify the target parameters, as they focus on modelling the outcome rather than the treatment assignment mechanism (design-based approach). Such a model-based approach is preferable in this context where the treatment assignment—conception attempts, their success, and their timing—is likely endogenous to our income and mental health outcomes, and the factors determining it are only partially observed. The target parameter is the dynamic average treatment effect on the treated (DATET), which captures causal impacts on the treated population. The treated population is defined differently depending on the outcome and the method, as each regression answers a different question.

4.1 Dynamic Triple Difference-in-Differences

To study the impact of childlessness on female outcomes among the IVF population, we take a DTDiD approach. We first implement it non-parametrically, by simply taking the difference between mean outcomes binned by relative time and treatment group. Then, we implement it via the following equation:

$$Y_{it} = \alpha_i + \lambda_t + \sum_{s \neq -2} \sigma_l D_{sit} + \sum_{s \neq -2} \tau_s D_{sit} * \text{Childless}_{ki} + \beta * X_{it} + \epsilon_{it} \tag{1}$$

Where α_i and λ_t are individual and calendar time fixed effects, respectively; Childless_{ki} is an indicator for being childless k years after the first IVF cycle. D_{sit} are indicators of being s years away from treatment start. We drop D_{sit} for s equal to -2[14] as the base year. Finally, X_{it} is a matrix of controls exclusively including a full set of single-year age indicators.

[14]In all estimations, we use year -2 as the reference period to ensure a neutral baseline, chosen to precede any potential anticipatory or treatment-related effects.

Intuitively, we take the difference between the event-study coefficients of women who were childless k years after their IVF initiation—defined as their first IVF-related item in the MBS dataset—and women who had a successful pregnancy within those k years. In other words, our approach works by estimating a dynamic DiD (or event study) per each treatment group—women childless for k years after IVF initiation women who had a successful pregnancy during that period—and then taking the difference between the two sets of dynamic treatment effect estimates.

Within this approach, treatment-group-specific dynamic DiD's are allowed to be biased as long as their bias is parallel (Olden and Møen, 2022). Specifically, a woman's IVF initiation is scheduled in advance and much anticipated, so that a dynamic DiD on the effect of her IVF initiation on mental health and income displays pretrends—this can be seen in Figure 4 by considering each treatment group separately. Instead, our TDDiD estimates are unbiased as long as the potential outcomes for the two treatment groups are parallel. Such is the case in this application, as supported by the parallel pretrends shown in Figure 4, and Tables 2 and3

We implement this approach using a two-way fixed effects model estimated via OLS. We are aware of the potential contamination-bias issues arising from cohort heterogeneity (Sun and Abraham, 2021). We choose this approach on (statistical) efficiency grounds and present evidence supporting the implied cohort homogeneity assumption in Section 5.2. Finally, the non-parametric estimates in Section 5.1 should mitigate concerns that our findings are an artefact of our choice of estimator and model.

4.2 Heterogeneity: male infertility

To examine heterogeneity based on the presence of male infertility, we use an interaction-based model. In this specification, the relative time variable is re-coded as a binary *Post* indicator, capturing the post-treatment period (years 0–2), relative to the pre-treatment period (years -4 to -2). This simplification allows us to interact the treatment effect with male infertility status without introducing an overwhelming number of interaction terms. The model is specified as follows:

$$Y_{it} = \beta \cdot \text{Post}_{it} \cdot C_i + \tau \cdot M_i \cdot \text{Post}_{it} \cdot C_i + \eta X_{it} + \gamma_t + \pi_i + \varepsilon_{it} \tag{2}$$

Here, M_i is an indicator for the presence of male infertility, C_i denotes the treatment group, and X_{it} is a vector of time-varying controls. The coefficient β captures the average estimated effect of IVF initiation in years 0–2 on women without a partner with male infertility, while $\beta + \tau$ represents the corresponding effect on women with a partner with male infertility.

4.3 Later-treated Dynamic Difference-in-Difference

To estimate the causal impact of undergoing IVF treatment on mental health and labor market outcomes—regardless of eventual fertility success—we employ a dynamic difference-in-differences (DiD) framework with later-treated control units, following the approach developed by Fadlon and Nielsen (2019, 2021). Specifically, we compare the outcomes of women who initiate IVF and remain childless in the subsequent 3 to 5 years (the treatment group) with the pre-IVF outcomes of observationally similar women who also remain childless but started IVF at a later period (the control group). This design exploits variation in the timing of treatment among those who eventually undergo IVF, helping to isolate the impact of the treatment process itself from time-invariant individual characteristics.

While biological factors such as age and underlying reproductive health conditions influence IVF outcomes, a substantial component of treatment success is driven by stochastic or idiosyncratic factors (e.g., embryo viability or implantation outcomes). Nonetheless, there may be systematic differences in unobserved risk factors—such as genetic predispositions, undiagnosed health conditions, or adherence to medical protocols—that affect both treatment outcomes and post-treatment trajectories. By focusing on within-person changes and comparing them to the future-treated control group, our dynamic DiD approach helps mitigate these confounding influences and captures the effect of engaging with IVF on mental health and earnings.

We estimate the following equation:

$$Y_{it} = \sum_{\substack{r=-4 \\ r\neq-2}}^{4} \delta_r \cdot \mathbb{I}_{ir} + \sum_{\substack{r=-4 \\ r\neq-2}}^{4} \theta_r \cdot \mathbb{I}_{ir} \cdot V_i + X_{it}\beta + \gamma_t + \pi_i + \varepsilon_{it} \tag{3}$$

where Y_{it} is the outcome of interest (e.g., annual earnings or mental health) for individual i at time t. The variables $\mathbb{I}_{ir}$ are event-time indicators that denote years relative to IVF treatment initiation, with $r = 0$ corresponding to the year treatment begins. These indicators interact with V_i, a treatment group indicator equal to one for women who began IVF between 2011 and 2013 (treatment group), and zero for those starting between 2013 and 2016 (control group). For the control group, a placebo treatment year is defined as three years prior to actual treatment. The coefficients θ_r capture the dynamic treatment effects of IVF across time relative to the first cycle.

Matrix X_{it} is a matrix of controls exclusively including a full set of single-year age indicators. Year fixed effects γ_t control for common shocks and macroeconomic trends, while individual fixed effects π_i account for time-invariant unobserved heterogeneity, such as underlying health or work preferences.

A central identifying assumption of this DiD framework is that, in the absence of IVF treatment, the treatment and control groups would have exhibited parallel trends in outcomes. We assess the validity of this assumption by first comparing baseline characteristics. Table 4 in the Appendix presents summary statistics for demographic, and socioeconomic characteristics prior to IVF initiation, for the three-year childless later-treated sample. The results indicate strong comparability between early and later-treated groups.

We further assess the plausibility of the parallel trends assumption empirically in Section 5 by examining pre-treatment earnings trajectories (Figure 6). Event-study estimates show no statistically significant differences in income trends between the two groups prior to treatment, reinforcing the credibility of our identification strategy and supporting the use of later-treated women as a valid counterfactual.

5 Baseline results

In this section, we present our evidence on the effect of childlessness on the mental health and income of women, focusing on an IVF cohorts.

5.1 Nonparametric Dynamic DiD

We start our investigation by taking a simple non-parametric approach. In Figure 4, we show mean MH-drugs use (4a) and income (4b) by event time—where "event" is defined as IVF initiation—and by treatment group—i.e. women that were or were not childless 5 years after their IVF initiation (treatment and control respectively). We also take the difference between these two vectors of coefficients—thus estimating the target treatment effects—but report them in Appendix in the interest of space (Tables 6 and 7).

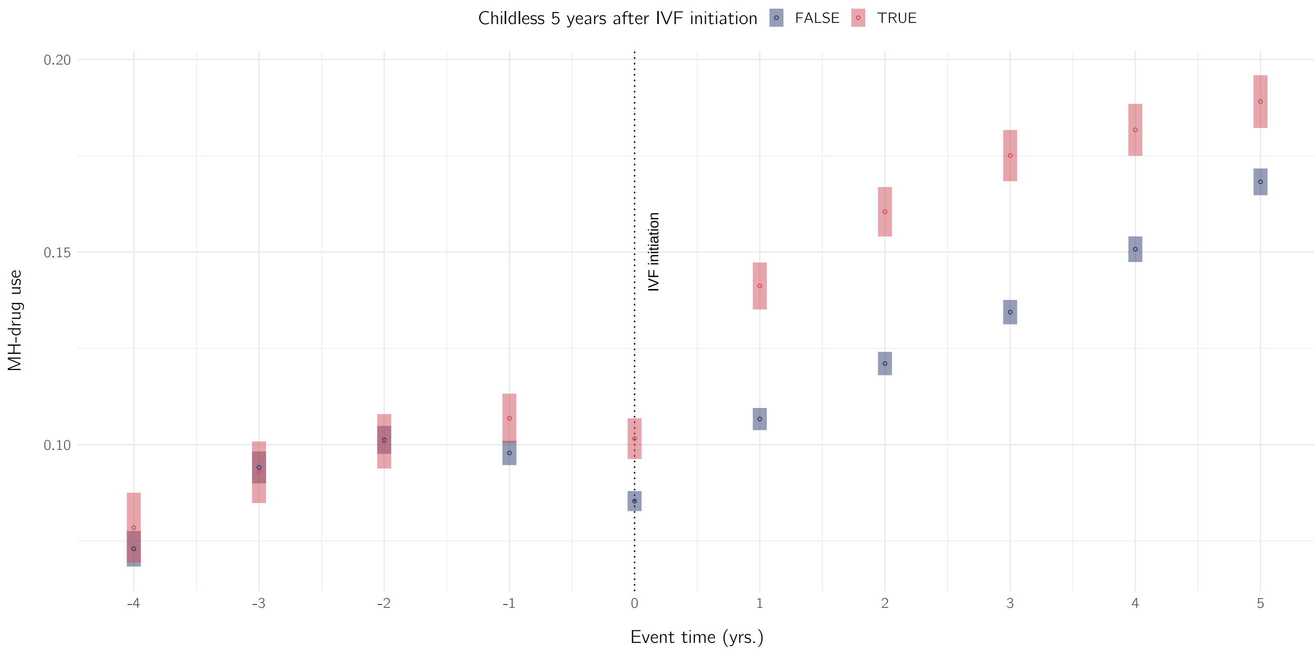
We find that childlessness has a persistent effect on mental health, peaking at 4 p.p. in the second year since IVF initiation and then displaying a slow downward trend. When looking at income effects among a sample of women earning at least the equivalent of a full-time minimum wage, it it not surprising to see a stark drop in the annual earnings after childbirth. This is the "child penalty" effect, which we estimate at 16,557 AUD per year, on average, in the 5 years of childlessness following IVF initiation—or 20,490 AUD per year (27% of baseline income) if we don't count the first year, mostly occupied by the potential pregnancy. What is more novel and perhaps less expected is the multi-year inflection in earnings displayed by the group of women that remain childless throughout our period of observation. This pattern points to a potential effect of the challenging experience of going through IVF treatment on the income of women—and hence the potential presence of bias in this approach to measuring the child penalty. However, this finding can only be suggestive of a causal relationship and is in need of a more formal investigation, which we conduct in Section 6.

Moreover, it can be noted that the effect on income is lagged—taking off in year

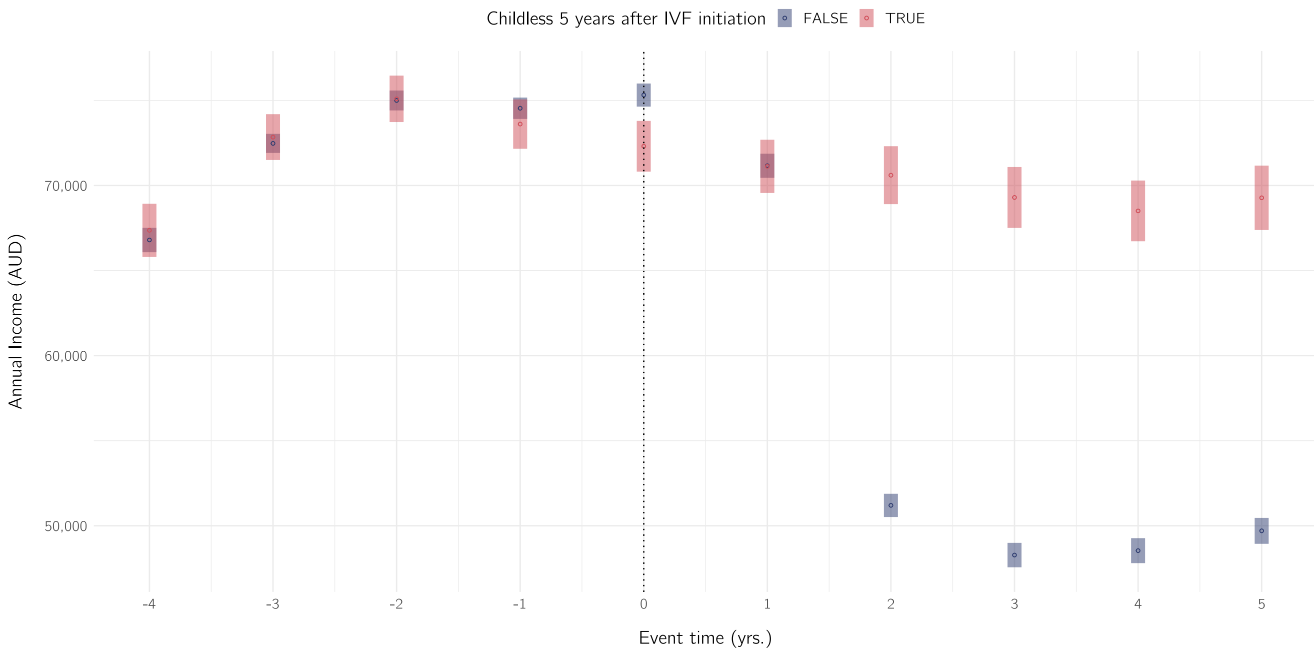
2—while the mental health effect is instantaneous. This difference is, in part, due to the nature of these shocks. A pregnancy can affects one's ability to work even months after conception, while the outcome of an IVF transfer—with the mental-health shock it represents—is learnt within less than a month from its occurrence. In part, however, this difference is due to the way in which the income variable is constructed. In our dataset, individual income captures one's income between 1 July and 30 June of the year after—following the fiscal rather than calendar year. We count, for instance, 2015/16 income as 2016, thus recording income drops in the second half of 2015 as 2016 drops. Instead, our Medicare data follows the calendar year.

