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Careers on Hold? Earnings, Sick Leave, and Mental Health after Assisted Reproduction

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Abstract

Over the past 30 years, the use of assisted reproductive technology (ART) has become increasingly common. While ART patients are also becoming more diverse and ART is recognised as inherently time-consuming, few studies have investigated its impact on outcomes beyond treatment safety. This study uses population-wide register data covering all individuals who initiated ART treatment in Norwegian public hospitals between 2008 and 2024. We investigate how ART use is related to different health and labour market outcomes for both the woman undergoing treatment and her partner. We find that starting treatment is associated with a substantial decline in women's earnings, a large increase in physician-certified sickness absence, and a change in the likelihood of mental health problems. While part of these effects reflects childbearing itself, we also document significant changes among ART-treated women who have not had children (yet or ever). We find fewer ART effects among partners. Nonetheless, when stratifying by subsequent live birth, we document contrasting post-treatment earnings patterns: the classical "fatherhood premium" appears among partners in successful couples, whereas earnings growth slows among partners in couples without a live birth. Disentangling the consequences of ART from those of underlying infertility is inherently difficult; however, we observe gradients by the number of treatment cycles consistent with treatment-related burdens beyond infertility itself. Our findings have important implications for understanding how the growing use of ART may affect treated couples' labour market participation.

JEL Classification: C01 , C21 , I10 , I12 , J13 , J16

1 Introduction

It is estimated that approximately 17 percent of all adults will experience infertility (the failure to achieve pregnancy within 12 months of trying) at some point during their lifetime [1]. Historically, persistently infertile couples have had few options for becoming parents other than adoption. However, the development and expansion of assisted reproductive technology (ART) has provided a now widely used alternative. ART refers to the *in vitro* handling of both female and male reproductive cells [2] and has enabled many infertile couples to achieve pregnancy. Consequently, over the past thirty years ART use has become increasingly common. While ART conceptions accounted for just 0.6 percent of the total fertility rate (TFR) in Norway in 1990, this share had increased to 4.9 percent by 2018 [3].

While ART increases the likelihood of having a child, the process in itself can be demanding. ART treatments involve not only direct monetary costs but also significant time investments and a physical and emotional toll. In addition to repeated clinical visits and invasive medical procedures, couples undergoing treatment also face uncertainty, stress, and in many cases repeated failed attempts before success. All these costs make ART a potentially important determinant of both health and labour market outcomes.

Most existing research on ART has focused on the medical safety of fertility treatments [4], with early work primarily concerned with the risks of ovarian stimulation and the higher rate of multiple pregnancies in ART-treated women [5, 6]. While in-vitro fertilisation (IVF), one of the most common types of ART, was originally intended for patients with known tubal disease [7], today it is used for a broader set of indications, including unexplained subfertility [8]. This changing profile of patients has significant implications. First, newer studies of mortality find evidence of a "healthy female effect" – as women undergoing IVF typically have lower mortality than the general population [9]. This likely reflects positive selection, as IVF patients increasingly represent relatively healthy women who actively seek treatment. Second, as ART patients are becoming increasingly heterogeneous, understanding the effects of ART is useful for the broader population and not only relevant for one very specific group of patients. While the medical literature has been important for understanding the safety of ART, it has paid less attention to how ART affects long-term health trajectories beyond immediate pregnancy outcomes.

Even less is known about how ART influences labour market outcomes. ART may affect labour supply through several channels. First, treatment requires repeated medical appointments, creating short-term work absences. Second, the physical and emotional burden of treatment may affect productivity, career planning, and mental health. Third, fertility expectations and eventual parenthood — or continued childlessness — may shift the patient's long-term labour market trajectories. All these channels may also extend to the partners, who could be affected through their supporting roles.

Existing evidence on the labour market consequences of ART is limited and tends to focus on the short run. A UK-based survey of individuals undergoing treatment while working found that the majority

of participants experienced treatment-related absence from work [10]. On average, respondents reported 8.74 days taken off per treatment cycle, drawing on a range of leave mechanisms including annual leave, sick leave, and unpaid leave. Nearly all respondents (87%) reported that fertility treatment affected their work, and more than half were concerned that it would affect their future career prospects. An older cohort study from the Netherlands found slightly smaller effects. Dutch women in paid work reported on average 23 hours of IVF-related absence during the 10-week period following initiation of treatment [11]. However, among those experiencing physical and/or emotional problems related to treatment, reported absence nearly doubled to 40.7–42 hours. These studies provide consistent evidence that ART treatment is associated with short-term work absence, but they are limited in scope: they do not consider partners, nor do they examine longer-term effects on health and labour market attachment. While there are few studies directly investigating the link between ART use and labour market outcomes, ART remains a popular instrument for fertility in the economic literature [12, 13].

One of the channels through which ART treatment may influence labour market attachment in the short and long run is through its effect on mental health. Previous studies from the Nordic context have found that women who remain childless after undergoing assisted reproduction have a higher risk of adverse mental health outcomes such as depression than women who successfully conceived [14, 15]. While this could be a result of large baseline differences, a large meta-analysis found no evidence that neither anxiety, depressive symptoms, nor perceived stress pre-treatment were associated with less favourable ART outcomes [16]. While it is difficult to separate the mental health effect of ART treatment from the mental health effect of simply remaining childless, a Dutch study comparing different treatment protocols found that treatment failure after standard hormone protocol was associated with more symptoms of depression compared to failure after a mild protocol [17].

The Norwegian setting provides a unique opportunity to address these gaps. First, ART is relatively common in Norway, and if one opts for treatment at public clinics the majority of its direct costs are covered through the public health care system. Second, Norway has high female labour force participation and relatively generous sick leave and parental leave policies. This institutional context reduces the financial barriers to treatment while also potentially moderating its impact on employment. An additional advantage of the Norwegian setting is that register data allow us to identify all patients receiving ART in public clinics, providing unusually comprehensive coverage of the treated population. This complete coverage of publicly treated patients substantially reduces concerns about selective observation and makes it possible to study the broader labour market consequences of ART in a setting where treatment is both widespread and policy relevant.

Consequently, this study aims to provide new evidence on how initiating ART treatment is related to health and labour market outcomes in both the short and longer run. We use population-wide register data covering the entire Norwegian population to examine the links between ART treatment, health, and

labour market participation. Specifically, we address three research questions:

1: How is the initiation of ART treatment related to changes in income and the use of sick leave?

2: How is the initiation of ART treatment related to changes in mental health?

3: To what extent are there spillover effects on partners?

2 Institutional background

The institutional setting of Norway provides a particularly interesting setting for studying the effects of ART. As mentioned, ART is considered to be healthcare and is therefore publicly funded and available at a relatively low cost at public clinics and hospitals. Second, Norway's strong welfare provisions (e.g. paid sick leave, workers' protection laws) could mean that while ART is time costly, it may not impact the careers of treated women and their partners. Finally, the existence of Norwegian register data mean that we can study ART effects within the entire population of all women seeking publicly provided ART treatment.

2.1 Availability of ART treatment in Norway

In Norway, ART is regulated under the biotechnology act. Patients who struggle with infertility may be referred to one of the public clinics who offer ART treatment by their general practitioner or a gynaecologist. While health personnel may refer anyone to ART treatment, the biotechnology act has guidelines which limits who can access ART and who will be prioritised in the publicly funded clinics. Couples have to be either married or in a stable partnership ("resembling marriage"). The woman *should* also be less than 39 years old at the time of referral, and have a BMI under 32. However, there is variation among clinics in terms of how strictly these guidelines are followed. For example, some clinics treat these thresholds as flexible and allow younger patients with marginally higher BMI, whereas others impose them as hard eligibility cut-offs that must both be met. Private clinics are generally less strict in their requirements. While patients can influence when they first contact their physician about their infertility, there is large variation in how long it takes from this first consultation to the first embryo transfer. First, the woman and her partner will be examined for infertility issues. Then, the physician will refer them to an infertility clinic at the hospital, where the treatment team will assess the referral with regards to the biotechnology act and guidelines on how patients should be prioritised. Once the referral is accepted, the waiting period starts. In 2025, this typically varied from 12-34 weeks[1], however, the waiting times have varied significantly over time. Furthermore, as the demand for ART is very high, many of the largest public clinics have set an expiration date for offered ART treatment. For example, Norway's largest public clinic at Oslo University Hospital requires that one starts treatment within 7 months of the first consultation. If one does not start treatment within these 7 months, one loses the right to treatment

[1] https://tjenester.helsenorge.no/velg-behandlingssted/behandlinger/ventetider-for?bid=183

and must get a new referral and then the waiting time is reset. Importantly, this intricate system of examinations, referrals, and variation in waiting time means that patients cannot control exactly when the first embryo transfer will occur.

