THE MENOPAUSE "PENALTY"

Gabriella Conti* Rita Ginja† Petra Persson‡ Barton Willage§¶

November 21, 2025

Abstract

The motherhood penalty is well-documented, but what happens at the other end of the reproductive spectrum? Menopause—a transition often marked by debilitating physical and psychological symptoms—also entails substantial costs. Using population-wide Norwegian and Swedish data and quasi-experimental methods, we show that a menopause diagnosis leads to lasting drops in earnings and employment, alongside greater reliance on social transfers. Increasing access to menopause-related health care can help offset these losses. Our findings reveal the hidden economic toll of menopause and the potential gains from better support policies.

*University College London, Department of Economics, and Institute for Fiscal Studies, CEPR, CESIFO, HCEO, and IZA. Email: gabriella.conti@ucl.ac.uk.

†University of Bergen, Department of Economics. Email: rita.ginja@uib.no.

‡Stanford University, Department of Economics, NBER, and Research Institute of Industrial Economics, Stockholm. Email: perssonp@stanford.edu.

§University of Delaware, Department of Economics and NBER; Email: willage@udel.edu.

¶The authors are grateful to the comments of Meltem Daysal, Amy Finkelstein, Michelle Marcus, Eva Meyerson Milgrom, Isabel Pastoor, Erik Plug, Imran Rasul, Mari Rege, Heather Royer, Maria Ræder, Emilia Simeonova, Isaac Sorkin, Michela Tincani, and seminar participants at the AIES Conference, ASSA Conference, Centre for Health Economic Research (HEFUU) at Uppsala University, CEPR Paris Symposium, CESifo Area Conference Labor Economics, dggö/LMU/KU Leuven/Universität Hamburg Workshop "Health and care from early life to old age", EALE Meetings (Bergen), Erasmus University Rotterdam, ESPE Conference, Imperial College London, Institute for Fiscal Studies, JRC (European Commission), LMU, ONS Public Health Research, Universidad de Alicante, University of Bergen, University of Bergamo, Brown University, University of Copenhagen, University College London (Department of Economics and Social Research Institute), Kansas State University, KU Leuven, NBER Summer Institute - Gender in the Economy, Newcastle University, Paris Dauphine University, Paris School of Economics, Pontificia Universidade Catolica - Rio de Janeiro, Rockwool Foundation Berlin, Stanford University, SOLE Meetings (Portland), Tinbergen Institute, Tokyo University, University of Stavanger, and Whistler Junior Health Economics Conference 2025. We thank Joshua Bricker and Taegan Mullane, as well as Sarah Bögl and Iliriana Shala at the Research Institute of Industrial Economics, for excellent research assistance.

1 Introduction

The landscape of female labor force participation is changing worldwide. One striking trend is the growing presence of older women who remain actively engaged in the workforce. While younger women have historically led the rise in female workers, the participation rate of women aged 55 and over is climbing steadily in many developed countries. For example, in the United States the participation rate for women aged 55-64 rose from 56.6% in 2003 to 59.6% in 2023, and for those over 65, it jumped from 10.6% to 16.0% in the same period (Bureau of Labor Statistics, 2024). Similar trends have been observed in Norway and Sweden, the countries that we study. For Norway, the participation rate for women aged 55-64 rose from 66.86% in 2011 to 70.12% in 2022; for Sweden, it rose from 75.99% in 2011 to 81.72% in 2022 (ILO),[1] with the participation rate for older women matching that for men (Laun and Palme, 2018).

These trends, combined with an aging population and rising retirement ages, imply that many more women than ever will be working during the menopausal transition and in their post-reproductive years. Yet, while for decades social scientists have analyzed the motherhood penalty, evidence is scant on the economic consequences of reaching the other end of the reproductive spectrum. Menopause, which marks the permanent cessation of menstruation and typically occurs between the ages of 45 and 55,[2] often brings a range of physical and physiological symptoms: hot flashes and night sweats, mood swings, fatigue, palpitations, dizziness, migraines, anxiety, depression, memory problems, "brain fog", and difficulty sleeping. These symptoms often start prior to menopause, during the so-called peri-menopause, and can last for years, well into the post-menopausal period. However, not all women are affected in the same way: there is substantial variation in the duration of the menopause transition, the age at onset of natural menopause, and the number and severity of menopausal symptoms experienced (Talaulikar, 2022).[3]

Two recent reviews (Theis et al., 2023; Verdonk, Bendien and Appelman, 2022) have documented strong negative associations between the presence and the severity of menopause symptoms with job performance, productivity, motivation and commitment to work, as well as overall quality of life; and both reviews point out the scarcity of studies linking menopause, health and work. Crucially, there is a dearth of studies that estimate the health and productivity costs of menopause for individuals, employers, and society at large. One of the first attempts is Bryson et al. (2022), who show that the onset of menopause before age 45 (referred to as "early menopause") reduces employment rates by 9 percentage points (around 4 months of employment) for women in their early 50s, with larger effects associated with more severe symptoms. However, there is extremely limited evidence available to date on the labor market, health and social welfare costs

[1] See https://www.ceicdata.com/en/sweden/labour-force-participation-rate-by-sex-and-age-annual and https://www.ceicdata.com/en/norway/labour-force-participation-rate-by-sex-and-age-annual.

[2] Menopause that happens before age 45 is called early menopause. Menopause that happens before age 40 is called premature menopause. Both typical, early and premature menopause can happen naturally or for a medical reason, such as surgical removal of the ovaries.

[3] Age at menopause is influenced by multiple factors, both modifiable (such as diet, exercise levels, smoking status, body mass index) and not (e.g. socio-economic background, ethnicity, and concurrent medical/gynaecological health issues) (Peycheva et al., 2022; Schoenaker et al., 2014).

of "normal-age" menopause. This study is an attempt to begin to fill this gap.

Using population-wide Norwegian and Swedish linked registry data and quasi-experimental methods, we identify the causal impact of menopause-related health issues on a broad swath of health and socio-economic outcomes, and assess how menopause-related health care can mitigate its economic costs. Our detailed data allow us to track health care use (contacts with primary care and specialist providers, inpatient and outpatient hospital use, prescriptions), labor market outcomes (earnings, hours worked), and social safety net use (unemployment and disability insurance). While there are some data differences between the two countries we study, we observe a rich set of outcomes in both and harmonize them for a consistent analysis.

Our identification strategy exploits the differential timing of menopause-related diagnoses, precisely determined via detailed diagnostic codes from medical records. We use an event study approach akin to that used in the child penalty (Kleven, Landais and Søgaard, 2019) and health shocks (Fadlon and Nielsen, 2019, 2021) literature: this allows us to construct counterfactuals for diagnosed women using women who receive the same diagnosis at a later date. Since recent work shows that variation based on treatment timing might cause bias with traditional two-way fixed effects models in the presence of heterogeneous effects over time (de Chaisemartin and D'Haultfœuille, 2020), we rely on a stacked difference-in-differences approach: this prevents previously treated units from being used as controls. While we present results for both Norway and Sweden, our baseline specification relies on Norwegian data, where we capture menopause-related diagnoses from both primary and specialist care (Swedish data only include diagnoses from specialist care).

We begin by estimating the causal impact of a menopause diagnosis on the demand for medical care, employment, earnings, and reliance on social safety net programs. We find that menopause causes a sharp but short-lived increase in the number of primary care and specialist doctor visits, but a longer-run increase in drug utilization, driven by medication used to alleviate its physical and mental health symptoms (namely, Menopausal Hormone Therapy (MHT)[4] and antidepressants). Beyond its effects on health care utilization, menopause also has lasting economic consequences, leading to a persistent decline in employment and earnings, along with greater dependence on social transfers. The economic losses are substantial: our baseline estimates show that, four years after a menopause-related diagnosis, earnings decline by 7.4% relative to the year before diagnosis — driven by both reduced work hours and early labor market exit. These effects vary significantly: the losses are most pronounced for women working in larger firms or in workplaces with a higher share of female coworkers, and for those with more severe symptoms.

Next, after having documented the economic costs of menopause, we turn to the question of whether menopause-related health care can alleviate some of them. We exploit the airing of a Swedish TV show on menopause in October 2018 in a regression discontinuity design that compares women whose gynecological visits took place shortly before and shortly after the show. We find that women whose doctor visits occurred shortly after the show's airing received more

[4]MHT is the most commonly prescribed treatment for menopausal symptoms.

menopause-related care: they were more likely to receive a menopause diagnosis, and to be prescribed MHT.[5] Moreover, those women who accessed this expanded care experienced significantly smaller earnings losses in the first three years post-menopause. This suggests that greater menopause awareness and improved access to menopause-related health care can help mitigate its economic costs. Notably, the benefits of expanded care are concentrated among women with lower education levels. These findings highlight the potential for policies that improve access to menopause-related health care to generate broad economic benefits, particularly for those women suffering the most severe symptoms.

This paper contributes to several literatures. First, we provide evidence on the causal impacts of menopause on women's economic outcomes. Despite the fact that menopause affects half of the world's adults, our current understanding of its consequences for women's economic lives is extremely limited. Two concurrent studies use similar methods to examine the impacts of menopause on health and economic outcomes using survey data from the United States (Juarez and Marquez-Padilla, 2025) and one of Norway's regions (Abrahamsson, Barschkett and Flatø, 2025), respectively; where outcomes overlap, the results are qualitatively similar.

Second, we contribute to a broader interdisciplinary literature on the consequences of menopause for women's health. While the medical literature has documented associations between the timing and symptoms of menopause with women's physical and mental health (see, e.g., Georgakis et al. (2016); Muka et al. (2016)), evidence is scarce on the causal impacts of menopause on women's health and well-being. A 2023 bipartisan U.S. congressional bill, *The Menopause Research Equity Act*, aimed to address this gap by directing the National Institutes of Health to evaluate its past and present support for menopause research (Clarke, 2023). This bill highlighted that the neglect of menopause extends beyond economics and reinforced the importance of using high-quality, population-wide administrative data to document its far-reaching effects on women's economic lives, health, and well-being.

Third, in sharp contrast to the dearth of research on the effects of the *end* of fertility, an extensive literature has documented the career costs of the *onset* of childbearing, across a variety of contexts.[6] Moreover, while economists have made significant strides in understanding the rise of women's labor force participation in the last decades (Goldin, 2006), much less is known about the forces that push women out: our findings suggest that menopause may be one such critical factor.

Fourth, our analysis of menopause-related health care and its role in reducing the economic costs of menopause builds on work by Daysal and Orsini (2014), which leverages variation in MHT uptake to show, using Medical Expenditure Panel Survey (MEPS) data, that MHT provides

[5] As we discuss in Section 5, the TV show aired at a time when new prescription guidelines – suggesting expanded prescribing of MHT – also were disseminated among physicians in Sweden. Thus, it is possible that the TV show affected both the awareness of menopause and the demand for menopause-related information and health care from patients, as well as the supply of menopause-related health care and treatment from physicians. In other words, the push toward more provision of menopause-related health care may have been driven by both a supply and a demand effect.

[6] See, e.g., Angelov, Johansson and Lindahl (2016); Kleven, Landais and Søgaard (2019); Andresen and Nix (2022).

significant short-term economic benefits.[7] More broadly, our study contributes to research on how new fertility-related health technologies impact women's well-being (see, e.g., Goldin and Katz, 2002; Bailey, 2006; Bögl et al., 2024; Conner et al., 2025) and on how individuals respond to new health-related information (e.g., Fadlon and Nielsen, 2019; Chen, Persson and Polyakova, 2022). In our setting, we find that college-educated women are more likely to respond to the TV show by increasing their demand for menopause-related health care: this aligns with evidence from other contexts showing that more advantaged populations are generally more responsive to new health information and recommendations (see, e.g., Grossman, 2006; Cutler and Lleras-Muney, 2010; Oster, 2020; Kowalski, 2021). The role of TV as an information channel in our study also connects to research on how TV access and content influence social outcomes (e.g., DellaVigna and Kaplan, 2007; Dahl and DellaVigna, 2009; La Ferrara, Chong and Duryea, 2012; Kearney and Levine, 2015). While we are unaware of prior research examining the effects of TV content on physicians, studies show that physicians do respond to new information from other sources (e.g., Johnson and Rehavi, 2016; Finkelstein et al., 2022*a*; Avdic et al., 2024; Cuddy and Currie, Forthcoming).

Fifth, our study contributes to the broader literature on the impact of health shocks on labor market outcomes. In line with human capital models, the level of health influences the amount and productivity of labor supplied to an economy (Grossman, 1972). The literature has convincingly documented substantial effects of improved health on labor market outcomes in adulthood (see, e.g., Stephens Jr and Toohey, 2022), and the significant economic costs of adverse health shocks (see, e.g., Fadlon and Nielsen, 2021). However, the economic consequences of female-specific health shocks – particularly those that are less acute but more diffuse, like the one examined in this study – have received markedly less attention.

Sixth and most broadly, an extensive literature studies the labor market impacts of productivity shocks that affect both men and women (often predominantly men), such as unemployment (see, e.g., Jacobson, LaLonde and Sullivan (1993); Lachowska, Mas and Woodbury (2020)). We contribute to this literature by documenting that menopause – a shock affecting 20% of the US workforce[8] – can have long-term economic effects comparable in scale and persistence to job displacement. Hence, menopause is not only a female-specific health shock, but for many women also a substantial productivity shock.

2 Hypotheses, Institutional Background, and Treatment

Hypotheses The primary contribution of this paper is to shed light on the health and economic effects of menopause. In this section, we discuss our hypotheses regarding the expected effects, as well as the expected timing of the onset of these effects.