Going back to the quick feedback around the outcome of an IVF cycle—it can be noted that in year zero (event time), the childless group experiences at once a reduction in income and an increase in MH-drugs use. This is consistent with childless women having a worse experience at their first transfer relative to the ones that are successful—including, potentially, miscarriages. Similarly to other results, this findings remains stable when taking a parametric approach.

Finally, in the Appendix, we report results investigating effect heterogeneity by year if birth, binned in 5-year cohorts (Figures 11 and 10). The impacts are remarkably consistent across cohorts. Moreover, a pattern of interest emerges in Figure 10: even when pretreatment income trends do not overlap across treatment groups, they remain parallel until IVF is initiated (the event). We also report a significant impact of the same sign on MH visits, with smaller coefficients (Figures 12 and 13).



(a) any MH drugs (p.p.)



(b) Annual Income (AUD)

Figure 4. Mean outcomes by relative time to IVF initiation

Notes. This figure plots mean MH-drugs use and income by event time—where "event" is defined as IVF initiation—and by treatment group—i.e. women that were or were not childless 5 years after their IVF initiation (treatment and control respectively). All women are childless (nulliparous) at event time zero. It does not plot regression estimates. The points represent sample means, while the shaded band 95% confidence intervals.

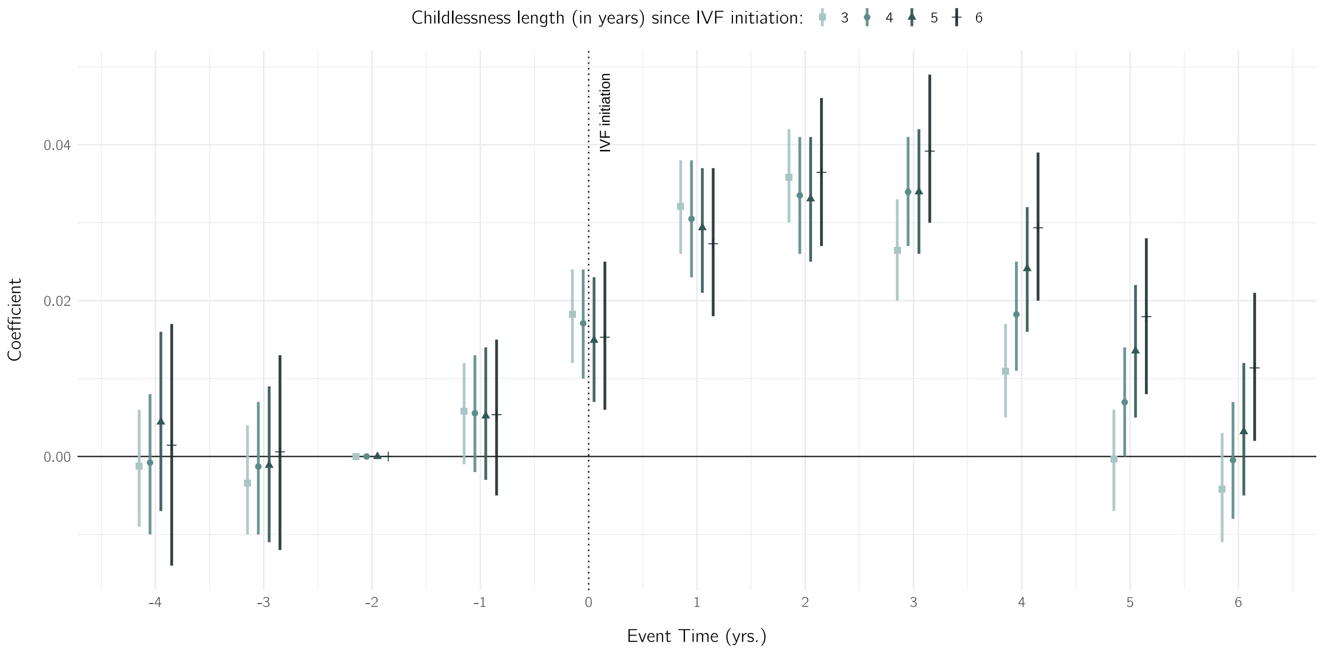
5.2 Parametric Dynamic DiD

Our parametric estimates, found by estimating Equation 1 via OLS, are consistent with those of the simple nonparametric estimator. In Figure 5, we display our treatment effect estimates for women experiencing for those who remained childless 3, 4, 5, or 6 years[15]—where the counterfactual is built using women who already had a child in a similar period since their IVF initiation, respectively. The estimates are consistent across these samples, and the effect size seems to be increasing with the length of the childlessness spell. In the Appendix, Tables 11, 12, 13, and 14 report the estimates visualised in Figure 5.

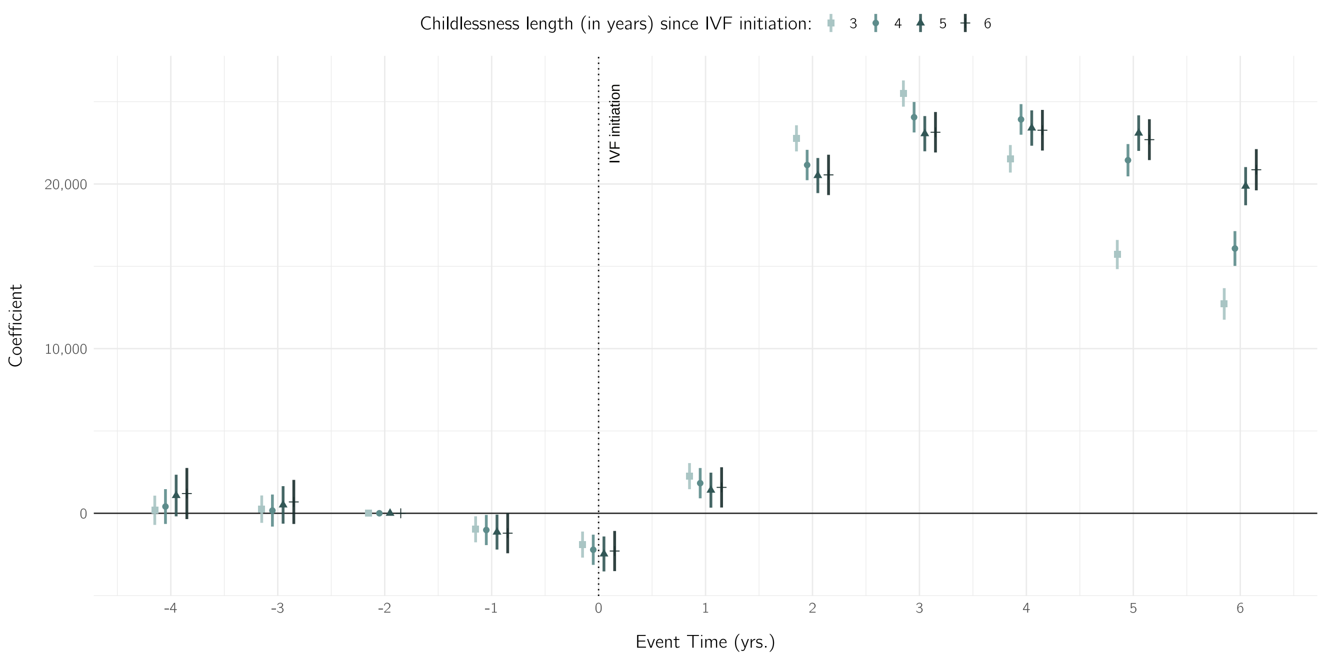
Mental-health impact range between 3 and 5 p.p. in the 5 years following the first IVF transfer, peaking between year 2 and 3, depending on the sample. Similarly, the income impact peaks between 23,000 and 25,500 AUD (31% and 34% of baseline income respectively) year 3 post initiation, depending on the sample. The impact of childlessness on income seems to be more persistent for the groups with longer period of remaining childless consistent with the fact the control would have had a child during that period. Once again, as can be seen clearly in Figure 4b, the jump in income for childless women is a product of a fall in the income of women carrying or caring for their newborn.

From an econometric perspective, Figure 14 and 16 in the Appendix provides no evidence of treatment effect heterogeneity across treatment cohorts (i.e., partitions of sampled women by the year of IVF initiation) or across different age groups at the time of IVF initiation, repsectively. The former heterogeneity, if it were present, would bias the TWFE estimator used in our analysis (Sun and Abraham, 2021). Instead, estimates are remarkably homogeneous across treatment cohorts.

[15]We also report the results for lack of success after only one year post IVF initiation in Figure 15 in the appendix. We find that similar trends, however with smaller coeficient sizes consistent with the fact that many continue their IVF treatment past the first year and have children in the years following, hence the difference between the treatment and control group is smaller.



(a) any MH drugs (p.p.)



(b) Annual Income (AUD)

Figure 5. Effect of Childlessness on Female Outcomes

Notes. This figure plots the dynamic treatment effect estimates from Equation 1, on the effect of childlessness on the income and use of mental health prescription drugs, among women initiating IVF. Different shades of blue indicate that the estimates come from different samples. For instance, the lightest shade of blue is associated with a sample where women who were childless in their third year since IVF initiation are compared to women who had their first child by that time. Darker shades indicate samples with longer childlessness spells. The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.

5.3 Male infertility

To investigate whether the presence of male infertility in a couple alters the mental health and economic outcomes for women undergoing IVF, we estimate Equation 2 using both income and mental health prescription drug use as outcomes. This specification allows us to test whether the impact of IVF treatment varies depending on whether infertility is diagnosed in the male partner.

Table 1, Column 2 show no statistically significant difference in income effects between women in couples with male infertility and those without. This suggests that, on average, the labor market consequences of IVF treatment do not differ based on which partner is diagnosed with infertility. One interpretation is that since the positive income impacts were due to lack of child penalty, that effect remains regardless of the underlying cause of infertility.

In contrast, in Table 1, Column 3, we find a significant difference in mental health outcomes. Specifically, women in couples where male infertility is diagnosed are significantly less likely to use prescription medications for mental health during the post-treatment period. The magnitude of this differential effect is nearly equivalent in size (but opposite in sign) to the average treatment effect found in the overall sample. In other words, among women in couples with male infertility, we do not observe the increase in mental health-related medication use that we see for the broader IVF-treated population.

This result is notable and suggests that the psychological burden of IVF treatment may be mitigated when the infertility diagnosis lies with the male partner. One possible mechanism is that the locus of "perceived responsibility" plays a role: women may experience less guilt, stigma, or self-blame when infertility is attributed to their partner, thus moderating the mental health toll of treatment failure. This aligns with qualitative evidence from the medical and psychological literature showing that attribution of infertility can influence emotional coping strategies and social stress (e.g., feelings of personal inadequacy or societal judgment may be attenuated when the diagnosis is not "self-assigned").

Table 1. Childlessness effects on couples with male infertility

	MH-drugs	Income
Main treatment effect	0.027***	14,518.455***
	(0.003)	(342.669)
Interaction effect: male infertility	-0.025***	-302.789
	(0.009)	(1,097.944)
Obs.	370,555	230,009

Notes: this table reports estimates for the effect childlessness on MH-drug use and income among women whose partner was (ever) treated for male infertility (the interaction effect). Standard error are reported between parentheses.

Alternatively, it is possible that partner support dynamics differ when male infertility is involved, potentially buffering emotional distress during treatment. Future work with richer data on partner behavior and subjective well-being would be valuable in disentangling these channels.

6 Later-treated results

In this section, we explore a counterfactual: what would have happened to women's income and mental health had they not initiated IVF treatment? This exercise isolates the effect of the IVF treatment experience itself, independent of fertility outcomes. As discussed in the Section 4, this comparison relies on conditioning the sample on remaining childless for $K \in \{3, 4, 5\}$ years, and estimating dynamic treatment effects separately for each value of K. In other words, we compare women who initiated IVF and remained childless to women who have not yet begun treatment, but we know will also remain childless. Equivalently, we use the pre-IVF outcomes of later-treated childless women to build the counterfactual outcomes of other childless women who were treated earlier in time. Mechanically, this method requires a longer observation window, and hence the analysis focuses on a shorter period of event time relative to the baseline analysis.

6.1 *Mental Health effects*

Our estimates show that the mental health impacts of IVF treatment among women who remain childless are remarkably similar to those observed in the baseline analysis. This is evident in Figure 6a, which closely mirrors the trends in Figure 5a. The baseline comparison contrasted women who undergo IVF and remain childless with those who undergo IVF and eventually give birth. The consistency of findings across these designs suggests that the negative mental health effects in the baseline results are largely driven by the unsuccessful IVF experience. This interpretation is reinforced by the patterns in Figure 4, which show a steady increase in mental health drug use over time—even among women who ultimately conceive. That is, mental health deteriorates across all IVF patients, regardless of the final outcome. What distinguishes the persistently childless is the additional deterioration—visible as a steeper slope—relative to those who become parents. The comparison in this section points to a perhaps underappreciated source of psychological distress: the experience of repeated, unsuccessful fertility treatment.

6.2 *Income effects*

Evaluating the labor market impacts for this counterfactual group, figure 6b reveals an immediate and sizable drop in income at time zero—the year of IVF initiation. Two years after treatment initiation, we estimate that 5-year-childless women incur an annual income loss of approximately AUD 7,100 on average (14% of baseline income)[16], as shown in Table 8).