At public clinics, couples can receive up to three IVF-cycles, where one cycle is considered complete after all viable embryos from retrieved eggs are transferred to the woman. This means that if the egg retrieval results in multiple viable embryos, each ART cycle can involve multiple embryo transfers. In Norway, health care is subsidised in a way such that each visit to specialised health care has a co-pay. In 2025 this amounts to NOK 403 (≈ 34 EUR) per visit. However, ART treatment is also considered as a "special health care service" and therefore has an additional co-pay of NOK 1500 (≈ 128 EUR) per completed treatment cycle, meaning that if one uses the maximum number of tries there is an additional cost of NOK 4,500 (≈ 380 EUR) in addition to the normal co-pay. Still, the biggest cost of ART treatment is the medication needed for hormone stimulation, which is used in the weeks leading up to egg retrieval. Oslo University Hospital estimates that each treatment cycle costs NOK 10,000 in medications. Norway has a cap on how much a patient can spend on medications each year. Consequently, one can claim reimbursement for expenses relating to ART medication once one have reached this maximum user fee. In 2024 this limit was NOK 20,761 (≈ 1,750 EUR) per ART-treatment (one treatment considered as the first three cycles of treatment per birth[2]). This means that if one uses all three trials and max out the spending on medication, ART offered through public health care costs each couple up to NOK 25,261 (≈ 2,140 EUR) per (potential) birth, in addition to the very small co-payments per consultation. Treatment at private clinics is considerably more expensive, typically costing around NOK 50,000 per try (one egg retrieval + embryo transfer), excluding the cost of medications. While the number of private clinics has grown over time, the majority of ART treatment cycles are still done at public hospitals[3]. However, even if the cost of ART is much lower at public hospitals, ART still comes at a considerable cost. This will impact who starts ART treatment, how many tries patients may have, and it is also an important explanation for why one could expect that unsuccessful ART treatment may have negative effects on the treated couple.

2.2 The ART treatment process

The most popular ART treatments in Norway are IVF (in vitro fertilisation) and ICSI (intracytoplasmic sperm injection). Both these processes involve a period of hormone therapy, egg retrieval of mature eggs from the woman, egg fertilisation, and lastly the transfer of the fertilised egg(s) or embryo(s) back to the woman. For the hormone therapy phase, there are two main protocols for treatment: short or long

[2] https://www.helsenorge.no/en/refusjon-og-stotteordninger/involuntary-childlessness-and-assisted-reproduction/

[3] Of all ART cycles, the split is approximately 60% public and 40% private (based on numbers from a forthcoming paper by HI Hanevik et al.). However this estimate is based on the total number of cycles and not the number of unique patients. Given that public clinics prioritise first births and that patients also may start with publicly funded trials before moving to private clinics if they run out of attempts, we believe the split of patients to be similarly in favour of public hospitals.

protocol. The short protocol starts from day 2-3 of the menstrual cycle, with the injection of either human follicle-stimulating hormone (FSH) or gonadotropins, both aimed at stimulating follicle production. Then there follows ultrasound control after 4-5 days of injections. From day 6 or 7, the hormone therapy is supplemented with a GnRH-antagonist. Finally, an injection of choriogonadotropin alfa is used to trigger ovulation (superovulation) before the mature egg cells can be retrieved. The long protocol is similar, but starts around 1 week before expected menstruation with GnRH-analogues aimed at preventing premature ovulation. After about two weeks, there is an ultrasound control, before one starts with the injection of either FSH or gonadotropins, simultaneously as one continues the treatment with GnRH-analogues. Then, similarly to the short protocol the hormone treatment ends with an injection of choriogonadotropin alfa to trigger ovulation before the mature egg cells can be retrieved. Both the short and long protocol may vary in treatment length, depending how the follicles develop and when they are ready. In some cases, one may have to stop treatment if the follicles are not developing as expected.

Following the egg retrieval, the process of actually fertilising the egg starts. In the conventional IVF procedure, the retrieved mature eggs are placed together with sperm cells in a laboratory dish to fertilise. After a few days (usually 2-5 days), the fertilised egg has developed to a blastocyst and can be transferred back to the uterus [18]. If the IVF procedure is unsuccessful in terms of fertilisation, or if the sperm quality is poor, the ICSI procedure is more popular. ICSI involves first choosing the most viable, motile, and mobile sperm cell, and then carefully injecting this cell directly into the egg cell [19]. Then, similarly to the case of IVF, the embryo that looks the most promising is transferred back to the uterus. While it originally was rather common to transfer multiple embryos do increase the likelihood of success at each transfer, the higher rate of multiple pregnancies and the increased risk associated with multiple pregnancies have led to single embryo transfer now being the most common [20].

Although many will start and complete a full ART cycle in one go (i.e. from starting hormone therapy to transferring an embryo), many patients will also have breaks in the treatment process. Some might become spontaneously pregnant, some might become overstimulated by the hormones and need to take a break, and some might want to take a break between the egg retrieval and embryo transfer for other reasons. So given that one has at least one successfully developed embryo, one or more (in some cases all) will be frozen for later transfers.

3 Methods

Sample

Our study population is based on the Norwegian Central Population Register. This register includes anyone who has been registered as residing in Norway since the 1960 census and contains information about time of birth, death, and parent identifiers until the end of 2023. This data is linked to educational

and socioeconomic register data as well as data from the Norwegian Patient Registry (NPR) which has data available from 2008 to 2024. The data from these different sources are joined using pseudonymised individual-specific personal identification numbers. Because we need to observe fertility, health, and income in the post-treatment period we limit our sample to those undergoing ART treatment before 2023. We also only include those with a first ART treatment observed in 2009 or later, as 2008 is our first observation year. To minimise incomplete data, we limit our analyses to only include Norwegian-born individuals who also were registered as residing in Norway during the observation period (2004-2024). While many rely on ART for their first child, some will also use ART for their second or third child (with first children conceived either naturally or through ART) [21]. For our main analysis, we limit the sample to only (potential) first-time mothers. However, in the supplements we present the results from our analysis when focusing only on those with previous children. We also use the population register to identify partners of those undergoing ART-treatment.

In order to assess whether the women in our sample are inherently different from women receiving ART treatment in private clinics, we also use data from the Medical Birth Registry (MBR) to identify *all* births associated with ART treatment. These births are again linked to the mother and her partner's socio-demographic records using pseudonymised individual-specific personal identification numbers.

Measures

ART Treatment

Data from the NPR is used to identify individuals who start ART treatment. NPR contains information on all contact with specialist health care services in Norway, and includes information such as date of contact (month and year), place of contact (e.g. hospital), whether the individual was admitted, and information about any procedures done. The procedures are recorded using the standardised NCSP and NCMP coding systems[4]. In this study, we use the procedure codes LCA30 and LCW30K to identify women undergoing ART treatment. These codes correspond to either a "transfer of egg or embryo to the uterus related to assisted fertilisation" (LCA30) or "transfer of egg or embryo to the uterus related to assisted fertilisation, ultrasound guided" (LCW30K). When we stratify the sample by success, we split our sample in two: those who have a live childbirth between 6 and 10 months after the first complete ART cycle (successful ART) and those who have no live childbirths within 10 months of their first complete round of ART (unsuccessful ART). Individuals in the unsuccessful group are included until the year prior to post-ART childbirth[5]. This means that in our unsuccessful group we will have both those who remain childless after their first ART trial and those who eventually have children. However, the not-yet parents are only observed in the years prior to pregnancy.

[4] https://www.helsedirektoratet.no/digitalisering-og-e-helse/helsefaglige-kodeverk/nkpk

[5] We exclude two years prior to childbirth if the child is born in August or earlier to avoid capturing any pregnancy effects.

Health Outcomes

Information about primary health care utilisation comes from the Norwegian Control and Payment of Health Reimbursements Database (KUHR), which was established in 2006. The KUHR database contains information from different contact points within the health care system, with the majority of the data coming from general practitioners. When practitioners submit their reimbursement claims to the Norwegian Health Economics Administration (Helfo), they use the International Classification of Primary Care (ICPC-2) system to register the reason for a patient's visit [22]. We focus on visits related to mental health (the "P-chapter" of ICPC-2). To measure mental health-related visits, we create a binary variable "mental health" which equals 1 if one has at least one visit to primary health care related to mental health concerns, and 0 otherwise. We also consider the case of diagnosed mental disorders only, with a variable "mental disorders" set up in a similar manner.