[7]This variation stems from the release of findings from the Women's Health Initiative Study (WHI). See also Juarez and Marquez-Padilla (2025), which provides additional analysis of the impact of WHI on menopausal women's economic outcomes, and Daysal and Orsini (2015), which shows that the WHI findings influenced the uptake of other preventive healthcare services among postmenopausal women.

[8]Information available at https://www.dol.gov/agencies/wb/data/latest-annual-data/working-women.

Menopause marks the point in a woman's life – typically occurring around the age of 50 – when she permanently ceases menstruating. Technically, the onset of menopause is defined to occur after 12 consecutive months without a menstrual period.

What, then, makes menopause a potential cause for economic losses? In fact, menstruation – not a lack thereof – has been proposed as a trigger of absenteeism and a barrier to economic investments. For example, menstruation combined with a lack of sanitary products has frequently been cited as an obstacle to girls' schooling (though with mixed support; see, e.g., Oster and Thornton, 2011). Further, premenstrual syndrome (PMS) – which may affect women in the part of the month close to menstruation – has been hypothesized to adversely impact women's productivity at work (see, e.g., Dean and Borenstein, 2004).

Against this background, the cessation of periods *per se* may, if anything, be expected to raise productivity. For many women, however, the biological process that results in the cessation of periods also brings about a number of health issues. We hypothesize that these health issues – triggered by the menopausal transition – may cause economic losses.

Specifically, there is a wide range of menopause-related health issues, including night sweats, joint aches and pains, hot flashes, trouble sleeping, fatigue, palpitations, dizziness, severe headaches and migraines, irritability and mood swings, anxiety and depression, panic, forgetfulness and poor concentration; women can experience one or more of these symptoms, and they can be mild or severe (Mishra and Kuh, 2012; Kuh, Wadsworth and Hardy, 1997). The economic losses stemming from menopause may thus be smaller among women with fewer, or less severe, menopause-related symptoms.

In terms of timing, menopause-related health issues can start several years before the permanent cessation of menstruation, during a period that is clinically referred to as peri-menopause (which marks the beginning of the menopause transition); furthermore, such symptoms can last for years, well into the post-menopausal period, and their intensity can fluctuate significantly over time.[9] Thus, for different women, the onset of menopause-related health issues may occur prior to, or after, the clinical menopause date. In subsection 3.1, we discuss how we measure menopause-related health issues in the data.

Treatment Recommendations MHT (also known as Hormone Replacement Therapy, HRT) remains the most effective treatment for menopausal symptoms (Davis and Baber, 2022). MHT can be administered as estrogen alone or combined with progestin, and is available in various forms, such as oral tablets, skin patches, gels, and creams. The Norwegian and Swedish Gynecological Associations both follow the treatment recommendations from the North American Menopause Society (NAMS).[10] The general guideline is to prescribe the lowest effective dose needed to alleviate symptoms.

[9]Details available at https://www.mayoclinic.org/diseases-conditions/perimenopause/symptoms-causes/syc-20354666.

[10]For the current Norwegian and Swedish recommendations see, respectively, https://www.legeforeningen.no/foreningsledd/fagmed/norsk-gynekologisk-forening/veiledere/veileder-i-gynekologi/overgangsalder-menopause and https://www.sfog.se/media/337273/mht-sfog-raad-210121.pdf.

More specifically, MHT is currently recommended for women (1) experiencing hot flashes, night sweats, or other estrogen deficiency symptoms and (2) those with early menopause (i.e., before age 45) or premature ovarian failure, provided there are no contraindications. Treatment is advised to begin as soon as possible after the onset of menopausal symptoms, and before the age of 60. These recommendations are supported by evidence of MHT's beneficial effects on quality of life, sleep, bone density, fracture risk, cardiovascular disease, and diabetes. However, MHT is either contraindicated for, or must be used with caution, in women with certain medical conditions.[11] As discussed in subsubsection 3.1.2, for Sweden we have access to prescription-level data that allow us to identify the use of MHT and other medications.

We primarily focus our analysis on the years after 2002, a period characterized by conservative recommendations for MHT use after the publication of the results of the Women's Health Initiative (WHI) RCT, a major U.S. trial to inform clinicians about the health effects of MHT (Writing Group for the Women's Health Initiative Investigators, 2002). Indeed, the WHI five-year follow-up found increased risk of coronary heart disease (nonfatal myocardial infarction and death) and invasive breast cancer among women in the treatment group who had received combined estrogen and progestin supplementation. Nevertheless, as longer term evidence from the trial was released, these recommendations were relaxed. In 2012, the NAMS adjusted its guidelines, allowing greater flexibility in the duration of estrogen therapy based on its more favorable benefit-risk profile compared to combined estrogen and progestin therapy (NAMS, 2012). The safety concerns with MHT were further reduced upon the publication of the long-term (18-year) follow-up results of the WHI study, which showed no increased risk of all-cause mortality, cardiovascular mortality, or total cancer mortality among MHT users (Manson et al., 2017). The recent Manson et al. (2024) review provides a nuanced perspective on the WHI trials, offering a balanced assessment of the benefits and risks of MHT, calcium and vitamin D supplementation, and dietary interventions for postmenopausal women.[12]

Healthcare system in Norway and Sweden The healthcare systems are fairly similar in Sweden and Norway. While details vary across the two countries, both systems are almost exclusively publicly funded through taxation, and hospitals are predominantly publicly owned and managed. General practitioners (GPs) serve as gatekeepers to specialist care to some extent in both countries. Adult GP consultations require out-of-pocket co-payments, though with upper limits. Norway and Sweden have comparable healthcare resources, with similar per capita health spending and a doctor-to-population ratios of 5.1 and 4.3 per 1,000 inhabitants, respectively (OECD, 2025).

The healthcare system in Norway is divided into two levels, with local municipalities provid-

[11] MHT is contraindicated for women with breast cancer, estrogen-sensitive malignancies, unexplained vaginal bleeding, venous thromboembolism or coronary heart disease, active liver disease, or *porphyria cutanea tarda*. The use of MHT with caution is recommended for women with diabetes with vascular complications, a history or elevated risk of venous thromboembolism, gallbladder disease, previous endometrial cancer, or conditions that can be exacerbated by MHT, such as asthma, epilepsy, migraines, lupus, hepatic hemangioma, and dementia.

[12] Angrist et al. (2025) have recently reanalyzed the WHI using instrumental variable methods, finding larger effects of MHT.

ing primary care services and larger health regions providing specialist care. Municipalities are responsible for delivering first-line health care services, including GPs, urgent care, infant and child health care centers, school health services, and elderly care. Specialist care in Norway is managed by four health regions and includes specialist medical services, psychiatric care, and private referral specialists contracted by the health regions. Except in cases of emergencies, Norwegian GPs represent the first point of contact between patients and the healthcare system, and are responsible for initial examination, treatment, diagnosis, medication prescription, and sick leave validation; when necessary, the GP refers patients to receive specialist care. There is typically a co-payment associated with GP consultations of approximately $20 or 210 Norwegian Kroner (NOK), with total out-of-pocket cost-sharing capped at 2,200 NOK per year.

As in Norway, the healthcare system in Sweden is decentralized. The main responsibility for financing, organizing, and providing health care is delegated to the 21 counties. Patients generally incur very low out-of-pocket costs, with some variation across counties. Primary care is often provided through local primary care centers (in Swedish: *vårdcentraler*), where patients see GPs or other health professionals for medical examinations and treatment of most common conditions. If necessary, the primary care providers refer patients to specialists. Patients may also request specialist care without any referral (Socialstyrelsen, 2020).

3 Data and Empirical Strategy

3.1 Data

The data used are compiled from several Norwegian and Swedish administrative records, including tax records, social security records, employer information, family records, and health records. In both Norway and Sweden, we use comparable samples restricted to women who have continuously resided in each respective country since 1996. Our primary analytical sample comprises women who receive a menopause diagnosis between the ages of 45 and 55. Given this focal age range and the years of data that we have access to, we further restrict attention to women born between 1961 and 1968.[13] All monetary values are deflated to 2015 prices using the Consumer Price Index for each country, reported in Norwegian kroner (NOK) and Swedish kronor (SEK), respectively (in 2015, 1 NOK $\approx$ 1–1.1 SEK).

3.1.1 Data: Norway

Individual-level information comes from several administrative registers maintained by Statistics Norway. These registers cover the entire resident population in the country between 1967 and 2020, and include demographic information such as date of birth, gender, immigration status and municipality of residence in each year, and socioeconomic data, such as education and earnings.

[13] In our analysis of the impact of access to menopause-related health care in Section 5, we use more recent years of data on economic outcomes, and therefore do not maintain this cohort restriction.

All registers include unique person-level identifiers, enabling the linkage of individuals across administrative records and connecting them to their parents, partners, and other relatives.

Information on individuals' education is obtained from administrative registers of the Norwegian school system, which records all degrees completed since 1970. Data on labor income (from employment and self-employment) and social benefits come from the tax registers, available from 1993 onward. We define employment as having strictly positive earnings. From the employment registers, we obtain data on workplace, sector of activity (public or private), contracted work hours, and information that allows us to determine coworkers' characteristics.[14] Welfare benefits come from the Social Security database; we use as outcomes both the total amount of benefits, and also the specific benefits relevant to the population studied, namely, unemployment benefits, disability income, and sick leave.[15]

The health data used in this study come from several administrative registers tracking the use of primary and specialist health care. General practitioners (GPs) and urgent care physicians in Norway are required to report all services provided and actions taken during each consultation—including main symptoms or diagnoses, exams, referrals, and certified sick leaves—to a national claims database, known as the Control and Payment of Health Refunds database (*"KUHR"*), in order to receive payment. These data are available from 2006 through 2020 and are used to construct indicators of any GP or urgent care visit within a given year or quarter, the total number of annual GP visits, and measures of medical examinations performed during visits. The *KUHR* database also includes a record of symptoms and diagnoses from each visit, coded according to the International Classification of Primary Care (ICPC-2). This coding system allows us to identify the exact timing of menopause-related diagnoses, particularly "X11 – Menopausal symptom/complaint" and "X12 – Postmenopausal bleeding." Additionally, we use the ICPC-2 diagnostic codes to define outcomes that reflect productivity and other health conditions affected by menopause onset.[16] Finally, *KUHR* includes information about the attending physician for each visit—including their specialty, patient caseload, gender, and age.

Specialist care is provided mainly through public hospitals and outpatient clinics, though contracted private specialists also offer these services. We obtain information on the utilization of specialist care from the Norwegian Patient Registry (NPR), which is available from 2008 to 2020. This Registry also documents the medical conditions diagnosed at admission, following the 10th

[14] While information on workplace is available from 1996 through 2020, contracted work hours are only recorded from 2003.

[15] The total amount of benefits includes regular and early retirement pensions, disability benefits, unemployment benefits, sick pay, parental allowance, child benefits, housing benefits, study grants, dependent deductions, social assistance, and cash support. In Norway, unemployment benefits are available only to active job seekers who earned at least 1.5G in the most recent year or 3G over the previous three years. "G" is the amount used to determine eligibility for many programs in Norway's national social security system; in 2024, G was set at NOK 122,225, approximately USD 11,343. To qualify for disability benefits, individuals must experience a primary reduction in work and earning capacity due to illness or injury, and must generally meet the following criteria: be between 18 and 67 years old, be member of the national insurance scheme for at least five years before the illness or injury, and have at least 50 percent reduction in work or earning capacity. Unemployment insurance and disability income are structured similarly in both Norway and Sweden.

[16] See Appendix B for details on constructing such outcomes. See https://ehelse.no/kodeverk/icpc-2e–english-version for the ICPC-2 code list.

revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). From the NPR, we identify women diagnosed by specialists with "Menopausal and other perimenopausal disorders" (ICD-10 code N95).

We combine information from the KUHR and NPR databases to determine the earliest recorded date of a menopause diagnosis, whether provided by a general practitioner, an urgent care physician, or a specialist.

3.1.2 Data: Sweden

We create comparable data for Sweden, with two important differences. First, in Sweden we are able to observe individual-level drug utilization, which allows us to track take-up of the key medical treatment for menopause-related symptoms, namely MHT, along with other drugs that are commonly prescribed to the population that we study. Second, in Sweden we do *not* observe primary healthcare visits; thus, we only observe menopause-related diagnoses that arise in the specialist outpatient healthcare system, not from GPs.

The core of our data is an extract from the Swedish Population Register of all individuals residing in Sweden from 2000 through 2016 (Skatteverket, 2022). To obtain information about gender, income, and educational attainment, we merge in data from Statistics Sweden's longitudinal database of individuals (LISA) from 1990 through 2022, which contains information drawn from various administrative records (Statistics Sweden, 2019).

To construct measures of MHT utilization and other health outcomes, we merge in health records from the National Board of Health and Welfare (Socialstyrelsen, 2019). For each individual, we observe the universe of prescription drug purchases made in outpatient pharmacies from July 2005 through 2019. For each purchase, we observe the name of the drug and the drug's seven-digit Anatomical Therapeutic Chemical (ATC) classification code. We also observe the universe of inpatient hospital visits and specialist outpatient visits from 2002 through 2019. For each visit, we observe the date of the visit and the diagnostic codes (ICD-10) attached to the visit.

We then define our key outcome variables for women in our sample. First, we use our LISA variables to create annual measures of key economic outcomes. We start with work-related earnings, which is analogous to the Norwegian measure and includes all earnings from employment and self-employment; we also define employment analogously, as having strictly positive earnings. We then create two outcomes that capture pathways out of employment for individuals who are near, but not at, retirement age: total unemployment insurance (UI) receipts and total disability insurance (DI) receipts.[17] Receipt of DI is the most common pathway out of the labor force for individuals who exit before the normal retirement age in Sweden (Jönsson, Palme and Svensson, 2012). While we do not observe exactly the same social transfers measure in Sweden as we do in Norway, we observe an economic variable that captures the total impact of all earnings and social transfers: total disposable income. This is a measure constructed by Statistics Sweden that

[17]UI receipts include regular UI payments as well public payments of benefits that compensate unemployed individuals for participation in re-training programs.

takes into account all earnings, benefits, and transfers to the individual, and thus gives us the best estimate of the total economic situation. We also use LISA to define the individual's highest level of completed schooling (i.e., no/some/completed college).