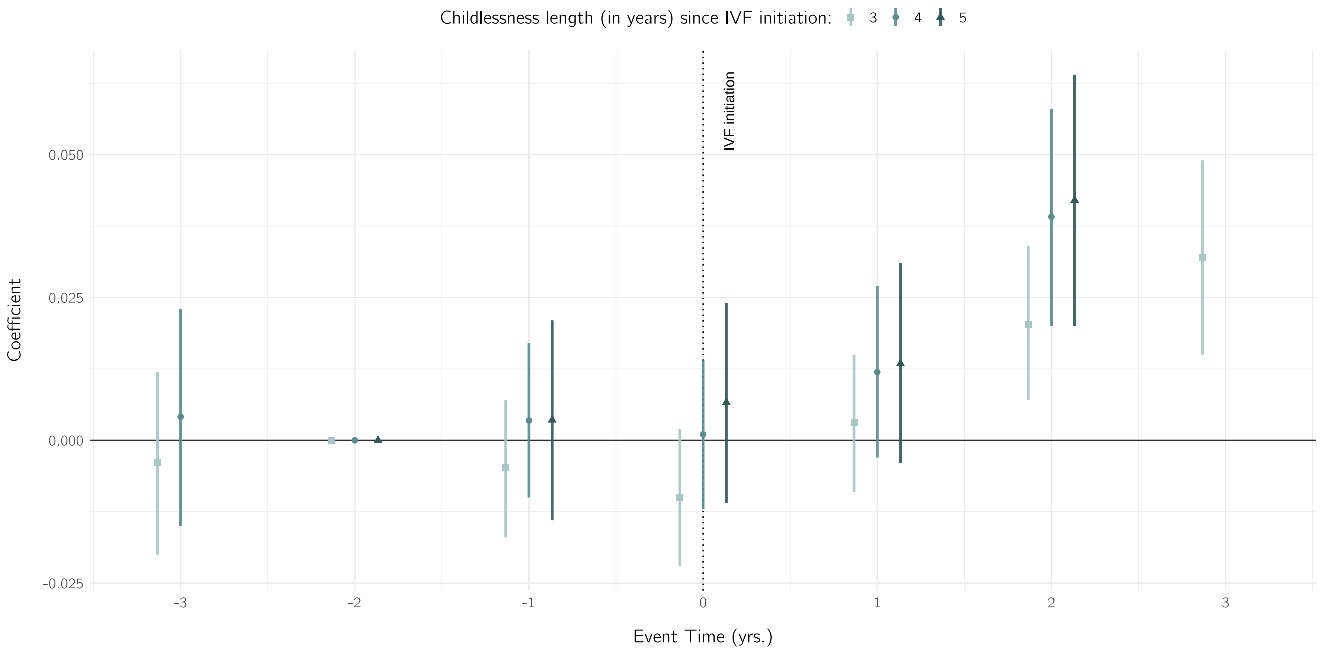
Several mechanisms could underlie this pattern. IVF cycles are time-intensive, physically demanding, and emotionally taxing, often requiring time off work and reducing the capacity for high-performance or long-hour roles. Additionally, some women may reduce labor force engagement in anticipation of a successful pregnancy or miss career advancement opportunities due to repeated treatment cycles. These short-term shocks may trigger longer-run consequences, including foregone promo-

[16] 6,800 for the 4-year childless, and 6,100 for the 3-year

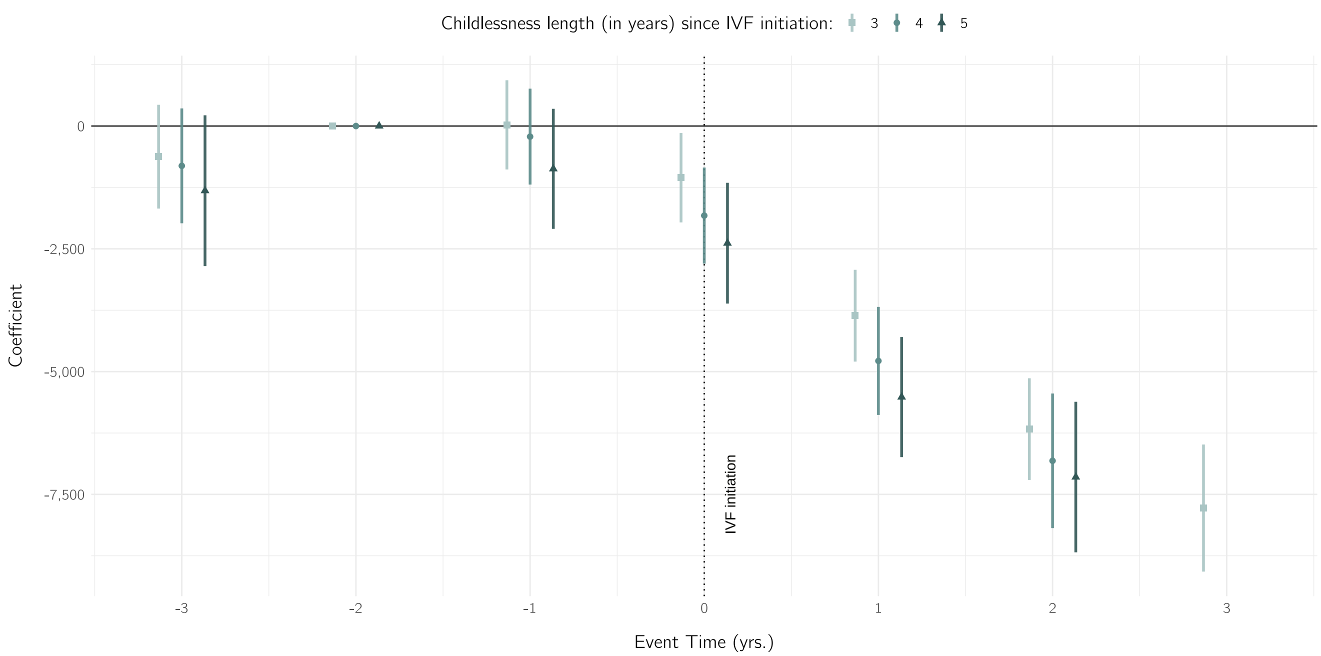
tions, disrupted career trajectories, or diminished skill accumulation. The gradual downward slope in post-treatment income (Figure 4b) supports this interpretation.

To further probe this dynamic, Appendix Figure 17 presents results for a subset of women who eventually give birth five years after their initial IVF attempt—after four consecutive years of unsuccessful treatment. Their income trajectory closely resembles that of persistently childless women during the pre-birth period, lending additional support to the argument that the treatment process itself—not only its outcome—generates lasting economic costs.

These results also have important implications for the measurement of the child penalty. Specifically, they suggest that using women who undergo IVF but remain childless as a counterfactual group may lead to an underestimation of the true penalty associated with childbearing. This is because the labor market trajectories of these women are themselves negatively affected by the emotional and physical toll of unsuccessful fertility treatment. As such, the comparison group is not a clean control, but one that also experiences significant career disruptions—independent of parenthood—thereby biasing the estimate of the true economic cost of having children downward.



(a) any MH drugs (p.p.)



(b) Annual Income (AUD)

Figure 6. Effect of Going Through IVF on Female Outcomes - Childless-only

Notes. This figure plots the dynamic treatment effect estimates from Equation 3, on the effect of "going through IVF" on the income and use of mental health prescription drugs, among women initiating IVF and remaining childless over the observed period. Different shades of blue indicate that the estimates come from different samples. For instance, the lightest shade of blue is associated with a sample where all women were childless in their third year since IVF initiation, and we use the pre-IVF outcomes of women treated in later calendar years to build the counterfactual outcomes for women treated earlier. Darker shades indicate samples with longer childlessness spells. The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.

7 Conclusion

This paper provides new evidence on the economic and psychological consequences of infertility and assisted reproductive technology (ART), with a particular focus on the experience of undergoing in-vitro fertilization (IVF). Using high-quality, linked administrative data for the full Australian population, we estimate the effects of IVF and involuntary childlessness on women's income and mental health, leveraging dynamic difference-in-differences strategies that exploit variation in treatment timing and eventual fertility outcomes.

We document three key findings. First, women who undergo IVF and remain childless experience substantial and persistent declines in mental health, as proxied by their use of prescription medication and mental health services. These effects remain evident up to five years after treatment initiation. Second, we find that women who successfully conceive face large and immediate income losses—consistent with the well-documented child penalty. However, women who do not conceive also experience significant income declines following IVF initiation, suggesting that the treatment process itself imposes a direct economic cost, independent of parenthood. Third, by comparing the outcomes of women who initiate IVF and remain childless with the pre-IVF outcomes of observationally similar women who also remain childless but started IVF at a later period, we show that these income and mental health effects are driven by the experience of undergoing IVF.

These findings carry important implications for economic theory and empirical measurement. Our results challenge conventional approaches in the child penalty literature that use unsuccessfully treated IVF patients as a control group. If the IVF process itself suppresses earnings and worsens mental health, then estimates of the child penalty that use these women to build counterfactual outcomes are likely biased downward. More broadly, our results highlight the need to consider the hidden economic costs of medical interventions that are increasingly used as part of modern family planning.

This paper also expands the scope of the health shock literature to include chronic, emotionally taxing, and identity-relevant experiences that unfold gradually and with uncertain outcomes. The evidence suggests that fertility treatment constitutes a form of health shock that is distinct from traditional acute events, such as injury or disease, but no less consequential in shaping economic lives.

The policy implications are significant. While IVF has empowered many women to reconcile delayed childbearing with professional ambitions, the journey through IVF can itself be economically and psychologically costly—particularly when unsuccessful. As the use of IVF continues to rise in high-income countries, understanding the full life-cycle effects of these treatments is critical for designing support systems that reflect the real burdens faced by those navigating infertility.

References

Aaronson, D., Dehejia, R., Jordan, A., Pop-Eleches, C., Samii, C., and Schulze, K. (2020). The Effect of Fertility on Mothers' Labor Supply over the Last Two Centuries. *The Economic Journal*, 131(633):1–32. [Cited on page 1.]

ACOG (2023). How does age affect fertility? Faq, The American College of Obstetricians and Gynecologists. `https://www.acog.org/womens-health/faqs/having-a-baby-after-age-35-how-aging-affects-fertility-and-pregnancy` Accessed: 2024-02-15. [Cited on page 10.]

Adda, J., Dustmann, C., and Stevens, K. (2017). The career costs of children. *Journal of Political Economy*, 125(2):293–337. [Cited on page 1.]

Angelov, N., Johansson, P., and Lindahl, E. (2016). Parenthood and the gender gap in pay. *Journal of Labor Economics*, 34:545–579. [Cited on page 4.]

Beaujouan, E. (2023). *Delayed Fertility as a Driver of Fertility Decline?*, pages 41–63. Springer International Publishing, Cham. [Cited on page 1.]

Bensnes, S., Huitfeldt, I., and Leuven, E. (2023). Reconciling estimates of the long-term earnings effect of fertility. [Cited on page 4.]

Bitler, M. and Schmidt, L. (2011). Utilization of infertility treatments: The effects of insurance mandates. *Demography*, 49:125–149. [Cited on pages 3 and 4.]

Bögl, S., Moshfegh, J., Persson, P., and Polyakova, M. (2024). The economics of infertility: Evidence from reproductive medicine. Working Paper 32445, National Bureau of Economic Research. [Cited on page 3.]

Chambers, G. M., Hoang, V. P., Zhu, R., and Illingworth, P. J. (2012). A reduction in public funding for fertility treatment - an econometric analysis of access to treatment and savings to government. *BMC Health Services Research*, 12(1):142. [Cited on page 6.]

Cortés, P. and Pan, J. (2023). Children and the remaining gender gaps in the labor market. *Journal of Economic Literature*, 61(4):1359–1409. [Cited on page 1.]

Currie, J. and Stabile, M. (2006). Child mental health and human capital accumulation: The case of adhd. *Journal of Health Economics*, 25(6):1094–1118. [Cited on page 4.]

Dobkin, C., Finkelstein, A., Kluender, R., and Notowidigdo, M. J. (2018). The economic consequences of hospital admissions. *American Economic Review*, 108:308–352. [Cited on page 5.]

Evensen, M., Lyngstad, T. H., Melkevik, O., Reneflot, A., and Mykletun, A. (2017). Adolescent mental health and earnings inequalities in adulthood: evidence from the young-hunt study. *Journal of Epidemiology & Community Health*, 71(2):201–206. [Cited on page 4.]

Fadlon, I. and Nielsen, T. H. (2019). Family health behaviors. *American Economic Review*, 109(9):3162–91. [Cited on page 16.]

Fadlon, I. and Nielsen, T. H. (2021). Family labor supply responses to severe health shocks: Evidence from danish administrative records. *American Economic Journal: Applied Economics*, 13(3):1–30. [Cited on page 16.]

Gallen, Y., Joensen, J. S., Johansen, E. R., and Veramendi, G. F. (2023). The labor market returns to delaying pregnancy. [Cited on page 4.]

Gameiro, S., van den Belt-Dusebout, A. W., Smeenk, J. M. J., Braat, D. D. M., van Leeuwen, F. E., and Verhaak, C. M. (2016). Women's adjustment trajectories during ivf and impact on mental health 11â17 years later. *Human Reproduction*, 31:1788–1798. [Cited on page 2.]

García-Gómez, P., van Kippersluis, H., O'Donnell, O., and van Doorslaer, E. (2013). Long-term and spillover effects of health shocks on employment and income. *Journal of Human Resources*, 48(4):873–909. [Cited on page 5.]

Gershoni, N. and Low, C. (2021a). Older yet fairer: How extended reproductive time horizons reshaped marriage patterns in israel. *American Economic Journal: Applied Economics*, 13(1):198–234. [Cited on page 1.]

Gershoni, N. and Low, C. (2021b). The power of time: The impact of free ivf on women's human capital investments. *European Economic Review*, 133:103645. [Cited on page 1.]

Gupta, A., Lu, E., and Thayer, Z. (2024). The influence of assisted reproductive technologies-related stressors and social support on perceived stress and depression. *BMC Women's Health*, 24:431. [Cited on page 1.]