Labour Market Outcomes

Our labour market data is based on two primary sources: Statistics Norway (SSB) and The Norwegian Labour and Welfare Administration (NAV). First, we will use SSB's tax registry to identify income and labour supply. For this outcome, we consider pensionable income. This is the sum of personal income via wages and income via self-employment. We use the Consumer Price Index (CPI) to adjust for inflation, and set 2015 as the baseline year. While income is not a perfect measure of hours worked, we assume that within-person changes in income at least partially reflect variations in labour supply. However, as sickness-related absence from work is compensated 100% in Norway, it is not possible to observe sickness-related shifts in labour supply in the short term through income. Therefore, to study labour market participation in more detail, we also use NAV's data on sick leave. Our primary variable of interest here is "sickness days", which is defined as the number of work days lost due to doctor-certified sickness leave. Importantly, we only have data on sickness leave spells that last longer than 16 days and therefore are covered by the National Insurance Scheme. Consequently, shorter sick leave spells are not captured by our data. Sickness leave can be either "full-time" (100%) or "part-time" (20-99%). We calculate the total sickness leave days as the number of days on leave multiplied by the sick leave percentage. Therefore, our measure of sickness days corresponds to the number of 100% sickness days.

Covariates

Data on educational attainment comes from Norway's National Education Database (NUDB), operated by Statistics Norway. The Norwegian Standard Classification of Education (NUS2000) is used to group individuals based on their highest level of completed education. We group individuals into four categories: lower secondary schooling or less (i.e. compulsory education), upper secondary schooling,

bachelor's degree, and master's degree or higher.

Ethics

This study was approved by the Regional Committees for Medical and Health Research Ethics (REK) in Norway (#2018/434).

Statistical Analysis

In order to study how ART treatment affects health and labour market outcomes, we use event-study models that are centred around treatment start, following the methodology of Kleven et al. [23].

$$Y_{ist}^{g} = \sum_{k \neq -1} \alpha_k^g \cdot \mathbf{I}\{k = t\} + \sum_{l} \beta_l^g \cdot \mathbf{I}\{l = age_{is}\} + \sum_{m} \phi_m^g \cdot \mathbf{I}\{m = s\} + \lambda'^{\mathbf{g}} \mathbf{Edu_i} + \varepsilon_{ist}^{g} \tag{1}$$

Where Y_{ist}^{g} is our main outcome of interest: either the annual income, number of sickness leave days, or the mental health for individual i in year s and at event time t. We run separate models for the treated individual ($g = treated$) and the treated individual's partner ($g = partner$). Our estimated terms are a full set of event time dummies ($\sum \alpha_k^g \cdot \mathbf{I}\{k = t\}$), age dummies ($\sum \beta_l^g \cdot \mathbf{I}\{l = age_{is}\}$), and year dummies ($\sum \phi_m^g \cdot \mathbf{I}\{m = s\}$). $\lambda'^{\mathbf{g}} \mathbf{Edu_i}$ is a vector capturing educational attainment. For near all outcomes we choose to omit the event time dummy at $t = -1$, and followingly, the event time coefficients measure the impact of ART relative to the final year before treatment start. The only exception is income, which is measured relative to the treatment year, i.e. $t = 0$.

We report our results in the main section of this paper as percentage effects: how much does the outcome deviate from the women's or partner's counterfactual outcome, absent of ART treatment. We calculate the counterfactual outcome as the predicted outcome if the event-dummies are set to zero, e.g.: $Y_{ist}^{g} = \sum_l \beta_l^g \cdot \mathbf{I}\{l = age_{is}\} + \sum_m \beta_m^g \cdot \mathbf{I}\{m = s\} + \lambda'^{\mathbf{g}} \mathbf{Edu_i} + \varepsilon_{ist}^{g}$. Consequently, the average percent effect at a given time $t = \hat{\alpha}_t^g / \mathbb{E}[\tilde{Y_{ist}^{g}} | t]$.

In addition to showing results for the full sample of ART-treated women and their partners, we also stratify our analyses by ART-success, as defined earlier. We stratify by ART-success (i.e. a live birth) to assess whether post-ART changes in income, mental health, and sick leave primarily reflect subsequent childbearing. However, as realised childbearing is a post-treatment outcome, these stratified trajectories should not be interpreted as causal effects of ART conditional on success, but as simply descriptive patterns by realised fertility outcomes.

4 Results

Table 1 shows the descriptive statistics for ART-treated women and their partners. Generally, the women who were successful at their first ART trial were slightly younger and treated later during our observation window. Those who succeeded at the first try also had slightly higher education, ended up having fewer trials, and had a larger number of children.

Table 1 Descriptive statistics for ART-treated couples by success at first trial

	Successful	**Unsuccessful**	*Difference*	
	(1)	(2)	(3)	(4)
Treated woman				
Age	31.7	32.7	-1.0	(0.06)
Treatment year	2015.9	2015.5	0.43	(0.06)
Number of embryo transfers	2.30	3.74	-1.44	(0.03)
Education level				
Compulsory	0.12	0.15	-0.03	(0.01)
High School	0.21	0.22	-0.01	(0.01)
Bachelor	0.43	0.40	0.03	(0.01)
Master	0.24	0.23	0.01	(0.01)
Number of children	1.66	1.12	0.54	(0.01)
No children	0	0.30	-0.30	(0.01)
1 child	0.44	0.34	0.10	(0.01)
2 children	0.51	0.32	0.18	(0.01)
3 children	0.09	0.06	0.03	(0.01)
4+ children	0.01	0.01	0.01	(0.01)
Mental health visit (%)	17.2	16.4	0.8	(0.5)
Diagnosed mental disorder (%)	7.1	7.1	-0.0	(0.0)
Has infertility diagnosis from GP (%)	39.2	39.6	-0.01	(0.1)
Income (NOK)	430,823	428,292	2,531	(2,976)
Sick leave (days)	6.97	6.47	0.5	(0.54)
Partner				
Mental health visit (%)	9.8	10.9	-0.01	(0.01)
Income (NOK)	559,278	548,153	10,126	(5,095)
Sick leave (days)	3.38	4.63	-1.25	(0.46)
N Treated	6,849	13,467		
N Partner	4,677	9,612		

Note: Table 1 shows the mean characteristics of women and their partners who underwent their first ART treatment between 2009 and 2022. Age and education is measured in the treatment year, mental health, income and sick leave is measured the year prior to treatment. Number of children is measured as the number of children born by the end of 2023. Not all women had a registered partner. The statistics are presented by success and failure at first trial (defined as childbirth within 10 months of trial). Column (3) and (4) present raw differences and their standard errors.

This following sections present estimates from the event-time models around ART initiation ($t = 0$) for women and the partners of women who start treatment. In our pooled sample, the coefficients can be interpreted as the effect of initiating ART on subsequent outcomes *under the standard event-study identifying assumption* that, absent treatment, outcomes would have continued to evolve according to the pre-treatment trend captured by the controls (age, calendar year, and educational attainment). We also present estimates when the same specification is modelled separately for women/partners who have a live birth within 10 months of the first ART treatment ("successful") and those who do not ("unsuccessful"). Because success is realised *after* treatment begins, and because unsuccessful individuals are followed only until a later live birth or the end of the observation window, these split-sample estimates should

be interpreted as *descriptive heterogeneity patterns* that are informative about the potential role of childbearing. The patterns should not be interpreted as a causal decomposition into "pregnancy-driven" versus "non-pregnancy-driven" effects.

4.1 ART effects among treated women

4.1.1 Income

Figure 1 plots average annual earnings by event time, relative to the year of ART initiation. In the years leading up to treatment, earnings rise for both groups, and the levels and slopes are very similar. In $t = -1$, average earnings are 430,823 NOK among women who later have a live birth within 10 months of treatment and 428,292 NOK among those who do not. After treatment starts, the series diverge: women who go on to have a child experience a sharper decline in earnings, consistent with maternity leave and the child penalty documented in [23]. In contrast, women without a live birth within 10 months display a comparatively flat earnings profile for several years, before earnings begin to increase again.