Second, we use our drug records to create health outcomes that capture mental and physical well-being, at the quarterly level. Specifically, we create an indicator variable for any drug claim (in each quarter), as well as indicators for the following drug categories that are particularly relevant for the population that we study: any MHT drug; any mental health drug; any antidepressant (a subset of mental health drugs); any anti-anxiety and sleep drug (a subset of mental health drugs); any hypertensive drug; any painkiller; and any contraceptive.[18] For MHT, we also define *initiation*, as follows: a woman initiates MHT on day d if she fills an MHT prescription for the first time in one calendar year (365 days).[19] Furthermore, we use our specialist outpatient records to create an indicator variable for any specialist outpatient visit during a quarter.

Measures of Menopause Diagnosis For our main results on the impact of a menopause diagnosis, we primarily rely on Norwegian administrative records, which capture both primary and specialist care diagnoses. We then use the Swedish administrative data for two reasons: first, to test whether the Norwegian findings on the impact of a menopause diagnosis replicate in a different context—albeit one reflecting only specialist-based diagnoses—and second, to exploit Sweden's comprehensive registry of prescriptions (from both GPs and specialists), providing drug-based measures of treatment for menopausal symptoms and other conditions. In the second part of the paper, we further use the data from Sweden to assess the impact of access to menopause-related health care.

3.2 Basic Descriptive Statistics

Panel A of Appendix Figure A.1 shows the age distribution for all first menopause-related diagnoses issued by a GP or specialist for Norwegian women born between 1961 and 1968 inclusive. On average, Norwegian women receive their first diagnosis at 50.47 years of age.[20] This measure captures the moment in time *when menopause-related health symptoms become bothersome enough to induce the woman to seek medical care, and the clinician to render a diagnosis* – the point in time when we hypothesize that menopause-related economic losses may begin to occur. Unlike self-reported (survey-based) measures that ask women to identify symptoms explicitly as related to menopause, our approach reflects a clinically recognized threshold at which health issues translate into medical action.[21]

[18] Appendix Table B.1 lists the exact ATC codes for all of our outcomes.

[19] If a woman satisfies this definition more than once, we use only the first initiation (ever).

[20] Panel B of Appendix Figure A.1 shows that the age distribution for first diagnoses by specialists in Norway and Sweden displays extensive overlap.

[21] As discussed in section 2, we would not expect this to precisely coincide with the clinical definition of menopause, i.e., the point in time that represents 12 months after the cessation of periods; instead, the initiation of menopause-related health symptoms may occur prior to, or after, the clinical menopause date. Information collected from the national breast cancer screening program in Norway, comprising 84% of the population who underwent the

As menopause-related symptoms can be mild or severe, we do not expect all women to seek healthcare for them. In fact, some women may experience no physical or psychological symptoms at all during the menopausal transition (Theis et al., 2023; Verdonk, Bendien and Appelman, 2022). And indeed, not all women receive a menopause-related diagnosis. Appendix Tables A.1 and A.2 (for Norway and Sweden, respectively) present summary statistics for outcomes measured at age 40 – thus before the usual age of natural menopause – for women with and without a menopause diagnosis.[22] Table A.1 shows that, in Norway, out of 266,101 women born between 1961 and 1968 (and alive during our sample period), 88,350 received a menopause diagnosis at ages 45 to 55 (during the years that we observe, i.e. 2006 through 2020). That is, *one in three* women experience menopause-related symptoms that are bothersome enough to trigger a medical diagnosis. The large share of women who are affected by menopausal symptoms to the extent that they are given a menopause-related diagnosis underscores the importance of menopause as a potential labor market productivity shock. By comparison, the share of women affected by unemployment – an extensively studied labor market productivity shock – is an order of magnitude smaller.[23]

In Norway, the majority of these diagnoses (63%) were issued by a primary care physician, while nearly 32,600 first diagnoses (comprising 12.2% of the sample) were made by a specialist. An additional 6,952 women received a diagnosis between ages 40 and 44, and the remaining 170,799 either did not receive any menopause diagnosis or were diagnosed after age 55. In Sweden, the proportion of women receiving a specialist diagnosis between ages 45 and 55 is similar, at 65,375 out of 452,849 women born between 1961 and 1968 (i.e., 14.4% of the sample, see Appendix Table A.2).

Table A.1 shows that 82% of all Norwegian women born between 1961 and 1968 had at least one contact with primary health care services or specialist outpatient care at age 40 (column 4). This proportion is higher for women in our main sample (86%, column 1) and remains high at 79% even among those who never receive a menopause diagnosis before age 55 (column 3). Hence, lack of contact with the health care system does not appear to be the principal reason some women go undiagnosed. Comparing columns (1) and (3), we observe that women who remain undiagnosed between the ages of 45 and 55 have, on average, one fewer annual GP visit, and are 8 percentage points less likely to have at least one annual specialist visit at age 40, as compared to women who received a menopause-related diagnosis. While these two groups have similar educational attain-

screening, shows that the self-reported mean age of menopause is 52.73 years old (Gottschalk et al., 2020), suggesting that our measure typically captures an earlier point in time than the standard clinical definition, closely related to the onset of menopause-related symptoms.

[22] The first four columns of the summary statistics table for Sweden, Appendix Table A.2, have the same structure as those for Table A.1; the fifth column of Appendix Table A.2 includes summary statistics for the RD sample (only defined in Sweden), which we use in Section 5. The sample size used in Panels A and B of these tables differs because the health registers are only available in both countries from 2006, while the tax and employment registers are available from 1996.

[23] Since the early 2000s, the female unemployment rate in Norway and Sweden varied between 3-4% and 5-7%, respectively (SSB, 2025; SCB, 2025). To provide additional perspective on magnitudes, the share receiving a menopause-related diagnosis also exceeds the share of women who report having experienced some form of physical and/or sexual violence by their intimate partner (NKVTS, 2025).

ment (64% of them have less than college education), women who receive a menopause diagnosis, on average, earn 5,267 NOK ($500) more per year, are more likely to be employed, work longer hours if employed, and take 3.5 additional sick leave days per year. By contrast, women diagnosed before age 45 (column 2) tend to use significantly more health services, and to have poorer socioeconomic outcomes than those without a menopause diagnosis (column 3). Specifically, compared with the main sample, early-diagnosed women have more frequent GP visits, are more likely to have mental health visits, and undergo more extensive and costly evaluations during medical visits, resulting in higher reimbursement claims. Such women are also less likely to hold a college degree, earn lower annual earnings (equivalent to nearly a full month's wages), and take more sick leave days per year. Because these early-diagnosed women differ markedly in both health care use and socioeconomic status, we exclude them from the main analysis.

In the Swedish data, it is not possible to identify visits to primary health care providers, so menopause diagnoses are recorded exclusively from outpatient specialist or hospital visits. Consequently, we rely on the Norwegian data to compare women who receive their first menopause diagnosis from a GP with those first diagnosed by a specialist (see Appendix Table A.3). Women diagnosed first by a GP have more frequent primary care contacts, are less likely to use specialist outpatient care, have lower levels of education, lower earnings, and lower costs per visit, yet they are similar to women first diagnosed by a specialist in terms of overall likelihood of using health care services, urgent care utilization, contracted working hours, labor market participation, and sick leave use.

Appendix Tables A.1 and A.2 also highlight notable differences between Sweden and Norway. In particular, column (4) shows higher overall utilization of specialist care in Sweden compared to Norway (36.7% vs. 20.5%; see Panel A), while Panel B in both tables indicates that women born between 1961 and 1968 have comparable socioeconomic characteristics in each country. Because the Norwegian data include primary care diagnoses that are not observed in the Swedish data, we cannot directly compare column (1) of Appendix Table A.1 with column (1) of Table A.2. Instead, we compare column (1) of Table A.2 with column (2) of Table A.3, revealing that 45.8% of Swedish women have at least one annual specialist visit versus 36.7% of Norwegian women. The average level of education and use of sick leave are similar among women who receive a specialist-based menopause diagnosis in both countries.

3.3 Main Strategy

All women who live long enough experience menopause.[24] However, not all women receive a medical diagnosis for menopause-related symptoms, so our main sample does not capture all

[24]While its most common cause is the loss of ovarian follicular activity due to aging, menopause can also be induced as a consequence of surgical procedures that involve removal of both ovaries or medical interventions that cause cessation of ovarian function (for example, radiation therapy or chemotherapy). While it is possible to identify some of the women with acquired absence of uterus/cervix/ovaries, because the health registers we use start in 2006, we may miss women with early procedures. Therefore, all women are included in our sample. Nevertheless, these cases are rare, e.g., in Norway there are 36 occurrences of acquired absence of uterus/cervix/ovaries (ICD10 Z90.7) in 2008 (21 in 2020).

women who experience menopause. Instead, it only includes women with a documented menopause-related diagnosis, with the first diagnosis occurring between ages 45 and 55. While socio-demographic factors, health behaviors, and genetics are known to influence the age at natural menopause, their sensitivity and specificity in predicting time to menopause are very low. Therefore, as of now, there are no reliable ways of predicting when a woman will enter menopause (Tanbo and Fedorcsak, 2021; Laven and Louwers, 2024).[25] Furthermore, the age at the time of the first menopause-related diagnosis follows a bell-shaped continuous distribution (see Appendix Figure A.1), suggesting that its exact timing is indeed unpredictable by women. Therefore, we adopt an event study approach to identify the impacts of menopause akin to that used in the child penalty (Kleven, Landais and Søgaard, 2019) and health shocks literatures (Fadlon and Nielsen, 2019, 2021), which allows us to construct counterfactuals for affected women using women that experience the same diagnosis a few years later (Murabito et al., 2005).

However, recent work shows that exploiting variation in treatment timing can cause bias when using a traditional two-way fixed effects (TWFE) estimator, because the "already treated" groups are used as controls (de Chaisemartin and D'Haultfœuille, 2020; Borusyak, Jaravel and Spiess, 2024). This is not problematic if treatment effects are constant over time, however, if they are time-varying, then the early treated groups are not following the same trend as the later treated groups. A stacked difference-in-differences or stacked event study design overcomes such problems because it is equivalent to a setting where the events happen contemporaneously; thus, it prevents the use of past treated units as effective comparison units (Gormley and Matsa, 2011; Cengiz et al., 2019; Deshpande and Li, 2019; Baker, Larcker and Wang, 2022). We then assess the robustness of our main findings using an alternative method (Callaway and Sant'Anna, 2020).

Specifically, we define b as a potential age for the menopause (which we refer to as *base-age*). Then, for each woman, we define a panel of five years before the base age and four years after the base age. If the base age is the actual menopause age (or year), that panel is the treated-panel, while preceding base age panels are control-panels. Base ages after the menopause age are not included. Each panel is a "sub-experiment", and the relative time in each "sub-experiment" is not relative to the shock of menopause, but relative to the base age which may or may not be the age (year) of menopause. We then stack the treated-panels and control-panels, where each observation is at the woman-by-base age-by-relative time level. This stacked difference-in-differences specification averages all of the time-varying effects into a single averaged effect, that is, we stack the event-specific data sets in relative time and calculate the average effect across all events using a single set of treatment indicators.

Thus, our basic estimating equation for the difference-in-differences model is:

$$y_{ibta} = \beta_0 + \beta_1 Post_{ibt} \times Treated_{ib} + \beta_2 Post_{ibt} + \delta_{ib} + \gamma_t + \eta_a + \varepsilon_{ibta} \quad (1)$$

where y_{ibta} is an outcome for woman i in base age b, in year t, at age a. The coefficient of interest is

[25] Different is the case for early menopause (i.e., before age 45), for which more established and consistently risk factors have been detected, such as smoking (Harlow and Signorello, 2000; Peycheva et al., 2022).

β_1, and $Post_{ibt}$ takes value one if the woman's age is greater than the base age b, and 0 otherwise; $Treated_{ib}$ takes value one if woman i experience menopause in base age b, and zero otherwise. We include women-base age fixed effects (δ_{ib}), calendar year fixed effects (γ_t), and age fixed effects (η_a). Note that, in addition to the change in the data structure, the only difference in the estimation equation between the standard TWFE approach and a stacked regression alternative is defining the main variables within each event-specific dataset, so that unit- and time-fixed effects are saturated with indicators for dataset identifiers (e.g., δ_{ib}). The error term is ε_{ibta}. For health outcomes – which we observe at a more granular level than the annual labor market outcomes – we construct analogous stacked panels at the quarterly level.

We also estimate event study models that allow us to use years leading up to a diagnosis to test for any differential pre-trends and to examine time-varying treatment effects. The estimating equation is:

$$\begin{aligned} y_{ibta} &= \alpha_0 + \sum_{\tau=-5}^{4} \alpha^{\tau}\Big(\mathbf{1}[t-b=\tau]\cdot Treated_{ib}\Big) + \sum_{\tau=-5}^{4} \zeta^{\tau}(\mathbf{1}[t-b=\tau]) \\ &+ \delta_{ib} + \gamma_t + \eta_a + \varepsilon_{ibta} \end{aligned} \tag{2}$$

where $\mathbf{1}[t-b=\tau]$ is an indicator for the time relative to the base age b, and all other variables are defined as above. The coefficients of interest are α^{τ}, which trace out the effect of menopause before and after the diagnosis of menopause (ζ^{τ} represents the estimates on control panels). Relative time -1 is omitted, so all estimates are relative to that period. For health outcomes, we use 8 quarters of data before and after the diagnosis of menopause.