Hamilton, B. H. and McManus, B. (2012). The effects of insurance mandates on choices and outcomes in infertility treatment markets. *Health Economics*, 21:994–1016. [Cited on page 3.]

Hjelmstedt, A., A-M., W., H., W., A, and Collins (2003). Patterns of emotional responses to pregnancy, experience of pregnancy and attitudes to parenthood among ivf couples: a longitudinal study. *Journal of Psychosomatic Obstetrics & Gynecology*, 24:153–162. doi: 10.3109/01674820309039669. [Cited on page 2.]

Huang, M.-Z., Kao, C.-H., Lin, K.-C., Hwang, J.-L., Puthussery, S., and Gau, M.-L. (2019). Psychological health of women who have conceived using assisted reproductive technology in taiwan: findings from a longitudinal study. *BMC Women's Health*, 19:97. [Cited on page 2.]

Ilciukas, J. (2025). Parenthood timing and gender inequality. [Cited on page 4.]

Ilyana, K., Jessica, P., and Jenny, S. (2018). The mommy effect: Do women anticipate the employment effects of motherhood? the mommy effect: Do women anticipate the employment effects of motherhood? Technical report. [Cited on page 4.]

Jones, A. M., Rice, N., and Zantomio, F. (2020). Acute health shocks and labour market outcomes: Evidence from the post crash era. *Economics & Human Biology*, 36:100811. [Cited on page 5.]

Kleven, H., Landais, C., Posch, J., Steinhauer, A., and ZweimuÌller, J. (2019a). Child penalties across countries: Evidence and explanations. *AEA Papers and Proceedings*, 109:122–126. [Cited on page 4.]

Kleven, H., Landais, C., and SÃžgaard, J. E. (2019b). Children and gender inequality: Evidence from denmark. *American Economic Journal: Applied Economics*, 11:181–209. [Cited on page 4.]

Kleven, H., Landais, C., and Søgaard, J. E. (2019c). Children and gender inequality: Evidence from denmark. *American Economic Journal: Applied Economics*, 11(4):181–209. [Cited on page 1.]

Kroeger, S. and La Mattina, G. (2017). Assisted reproductive technology and women's choice to pursue professional careers. *Journal of Population Economics*, 30(3):723–769. [Cited on page 1.]

Kupka, M. S., Chambers, G. M., Dyer, S., Zegers-Hochschild, F., de Mouzon, J., Ishihara, O., Banker, M., Jwa, S. C., Fu, B., Elgindy, E., Baker, V., and Adamson, G. D. (2024). International committee for monitoring assisted reproductive technology world report: assisted reproductive technology, 2015 and 2016. *Fertility and Sterility*. [Cited on page 1.]

Levine, H., Jørgensen, N., Martino-Andrade, A., Mendiola, J., Weksler-Derri, D., Mindlis, I., Pinotti, R., and Swan, S. H. (2017). Temporal trends in sperm count: a systematic review and meta-regression analysis. *Human Reproduction Update*, 23(6):646–659. [Cited on page 1.]

Lind, J. (2020). Child welfare assessments and the regulation of access to publicly funded fertility treatment. *Reproductive Biomedicine Society Online*, 10:19–27. [Cited on page 6.]

Lundborg, P., Plug, E., and Rasmussen, A. W. (2017). Can women have children and a career? iv evidence from ivf treatments. *American Economic Review*, 107:1611–37. [Cited on page 4.]

Lundborg, P., Plug, E., and Rasmussen, A. W. (2024). Is there really a child penalty in the long run? new evidence from ivf treatments. [Cited on page 4.]

McLernon, D. J. and Bhattacharya, S. (2023). Quality of clinical prediction models in in vitro fertilisation: Which covariates are really important to predict cumulative live birth and which models are best? *Best Practice & Research Clinical Obstetrics & Gynaecology*, 86:102309. [Cited on page 11.]

National Health and Medical Research Council (2017). *Ethical guidelines on the use of assisted reproductive technology in clinical practice and research*. National Health and Medical Research Council, Canberra. NHMRC Publication reference: E79. [Cited on page 7.]

Newman, J., Kotevski, D., Paul, R., and Chambers, G. (2024). Assisted reproductive technology in australia and new zealand 2022. Technical report, National Perinatal Epidemiology and Statistics Unit, the University of New South Wales, Sydney, Sydney. [Cited on page 8.]

Olden, A. and Møen, J. (2022). The triple difference estimator. *The Econometrics Journal*, 25(3):531–553. [Cited on page 15.]

Purewal, S., Chapman, S. C. E., and van den Akker, O. B. A. (2018). Depression and state anxiety scores during assisted reproductive treatment are associated with outcome: a meta-analysis. *Reproductive BioMedicine Online*, 36:646–657. [Cited on page 2.]

Schmidt, L., Sobotka, T., Bentzen, J. G., Andersen, A. N., on behalf of the ESHRE Reproduction, and Force, S. T. (2012). Demographic and medical consequences of the postponement of parenthood. *Human Reproduction Update*, 18:29–43. [Cited on page 4.]

Sun, L. and Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2):175–199. Themed Issue: Treatment Effect 1. [Cited on pages 15, 21, and 42.]

A Figures

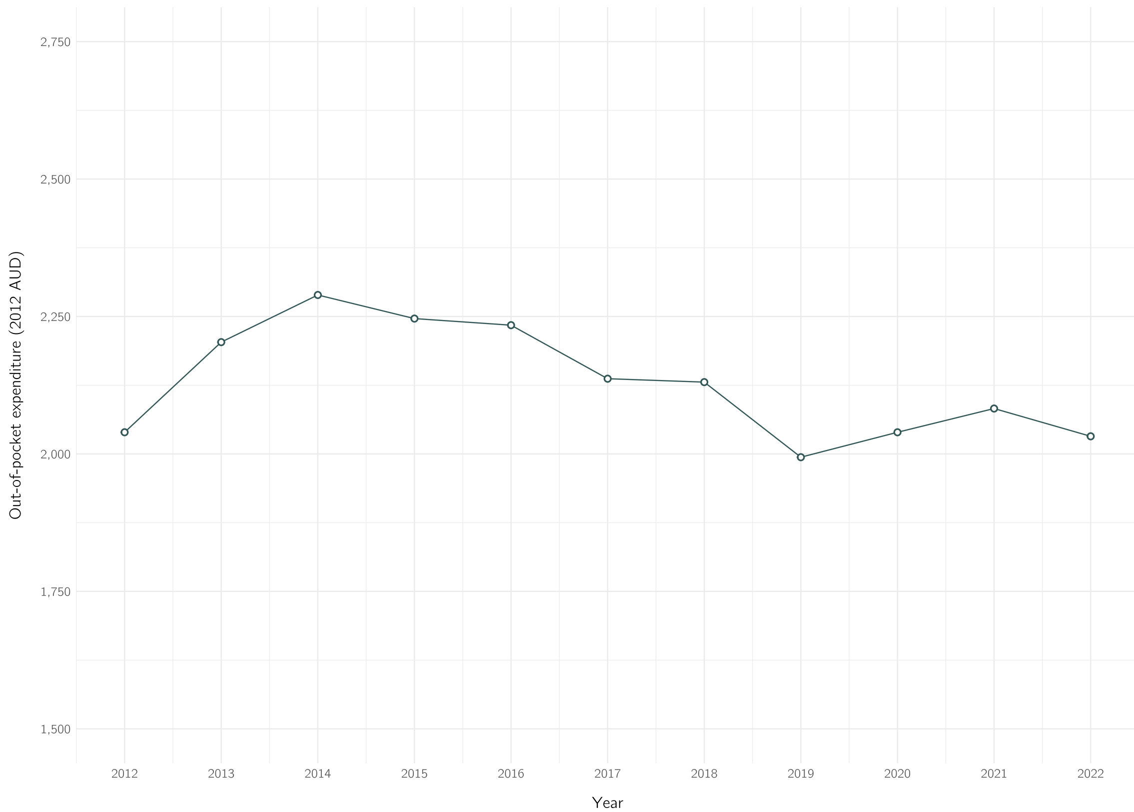


Figure 7. Real out-of-pocket costs per cycle over time

Notes. This figure plots real mean out-of-pocket costs over time in Australian dollars, corrected for CPI and pegged to 2012. Calculations based on population-level Medicare data averaged by year of IVF initiation.

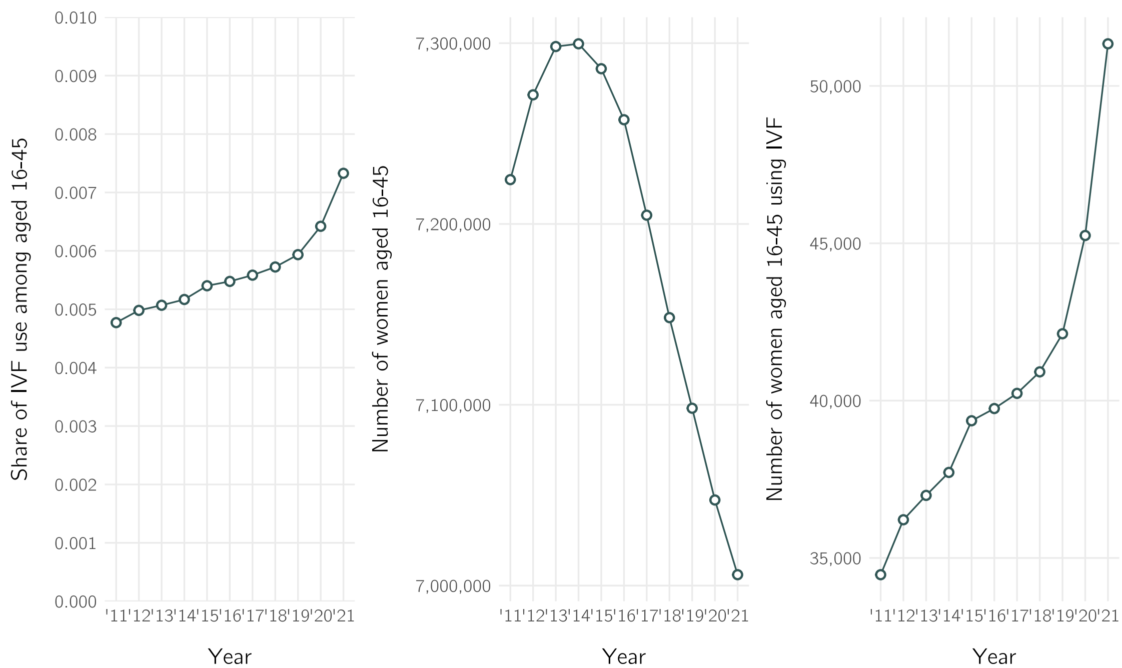


Figure 8. Incidence of IVF and its components

Notes. This figure plots the incidence of IVF use among aged 16-45. The sample used links MBS data to demographics data sourced from the ABS *Combined Demographics* data asset. For each calendar year, we count the number of females aged 16-45 in the *Combined Demographics* data asset (Panel 2), and the number of females using MBS for ART purposes (Panel 3), and divide the latter by the former (Panel 1).

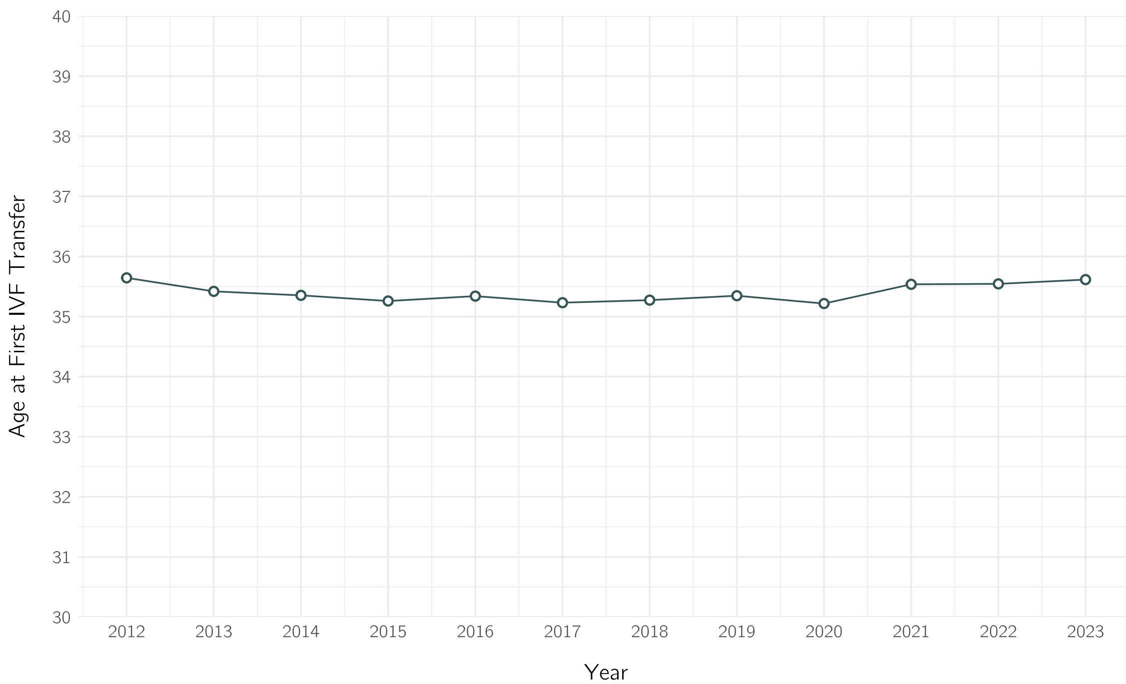


Figure 9. Age at first IVF transfer

Notes. This figure plots the mean age at first IVF transfer over time. Calculations based on population-level Medicare data.