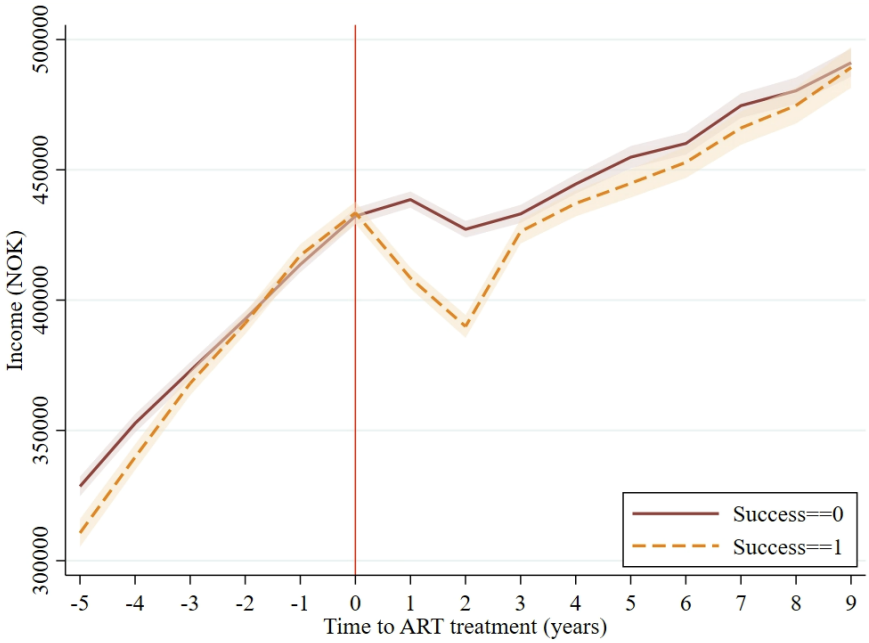


Fig. 1 Average incomes (in NOK) over time, relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

Figure 2 reports event-study coefficients from Equation (1). In the pooled model, earnings increase in the pre-treatment years and then fall sharply at treatment start, indicating a clear break from the pre-treatment trajectory. The decline stabilises after roughly two years, with earnings remaining about 7% below the pre-treatment trend thereafter. The split-sample estimates show that the post-treatment decline is more pronounced among women who have a live birth within 10 months of treatment, while the "unsuccessful" group exhibits a smaller initial decline and a flatter profile over the next few years.

Over the longer run, the two profiles converge: nine years after ART initiation, both groups earn around 7–8% less relative to the pre-treatment trend.

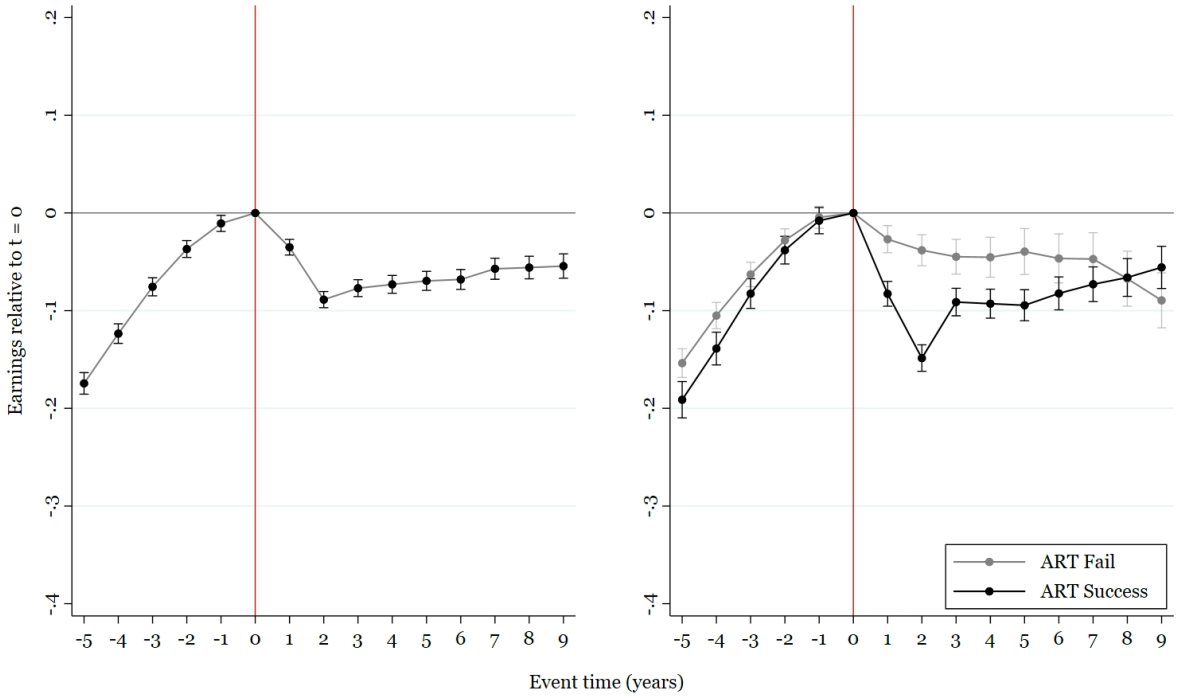


Fig. 2 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated women, as well as separately for women who either successfully have children after their first ART treatment and women who did not successfully conceive after the first ART treatment. Unsuccessful women are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

4.1.2 Sick leave

Figure 3 plots doctor-certified sick-leave days by event time. In the pre-treatment period, sick leave trends slightly upward. At $t = 0$, sick leave increases sharply, indicating a pronounced break in the pre-treatment pattern.

Figure 4 reports the corresponding event-study estimates from Equation (1). In the pooled model, sick leave rises modestly prior to treatment and then increases sharply at $t = 0$. Compared to the counter-factual no-treatment trajectory, sick leave increases by more than 200%. The elevated sick-leave persists for the entire post-treatment period. The split-sample results show a substantially larger spike at $t = 0$ among women who go on to have a live birth within 10 months, consistent with pregnancy-related sick leave. However, sick leave also increases meaningfully among women without a live birth (yet or ever). Notably, among the latter group, elevated sick leave persists for multiple post-treatment years and returns closer to baseline only around 5-6 years after treatment initiation.

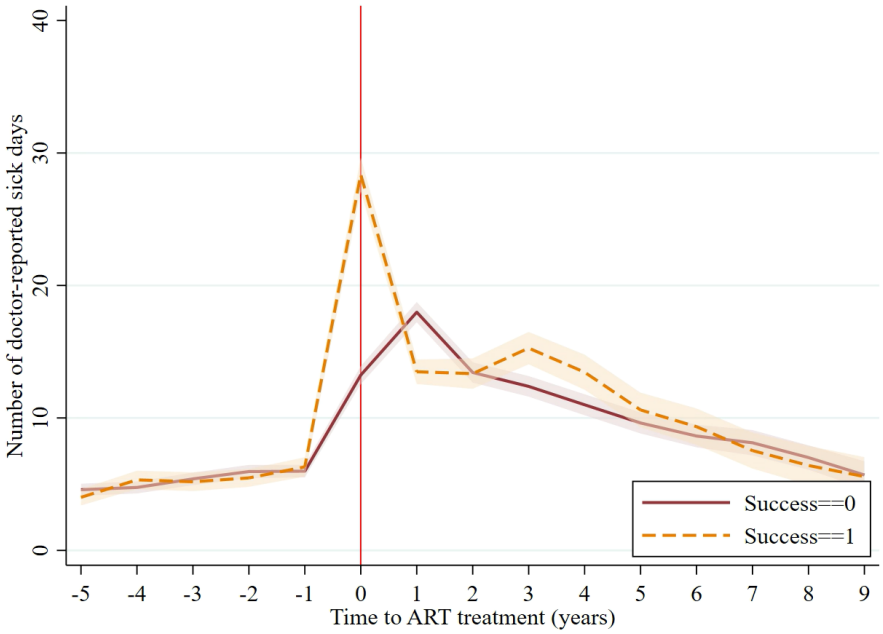


Fig. 3 Average number of doctor-reported sickness leave days, relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