In our analyses, standard errors are clustered at the level of the woman to account for woman-specific serial correlation in the timing of diagnosis.

Definition of Samples Since the different datasets used cover different periods, we clarify here the exact samples utilized. First, we rely on annual panels for the economic outcomes studied in Norway and Sweden, that is, labor market outcomes and use of social benefits, which in both countries are available from 1996 to 2020. In accordance with model (2), that requires us to observe outcomes in a window of five years pre- and four years post-diagnosis, we further restrict to diagnoses occurring by the end of 2016, ultimately resulting in a sample of women diagnosed between the first quarter of 2006 (when the KUHR data becomes available) and the fourth quarter of 2016.

For health outcomes, we rely on quarterly panels. Furthermore, the time coverage of the health registries is less homogeneous. Whereas the Swedish outpatient specialist and inpatient data start in 2001, the Swedish drug register data only starts in the third quarter of 2005 and the KUHR data (Norway) in 2006. As a consequence, we restrict the sample for this part of the analysis to women who were diagnosed between 2008 and 2018. This allows us to follow each woman for at least eight quarters before and after her menopause diagnosis.

Identifying Assumptions The difference-in-differences design identifies the causal effect of a menopause-related diagnosis under the assumption that the trends in outcomes should be the same in the treated-panels as in the control-panels if women did not receive the diagnosis (in the base-age of the treated-panel). Although this assumption cannot be tested directly, we conduct a variety of checks to support its validity, using the fact that the time-to-event specification allows us to assess potential preexisting trends in the outcomes studied. First, Panel (A) of Appendix Figure A.2 demonstrates that women receiving a diagnosis at varying ages between 45 and 55 exhibit different levels but similar earnings trajectories from the ages 30 to 44. These similar trends mitigate concerns of systematic differential pre-diagnosis trends for women diagnosed at different ages. However, women with different education levels likely have different earnings across the life cycle. To investigate this, we split the trajectories by women's education level at age 40 (namely, whether they have a college degree or not) in Panel (B). While women with different education levels do have different trajectories (lower educated women peak earlier), within education levels trends do not vary based on age of menopause diagnosis. To more accurately model the interaction of education and time, our estimation not only includes woman fixed effects, which controls for systematic differences between women who receive the first diagnosis at different ages[26] but also higher education at age 40-by-year and higher education at age 40-by-age fixed effects in our primary specification, which account for differential aging and common shocks for women of different education levels.

Second, in subsection 5.1, we present estimates of α^{τ}s from the event study model (Equation 2), in the periods before the first menopause diagnosis. In all panels presented below (in subsection 5.1), the estimates for α^{τ}s in the pre-diagnosis period are nearly zero, supporting our main identifying assumption that women diagnosed at different ages follow similar outcome trajectories prior to diagnosis.

Additionally, column (1) Appendix Table A.4 presents correlations between the age of the menopause diagnosis (between 45 and 55) and several characteristics measured at age 40. On average, the women who receive a diagnosis at an older age have fewer annual health care contacts at age 40 than those diagnosed earlier and fare better in socioeconomic terms. Specifically, by age 40, these women are more likely to have a college degree, earn higher wages, take fewer sick leave days, work more contracted hours, and have more children. Such differences are accounted for in our design by the women fixed effects. However, columns (2) to (10), provide evidence that it is not possible to predict *exactly* the age of the first menopause diagnosis, as we consider women who were diagnosed at close ages. When we consider women diagnosed three or fours years apart, we cannot reject the null of no correlation between baseline characteristics and the age of menopause.

In subsection 4.2, we subject our main estimates to a battery of robustness checks and we rule-out the possibility that our results are driven by other shocks (economic or health-related) coinciding with the first menopause-related diagnosis.

[26]As we employ a stacked difference-in-differences (or stacked event study) design to overcome possible biases that could arise from heterogeneous treatment effects, we include women-base age fixed effects in our estimation.

4 Results

4.1 Norwegian Sample: Main Results

Utilization of Health Care Services Panel A of Table 1 presents the estimates for β_1 from model 1 for several measures of health care utilization: β_1 measures the impact of the first menopause-related diagnosis by a GP or a specialist on outcomes during the subsequent eight quarters. Column 1 shows that a diagnosis increases the likelihood of a GP visit per quarter by 3.1 percentage points, which is equivalent to a 5% increase relative to the likelihood of visits in the quarter prior to the diagnosis. Column 2 of Table 1 shows no effects on primary urgent care visits. As expected, the increase in the number of primary care visits leads to an increase in the overall value of reimbursements, by 39NOK/$3.6 (column 3), and a 9.7NOK/$0.9 increase in the cost per visit (column 4), which are economically small impacts. Finally, a menopause diagnosis causes an increase in the extensive margin of specialist visits: there is a 3.5 percentage points (31%) increase in the likelihood of at least one quarterly specialist visit, relative to a mean of 11.3% in the quarter prior to the diagnosis.[27] Columns (6) and (7) exclude the visit of the menopause diagnosis and show that the increase in the likelihood of having at least one GP or specialist visit per quarter is above and beyond that of the diagnosis-related encounter.

To examine the temporal pattern of these effects, Figure 1 presents estimates of α^{τ}s from the event study model (Equation 2), along with 95 % confidence intervals. These figures depict outcomes before and after the diagnosis, allowing a visual check of the parallel trends assumption. Panels A and B of Figure 1 show that the increase in the likelihood of at least one quarterly GP or specialist visit documented in Table 1 (Panel A) is not driven solely by additional visits during the quarter of diagnosis ($t = 0$). During the diagnosis year, both reimbursement costs and the cost per visit rise (Panels C and D), suggesting more extensive examinations occur in the year of diagnosis. Finally, in all panels, the estimates for α^{τ}s in the pre-diagnosis period are nearly zero, indicating parallel pre-trends in the outcomes examined. This finding supports our main identifying assumption that women diagnosed at different ages follow similar outcome trajectories prior to diagnosis.

Appendix Table A.5 presents the effects of menopause diagnosis on specific medical diagnoses recorded during GP visits. As anticipated, the increase in GP visits documented in column (1) of Panel A in Table 1 is driven by higher frequencies of female genital diagnoses/symptoms (ie, any ICPC-2 starting with X), but also by cardiovascular conditions (ICPC-2 K), musculoskeletal issues (ICPC-2 L), psychological symptoms/diagnoses (ICPC-2 P), and endocrine, metabolic or nutritional conditions (ICPC-2 T). Appendix Figure A.3 shows that the increase in these diagnoses is temporary, with the exception of mental health-related ones (Panel C). Additionally, Panel D of Figure A.3 shows a rise in what we term "productivity-related" diagnoses (see Appendix B). Finally, Panel E of Figure A.3 indicates an increase in the likelihood of lab tests during the quarter of

[27] Consistent with increased referrals to specialist care, Appendix Table A.7 also documents that a menopause diagnosis causes a 3.4% increase in hospitalizations, driven by outpatient visits.

diagnosis, consistent with further investigations triggered by women's reported health complaints.

In sum, the results in Table 1 and Figure 1 show that, in general, a menopause diagnosis is associated with a temporary change in the use of healthcare services in Norway, but little sustained impacts up to 2 years after it.

Labor Market and Welfare Outcomes In Panel A of Table 2, we examine the effects on labor market outcomes. Despite the relatively small changes in healthcare utilization shown in Table 1 and Figure 1, the estimates in Table 2 reveal economically meaningful impacts on labor supply. Over the four years following a menopause diagnosis, earnings decline by 3.3% (column 1), driven by both extensive and intensive margin adjustments: a 0.2% decrease in the probability of working (column 2) and a 0.4% decrease in hours worked (column 3). Panels A–C of Figure 2 illustrate that these labor market effects intensify over time, reflecting an increasing detachment from the workforce post-diagnosis. By four years after diagnosis, earnings have fallen by 7.4%.

Turning to the use of social safety net programs, column (4) of Table 2 (Panel A) shows no effect on the number of sick leave days, while column (5) indicates a 1.7% increase in the amount of social benefits relative to pre-diagnosis levels. Panel D of Figure 2 illustrates that the time-varying effects for social transfers move in the opposite direction as the effects for earnings.

Next, Appendix Table A.6 explores several common pathways out of employment for individuals approaching—but not yet at—retirement age in Norway: specifically, unemployment insurance (UI) and disability insurance (DI). We find that the observed increase in social transfers is driven by higher DI receipt rather than UI benefits. Over the four years following a menopause diagnosis, the probability of receiving DI rises by 0.5% (column 5), and DI benefit amounts increase by 4.7% of the baseline mean (column 6).[28] These DI impacts—particularly salient given that DI is the most common pathway out of the labor force for individuals who exit before Norway's (and Sweden's) normal retirement age (Jönsson, Palme and Svensson, 2012)—suggest that menopause symptoms may prompt women to adjust their labor market participation in ways that align with an accelerated, though gradual, transition into retirement.

Other Findings We additionally investigate if a menopause diagnosis affects household dynamics, namely, divorce rates or the health and labor market characteristics of the spouse. Table A.8 shows a small reduction in the divorce rate by 1.5% (0.3 p.p. relative to the divorce rate of 0.199 in the year leading up to the diagnosis). To understand possible spousal responses, we examine the labor market outcomes of the woman's husband following a menopause diagnosis: columns (2) to (5) show negligible effects for the spouse, both in terms of labor market impacts and health care use for the spouse.

[28] Among women in our sample on DI, the two most prevalent conditions for awarding the benefit are mental health and musculoskeletal diseases, each representing, respectively, 28% and 34% of the cases.

4.2 Sensitivity Analyses

We now examine the robustness of our findings. First, we leverage the stacked data structure of our main analytical sample and present in Figure A.4 the estimates for α^τ and ζ^τ in model (2). These parameters capture the impact of menopause in the treated and control panels, respectively. The estimates for α^τ are those in Figure 2, whereas the control-panel estimates (ζ^τ) hover around zero (and slightly increase over time). This pattern suggests that the α^τs estimates indeed capture the effect of the onset of menopausal symptoms, as proxied by a first medical diagnosis, rather than a simple aging effect.[29]

Second, we focus on a more restricted sample: women born between 1961 and 1964, still diagnosed between ages 45 and 55, so that we are able to construct 10-year balanced stacked panels for all cohorts for the economic outcomes. The results are presented in Figure A.5 and are similar to those in Figures 1 and 2, suggesting that our main findings are not driven by specific cohorts.

Third, we show that our results are robust to including in the control group women who received the first diagnosis of menopause between ages 56 and 60. The impacts on our key outcomes are presented in Figure A.6: the estimates in Panels A and B for health care use are similar to those in Figure 1, and those in Panels C and D for log earnings and social transfers are also comparable to those in Figure 2.

Fourth, we use the data for the economic outcomes from 2006 onward, so to ensure a common sample with the health data (that starts in 2006). The key socioeconomic results are presented in Figure A.7 and are similar to those in Figure 2.

Fifth, we conduct a placebo exercise using the sample of women born between 1961 and 1968 who do not receive a menopause diagnosis between ages 45 and 55 (or earlier). In this sample, we randomly assign an age of first menopause diagnosis between 45 and 55, based on the distribution observed in our main sample. We then re-estimate model (2) with this newly assigned placebo age of diagnosis. As shown in Figure A.8, the estimates for our primary socioeconomic outcomes are indistinguishable from zero, indicating no detectable effect of menopause in this placebo setting.

Finally, we estimate the effect of receiving a menopause diagnosis on labor earnings using the alternative estimator proposed by Callaway and Sant'Anna (2020). The results, reported in Figure A.9, reproduce the same pattern observed in Figure 2.

Confounding Factors After probing our main findings with several robustness checks regarding choice of control group and sample selection, we now address the possibility that our results are driven by other shocks (economic or health-related) coinciding with the first menopause-related diagnosis. We consider three types of contemporaneous shocks.

First, we consider the possibility that the timing of the first menopause diagnosis might be determined not only by women's health but also by external shocks. In Panel A of Appendix Table A.9, we address this concern by augmenting our baseline model to include municipality-

[29] We identify only 9 ζ^τs rather than 10 because the model (2) includes women-base age fixed effects.

year fixed effects, thereby accounting for potential localized labor market shocks. The resulting estimates remain similar to those in Tables 1 and 2, indicating that any contemporaneous negative labor market shocks are unlikely to coincide systematically with the healthcare visit at which a first menopause diagnosis occurs.

Second, we account for the fact that some of the menopausal symptoms may also be classified as psychological conditions. In the primary care diagnoses and symptom classification list, symptoms such as feeling anxious, nervous or tense (ICPC-2 P01), feeling depressed (ICPC-2 P03), feeling irritable (ICPC-2 P04), sleep disturbance (ICPC-2 P06), and memory disturbance (ICPC-2 P20) overlap with psychological issues. We then extend our baseline model by including an indicator for whether the woman has any mental health diagnosis or symptoms recorded in primary care during the year. The estimates, reported in Panel B of Appendix Table A.9, remain consistent with our baseline results, suggesting that mental health does not substantially mediate the observed effects of a menopause diagnosis.

Third, in Panel C we additionally control for the number of annual GP visits, to account for overall healthcare utilization: also in this case the estimates for the labor market outcomes are, in general, similar to those in Tables 1 and 2. In sum, we rule out that our findings might be confounded by contemporaneous economic or health shocks.