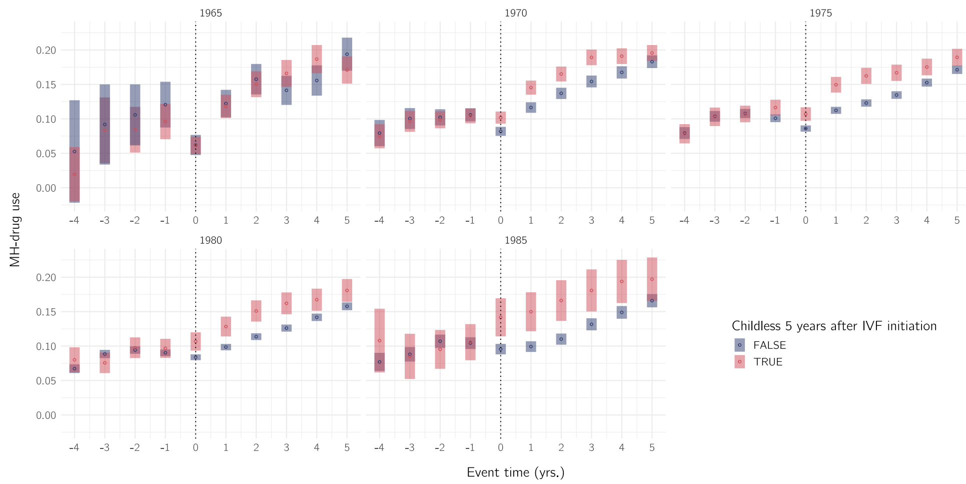


Figure 10. Mean female MH-drugs use by event time, treatment group, and year of birth (5-year bins)

Notes. This figure plots mean mental-health prescription drugs use by event time, treatment group (childless at their 5th year since IVF initiation vs. having one child by that time), and year of birth in 5-year bins—one bin per panel. "Event" is defined as IVF initiation. It does not plot regression estimates. The points represent sample means, while the shaded band 95% confidence intervals.

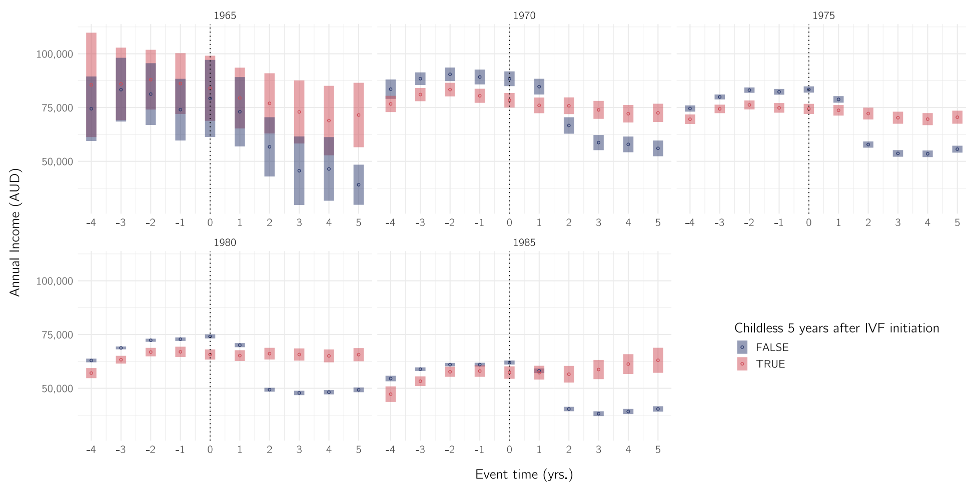


Figure 11. Mean female income by event time, treatment group, and year of birth (5-year bins)

Notes. This figure plots mean annual income by event time, treatment group (childless at their 5th year since IVF initiation vs. having one child by that time), and year of birth in 5-year bins—one bin per panel. "Event" is defined as IVF initiation. It does not plot regression estimates. The points represent sample means, while the shaded band 95% confidence intervals.

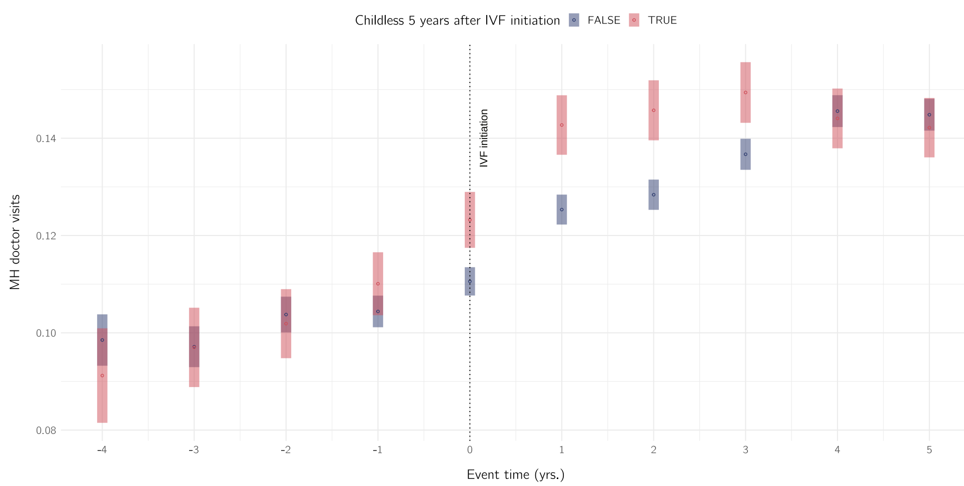


Figure 12. Mean female MH visits by event time and treatment group

Notes. This figure plots the use of any mental health services by event time—where "event" is defined as IVF initiation—and by treatment group—i.e. women that were (treatment) or were not (control) childless 5 years after their IVF initiation. All women are childless (nulliparous) at event time zero. It does not plot regression estimates. The points represent sample means, while the shaded band 95% confidence intervals.

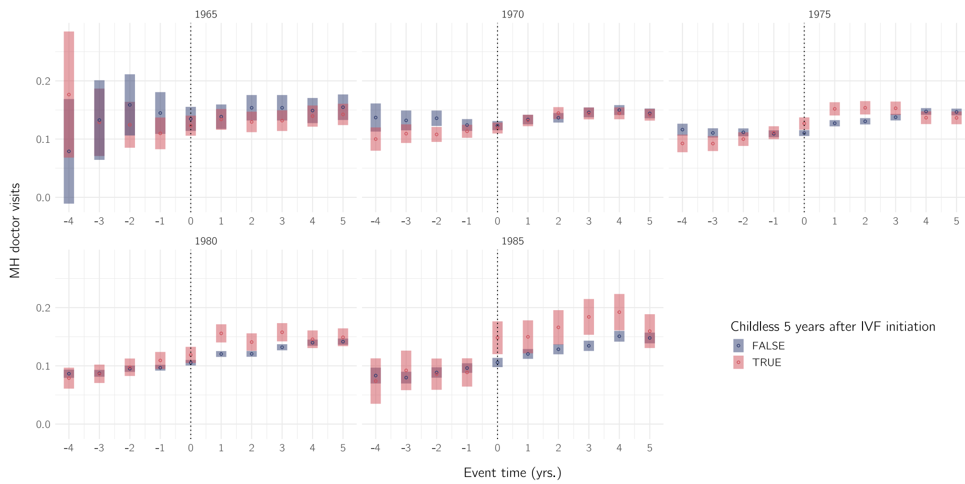
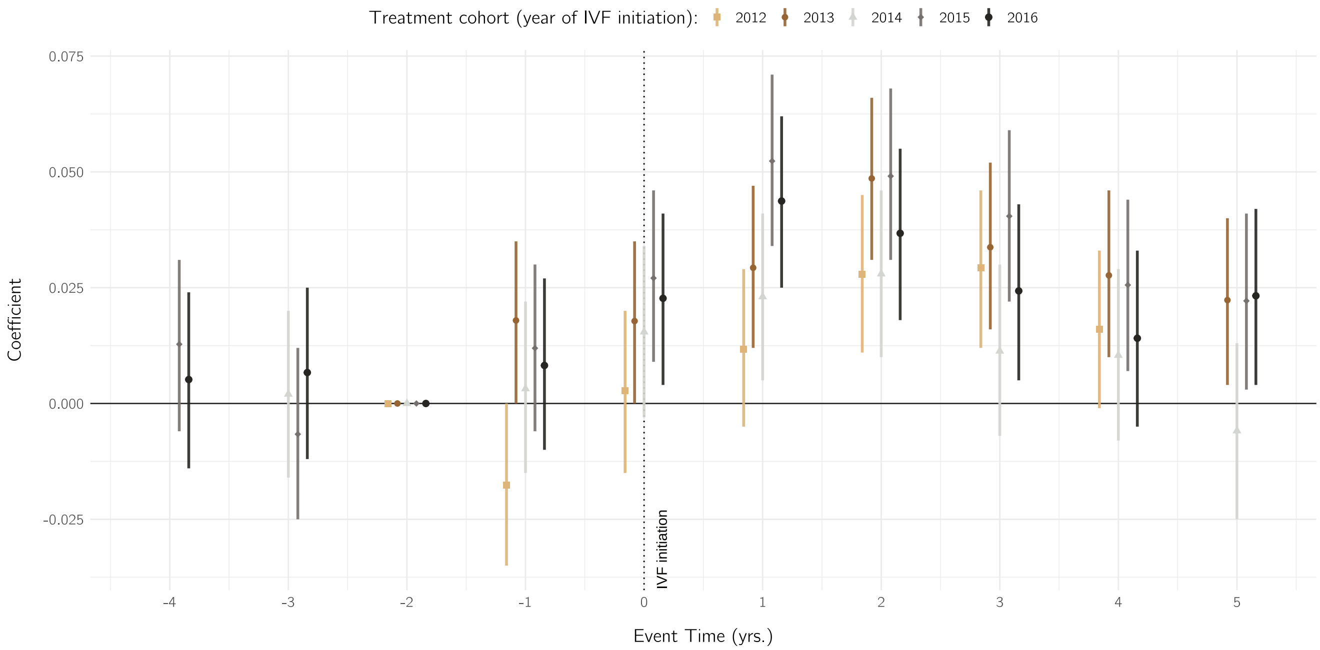
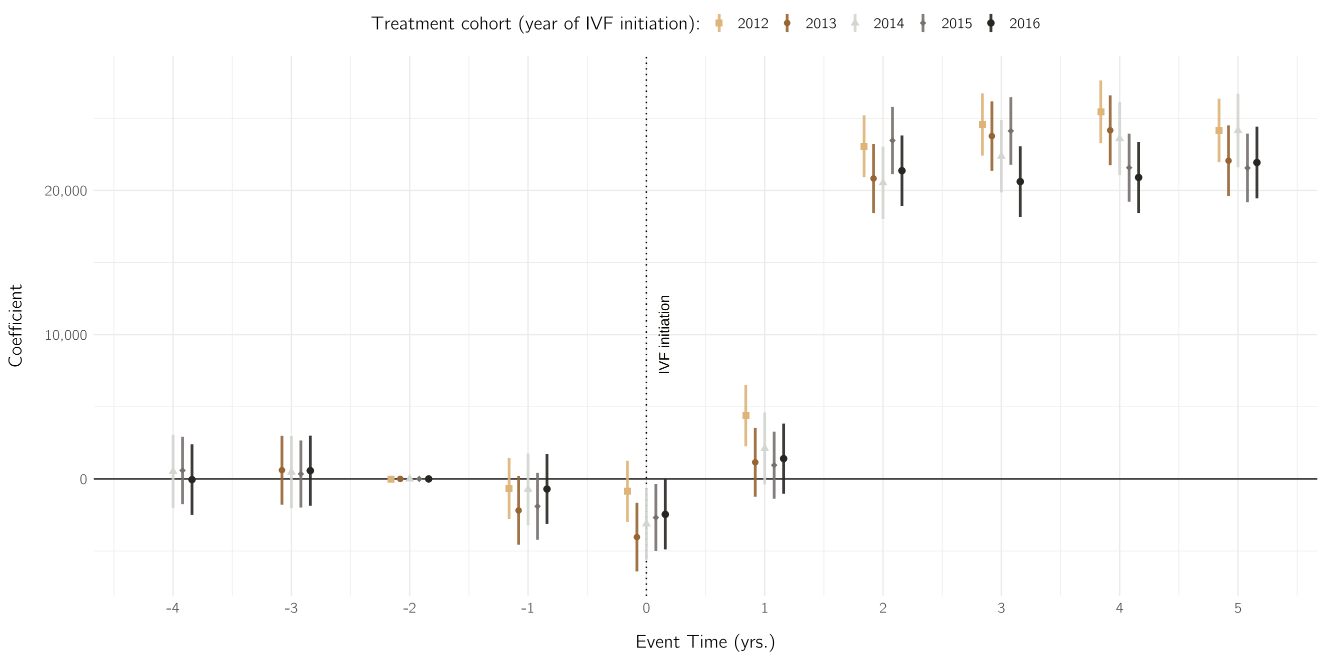


Figure 13. Mean female MH visits by event time, treatment group, and year of birth (5-year bins)

Notes. This figure plots the use of any mental health services by event time, treatment group (childless at their 5th year since IVF initiation vs. having one child by that time), and year of birth in 5-year bins—one bin per panel. "Event" is defined as IVF initiation. It does not plot regression estimates. The points represent sample means, while the shaded band 95% confidence intervals.