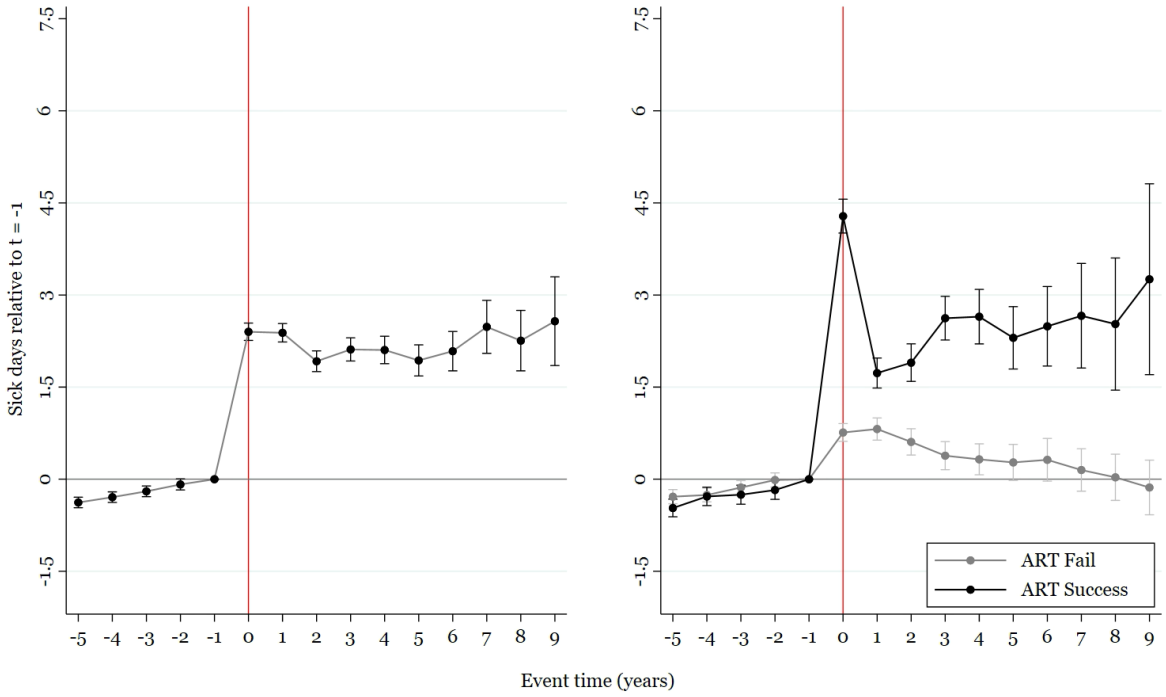


Fig. 4 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated women, as well as separately for women who either successfully have children after their first ART treatment and women who did not successfully conceive after the first ART treatment. Unsuccessful women are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

4.1.3 Mental health

Figure 5 shows the share of women with a mental-health-related primary-care visit by event time. Mental-health-related care increases leading up to treatment initiation for both groups. Among women who have a live birth within 10 months, mental health visits fall sharply the first two years after treatment, which may partly reflect coding and utilisation changes during pregnancy and the post-partum period (e.g., pregnancy-related visits being recorded under pregnancy codes rather than mental health). Unsuccessful women do not share this pattern, instead they see a jump in consultations around treatment start.

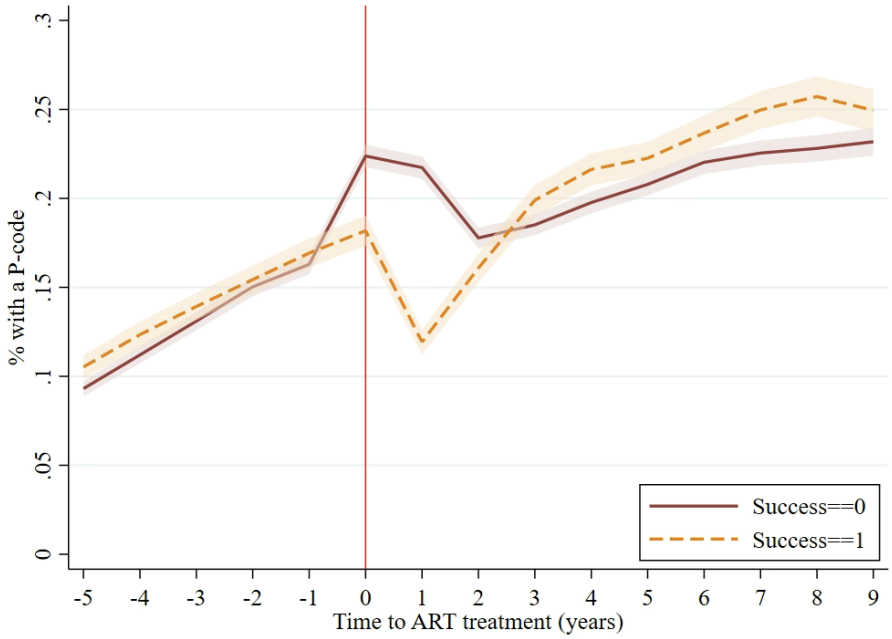


Fig. 5 Share with a mental health related doctor's visit (%) over time, relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

Figure 6 reports event-study estimates from Equation (1). In our pooled model, we only see a significant increase in mental health visits during the first treatment year. In the stratified estimates, we find that the two groups follow similar pre-treatment trajectories. Starting from $t = 0$, both experience a significant change in mental-health-related primary-care use. Women with a live birth within 10 months see a large drop ($\approx$ 38% at t=1) in the likelihood of mental health care visits relative to the pre-treatment trend. In contrast, the unsuccessful group see an even larger increase ($\approx$ 48% at t=1). Although the profiles move closer together toward the end of the observation window, mental-health-related care remains higher for the unsuccessful group for most post-treatment years. When focusing on diagnosed mental disorders (Appendix Fig. A1), the pattern is similar but more persistent, consistent with disorder codes capturing longer-lasting conditions. As noted earlier, the success split should be viewed as descriptive evidence on heterogeneity rather than causal evidence on mechanisms.

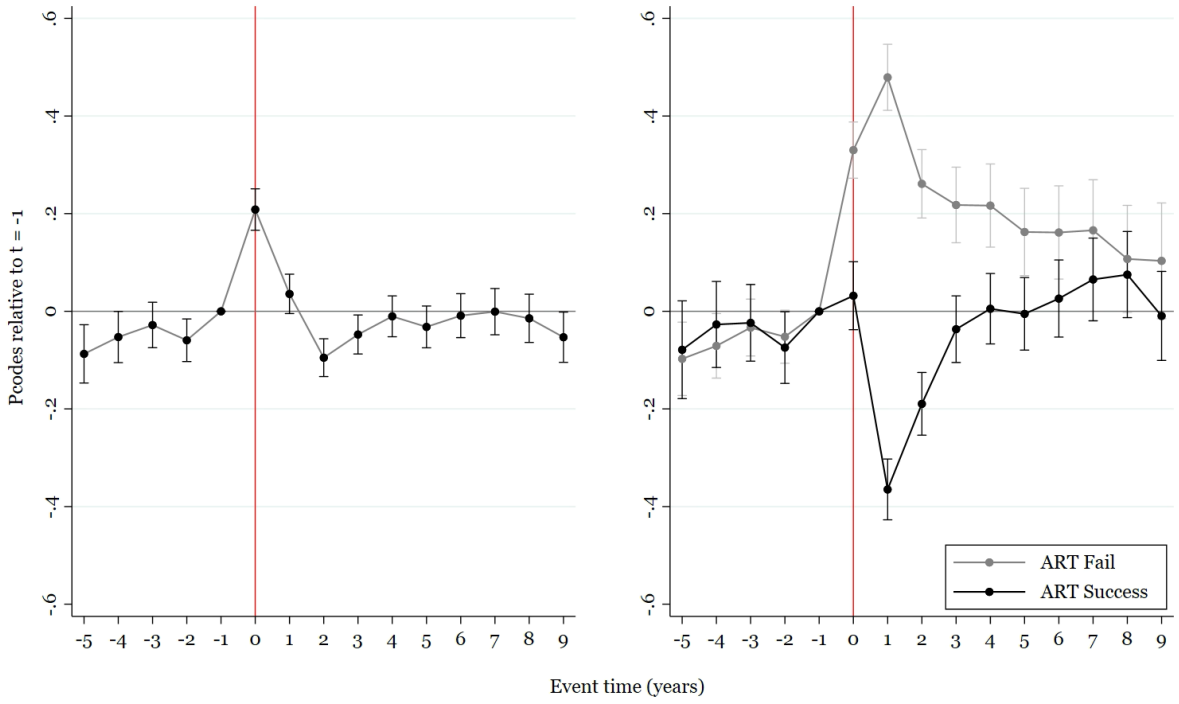


Fig. 6 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated women, as well as separately for women who either successfully have children after their first ART treatment and women who did not successfully conceive after the first ART treatment. Unsuccessful women are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

4.2 ART effects among partners of treated women

4.2.1 Income

Figure 7 plots partners' earnings by event time. In contrast to treated women (Figure 1), there is no obvious break in the average earnings profile around treatment initiation. Pre-treatment earnings are very similar for partners of successful and unsuccessful women, both in levels and trends. Differences in the post-treatment period are modest, however, the differences increase toward the end of the observation window.