4.3 Heterogeneity of Impacts

To shed light on potential mechanisms, we now turn to testing if some groups of women are more affected by a menopause diagnosis than others. To do so, we re-estimate equation (1) allowing β_1 to vary along several dimensions. Specifically, we investigate how estimates vary by the woman's level of education, by access to health-related information (see, for example, Aizer and Stroud, 2010; Chen, Persson and Polyakova, 2022; Finkelstein et al., 2022*b*), severity of symptoms, and by workplace characteristics, which have been shown to affect the impact of family leave policies (see, for example, Ginja, Karimi and Xiao (2023)).

Socioeconomic and Health Care Characteristics We begin by allowing the estimates in model (1) to vary depending on whether women hold a college degree at age 40. Turning first to health outcomes, Panel A of Table 3 shows that women with a college degree increase their use of GP services more than women without a college degree — likely reflecting the demand-driven nature of GP visits. The higher primary care usage among college-educated women translates into an increased probability of referrals to specialist services (column 3). In contrast, women with and without a college degree have similar negative labor market impacts (columns 4 to 8).

In Panel B of Table 3, we examine whether the impacts of a menopause diagnosis differ by health-related expertise within the family. Specifically, we flag women who have a medical degree themselves or have at least one direct relative (parent or sibling) with a medical degree. We find that women with access to such expertise exhibit a smaller increase in GP visits (column 1) but a higher referral rate to specialist services (column 3), relative to those without it. Negative employment effects are, however, larger for this group.

Next, we explore whether the effects of a menopause diagnosis vary by the diagnosing GP's characteristics — specifically, the GP's gender. In Panel C of Table 3, we restrict our sample to women who had been listed with the same GP for at least two years prior to their (first) menopause diagnosis, thereby increasing the likelihood of a continued patient-doctor relationship. The results reveal that women with a female GP experience a smaller increase in specialist visits, as compared to women with a male GP. Additionally, for these women, we do not observe a fall in employment or earnings, and we detect no reduction in working hours.[30]

Finally, recall that we identify the onset of menopause from the first visit with a primary care physician or specialist where we observe a menopause-related diagnosis. Although most Norwegian women have at least one annual healthcare contact, it is possible that multiple diagnoses occur during a single visit. Nevertheless, in most cases (75%), the first menopause-related diagnosis appears on its own, i.e. it is not accompanied by any other registered symptom, complaint, or diagnosis — regardless of whether the visit occurs in primary or specialist care. Thus, in panel D of the appendix Table 3, we allow for differential effects for women who, during a visit to a primary care physician or specialist when they have the first menopause-related diagnosis, have that sole diagnosis registered ("less severe") vs. women who, in addition to the menopause-related diagnosis, receive other ones during the same visit. The estimates in Panel D show that women with a "less severe" menopause diagnosis (i.e. with no other diagnoses received in the same visit) have fewer visits to GPs or specialists and are less likely to have a mental health diagnosis in the two years after the diagnosis of menopause (columns 1 to 3). Additionally, women with a "less severe" menopause diagnosis have a smaller earnings penalty than women who were diagnosed with multiple health conditions when they first received a menopause-related diagnosis.

Workplace Characteristics and Peers In Table 4, we investigate the role of workplace characteristics and peer composition by examining the workplace of employed women in the year of their menopause diagnosis. Specifically, we consider workplace sector (private versus public) in Panel A, whether the workplace exceeds the median size of 20 employees in Panel B, and whether the workplace has a high proportion of female coworkers (the median workplace in our sample has 73% female employees) in Panel C.

Columns (1) to (3) across Panels A–C of Table 4 reveal minimal heterogeneity in health outcomes by workplace characteristics at the time of diagnosis. However, the labor market outcomes display more pronounced variation. Panel A shows smaller adverse effects on earnings, employment, and hours of work for public-sector workers (60% of women worked in the public sector in the year prior to diagnosis[31]). This pattern is plausible given that the public sector (largely comprising education and health services) is financed via annual budgets, potentially leaving less

[30] These estimates should be interpreted with caution, though, as individuals are allowed to change GPs up to twice per year.

[31] This share is similar in other Nordic countries such as Sweden, Denmark, and Finland; see https://doi.org/10.1787/22214399.

scope for immediate employment adjustments. Nevertheless, as our estimates aggregate the four years following diagnosis, some longer-term adjustments, such as flexible work arrangements, may still occur.

In Panel B, the impact of menopause is examined by workplace size.[32] Columns (4) and (5) show that negative effects on employment and hours worked are more pronounced in smaller workplaces. Finally, Panel C considers whether working in a firm with a high proportion of female peers influences the impacts of menopause: the results suggest that, when the share of female coworkers is high, the negative impacts on earnings and employment intensify.

In sum, menopause impacts on labor market outcomes vary significantly by workplace context. While public-sector workers face smaller employment and earnings effects, women in smaller workplaces or those with predominantly female coworkers experience larger earnings and employment losses. These findings underscore the importance of workplace composition and institutional structures in shaping the economic consequences of menopause.

4.4 Labor Market, Health Services, and Prescription Drugs in Sweden

The central results in Figures 1 and 2 above raise an interesting question: how can we reconcile the large and persistent labor market impacts of menopause with the apparent absence of persistent impacts on the use of healthcare services? To understand these patterns, we turn to the Swedish administrative records, where we are able to trace healthcare services also using drug data.

Before turning to the drug data, however, we present the impacts of a menopause-related diagnosis, in the context of Sweden, on outcomes that are observed in both countries. Appendix Figure A.10, Panels A through C, show our event study estimates of the effect of a menopause diagnosis on annual economic outcomes. We observe a persistent drop in earnings (Panel A) and employment (Panel B). Furthermore, Panel C shows that disposable income — defined as the sum of earnings and social transfers — falls by less than earnings, highlighting the role of the social safety net. Appendix Table A.10 reports the difference-in-differences estimates for a broad range of labor market outcomes. Earnings decline by 2.9% in Sweden; thus, the earnings estimate is qualitatively similar to our estimate from Norway, but smaller in magnitude (in Norway the corresponding earnings penalty is 8.2%).[33]

We now return to the key question: How do we reconcile the large and persistent labor market impacts of a menopause diagnosis — a central finding of this paper — with its temporary effects on healthcare services observed in Norway? One potential mechanism is that menopause-related symptoms themselves are persistent — even if the increase in healthcare utilization is not. This is especially plausible for menopause because *initiating* MHT usually requires interaction with the healthcare system (which appears in our Norwegian data), whereas *continuing* MHT does not

[32]We exclude workplaces with only one or two workers, as these typically indicate self-employment.

[33]Because Swedish data do not capture GP diagnoses, these estimates are most comparable to those in Panel B of Tables 2 and A.6, where the sample (from Norway) includes all women who receive a menopause diagnosis at an outpatient specialist visit or an inpatient visit, though Swedish women use specialist care more intensively (see Appendix Tables A.2 and A.3).

necessarily entail an additional visit.

To shed light on this potential mechanism, we use Swedish administrative records that track both individual-level drug use and healthcare utilization. Figure 3 and Table 5 summarize these results. The increase in outpatient specialist visits following a menopause diagnosis mirrors the Norwegian pattern, but the effect size differs: in Norway, specialist outpatient visits rise by 53% upon menopause onset (0.078 p.p. relative to a pre-onset mean of 0.147; Panel B of Table 1), whereas in Sweden they increase by 21% (0.063 p.p. relative to a pre-onset mean of 0.297; Table 5). By contrast, Figure 3 shows an immediate spike in medication use at the time of the diagnosis (Panel A). Table 5 and Figure 3 (Panels B, C, D) confirm that this is driven by MHT as well as by medications for psychological symptoms (antidepressants, anti-anxiety drugs, and sleep aids) and antihypertensives, consistent with research linking hot flashes to cardiovascular disease risk (Thurston et al., 2015).

Therefore, when we track ongoing drug utilization beyond a single healthcare visit, the evidence strongly suggests that menopause-related symptoms, like the observed labor market effects, are both significant and long-lasting. This is evident in the sustained use of hormonal and non-hormonal medications (antidepressants and antihypertensives) following a menopause diagnosis. Taken together, the Swedish findings reveal that, while menopause triggers only a brief spike in specialist visits, medication use (including MHT and treatments for psychological and cardiovascular symptoms) remains elevated. This pattern underscores how persistent symptoms, rather than ongoing healthcare visits, likely drive the longer-term labor market disruptions observed in both Norway and Sweden.

5 Menopause-Related Care and Labor Market Outcomes

So far, we have documented extensive economic costs of menopause-related health issues. Next, we turn to the question of whether menopause-related care can alleviate these costs.

To answer this question, we leverage variation in awareness of, and access to care for, menopause-related symptoms stemming from a TV show, which aired on one of Sweden's two public TV channels, in October 2018. This show, produced by Sweden's public broadcasting company, SVT, consisted of two hour-long informationals. The first episode was centered around the fact that menopause seldom is discussed in society, and aimed to raise awareness of menopause and menopause-related symptoms. It featured multiple women talking about their menopause-related symptoms – and the fact that they had not, at first, understood that these symptoms were caused by menopause – and relaying their broader accounts of the menopausal phase of life. The second episode had more accounts from women, and also focused on treatment options. It featured physicians and researchers talking about the availability of, and potential therapeutic benefits of, MHT, as well as broader lifestyle aspects that may matter for well-being during the menopausal transition.[34] The informational first aired in the evening of October 11, 2018, and generated

[34]The title of the TV show was "Klimakteriet: Det ska hända dig med" (in english: Menopause: It will happen to

follow-up discussions in other media outlets about increasing menopause awareness, menopause-related symptoms, medical treatment, and more broadly how to live and manage symptoms in the menopausal and post-menopausal phase of life.[35] One potential reason why the show was so influential was that some of the women participating were celebrities – perhaps akin to the discussion in the United States in popular media following Michelle Obama's public comments about her menopause symptoms (see, e.g., Walters (2020)).

At the time when the show aired, Sweden's national MHT recommendations were also in the process of being changed. Specifically, just a year earlier, in 2017, the long-run (18-year) follow-up results of the Women's Health Initiative (WHI) study had been published, which showed no increased risk of all-cause mortality among MHT users, nor of cardiovascular or total cancer mortality (Manson et al., 2017). These results substantially reduced the safety concerns associated with MHT, and the North American Menopause Society (NAMS) subsequently updated its recommendations, suggesting expanded prescribing of MHT (The NAMS 2017 Hormone Therapy Position Statement Advisory Panel, 2017). Sweden's recommendations follow those of NAMS – but typically with a lagged adoption. The official new guidelines were released in Sweden in 2019, but the proposal was shared in the medical community already in 2018 (Sundell et al., 2023); hence, the TV show effectively aired exactly when physicians were also learning about the new guidelines from their own medical society. It is thus possible that the TV show affected both the awareness of menopause and demand for menopause-related information and health care from patients, as well as the supply of menopause-related health care and treatment from physicians. In other words, the TV show can be thought of as a bundle of treatments, all of which push toward the provision of more menopause-related health care.

Figure 4, panel A, plots the Google search interest for the term "Klimakteriet" (in Swedish: menopause) from 2012 through 2019. The figure shows a slow and gradual increase in search interest over time; then a sharp spike in information-seeking behavior about menopause exactly around the time of the TV show; and subsequently a decline, possibly consistent with a return to pre-trend information seeking. Next, Panel B, plots the number of outpatient specialist visits to a gynecologist or Ob-Gyn, per 100,000 women, over the same time period. The figure shows a gradual increase in the number of visits over time since 2012; then suggests a "jump" around October 2018, for about one month. Thereafter, the number of visits falls again. These plots of raw data thus suggest that the TV show had an immediate impact on demand for menopause-related information (Panel A), as well as an impact on demand for menopause-related healthcare visits, at least in the month immediately following the TV show (Panel B).

Next, Panel C illustrates the number of diagnoses, per 100,000 visits, over time. It illustrates a sharp increase at the time of the TV show. After this initial spike, the diagnosis rate falls somewhat, but remains at a higher "steady-state" diagnosing level. Finally, Panel D plots the number of

---

you too). The first episode had the subtitle "Hormonernas svall och den stora okunskapen" (in English, loosely: The tide of the hormones and the great lack of knowledge). The second episode had the subtitle: "Pillerjakt, döhalvan och de torra liggens tid" (in english, loosely: A chase for pills, life after fifty, and the times of dry sex).

[35] See, e.g., Brodrej (2018) for coverage in one of Sweden's largest evening newspapers.

women initiating MHT within three months of the visit, per 100,000 visits, over time. This graph, too, shows a sharp increase in the MHT initiation rate right around the TV show, and a subsequent return to a higher steady-state initiation rate thereafter. Thus, panels C and D suggest that the TV show caused changes to physicians' diagnosis and prescribing behavior (possibly partly driven by the increased awareness and information of the patients), and that these changes lasted well beyond the first month after the TV show.

Taken together, these panels suggest that the TV show provided a shock that raised effective access to menopause-related care, broadly defined to encompass both patient-side mechanisms (increased awareness; increased demand for information; increased demand for healthcare visits), as well as supply-side mechanisms (increased recognition of menopausal symptoms in diagnostic behavior; increased prescribing of the most effective drugs treating menopausal symptoms). This suggests that we can exploit this shock to examine the causal impact of increased menopause-related awareness and care, broadly, in society.