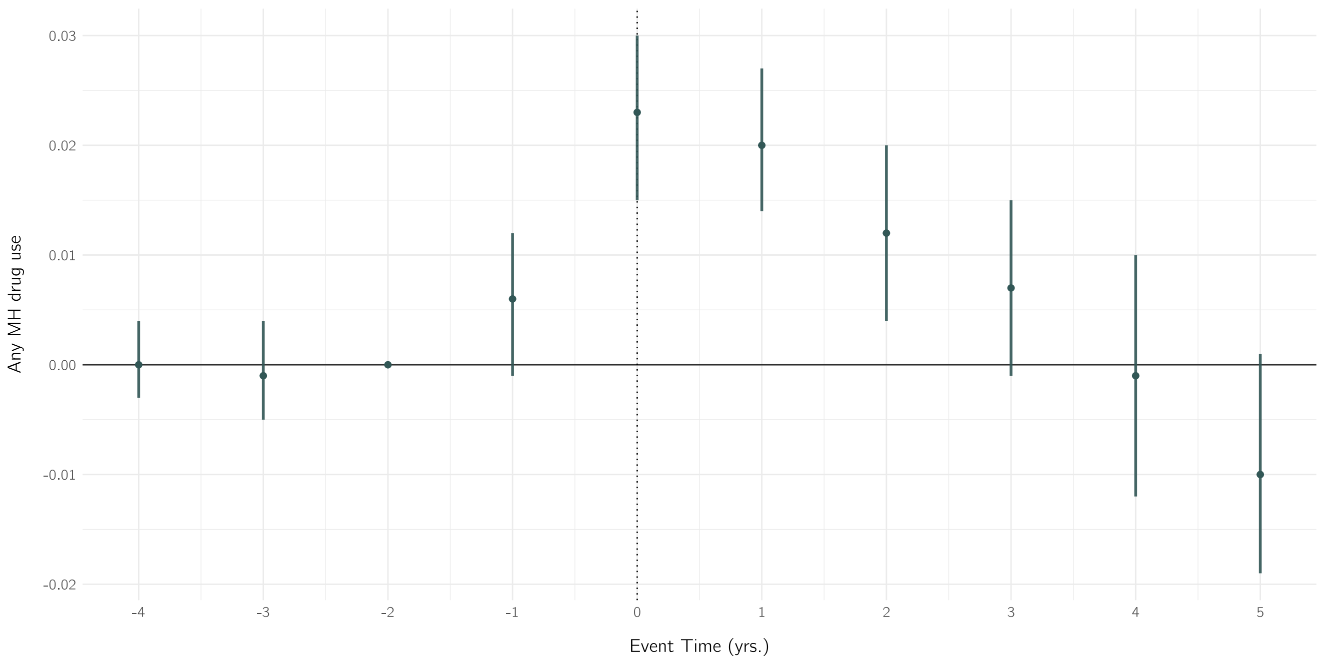
(a) any MH drugs (p.p.)



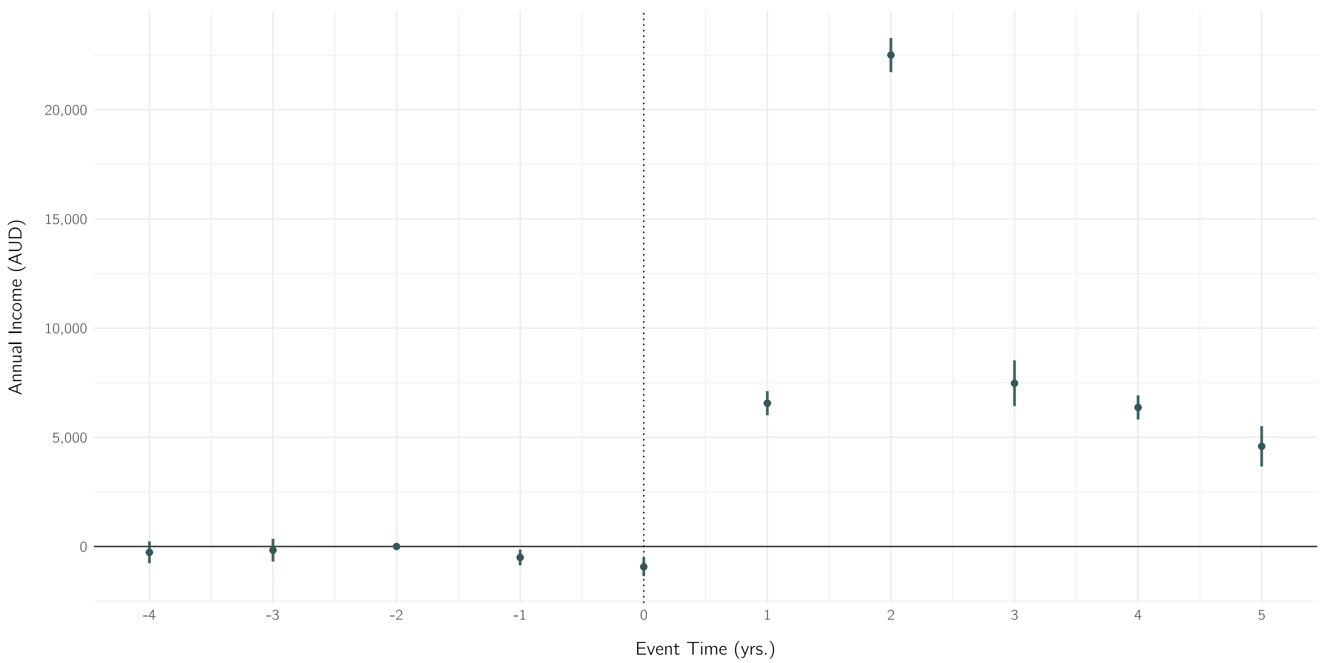
(b) Annual Income (AUD)

Figure 14. Effect of Childlessness on Female Outcomes by Treatment Cohort

Notes. This figure plots the dynamic treatment effect estimates from Equation 1 by treatment cohort, on the effect of childlessness on the income and use of mental health prescription drugs, among nulliparous women initiating IVF. Following Sun and Abraham (2021), treatment cohorts are partitions of sampled women by the calendar year in which they initiated treatment. Different colors indicate that the estimates come from different samples. For instance, the color black is associated with a sample where all women (treated and control) initiated IVF treatment in 2016. The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.



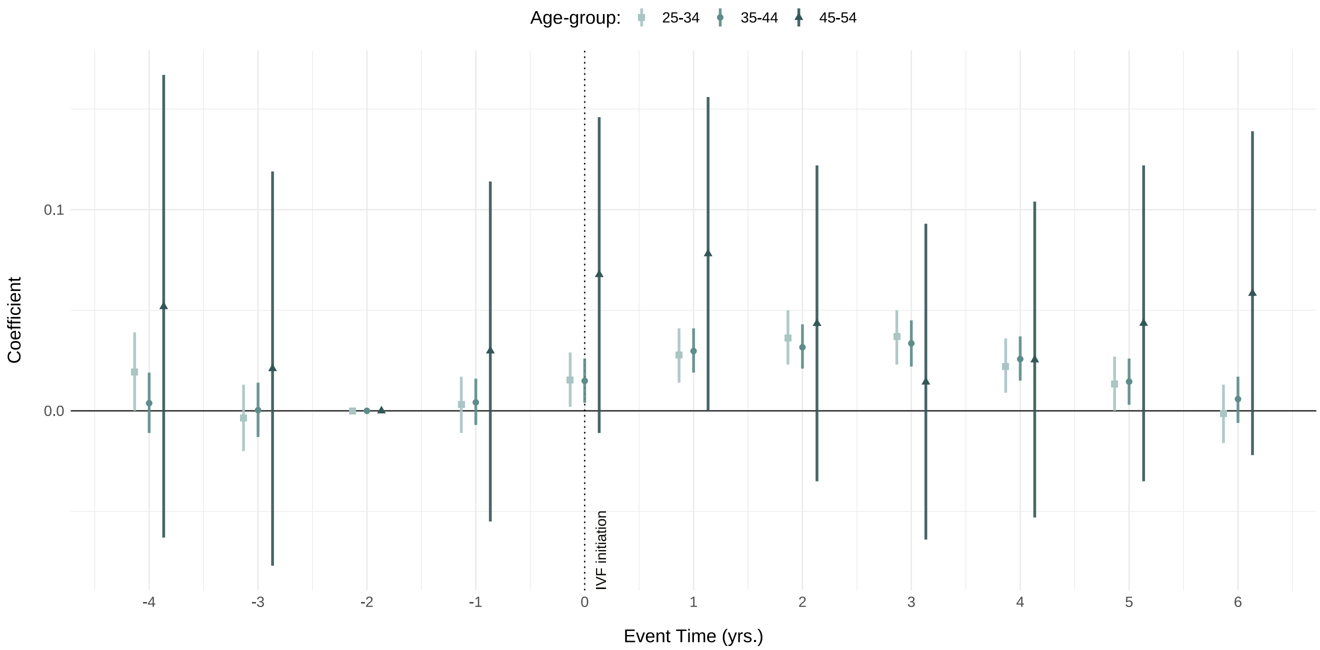
(a) any MH drugs (p.p.)



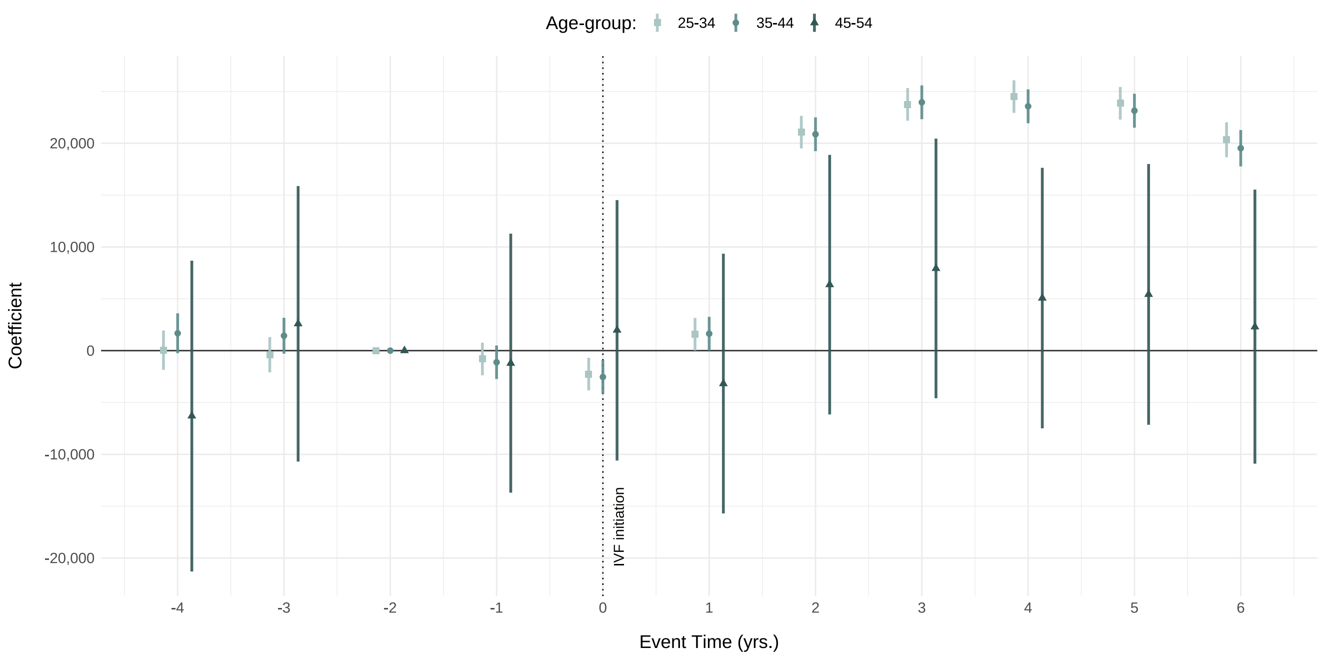
(b) Annual Income (AUD)

Figure 15. Effect of 1-Year Childlessness on Female Outcomes

Notes. This figure plots the dynamic treatment effect estimates from Equation 1, on the effect of 1-year childlessness on the income and use of any mental health prescription drugs, among women initiating IVF. All women have no children (nulliparous) at or before event time. Some have a child by year one (control), while others do not (treatment). The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.



(a) any MH drugs (p.p.)



(b) Annual Income (AUD)

Figure 16. Effect of 5-year Childlessness on Female Outcomes by Age Group

Notes. This figure plots the dynamic treatment effect estimates from Equation 1, on the effect of childlessness on the income and use of mental health prescription drugs by age group, among women initiating IVF. Different shades of blue indicate that the estimates come from different samples. For instance, the lightest shade of blue is associated with a sample where all women were between 25 and 34 years of age when initiating IVF. Then, women who were childless in their fifth year since IVF initiation are compared to women who had their first child by that time. Darker shades indicate samples with IVF initiation occurring at later ages. The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.

B Tables

Table 2. Covariate balance table for the MH sample (5-year childless)

	1^+ Children		Childless		Difference	
Variable	Mean	Obs.	Mean	Obs.	Value	p-value
Year of birth	1979.12	44505	1975.28	12563	3.841	0.0000
	(4.75)		(5.14)		(0.054)	
Age at first cycle	34.23	44,505	37.86	12,563	-3.625	0.0000
	(4.33)		(4.7)		(0.049)	
Any MH history	0.13	44,505	0.13	12,563	0.003	0.3312
	(0.34)		(0.34)		(0.004)	
No. of transfers	6.09	44,505	5.91	12,563	0.183	0.0012
	(5.05)		(5.73)		(0.056)	
Real income at $t = -2$	55,727.62	27,881	50,011.18	7,143	5716.441	0.0000
	(40594.91)		(43562.23)		(566.965)	
Born in Australia	0.66	44,353	0.58	12,511	0.083	0.0000
	(0.47)		(0.49)		(0.005)	
Completed Schooling Years	11.82	44,390	11.69	12,527	0.132	0.0000
	(0.71)		(1.04)		(0.01)	
Indigenous	0.01	44,445	0.01	12,554	-0.002	0.0337
	(0.09)		(0.1)		(0.001)	
Religiously Affiliated	0.6	43,966	0.64	12,417	-0.039	0.0000
	(0.49)		(0.48)		(0.005)	
Year 12 or Certif. II or Higher	0.96	44,372	0.93	12,505	0.032	0.0000
	(0.19)		(0.25)		(0.002)	
Year 12 or Certif. III or Higher	0.96	44,372	0.93	12,505	0.032	0.0000
	(0.19)		(0.26)		(0.002)	
Diploma or Higher	0.74	44,505	0.66	12,563	0.076	0.0000
	(0.44)		(0.47)		(0.005)	
Bachelord degree or Higher	0.6	44,505	0.5	12,563	0.101	0.0000
	(0.49)		(0.5)		(0.005)	
Master degree or Higher	0.15	44,505	0.14	12,563	0.01	0.0033
	(0.36)		(0.35)		(0.004)	
Doctoral degree (PhD)	0.02	44,505	0.02	12,563	0.001	0.4146
	(0.15)		(0.15)		(0.001)	

Notes: this table reports, for the MH sample, mean covariate values by treatment group and their difference, for key individual characteristics. Column 1 reports mean covariate values for women who had a least one child in the 5 years following IVF initiation (control). Column 2 reports the number of observations for this group. Column 3 reports mean covariate values for women who did not have any child within this same 5-year time span (treatment). Column 4 reports the number of observations for this group. Column 5 reports the difference between control and treatment group means extemdash Columns 1 and 3, respectively. The p-value of this difference is reported in column 6. Standard errors are reported between parentheses.