Figure 8 reports event-study estimates from Equation (1). Pre-treatment coefficients are close for both groups. Post-treatment, partners of women who have a live birth within 10 months exhibit a gradual increase relative to the pre-treatment trend, whereas partners of women without a live birth display comparatively weaker earnings growth. As above, split-sample differences should be interpreted descriptively.

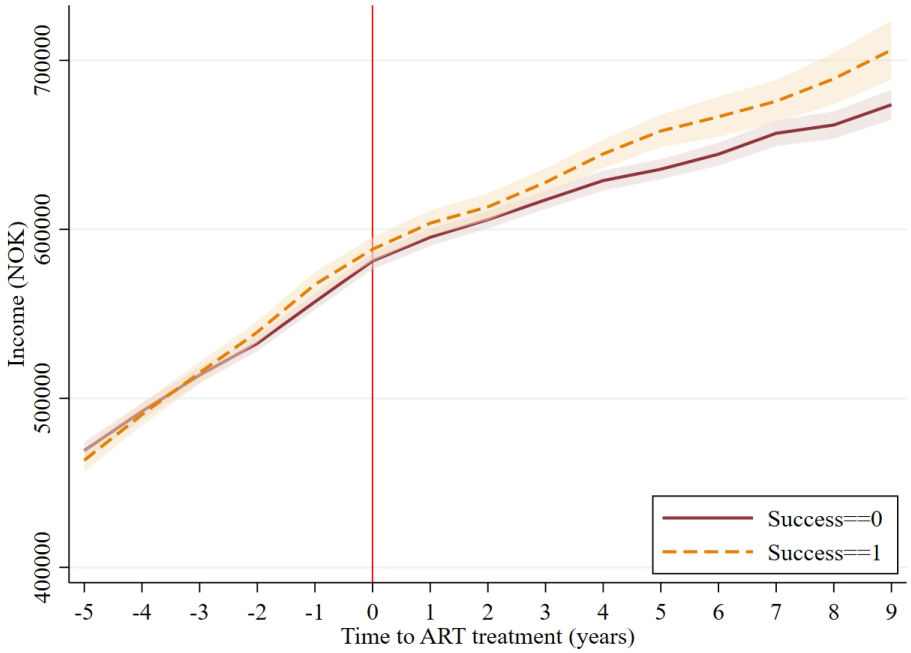


Fig. 7 Average incomes (in NOK) of partners of ART-treated women, over time and relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

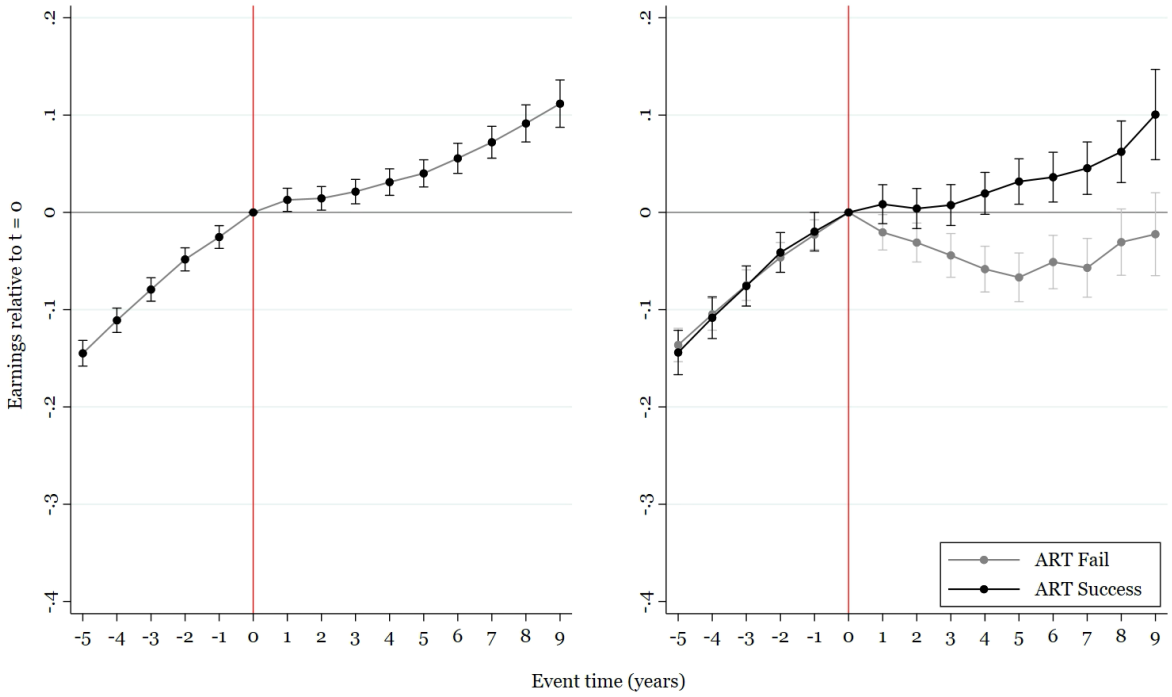


Fig. 8 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated partners, as well as separately for partners of women who either successfully have children after their first ART treatment and partners of women who did not successfully conceive after the first ART treatment. Unsuccessful couples are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

4.2.2 Sick leave

Figures 9 and 10 show partners' doctor-certified sick-leave days by event time and the corresponding event-study estimates. Compared to treated women, partners exhibit a considerably more stable profile around ART initiation, with no clear discontinuity at $t = 0$ in the raw data (when compared to Fig. 3). While we find higher sick-leave in the post-treatment period, the post-treatment deviations are modest and differences between partners of successful and unsuccessful women are limited.

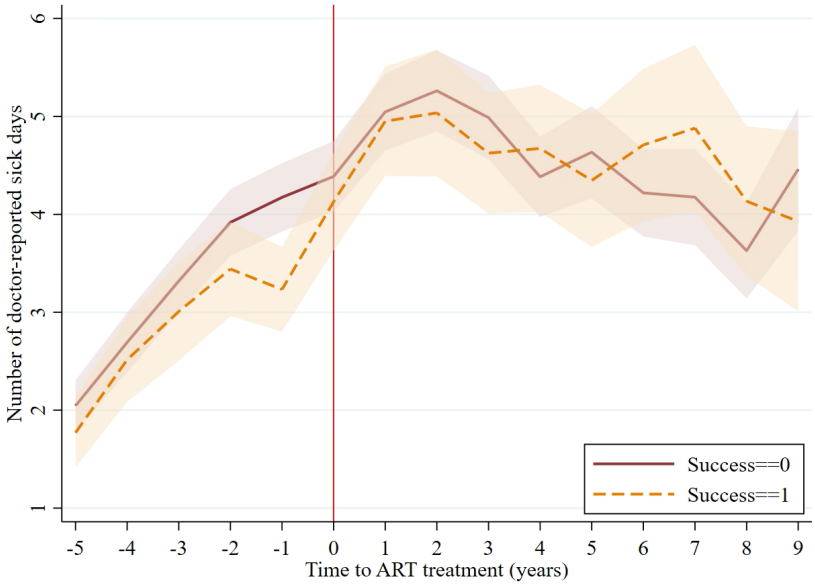


Fig. 9 Average number of doctor-reported sickness leave days, relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