Figure 4 further highlights several features that are important to account for when aiming to use this setting to identify causal effects of menopause-related awareness and care on labor market outcomes. First, the TV show had an impact on the health care that women with menopause-related symptoms in Sweden *de facto* had access to. These changes operated to some extent through demand (the TV show prompted more women to seek care for menopause-related symptoms, at least immediately after the show), but perhaps even more chiefly through supply: the TV show appears to have influenced physicians' propensity to diagnose and treat menopause-related symptoms – perhaps because physicians, themselves, were influenced by the TV show, especially as it aired when the new guidelines were being disseminated among them; and perhaps because patients now were more empowered to request treatment, including MHT. In either case, the end result is that more women are treated for menopause-related symptoms. These large changes in treatment of women with menopause-related symptoms before and after the TV show, coupled with the fact that we have data that shows the exact date of each outpatient specialist visit and each MHT prescription, motivate the use of a Regression Discontinuity Design around the date of the airing of the show.

A second feature that is evident from several of the raw data plots is the pronounced seasonality of the treatment of women with menopause-related symptoms. This is perhaps most evident in Panel B, which shows that there are markedly fewer outpatient visits during the summer months, June through August, when physicians take longer summer vacations, and hence make scheduled care less available. This is important for our empirical design, as even a short bandwidth around October 11^{th} will overlap with the summer period. To account for this pronounced seasonality we implement a regression discontinuity difference-in-differences (RD-DD) design, where we essentially compare women whose specialist visit falls very close to, but on opposite sides of, the morning after the TV show (October 12, 2018), and we difference out seasonality effects using women who had their outpatient specialist visit in the same months but in earlier years.

Specifically, our primary specification compares the outcomes of women who had an outpatient specialist visit with a gynecologist or Ob-Gyn in the 90 days before and the 90 days after

October 12, 2018 ("TV show sample"), relative to the difference in outcomes in the same time periods in the previous five years (centered around October 12 in each of the years 2017, 2016, 2015, 2014, and 2013; "non-TV show sample"). Our regression model, which uses the woman's day of visit, d, as the running variable, can be expressed as follows:

$$y_{idp} = \alpha + \beta_1 \mathbf{1}[d \geq c] + \beta_2 R_i \times \mathbf{1}[d \geq c]$$
$$+ f(d-c) + \mathbf{1}[d \geq c] \times f(d-c) + \mathbf{x}'_{idp}\kappa + \theta_p + \varepsilon_{idp} \quad (3)$$

for each woman i who had an outpatient visit on day of the year d in time period p (e.g. within 90 days of October 2018, within 90 days of October 12, 2017, etc.). y_{idp} is an outcome of interest, such as an indicator for any menopause diagnosis, an indicator for MHT take-up within three months, or a measure capturing the future labor market outcomes of the woman. c denotes October 12, the morning after the day of the TV show (i.e., the first possible day that a woman could have an outpatient specialist visit and have seen the TV show). R_i is an indicator set to 1 for women who are in the TV show sample, and 0 otherwise. The dummy variable $\mathbf{1}[d \geq c]$ is set to 1 for women who have their visit after October 11 in any year. $f(d-c)$ is a flexible function of the running variable, day of specialist visit centered around October 12, for which we use a linear polynomial in our main specifications and allow for it to have a different shape on opposite sides of the threshold. We also include fixed effects for every time period, θ_p. The vector $\mathbf{x}_{idp}$ includes fixed effects for a woman's age at the time of the specialist visit. ε_{idp} is an unobserved error term.

The key coefficient of interest is the one on the interaction between the TV show sample dummy, R_i and the dummy for visits in the post-October 12-period, $\mathbf{1}[d \geq c]$, denoted by β_2. It represents an estimate of the difference in outcomes between women who had their visits right after versus right before October 12 in the year when the TV show aired, relative to the analogous difference in outcomes in the non-TV-show sample.

In our main analyses, we use a bandwidth of 90 days around October 12, which is motivated by the Swedish national guaranteed access to healthcare, which is a standard established for public healthcare services.[36] In our main analyses, we also use a triangular kernel centered on the TV-show cutoffs. We show below that our results are robust to the choice of alternative bandwidths, weights and sets of control variables. Standard errors are clustered at the day level.

Validity of the RD-DD A third feature that is highlighted by the raw data plots, and that is important to account for in our empirical design, is that the TV show influenced many aspects of menopause-related care. Specifically, it did not only affect supply of healthcare through physician responses, but also – at least in the first month following the airing, and possibly longer – the

[36] This feature is usually called "The 0-7-90-90-Rule," and it stipulates that patients have the right to see a doctor at the health center within seven days from the day they sought help, to see a specialist doctor within 90 days, and further to initiate treatment within an additional 90 days, if the specialist considers this justified. The national guaranteed access to care was established on 1 November 2005, and it applies to planned visits and surgery within specialist care, but not to emergency care. See https://www.vardhandboken.se/arbetssatt-och-ansvar/ansvar-och-regelverk/patientens-rattsliga-stallning/nationella-vardgarantin.

demand for healthcare through patient responses. In contrast, in an ideal design to isolate the causal impact of supply-side aspects of menopause-related care alone on labor market outcomes, we would have a setting where there were no demand responses (i.e., where only the supply, through physicians' diagnostic and prescribing behavior, had responded).

More formally, a standard RD design would rely on the assumption that only the treatment variable — in our case, exposure to the TV show — is changing discontinuously at the airing date; all other variables possibly related to our outcomes of interest should be continuous functions of the assignment variable (Imbens and Lemieux, 2008; Lee and Lemieux, 2010). In our setting with pronounced seasonality, we use gynecologist visits in the same months in five years before the TV show to account for it, as described above. Thus, for our setting, we rely on an assumption that any discontinuities in other variables at the TV show date are not distinguishable from those in the non-TV-show years.

To assess the plausibility of such an identifying assumption, we first perform the RD-DD version of the McCrary (2008) test. Specifically, we collapse our data into week-of-visit bins, and estimate a version of model (3) using the collapsed data with the number of visits as the dependent variable and a 13-week bandwidth. The running variable is the week of the visit normalized relative to the week of October 12 in every period, and we report coefficients from RD-DD models for the full sample, as well as separately for women with and without college education. Appendix Table A.11 presents the results. For the full sample, we do detect a significant discontinuity in the number of visits at the time of the TV show. Interestingly, such discontinuity in the number of visits is, to some extent, larger for women with college education.

These results suggest that the demand-side response to the TV show were stronger for women with college education.[37] This finding is consistent with other work documenting that more advantaged populations are more likely to respond to the arrival of new health-related information or recommendations (see, e.g., Aizer and Stroud, 2010; Oster, 2020; Kowalski, 2021). However, the non-random sorting of highly educated women around the TV show date may bias our estimates in the sample of women who are highly educated (as well as in the full sample). To address this concern, we estimate a "donut-RD" model that omits all women with visits happening within 30 days of the TV show date (in the TV show year as well as in the five years prior to the show), and show that our results are robust.

Validity of Exclusion Restriction As the non-random sorting indicates, demand-side responses did play a significant role, along with supply-side responses. Thus, our design does not allow us to isolate the causal impact of any particular single feature of menopause-related care; rather, it captures the aggregate impact of "the package" of demand-side and supply-side responses of

[37]This is also apparent when we check for any discontinuities in pre-determined characteristics. Appendix Figure A.11 reports results from estimating versions of model (3), using women's pre-menopause diagnosis characteristics as the dependent variables. Consistent with the evidence above that suggests a stronger demand-side response to the TV show from women with college education, panel (a) shows a statistically significant discontinuity in precisely the outcome capturing higher education. We observe no statistically significant discontinuity in other pre-menopause diagnosis characteristics.

menopause-related care induced by the TV show (increased awareness and demand for care; increased diagnoses and MHT prescribing). For this reason, we will present the reduced form estimates, but we will not scale them relative to any one particular response.

5.1 Results on the Impact of Menopause-Related Care

We begin by providing evidence that the TV show affects the menopause diagnosis rate and the takeup of MHT. Appendix Figure A.12, panel (A), plots the difference in the mean probability of a menopause diagnosis in the TV show year relative to the five control years, by 7-day bin, along with the predictions from estimating local linear polynomial models, using a 90-day bandwidth. Shortly before the cutoff, this mean difference is close to zero, indicating that the probability of menopause diagnosis was similar in control years and the treatment year, in the period leading up to October 12. Directly to the right of the threshold, we see a sharp increase in the probability that a visit results in a menopause diagnosis. Appendix Figure A.12, panel (B), shows a similar pattern for the share of women who initiate treatment with MHT drugs within three months of the visit.

The top panel of Figure 5 presents results from estimating equation 3 using the menopause diagnosis and MHT initiation variables as outcomes, for the whole sample and for two sub-samples: women with and without college education. For each outcome we plot our estimate relative to the pre-October 12 outcome mean, along with 95 percent confidence intervals. The corresponding point estimates are presented in Appendix Table A.12, panel (A). In the overall sample, the TV show raises the likelihood of a menopause diagnosis by 4.7 percentage points. The pre-TV show mean was 0.16, so Figure 5 shows a 29.4% ($\frac{0.047}{0.16}$) increase in the likelihood of a menopause diagnosis among women with a visit after the TV show. The second estimate shows an even larger increase – 50% – in the likelihood of the patient initiating MHT within three months of the visit (an increase of 3.6 percentage points, relative to a pre-TV show mean of 0.072). Interestingly, we observe roughly equal impacts in relative terms among women with and without a college education (they also have similar pre-TV show means). This underscores that, while the demand-side response to the TV show (i.e. the number of ob/gyn visits) were larger for women with higher education, menopause-related health care increases similarly, regardless of the patient's educational attainment.

Next, we consider log earnings in the three calendar years following the visit, and the extensive margin of the labor supply in the year after the visit. The second panel of Figure 5 shows impacts on log earnings in the three years after the visit, and the corresponding point estimates are presented in Appendix Table A.12, panel (A).[38] In the overall sample, the reduced form estimate suggests an increase in three-year earnings by 10 percent after the TV show. The third panel of Figure 5 shows impacts on earnings along the extensive margin at the one, two, and three year horizon, scaled by the pre-TV-show-mean.[39] In the full sample, we see a one percent increase

[38]We observe earnings through 2022 in Sweden; thus, we are able to observe earnings for three full years after the TV show in all our specifications.

[39]Panels C and D of Appendix Figure A.12 show the corresponding RDD graphs for earnings along the extensive margin at the one year horizon and three-year log earnings, respectively.

in the likelihood of having positive earnings in each of the first and second years after the gynecologist visit, and about a 0.7 percent increase in the likelihood of having positive earnings in the third year after it. All impacts on labor market outcomes are driven by women with no college education, suggesting that this group of women stands to benefit the most from the increased supply of menopause-related healthcare. This suggests that, at least in the short run, access to menopause-related treatment is an equality-promoting policy.[40]

Sensitivity Analyses We conduct several robustness exercises. Appendix Figure A.15, panel A, shows results from the same baseline regression specification, but without triangular kernel weights. Panel B shows results from the same baseline regression specification, with the addition of a 30-day donut. In Panel C, we further add a control for prior earnings, to directly account for potential selection based on income differences. Next, Appendix Figure A.16 and Table A.13 repeat estimates for the baseline model, as well as all the robustness specifications used in Appendix Figure A.15, but rather than using a 90-days bandwidth around the airing data, we use the optimal bandwidth obtained following Calonico, Cattaneo and Titiunik (2014).[41] Our results are generally quantitatively and qualitatively similar in all these specifications – including using the "donut" design to assuage the concerns with non-random sorting. Our most conservative estimate of the reduced-form impact on earnings suggests an increase of 3.4 percent (from the specification with optimal bandwidth, without triangular kernel weights, see Table A.13 panel B).

6 Concluding Remarks

The remarkable increase in female labor force participation and the changing economic roles of women have been described as among the greatest advances in society in the last century (Goldin, 2014). The large-scale entry of women into the formal economy amounts to a momentous transformation of the labor market, and today women over the age of 50 drive employment growth in a range of countries (Goldin and Katz, 2018).

Yet, evidence is scarce about the economic and health impacts of a major midlife health event in women's lives: the menopausal transition. This paper begins to fill this gap by providing causal evidence on the effects of menopause-related health issues on a broad swath of outcomes capturing women's well-being, using linked administrative data from Norway and Sweden.

We show that *one in three* women experience menopause-related health issues that are bothersome enough to induce them to seek medical care, and to receive a clinical diagnosis. This share

[40]We also examined the following outcomes, measured within three months of the focal visit to a gynecologist or Ob-Gyn: any cancer diagnosis, any mental health diagnosis, any musculoskeletal diagnosis, and having an inpatient stay. While some specifications suggest impacts on the likelihood of receiving a mental health diagnosis (among women with no college education) or a cancer diagnosis (among women with college education), these impacts are generally not robust across specifications. Appendix Figures A.13 and A.14 show results estimated using a 90-day and optimally chosen bandwidth, respectively.

[41]The optimal bandwidth is chosen for each outcome and sample. It ranges between 93 days (for the initiation of MHT among the high education sample) and 197 days (for the earnings in the three years following a visit in the whole sample).

is several times larger than the share of women affected – either directly or indirectly – by unemployment, and highlights menopause as a significant potential shock to labor market productivity.

Indeed, leveraging stacked difference-in-differences designs and event studies, we document that a menopause-related diagnosis impacts multiple dimensions of women's lives. It causes a sharp, but short-lived, increase in the number of primary care and specialist doctor visits, and a permanent increase in prescription drug utilization – driven by medications used to alleviate the physical and mental health symptoms of menopause (namely, MHT and antidepressants). Further, following a menopause diagnosis, we document a large and persistent decline in employment and earnings, coupled with an increased use of social transfers.

These findings suggest substantial social costs associated with menopause. These costs encompass private earnings losses for women, the loss of productive human capital for employers, and significant public finance implications. The latter include lost tax revenue from reduced earnings, increased expenditure on social transfers, and higher healthcare costs.