Table 3. Covariate balance table for the income sample (5-year childless)

	1^+ Children		Childless		Difference	
Variable	Mean	Obs.	Mean	Obs.	Value	p-value
Year of birth	1980.82	14008	1977.34	3097	3.483	0.0000
	(4.18)		(4.59)		(0.107)	
Age at first cycle	34.18	14,008	37.69	3,097	-3.507	0.0000
	(4.11)		(4.54)		(0.097)	
Any MH history	0.22	14,008	0.23	3,097	-0.005	0.5153
	(0.42)		(0.42)		(0.007)	
No. of transfers	6.08	14,008	6.17	3,097	-0.094	0.3924
	(4.92)		(5.67)		(0.111)	
Real income at $t=-2$	74,110.71	14,008	74,678.52	3,097	-567.81	0.4480
	(34405.27)		(38368.98)		(850.472)	
Born in Australia	0.74	13,968	0.65	3,092	0.082	0.0000
	(0.44)		(0.48)		(0.01)	
Completed Schooling Years	11.88	13,977	11.82	3,092	0.057	0.0000
	(0.53)		(0.69)		(0.02)	
Indigenous	0.01	13,992	0.01	3,096	-0.001	0.8016
	(0.1)		(0.1)		(0.002)	
Religiously Affiliated	0.57	13,870	0.6	3,064	-0.029	0.0028
	(0.5)		(0.49)		(0.01)	
Year 12 or Certif. II or Higher	0.98	13,979	0.96	3,094	0.015	0.0000
	(0.15)		(0.19)		(0.005)	
Year 12 or Certif. III or Higher	0.97	13,979	0.96	3,094	0.016	0.0000
	(0.16)		(0.2)		(0.005)	
Diploma or Higher	0.77	14,008	0.71	3,097	0.051	0.0000
	(0.42)		(0.45)		(0.009)	
Bachelord degree or Higher	0.63	14,008	0.56	3,097	0.077	0.0000
	(0.48)		(0.5)		(0.01)	
Master degree or Higher	0.15	14,008	0.15	3,097	-0.004	0.6113
	(0.36)		(0.36)		(0.007)	
Doctoral degree (PhD)	0.02	14,008	0.02	3,097	-0.004	0.1787
	(0.14)		(0.15)		(0.003)	

Notes: this table reports, for the income sample, mean covariate values by treatment group and their difference, for key individual characteristics. Column 1 reports mean covariate values for women who had a least one child in the 5 years following IVF initiation (control). Column 2 reports the number of observations for this group. Column 3 reports mean covariate values for women who did not have any child within this same 5-year time span (treatment). Column 4 reports the number of observations for this group. Column 5 reports the difference between control and treatment group means extemdash Columns 1 and 3, respectively. The p-value of this difference is reported in column 6. Standard errors are reported between parentheses.

Table 4. Covariate balance table for the later-treated sample (3-year childless)

	Treatment		Control		Difference	
Variable	Mean	Obs.	Mean	Obs.	Value	p-value
Year of birth	1979.07	2384	1975.46	14264	3.615	0.0000
	(4.81)		(5.17)		(0.115)	
Age at first cycle	36.93	2,384	37.25	14,264	-0.322	0.0025
	(4.81)		(4.84)		(0.113)	
Any MH history	0.25	2,384	0.11	14,264	0.136	0.0000
	(0.43)		(0.32)		(0.009)	
No. of transfers	6.67	2,384	6.77	14,264	-0.106	0.4100
	(5.72)		(6.19)		(0.127)	
Real income at $t = -2$	54,243.62	2,384	51,412.81	7,057	2,830.819	0.0115
	(48,484.91)		(43,452.61)		(1,117.751)	
Born in Australia	0.56	2,379	0.6	14,207	-0.041	0.0002
	(0.5)		(0.49)		(0.011)	
Completed Schooling Years	11.77	2,373	11.7	14,224	0.065	0.0016
	(0.91)		(1.01)		(0.022)	
Indigenous	0.01	2,384	0.01	14,253	0.002	0.3648
	(0.11)		(0.1)		(0.003)	
Religiously Affiliated	0.62	2,354	0.64	14,100	-0.015	0.1579
	(0.49)		(0.48)		(0.011)	
Year 12 or Certif. II or Higher	0.95	2,378	0.94	14,198	0.015	0.0029
	(0.22)		(0.24)		(0.005)	
Year 12 or Certif. III or Higher	0.95	2,378	0.93	14,198	0.016	0.0010
	(0.22)		(0.25)		(0.005)	
Diploma or Higher	0.7	2,384	0.68	14,264	0.024	0.0168
	(0.46)		(0.47)		(0.01)	
Bachelord degree or Higher	0.55	2,384	0.52	14,264	0.035	0.0013
	(0.5)		(0.5)		(0.011)	
Master degree or Higher	0.16	2,384	0.14	14,264	0.02	0.0137
	(0.37)		(0.35)		(0.008)	
Doctoral degree (PhD)	0.02	2,384	0.02	14,264	-0.003	0.2480
	(0.13)		(0.15)		(0.003)	

Notes: this table reports mean covariate values by treatment group and their difference for key individual characteristics in the later-treated sample. All women in this sample remained childless in the 3 years following IVF initiation. Column 1 reports mean covariate values for women the control group, who had IVF initiation between 2012 and 2015 included. Column 2 reports the number of observations for this group. Column 3 reports mean covariate values for women the treatment group, who had IVF initiation between 2016 and 2018 included, i.e. after women in the control group. Column 4 reports the number of observations for this group. Column 5 reports the difference between control and treatment group mean—Columns 1 and 3, respectively. The p-value of this difference is reported in column 6. Standard errors are reported between parentheses.

Table 5. Covariate balance table for the later-treated sample (5-year childless)

	Treatment		Control		Difference	
Variable	Mean	Obs.	Mean	Obs.	Value	p-value
Year of birth	1977.92	3589	1974.23	8974	3.689	0.0000
	(4.7)		(4.92)		(0.098)	
Age at first cycle	37.58	3,589	37.97	8,974	-0.383	0.0000
	(4.68)		(4.71)		(0.097)	
Any MH history	0.23	3,589	0.09	8,974	0.141	0.0000
	(0.42)		(0.29)		(0.008)	
No. of transfers	5.88	3,589	5.92	8,974	-0.042	0.7028
	(5.36)		(5.87)		(0.109)	
Real income at $t = -2$	54,234.6	3,589	49,800.73	3,457	4433.873	0.0000
	(46545.94)		(44413.13)		(1083.626)	
Born in Australia	0.54	3,576	0.6	8,935	-0.057	0.0000
	(0.5)		(0.49)		(0.01)	
Completed Schooling Years	11.73	3,577	11.68	8,950	0.051	0.0179
	(1.11)		(1.02)		(0.021)	
Indigenous	0.01	3,589	0.01	8,965	0.003	0.2257
	(0.11)		(0.1)		(0.002)	
Religiously Affiliated	0.62	3,544	0.65	8,873	-0.03	0.0018
	(0.49)		(0.48)		(0.01)	
Year 12 or Certif. II or Higher	0.95	3,578	0.93	8,927	0.022	0.0000
	(0.22)		(0.26)		(0.005)	
Year 12 or Certif. III or Higher	0.95	3,578	0.92	8,927	0.023	0.0000
	(0.23)		(0.27)		(0.005)	
Diploma or Higher	0.69	3,589	0.65	8,974	0.04	0.0000
	(0.46)		(0.48)		(0.009)	
Bachelord degree or Higher	0.54	3,589	0.48	8,974	0.056	0.0000
	(0.5)		(0.5)		(0.01)	
Master degree or Higher	0.16	3,589	0.14	8,974	0.025	0.0006
	(0.37)		(0.34)		(0.007)	
Doctoral degree (PhD)	0.02	3,589	0.02	8,974	0	0.9064
	(0.15)		(0.14)		(0.003)	

Notes: this table reports mean covariate values by treatment group and their difference for key individual characteristics in the later-treated sample. All women in this sample remained childless in the 5 years following IVF initiation. Column 1 reports mean covariate values for women the treatment group, who had IVF initiation between 2012 and 2014 included. Column 2 reports the number of observations for this group. Column 3 reports mean covariate values for women the treatment group, who had IVF initiation between 2015 and 2016 included, i.e. after women in the control group. Column 4 reports the number of observations for this group. Column 5 reports the difference between control and treatment group means extemdash Columns 1 and 3, respectively. The p-value of this difference is reported in column 6. Standard errors are reported between parentheses.

Table 6. Effect of 5-year childlessness on female mental health - nonparametric

Event time	Coefficient	Std. error
-4	0.0054889	0.0051919
-3	-0.0012530	0.0045939
-2	-0.0003841	0.0040542
-1	0.0090021	0.0036363
0	0.0162069	0.0030031
1	0.0345461	0.0034343
2	0.0394062	0.0036215
3	0.0406259	0.0037562
4	0.0309770	0.0038359
5	0.0208340	0.0039179

Notes: Nonparametric DTDiD estimates of the effect of 5-year childlessness on female mental health, calculated by taking the difference between mean MH-drug-use binned by relative time and treatment group. Here, the allocation to treatment depends on whether a woman remained childless (treated) or not (control) 5 years after initiating IVF. Standard errors are calculated using the formula $\sqrt{SE^2_{\text{treated}} + SE^2_{\text{control}}}$.

Table 7. Effect of 5-year childlessness on female annual income (AUD) - nonparametric

Event time	Coefficient	Std. error
-4	-327.7271	893.3889
-3	-699.0111	759.8136
-2	-644.3623	751.3295
-1	-965.5318	786.8485
0	-2564.8176	813.7426
1	612.1745	860.7925
2	19928.9348	905.7710
3	22027.3177	953.6327
4	21464.9564	971.0766
5	20939.5230	1018.6408

Notes: Nonparametric DTDiD estimates of the effect of 5-year childlessness on female annual income, calculated by taking the difference between mean income binned by relative time and treatment group. Here, the allocation to treatment depends on whether a woman remained childless (treated) or not (control) 5 years after initiating IVF. Standard errors are calculated using the formula $\sqrt{SE^2_{\text{treated}} + SE^2_{\text{control}}}$.

Table 8. Effect of childlessness on income - childless population

Event time	5-year	4-year	3-year
-3	-1,316.38	-810.48	-624.18
	(783.26)	(596.56)	(539.05)
	0.09	0.17	0.25
-2	0.00	0.00	0.00
-1	-871.43	-215.70	24.12
	(623.49)	(498.16)	(463.52)
	0.16	0.67	0.96
0	-2,385.39	-1,823.51	-1,052.21
	(627.18)	(499.16)	(464.31)
	0.00	0.00	0.02
1	-5,518.70	-4,782.40	-3,861.77
	(623.60)	(561.16)	(476.74)
	0.00	0.00	0.00
2	-7,146.76	-6,816.05	-6,170.91
	(781.75)	(699.12)	(528.25)
	0.00	0.00	0.00
3			-7,777.95
			(660.04)
			0.00
Obs.	57,916	72,222	105,269

Notes: this table reports DTDiD estimates of the effect of 5-, 4-, and 3-year childlessness on income. Women are considered as treated starting from their IVF initiation, and the sample only includes women who birthed a child strictly between 25 and 60 years of age. For further details, see Section 3. Column 1 reports event times, Columns 2 to 4 report treatment effect estimates for samples of women that, respectively, are childless 5, 4, and 3 years after initiating IVF. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 9. Effect of childlessness on MH drugs - childless population

Event time	5-year	4-year	3-year
-3		0.00	-0.00
		(0.01)	(0.01)
		0.67	0.62
-2	0.00	0.00	0.00
-1	0.00	0.00	-0.00
	(0.01)	(0.01)	(0.01)
	0.69	0.61	0.43
0	0.01	0.00	-0.01
	(0.01)	(0.01)	(0.01)
	0.47	0.88	0.10
1	0.01	0.01	0.00
	(0.01)	(0.01)	(0.01)
	0.14	0.12	0.62
2	0.04	0.04	0.02
	(0.01)	(0.01)	(0.01)
	0.00	0.00	0.00
3			0.03
			(0.01)
			0.00
Obs.	46,540	58,139	95,070

Notes: this table reports DTDiD estimates of the effect of 5-, 4-, and 3-year childlessness on MH drugs. Women are considered as treated starting from their IVF initiation, and the sample only includes women who birthed a child strictly between 25 and 60 years of age. For further details, see Section 3. Column 1 reports event times, Columns 2 to 4 report treatment effect estimates for samples of women that, respectively, are childless 5, 4, and 3 years after initiating IVF. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 10. Effect of childlessness on MH visits - childless-only

Event time	5-year	4-year	3-year
-3	-0.01		-0.01
	(0.01)		(0.01)
	0.48		0.38
-2	0.00	0.00	0.00
-1	0.00	0.01	-0.00
	(0.01)	(0.01)	(0.01)
	0.59	0.53	0.83
0	0.01	0.03	0.01
	(0.01)	(0.01)	(0.01)
	0.19	0.01	0.08
1	0.02	0.04	0.04
	(0.01)	(0.01)	(0.01)
	0.02	0.00	0.00
2		0.05	0.04
		(0.01)	(0.01)
		0.00	0.00
3			0.03
			(0.01)
			0.00
Obs.	46,540	51,318	95,070