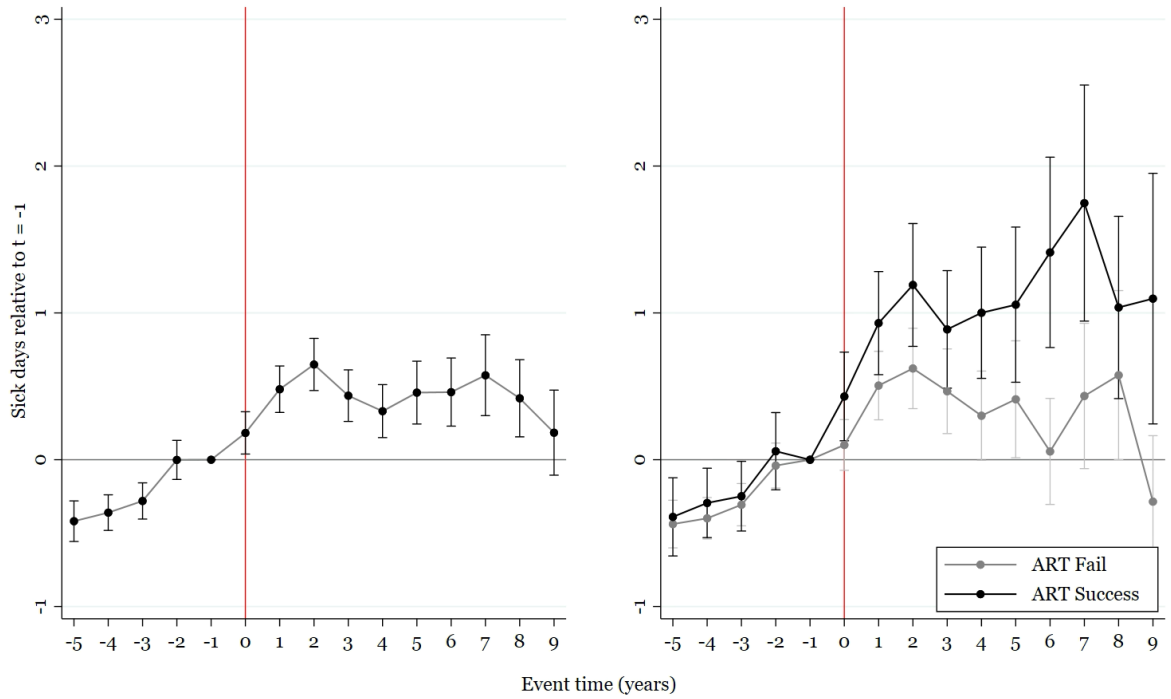


Fig. 10 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated partners, as well as separately for partners of women who either successfully have children after their first ART treatment and partners of women who did not successfully conceive after the first ART treatment. Unsuccessful couples are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

4.2.3 Mental health

Figure 11 plots the share of partners with a mental-health-related primary-care visit by event time. Again, relative to treated women, partners show no pronounced change around treatment initiation.

Figure 12 reports event-study estimates from Equation (1). After adjusting for age and calendar year trends, we find a very small but significant increase in mental-health-related primary-care use after ART treatment start. Comparing patterns between the successful and unsuccessful partners, we see the largest change among successful partners. However, overall, coefficients suggest at most modest post-treatment increases, and differences by success status are not significant.

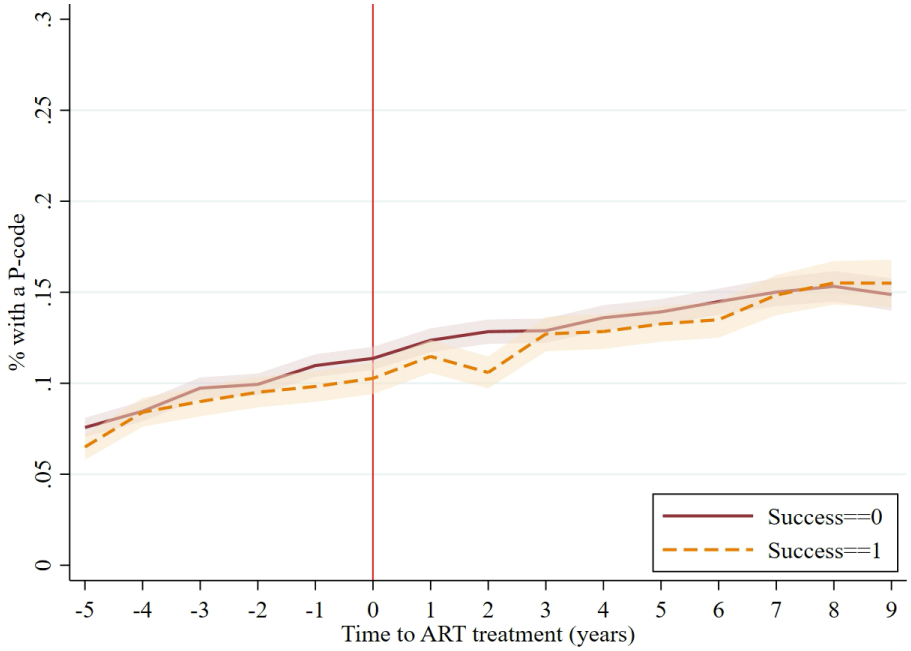


Fig. 11 Share of parters of ART-treated women with a mental health related doctor's visit (%) over time, relative to ART-treatment initiation at time 0. Success is defined as having a live childbirth either within 10 months of ART treatment. Shaded areas represent 95% confidence intervals

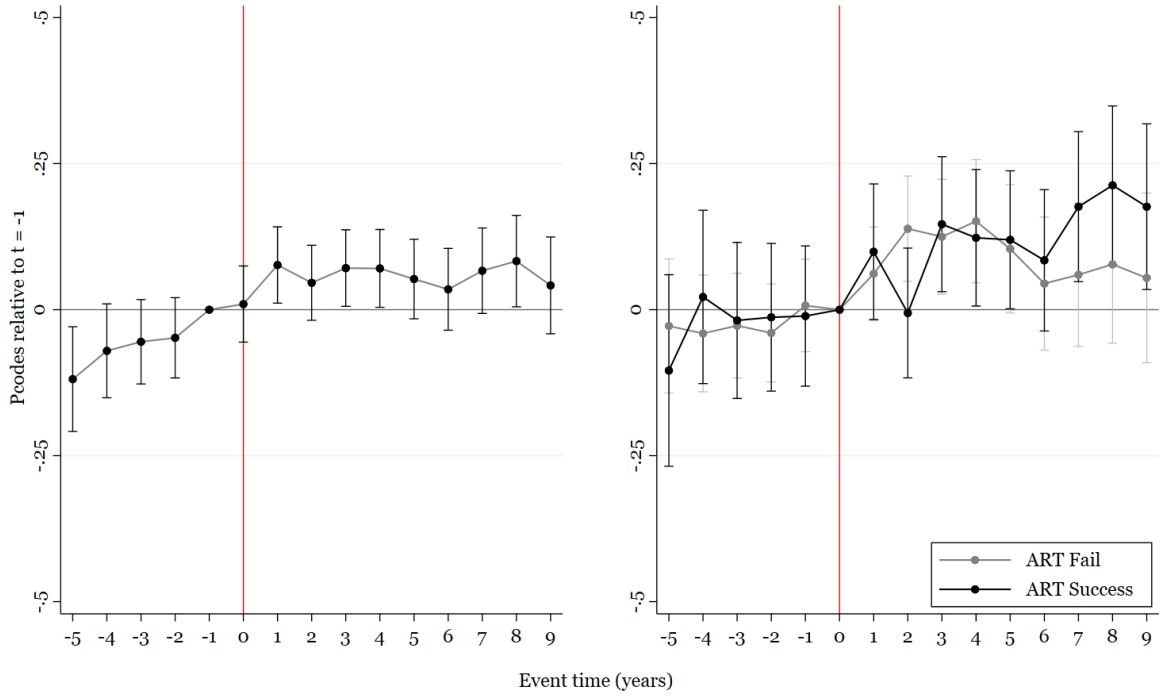


Fig. 12 The figure shows event time coefficients estimated from equation 1 as a percentage of the counterfactual outcome, absent ART treatment. The model is run for the entire sample of ART-treated partners, as well as separately for partners of women who either successfully have children after their first ART treatment and partners of women who did not successfully conceive after the first ART treatment. Unsuccessful couples are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

5 Heterogeneity: number of trials

So far we have shown how starting ART treatment marks an important transition with regards to income trends, changes in mental health, and doctor-certified sick leave. However, the path from starting ART treatment to a successful childbirth varies a lot within the sample of ART treated women. As discussed in Section 2, the treatment process involves a period of hormone stimulation, egg retrieval, fertilisation, and embryo transfer. If the first transfer fails, one could then either have a new full cycle if there are no more viable embryos to transfer, or one could have a shorter hormone stimulation period before a frozen embryo is thawed and then transferred. In this section we look at whether the number of embryo transfers before the first live birth matters for the effect of ART on earnings among successfully treated women, and similarly, whether the number of failed attempts has any impact on the mental health effect seen in unsuccessful women.