How large are these social costs? Our sample comprises one third of all women who are menopause age – the women who experience symptoms severe enough to be diagnosed with a menopause-related health issue. The most conservative assumption possible is that women outside of our sample – i.e., women who do not seek medical care for menopause-related symptoms – experience zero losses during menopause. Under this assumption, we can obtain an estimate of the full costs of menopause by aggregating our estimates across one-third of the menopause-age population. If, in practice, women who do not seek healthcare for menopause-related symptoms also experience some losses, then this calculation would yield a *lower bound* of the total costs of menopause.[42]

To put this into perspective, there are currently 45 million women in the U.S. between ages 45 and 55, with women near the menopausal transition estimated to account for 20 percent of the U.S. workforce.[43] Extrapolating even our most conservative estimate suggests that a third of these women may experience productivity losses during the menopausal transition. This highlights the fact that menopause may constitute a labor market productivity shock of tremendous importance.

Many important questions remain to be addressed in future work. Chief among them is documenting menopause penalties in diverse contexts: just as child penalties vary across places (Kleven, Landais and Leite-Mariante, 2024), menopause penalties likely differ across locations. To date, evidence on menopause penalties is only beginning to emerge. The sole estimate from outside of Scandinavia comes from Juarez and Marquez-Padilla (2025), who make an important contribution by estimating the menopause penalty using survey data from the United States. However, the current dearth of evidence underscores two critical needs: broader documentation

[42] Abrahamsson, Barschkett and Flatø (2025) show that the economic costs of menopause that they estimate among survey respondents are chiefly driven by women who receive a menopause diagnosis; women who do not receive any diagnosis suffer little economic losses. While these results stem from a particular region in Norway, they suggest that our sample – women who receive a menopause-related diagnosis – may capture precisely the women who are at risk for suffering economic consequences of menopause.

[43] Information available here: https://www.nia.nih.gov/news/research-explores-impact-menopause-womens-health-and-aging.

of menopause penalties across diverse contexts, and investigation into the driving forces behind differing menopause penalties across places.

A second, and closely related, important question for future research is to deepen our understanding of the policies that may ameliorate the menopause penalty. Our paper has begun to provide evidence on this by demonstrating that increased awareness and access to menopause-related health care can reduce the economic losses associated with menopause. This finding is encouraging, as it suggests that addressing informational gaps and expanding access to menopause-related healthcare could have significant benefits to women, firms, and society more broadly. However, other important policy avenues remain to be explored. These include firm-level initiatives offering menopause-specific benefits and government policies that accommodate short-term productivity losses during the menopausal transition, similar to parental leave provisions. The effectiveness of such policies and their potential to mitigate the menopause penalty presents an important area for future research, crucial for developing comprehensive strategies to support women's economic participation throughout this significant life stage.

References

Abrahamsson, Sara, Mara Barschkett, and Martin Flatø. 2025. "Beyond Hot Flashes: The Career Cost of Menopause." *IZA Discussion Paper No. 17789.*

Aizer, Anna, and Laura Stroud. 2010. "Education, Knowledge and the Evolution of Disparities in Health." *NBER Working Paper No. 15840.*

Andresen, Martin Eckhoff, and Emily Nix. 2022. "What Causes the Child Penalty? Evidence from Adopting and Same-Sex Couples." *Journal of Labor Economics*, 40(4): 971–1004.

Angelov, Nikolay, Per Johansson, and Erica Lindahl. 2016. "Parenthood and the Gender Gap in Pay." *Journal of Labor Economics*, 34(3): 545–579.

Angrist, Josh E, Amanda Kpwalski, Ljubica Ristovska, and Marcia Stefanick. 2025. "Instrumental Variable Methods Reveal Larger Effects of Menopausal Hormone Therapy in the Landmark Women's Health Initiative Clinical Trial." *AEA Papers & Proceedings*.

Avdic, Daniel, Stephanie von Hinke, Bo Lagerqvist, Carol Propper, and Johan Vikström. 2024. "Do Responses to News Matter? Evidence from Interventional Cardiology." *Journal of Health Economics*, 94: 102846.

Bailey, Martha J. 2006. "More Power to the Pill: The Impact of Contraceptive Freedom on Women's Life Cycle Labor Supply." *The Quarterly Journal of Economics*, 121(1): 289–320.

Baker, Andrew C., David F. Larcker, and Charles C.Y. Wang. 2022. "How much should we trust staggered difference-in-differences estimates?" *Journal of Financial Economics*, 144(2): 370–395.

Bögl, Sarah, Jasmin Moshfegh, Petra Persson, and Maria Polyakova. 2024. "The Economics of Infertility: Evidence from Reproductive Medicine." *NBER Working Paper No. 32445*.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess. 2024. "Revisiting Event-Study Designs: Robust and Efficient Estimation." *The Review of Economic Studies*, rdae007.

Brodrej, Gunilla. 2018. "Varför måste kvinnors kroppar fläkas ut?" *Link*, Accessed 15-March-2025.

Bryson, Alex, Gabriella Conti, Rebecca Hardy, Darina Peycheva, and Alice Sullivan. 2022. "The consequences of early menopause and menopause symptoms for labour market participation." *Social Science & Medicine*, 293: 114676.

Callaway, Brantly, and Pedro H.C. Sant'Anna. 2020. "Difference-in-Differences with multiple time periods." *Journal of Econometrics*.

Calonico, Sebastian, Matias D. Cattaneo, and Rocio Titiunik. 2014. "Robust Nonparametric Confidence Intervals for Regression - Discontinuity Designs." *Econometrica*, 82(6): 2295–2326.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer. 2019. "The Effect of Minimum Wages on Low-Wage Jobs*." *The Quarterly Journal of Economics*, 134(3): 1405–1454.

Chen, Yiqun, Petra Persson, and Maria Polyakova. 2022. "The Roots of Health Inequality and the Value of Intrafamily Expertise." *American Economic Journal: Applied Economics*, 14(3): 185–223.

Clarke, Yvette D. 2023. "Menopause Research and Equity Act of 2023."

Conner, Peter, Liran Einav, Amy Finkelstein, and Petra Persson. 2025. "Targeting Precision Medicine: Evidence from Prenatal Screening." *Journal of Political Economy*, 133(2): 604–651.

Cuddy, Emily, and Janet Currie. Forthcoming. "Rules vs. Discretion: Treatment of Mental Illness in US Adolescents." *Journal of Political Economy*.

Cutler, David M, and Adriana Lleras-Muney. 2010. "Understanding Differences in Health Behaviors by Education." *Journal of Health Economics*, 29(1): 1–28.

Dahl, Gordon, and Stefano DellaVigna. 2009. "Does Movie Violence Increase Violent Crime?" *The Quarterly Journal of Economics*, 124(2): 677–734.

Davis, Susan R, and Rodney J Baber. 2022. "Treating menopause—MHT and beyond." *Nature Reviews Endocrinology*, 18(8): 490–502.

Daysal, Meltem, and Chiara Orsini. 2014. "The Miracle Drugs: Hormone Replacement Theory and Labor Market Behavior of Middle-Aged Women." IZA Institute of Labor Economics Working Paper 7993.

Daysal, Meltem, and Chiara Orsini. 2015. "Spillover effects of drug safety warnings on preventive health care use." *The BE Journal of Economic Analysis & Policy*, 15(1): 179–208.

Dean, Bonnie B, and Jeff E Borenstein. 2004. "A Prospective Assessment Investigating the Relationship Between Work Productivity and Impairment With Premenstrual Syndrome." *Journal of Occupational and Environmental Medicine*, 46(7): 649–656.

de Chaisemartin, Clément, and Xavier D'Haultfœuille. 2020. "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects." *American Economic Review*, 110(9): 2964–96.

DellaVigna, Stefano, and Ethan Kaplan. 2007. "The Fox News Effect: Media Bias and Voting*." *The Quarterly Journal of Economics*, 122(3): 1187–1234.

Deshpande, Manasi, and Yue Li. 2019. "Who Is Screened Out? Application Costs and the Targeting of Disability Programs." *American Economic Journal: Economic Policy*, 11(4): 213–48.

Fadlon, Itzik, and Torben Heien Nielsen. 2019. "Family Health Behaviors." *American Economic Review*, 109(9): 3162–91.

Fadlon, Itzik, and Torben Heien Nielsen. 2021. "Family Labor Supply Responses to Severe Health Shocks: Evidence from Danish Administrative Records." *American Economic Journal: Applied Economics*, 13(3): 1–30.

Finkelstein, Amy, Petra Persson, Maria Polyakova, and Jesse M Shapiro. 2022*a*. "A Taste of Their Own Medicine: Guideline Adherence and Access to Expertise." *American Economic Review: Insights*, 4(4): 507–526.

Finkelstein, Amy, Petra Persson, Maria Polyakova, and Jesse M. Shapiro. 2022*b*. "A Taste of Their Own Medicine: Guideline Adherence and Access to Expertise." *American Economic Review: Insights*, 4(4): 507–26.

Georgakis, Marios K, Thomas P Thomopoulos, Andreas-Antonios Diamantaras, Eleni I Kalogirou, Alkistis Skalkidou, Stella S Daskalopoulou, and Eleni Th Petridou. 2016. "Association of age at menopause and duration of reproductive period with depression after menopause: a systematic review and meta-analysis." *JAMA psychiatry*, 73(2): 139–149.

Ginja, Rita, Arizo Karimi, and Pengpeng Xiao. 2023. "Employer Responses to Family Leave Programs." *American Economic Journal: Applied Economics*, 15(1): 107–35.

Goldin, Claudia. 2006. "The quiet revolution that transformed women's employment, education, and family." *American economic review*, 96(2): 1–21.

Goldin, Claudia. 2014. "A grand gender convergence: Its last chapter." *American economic review*, 104(4): 1091–1119.

Goldin, Claudia, and Lawrence F Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy*, 110(4): 730–770.

Goldin, Claudia, and Lawrence F. Katz. 2018. *Women Working Longer: Increased Employment at Older Ages.* Chicago:University of Chicago Press and NBER.

Gormley, Todd A., and David A. Matsa. 2011. "Growing Out of Trouble? Corporate Responses to Liability Risk." *The Review of Financial Studies*, 24(8): 2781–2821.

Gottschalk, M S, A Eskild, S Hofvind, J M Gran, and E K Bjelland. 2020. "Temporal trends in age at menarche and age at menopause: a population study of 312656 women in Norway." *Human Reproduction*, 35(2): 464–471.

Grossman, Michael. 1972. "On the Concept of Health Capital and the Demand for Health." *Journal of Political Economy*, 80(2): 223–255.

Grossman, Michael. 2006. "Education and nonmarket outcomes." *Handbook of the Economics of Education*, 1: 577–633.

Harlow, Bernard L, and Lisa B Signorello. 2000. "Factors associated with early menopause." *Maturitas*, 35(1): 3–9.

Imbens, Guido W, and Thomas Lemieux. 2008. "Regression Discontinuity Designs: A Guide to Practice." *Journal of Econometrics*, 142(2): 615–635.

Jacobson, Louis S, Robert J LaLonde, and Daniel G Sullivan. 1993. "Earnings losses of displaced workers." *The American economic review*, 685–709.

Johnson, Erin M, and M Marit Rehavi. 2016. "Physicians Treating Physicians: Information and Incentives in Childbirth." *American Economic Journal: Economic Policy*, 8(1): 115–141.

Juarez, Laura, and Fernanda Marquez-Padilla. 2025. "Midlife Crisis: The Labor and Health Impacts of the Menopause Transition." *SSRN Working Paper No. 5264120.*

Jönsson, Lisa, Mårten Palme, and Ingemar Svensson. 2012. "Disability Insurance, Population Health, and Employment in Sweden." In *Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participatio*. *NBER Chapters*, 79–126. National Bureau of Economic Research.

Kearney, Melissa S., and Phillip B. Levine. 2015. "Media Influences on Social Outcomes: The Impact of MTV's 16 and Pregnant on Teen Childbearing." *American Economic Review*, 105(12): 3597–3632.

Kleven, Henrik, Camille Landais, and Gabriel Leite-Mariante. 2024. "The Child Penalty Atlas." *The Review of Economic Studies*, rdae104.

Kleven, Henrik, Camille Landais, and Jakob Egholt Søgaard. 2019. "Children and Gender Inequality: Evidence from Denmark." *American Economic Journal: Applied Economics*, 11(4): 181–209.

Kowalski, Amanda E. 2021. "Mammograms and Mortality: How Has the Evidence Evolved?" *Journal of Economic Perspectives*, 35(2): 119–40.

Kuh, Diana L., Michael Wadsworth, and Rebecca Hardy. 1997. "Women's health in midlife: the influence of the menopause, social factors and health in earlier life." *BJOG: An International Journal of Obstetrics and Gynaecology*, 104(8): 923–933.

Lachowska, Marta, Alexandre Mas, and Stephen A Woodbury. 2020. "Sources of displaced workers' long-term earnings losses." *American Economic Review*, 110(10): 3231–3266.

La Ferrara, Eliana, Alberto Chong, and Suzanne Duryea. 2012. "Soap Operas and Fertility: Evidence from Brazil." *American Economic Journal: Applied Economics*, 4(4): 1–31.

Laun, Lisa, and Mårten Palme. 2018. "The recent rise of labor force participation of older workers in Sweden." National Bureau of Economic Research.

Laven, Joop SE, and Yvonne V Louwers. 2024. "Can we predict menopause and premature ovarian insufficiency?" *Fertility and Sterility*, 121(5): 737–741.

Lee, David S., and Thomas Lemieux. 2010. "Regression Discontinuity Designs in Economics." *Journal of Economic Literature*, 48(2): 281–355.