Notes: this table reports DTDiD estimates of the effect of 5-, 4-, and 3-year childlessness on MH visits. Women are considered as treated starting from their first IVF cycle, and the sample only includes women who birthed a child strictly between 25 and 60 years of age. For further details, see Section 3. Column 1 reports event times, Columns 2 to 4 report treatment effect estimates for samples of women that, respectively, are childless 5, 4, and 3 years after their first IVF transfer. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 11. Effect of 3-year childlessness on female income and mental health

Event time	Income	Any MH drugs	Any MH visits
-4	182.19	-0.00	-0.00
	(453.72)	(0.00)	(0.00)
	0.69	0.75	0.41
-3	250.44	-0.00	0.00
	(424.44)	(0.00)	(0.00)
	0.56	0.34	0.35
-2	0.00	0.00	0.00
-1	-973.77	0.01	0.01
	(403.21)	(0.00)	(0.00)
	0.02	0.07	0.11
0	-1,902.10	0.02	0.02
	(403.68)	(0.00)	(0.00)
	0.00	0.00	0.00
1	2,255.48	0.03	0.03
	(404.41)	(0.00)	(0.00)
	0.00	0.00	0.00
2	22,773.51	0.04	0.03
	(405.41)	(0.00)	(0.00)
	0.00	0.00	0.00
3	25,493.05	0.03	0.02
	(406.74)	(0.00)	(0.00)
	0.00	0.00	0.00
4	21,529.81	0.01	0.00
	(426.54)	(0.00)	(0.00)
	0.00	0.00	0.22
5	15,715.13	-0.00	0.00
	(452.00)	(0.00)	(0.00)
	0.00	0.91	0.41
6	12,715.80	-0.00	0.00
	(488.68)	(0.00)	(0.00)
	0.00	0.24	0.55
Obs.	425,124	662,164	662,164

Notes: this table reports DTDiD estimates of the effect of 3-year childlessness on female outcomes. Women are considered as treated starting from their IVF initiation, and the sample only includes women strictly between 25 and 60 years of age. Additional restrictions are imposed in the income regression, in order to focus on women employed full-time. For further details, see Section 3. Column 1 reports event times, Column 2, 3, and 4 the treatment-effect coefficients for the income, MH-drugs, and MH-visits outcomes, respectively. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 12. Effect of 4-year childlessness on female income and mental health

Event time	Income	Any MH drugs	Any MH visits
-4	408.50	-0.00	-0.01
	(539.09)	(0.00)	(0.00)
	0.45	0.87	0.34
-3	164.94	-0.00	0.00
	(496.82)	(0.00)	(0.00)
	0.74	0.76	0.34
-2	0.00	0.00	0.00
-1	-1,016.72	0.01	0.01
	(467.92)	(0.00)	(0.00)
	0.03	0.14	0.14
0	-2,216.44	0.02	0.02
	(468.47)	(0.00)	(0.00)
	0.00	0.00	0.00
1	1,828.43	0.03	0.02
	(469.32)	(0.00)	(0.00)
	0.00	0.00	0.00
2	21,152.81	0.03	0.02
	(470.50)	(0.00)	(0.00)
	0.00	0.00	0.00
3	24,055.53	0.03	0.02
	(472.05)	(0.00)	(0.00)
	0.00	0.00	0.00
4	23,921.40	0.02	0.00
	(474.12)	(0.00)	(0.00)
	0.00	0.00	0.28
5	21,444.43	0.01	0.00
	(500.35)	(0.00)	(0.00)
	0.00	0.07	0.26
6	16,081.36	-0.00	0.00
	(538.75)	(0.00)	(0.00)
	0.00	0.91	0.84
Obs.	374,290	591,315	591,315

Notes: this table reports DTDiD estimates of the effect of 4-year childlessness on female outcomes. Women are considered as treated starting from their IVF initiation, and the sample only includes women strictly between 25 and 60 years of age. Additional restrictions are imposed in the income regression, in order to focus on women employed full-time. For further details, see Section 3. Column 1 reports event times, Column 2, 3, and 4 the treatment-effect coefficients for the income, MH-drugs, and MH-visits outcomes, respectively. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 13. Effect of 5-year childlessness on female income and mental health

Event time	Income	MH drugs[a]	MH drugs[b]	MH visits[a]	MH visits[b]
-4	1,077.65	0.00	-0.00	-0.01	-0.01
	(644.92)	(0.01)	(0.01)	(0.01)	(0.01)
	0.09	0.44	0.58	0.23	0.20
-3	507.55	-0.00	0.00	0.00	0.00
	(581.19)	(0.00)	(0.01)	(0.01)	(0.01)
	0.38	0.82	0.65	0.99	0.88
-2	0.00	0.00	0.00	0.00	0.00
-1	-1,143.46	0.01	0.01	0.00	0.01
	(540.91)	(0.00)	(0.00)	(0.00)	(0.01)
	0.03	0.23	0.08	0.34	0.24
0	-2,469.72	0.01	0.02	0.01	0.02
	(541.56)	(0.00)	(0.00)	(0.00)	(0.01)
	0.00	0.00	0.00	0.00	0.00
1	1,403.57	0.03	0.04	0.02	0.03
	(542.55)	(0.00)	(0.00)	(0.00)	(0.01)
	0.01	0.00	0.00	0.00	0.00
2	20,512.64	0.03	0.04	0.02	0.02
	(543.87)	(0.00)	(0.00)	(0.00)	(0.01)
	0.00	0.00	0.00	0.00	0.01
3	23,055.82	0.03	0.04	0.02	0.02
	(545.61)	(0.00)	(0.00)	(0.00)	(0.01)
	0.00	0.00	0.00	0.00	0.00
4	23,398.16	0.02	0.03	0.01	0.00
	(547.94)	(0.00)	(0.00)	(0.00)	(0.01)
	0.00	0.00	0.00	0.29	0.43
5	23,090.40	0.01	0.02	0.00	0.01
	(551.22)	(0.00)	(0.00)	(0.00)	(0.01)
	0.00	0.00	0.00	0.36	0.18
6	19,867.36	0.00	0.01	-0.00	0.00
	(591.80)	(0.00)	(0.01)	(0.00)	(0.01)
	0.00	0.47	0.04	1.00	0.88
Obs.	316,438	510,397	298,873	510,397	298,873

Notes: this table reports DTDiD estimates of the effect of 5-year childlessness on female outcomes. Women are considered as treated starting from their IVF initiation, and the sample only includes women strictly between 25 and 60 years of age. Additional restrictions are imposed in the income regression, in order to focus on women employed full-time. For further details, see Section 3. Column 1 reports event times, Column 2 to 6 the treatment-effect coefficients for the income (2), MH-drugs (3-4), and MH-visits (5-6) outcomes, respectively. Among the MH-outcome regressions, "(a)" indicates that the full baseline sample was used, while "(b)" that a sample with the same restrictions as the one used in the income regression was used. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

Table 14. Effect of 6-year childlessness on female income and mental health

Event time	Income	Any MH drugs	Any MH visits
-4	1,198.77	0.00	0.00
	(792.19)	(0.01)	(0.01)
	0.13	0.86	0.97
-3	688.74	0.00	0.01
	(682.79)	(0.01)	(0.01)
	0.31	0.92	0.32
-2	0.00	0.00	0.00
-1	-1,210.18	0.01	0.01
	(621.73)	(0.00)	(0.01)
	0.05	0.29	0.37
0	-2,293.05	0.02	0.01
	(622.51)	(0.00)	(0.01)
	0.00	0.00	0.02
1	1,572.69	0.03	0.02
	(623.66)	(0.00)	(0.01)
	0.01	0.00	0.00
2	20,552.07	0.04	0.02
	(625.16)	(0.00)	(0.01)
	0.00	0.00	0.00
3	23,142.65	0.04	0.02
	(627.10)	(0.00)	(0.01)
	0.00	0.00	0.00
4	23,265.11	0.03	0.01
	(629.68)	(0.00)	(0.01)
	0.00	0.00	0.10
5	22,692.75	0.02	0.01
	(633.24)	(0.00)	(0.01)
	0.00	0.00	0.11
6	20,866.27	0.01	0.00
	(638.59)	(0.00)	(0.01)
	0.00	0.02	0.55
Obs.	254,176	423,663	423,663

Notes: this table reports DTDiD estimates of the effect of 6-year childlessness on female outcomes. Women are considered as treated starting from their IVF initiation, and the sample only includes women strictly between 25 and 60 years of age. Additional restrictions are imposed in the income regression, in order to focus on women employed full-time. For further details, see Section 3. Column 1 reports event times, Column 2, 3, and 4 the treatment-effect coefficients for the income, MH-drugs, and MH-visits outcomes, respectively. For each relative period, under the coefficient are listed the heteroskedasticity-robust standard error, and the p-value at the 5%.

C Eventually successful samples and results

This sample partially overlaps with the childless sample described in Section **??**. It focuses on women that we observe having a child in the 5-year period after their first IVF transfer. It includes women that between 2012 and 2018 were: (i) strictly between 25 and 60 years old, and are dropped from the sample for any year where their age is outside this interval, (ii) had their first IVF transfer strictly between ages 25 and 56, (iii) did not die during the period of observation, (iv) delivered a child in the second year after their first IVF transfer, (v) had their first IVF transfer before 2019. To implement the later-treated approach, women are assigned to the treatment group if they had their first IVF transfer between 2012 and 2015, inclusive, and to the control group if they had it between 2016 and 2018, inclusive.

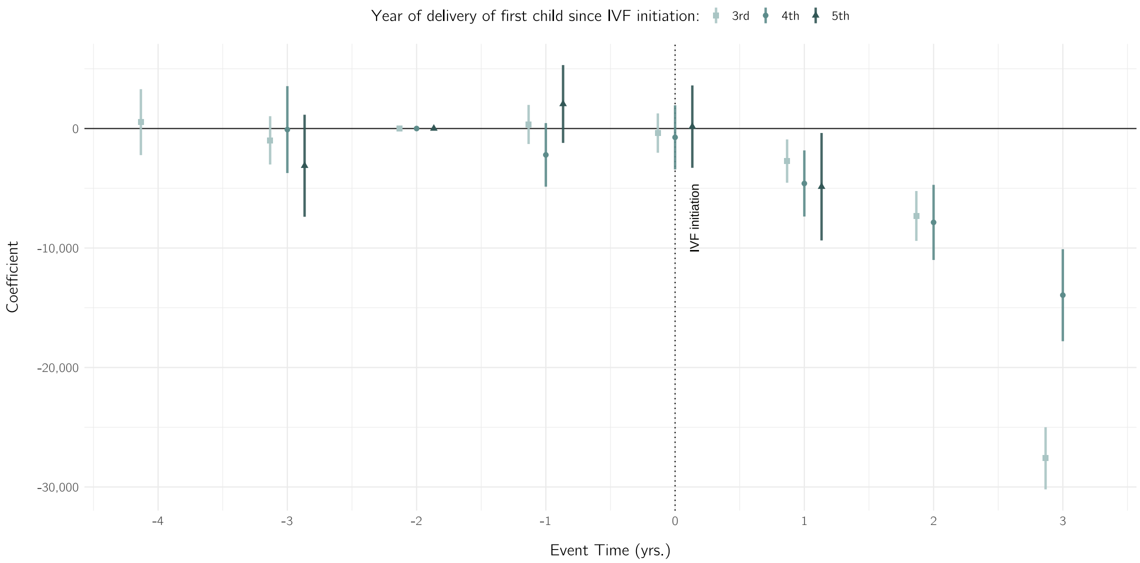


Figure 17. Effect of Going Through IVF on Annual Income (AUD) - Child-with population

Notes. This figure plots the dynamic treatment effect estimates from Equation 3, capturing the effect of "going through IVF" on the income and use of mental health prescription drugs. All women in the samples initiate IVF (at time zero) and deliver a live birth in their third, fourth, or fifth year since initiation, depending on the sample. Different shades of blue indicate that the estimates come from different samples. For instance, the lightest shade of blue is associated with a sample where all women had a child in their third year since IVF initiation, and we use the pre-IVF outcomes of women treated in later calendar years to build the counterfactual outcomes for women treated earlier. Darker shades indicate samples with longer childlessness spells before childbirth. The line crossing the markers represents 95% confidence intervals, built using heteroskedasticity-robust standard errors.

Table 15. Effect of childlessness on female income - child-with population

Event time	5-year	4-year	3-year
-4			534.10
			(1,407.68)
			0.70
-3	-3,114.89	-89.20	-988.70
	(2,177.93)	(1,854.87)	(1,031.31)
	0.15	0.96	0.34
-2	0.00	0.00	0.00
-1	2,053.20	-2,205.77	339.59
	(1,661.48)	(1,357.69)	(835.09)
	0.22	0.10	0.68
0	159.53	-738.01	-381.06
	(1,758.93)	(1,369.04)	(840.15)
	0.93	0.59	0.65
1	-4,868.69	-4,597.64	-2,725.35
	(2,292.92)	(1,411.86)	(924.57)
	0.03	0.00	0.00
2		-7,853.79	-7,317.11
		(1,602.51)	(1,064.50)
		0.00	0.00
3		-13,944.56	-27,585.01
		(1,952.70)	(1,315.81)
		0.00	0.00
Obs.	5,690	14,446	32,568

Notes. This figure reports the dynamic treatment effect estimates from Equation 3, capturing the effect of "going through IVF" on the income and use of mental health prescription drugs. All women in the samples initiate IVF (at time zero) and deliver a live birth in their third, fourth, or fifth year since initiation, depending on the sample. Different columns report estimates come different samples. For instance, Column 4 reports estimates from a sample where all women had a child in their third year since IVF initiation, and we use the pre-IVF outcomes of women treated in later calendar years to build the counterfactual outcomes for women treated earlier. Columns 3 and 2, report estimates from samples with longer childlessness spells before childbirth—i.e. who had their first child in the fourth and fifth year, respectively. Coefficients are reported one the same rows as event times, with heteroskedasticity-robust standard errors (in parenthesis) and p-values below them.