First, we compare the earnings effect among those who succeeded at their first embryo transfer to those who needed 3 or more transfers, but still were successful at conceiving within two years. Leading up to the first embryo transfer, these groups have similarly developing earnings. However, after ART treatment we see that women who needed multiple transfers before successful conception have slightly lower earnings in the long run compared to women who were successful at their first transfer.

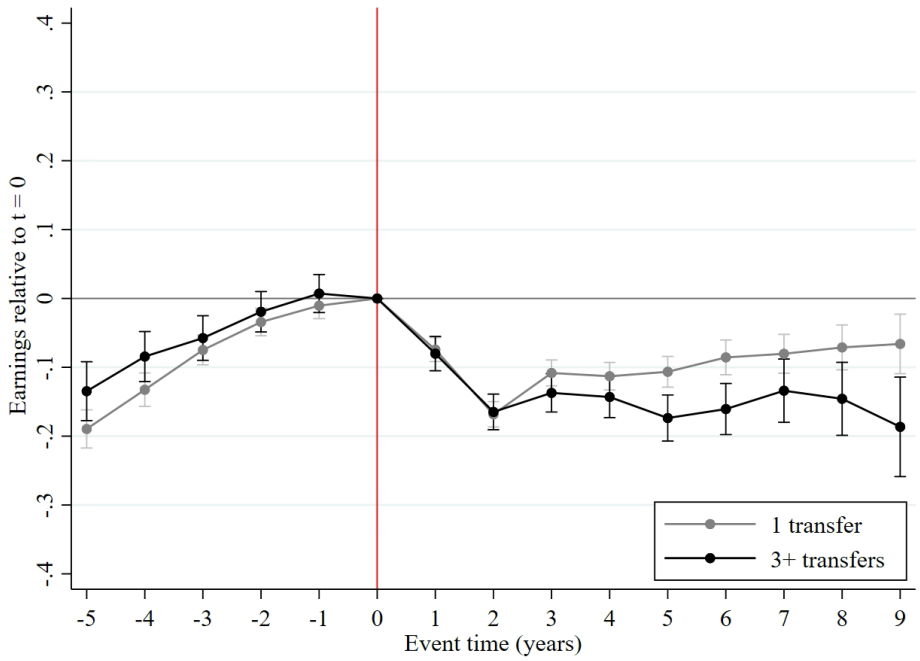


Fig. 13 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The sample is restricted to women who has their first child within 2 years of ART treatment start. The model is run separately for women who had a child after only 1 embryo transfer and women who had 2 or more transfers. The bars represent 95% confidence intervals and are based on robust standard errors.

Second, we compare the changing mental health of unsuccessful women who had 1-3 or 4+ embryo transfers. Again, these groups are very similar leading up to ART treatment start. However, after this

they diverge, as unsuccessful women who went through more embryo transfers see larger jumps in the likelihood of mental health consultations, compared to unsuccessful women who stopped at or before three transfers.

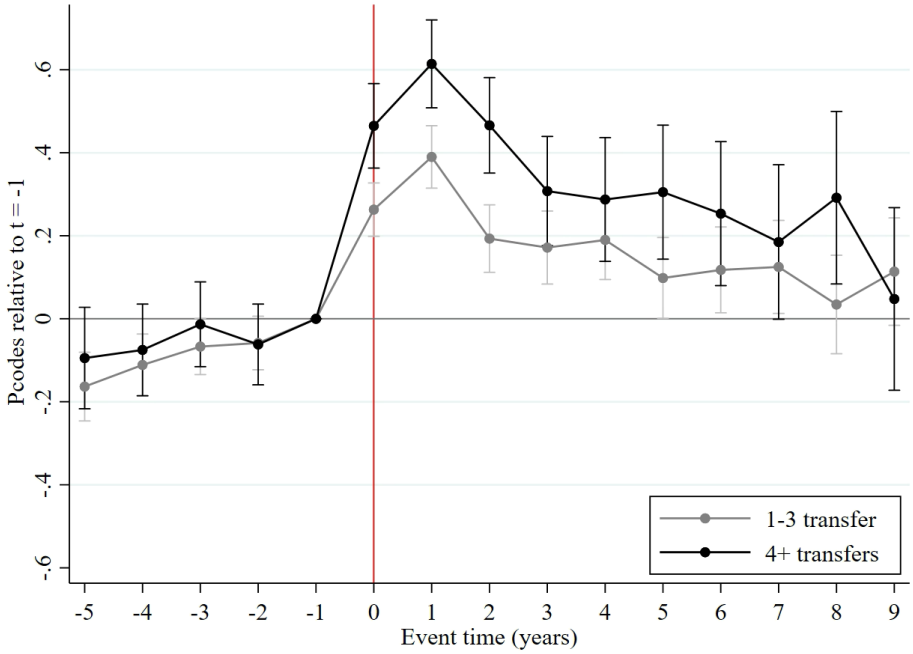


Fig. 14 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The sample is restricted to women who were unsuccessful at their first embryo transfer. The model is run separately for women who had between 1 and 3 embryo transfers and women who had 4 or more transfers. The women are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

6 Discussion

While the use of ART was once limited to a highly selected group of couples, the increasing accessibility of ART as well as the rising age at first birth have made assisted reproduction increasingly popular. While much of the past literature on ART has either focused on the safety aspect of the treatment and the variety of ART protocols (e.g. simple vs. multiple embryo transfer), this paper investigated how ART treatment in itself impacts both the women undergoing treatment and her partner. Using administrative data from Norway on all ART treatments at public hospitals between 2008 and 2022 and a quasi-experimental event study approach, we show how ART treatment have lasting impacts on the labour market participation and mental health of treated women. While we find no clear sick leave or mental health effects among partners, we also show that partners' incomes are impacted by ART treatment start.

Importantly, the fact that these effects can be seen in a strong welfare state like Norway suggests that the effects of ART may be even larger in contexts with weaker employment protection and rights related to health-related work absence.

[Discussion will be updated.]

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Appendix A Supplements

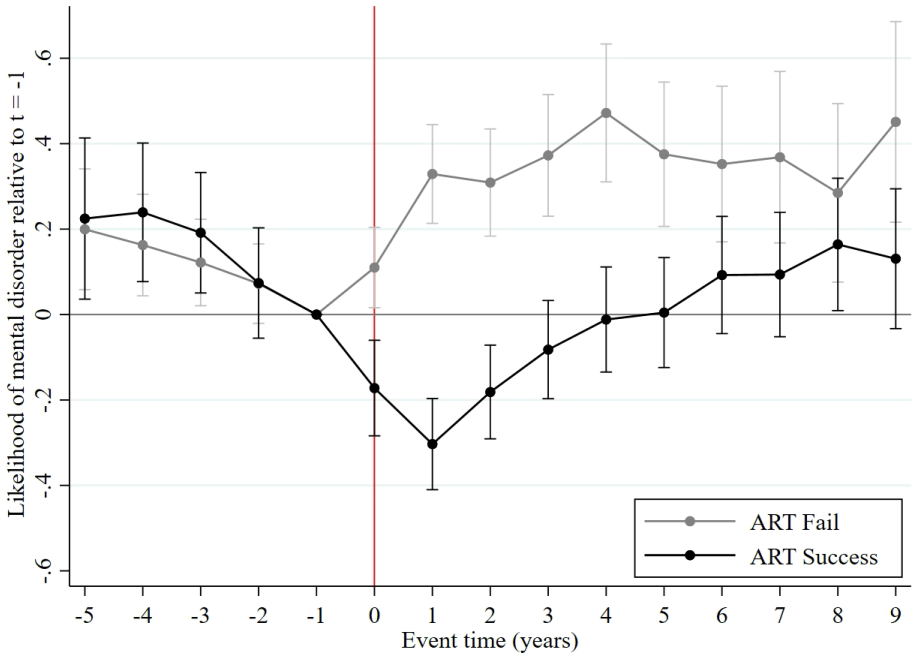


Fig. A1 The figure shows event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome, absent ART treatment. The model is run separately for women who either successfully have children after their first ART treatment and women who did not successfully conceive after the first ART treatment. Unsuccessful women are observed until they have a live childbirth, or until the end of our observation window if they remain childless. The bars represent 95% confidence intervals and are based on robust standard errors.

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