Lindh-Åstrand, L., M. Hoffmann, L. Järvstråt, M. Fredriksson, M. Hammar, and A.-C. Spetz Holm. 2015. "Hormone therapy might be underutilized in women with early menopause." *Human Reproduction*, 30(4): 848–852.

Manson, JoAnn E., Aaron K. Aragaki, Jacques E. Rossouw, Garnet L. Anderson, Ross L. Prentice, Andrea Z. LaCroix, Rowan T. Chlebowski, Barbara V. Howard, Cynthia A. Thomson, Karen L. Margolis, Cora E. Lewis, Marcia L. Stefanick, Rebecca D. Jackson, Karen C. Johnson, Lisa W. Martin, Sally A. Shumaker, Mark A. Espeland, Jean Wactawski-Wende, and for the WHI Investigators. 2017. "Menopausal Hormone Therapy and Long-term All-Cause and Cause-Specific Mortality: The Women's Health Initiative Randomized Trials." *JAMA*, 318(10): 927–938.

Manson, JoAnn E, Carolyn J Crandall, Jacques E Rossouw, Rowan T Chlebowski, Garnet L Anderson, Marcia L Stefanick, Aaron K Aragaki, Jane A Cauley, Gretchen L Wells, Andrea Z LaCroix, et al. 2024. "The Women's Health Initiative randomized trials and clinical practice: a review." *Jama*, 331(20): 1748–1760.

McCrary, Justin. 2008. "Manipulation of the running variable in the regression discontinuity design: A density test." *Journal of Econometrics*, 142(2): 698–714. The regression discontinuity design: Theory and applications.

Mishra, Gita D, and Diana Kuh. 2012. "Health symptoms during midlife in relation to menopausal transition: British prospective cohort study." *BMJ*, 344.

Muka, Taulant, Clare Oliver-Williams, Setor Kunutsor, Joop SE Laven, Bart CJM Fauser, Rajiv Chowdhury, Maryam Kavousi, and Oscar H Franco. 2016. "Association of age at onset of menopause and time since onset of menopause with cardiovascular outcomes, intermediate vascular traits, and all-cause mortality: a systematic review and meta-analysis." *JAMA cardiology*, 1(7): 767–776.

Murabito, Joanne M., Qiong Yang, Caroline Fox, Peter W. F. Wilson, and L. Adrienne Cupples. 2005. "Heritability of Age at Natural Menopause in the Framingham Heart Study." *The Journal of Clinical Endocrinology and Metabolism*, 90(6): 3427–3430.

NAMS. 2012. "The 2012 hormone therapy position statement of the North American Menopause Society." *Menopause*, 19(3): 257–271.

NKVTS. 2025. "Norwegian Centre for Violence and Traumatic Stress Studies: Violence and abuse." *Link*, Accessed 20-May-2025.

OECD. 2025. "Health Indicators: Doctors." *Link*, Accessed 20-May-2025.

Oster, Emily. 2020. "Health Recommendations and Selection in Health Behaviors." *American Economic Review: Insights*, 2(2): 143–60.

Oster, Emily, and Rebecca Thornton. 2011. "Menstruation, Sanitary Products, and School Attendance: Evidence from a Randomized Evaluation." *American Economic Journal: Applied Economics*, 3(1): 91–100.

Peycheva, Darina, Alice Sullivan, Rebecca Hardy, Alex Bryson, Gabriella Conti, and George Ploubidis. 2022. "Risk factors for natural menopause before the age of 45: evidence from two British population-based birth cohort studies." *BMC Women's Health*, 22(1): 438.

SCB. 2025. "Employment is rising." *Link*, Accessed 17-May-2025.

Schoenaker, Danielle AJM, Caroline A Jackson, Jemma V Rowlands, and Gita D Mishra. 2014. "Socioeconomic position, lifestyle factors and age at natural menopause: a systematic review and meta-analyses of studies across six continents." *International journal of epidemiology*, 43(5): 1542–1562.

Skatteverket. 2022. "Individuals and Employees." Accessed January 4, 2022.

Socialstyrelsen. 2019. "Hälsodataregister - räddar liv och ger bättre vård." Accessed August 2021. Link.

Socialstyrelsen. 2020. "About the Swedish Healthcare System." Accessed March 2024. Link.

SSB. 2025. "Unemployed persons, by age and sex 1972 - 2024." *Link*, Accessed 17-May-2025.

Statistics Sweden. 2019. "Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA)." Accessed May 2019. Link.

Stephens Jr, Melvin, and Desmond Toohey. 2022. "The impact of health on labor market outcomes: evidence from a large-scale health experiment." *American Economic Journal: Applied Economics*, 14(3): 367–399.

Sundell, Micaela, Jan Brynhildsen, Anna-Clara Spetz Holm, Mats Fredrikson, and Mikael Hoffmann. 2023. "Trends in the Incidence, Prevalence and Sales Volume of Menopausal Hormone Therapy in Sweden from 2000 to 2021." *Maturitas*, 175: 107787.

Talaulikar, Vikram. 2022. "Menopause transition: Physiology and symptoms." *Best practice & research Clinical obstetrics & gynaecology*, 81: 3–7.

Tanbo, Tom G, and Peter Z Fedorcsak. 2021. "Can time to menopause be predicted?" *Acta obstetricia et gynecologica Scandinavica*, 100(11): 1961–1968.

Theis, S, Sabrina Josefine Baumgartner, H Janka, A Kolokythas, C Skala, and Petra Stute. 2023. "Quality of life in menopausal women in the workplace–a systematic review." *Climacteric*, 26(2): 80–87.

The NAMS 2017 Hormone Therapy Position Statement Advisory Panel. 2017. "The 2017 Hormone Therapy Position Statement of The North American Menopause Society." *Menopause*, 24(7): 728–753.

Thurston, Rebecca, Howard Aizenstein, Carol Derby, Ervin Sejdic, and Pauline Maki. 2015. "Menopausal Hot Flashes and White Matter Hyperintensities." *Menopause (New York, N.Y.)*, 23.

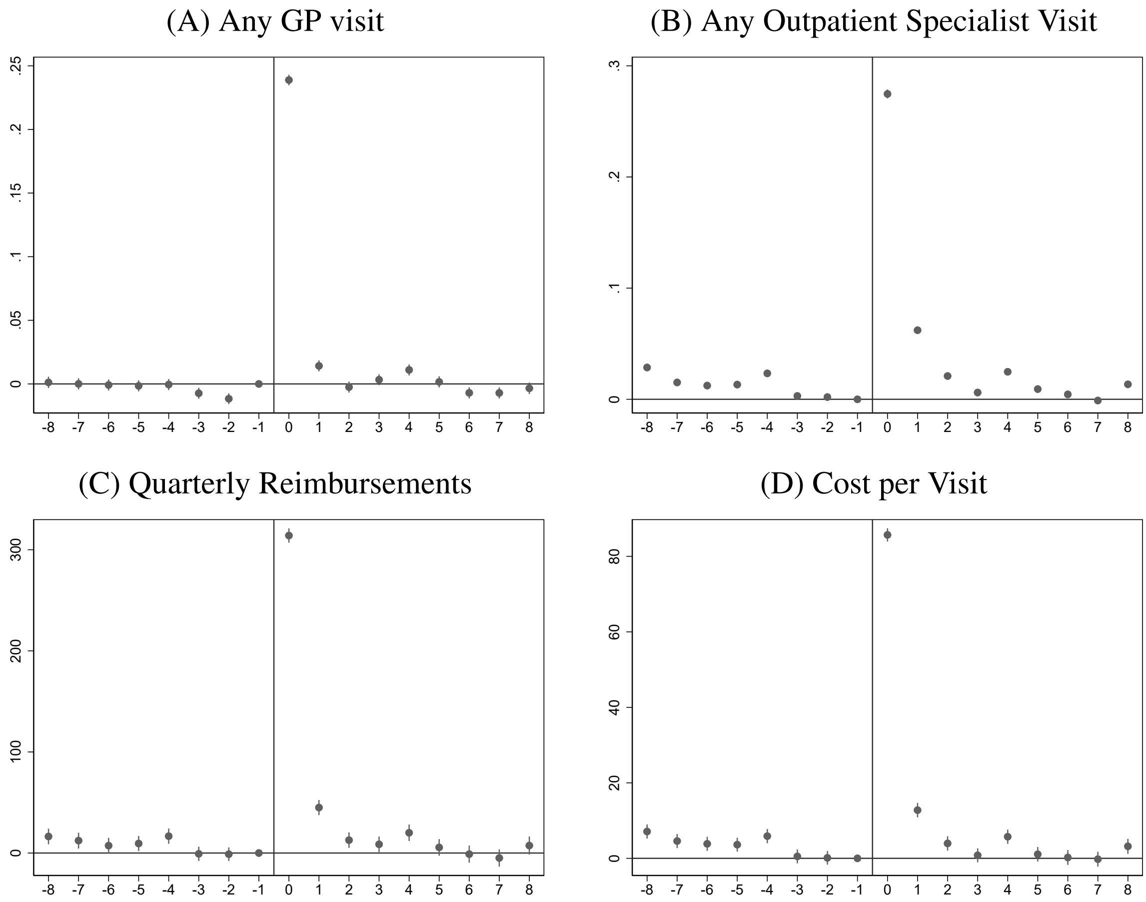
Verdonk, Petra, Elena Bendien, and Yolande Appelman. 2022. "Menopause and work: A narrative literature review about menopause, work and health." *Work*, 72(2): 483–496.

Walters, Joanna. 2020. "'We're living like it's not happening': Michelle Obama opens up about menopause." *Link*, Accessed 15-March-2025.

Writing Group for the Women's Health Initiative Investigators. 2002. "Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results From the Women's Health Initiative Randomized Controlled Trial." *JAMA*, 288(3): 321–333.

7 Figures and Tables

Figure 1: Health Care Utilization Around Menopause (Norway)

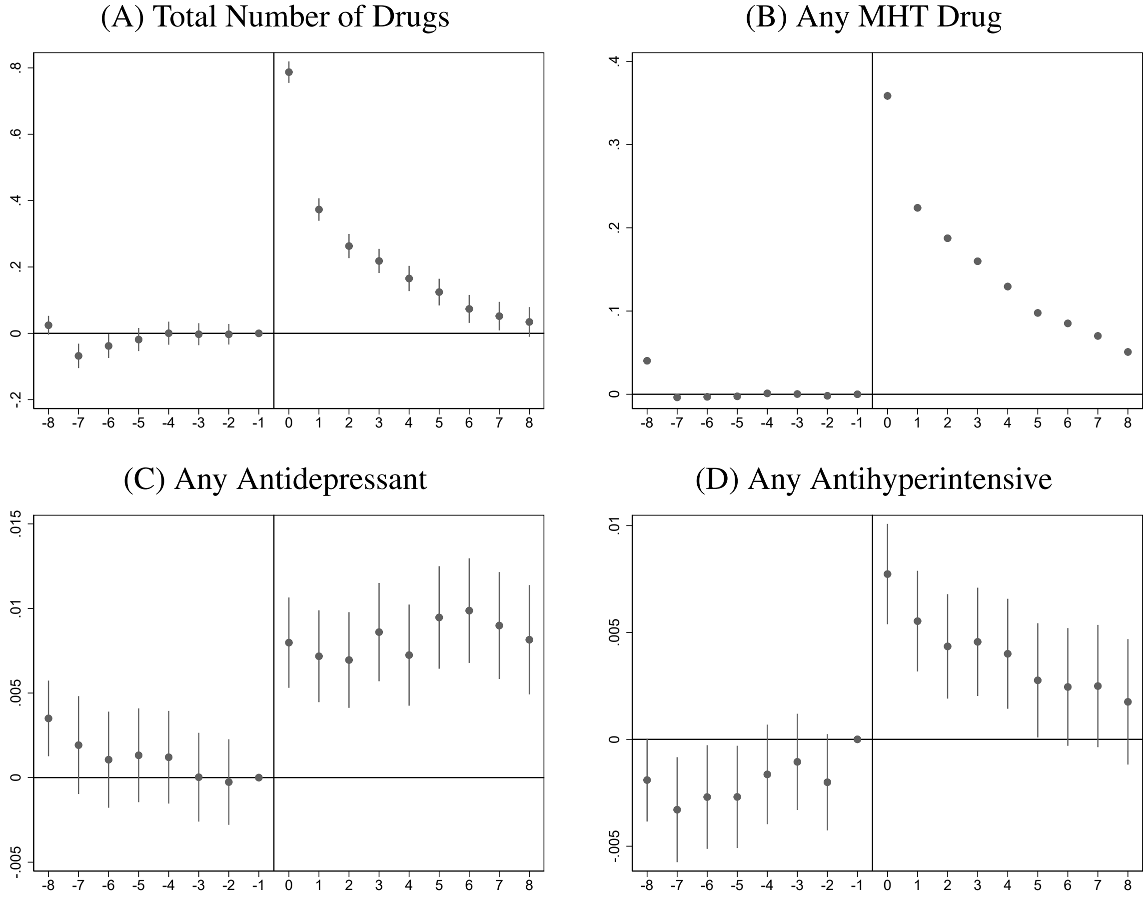


Notes: Each graph presents the estimates of α^{τ} from a separate regression of model 2, along with the 95% confidence intervals (based on standard errors clustered by woman). The sample includes women with a first menopause diagnosis between ages 45 and 55, born between 1961 and 1968, in Norway (where we observe both GP and specialist visits). The x-axis represent quarters around the menopause diagnosis. Panel (D) of Appendix Figure A.10 shows an analogue of this figure's Panel (B) for Sweden (we are unable to observe the other outcomes in the Swedish data), where we use women diagnosed in specialist care only (as we do not observe GP visits in the Swedish data).

Figure 2: Labor Market Outcomes Around Menopause Diagnosis (Norway)

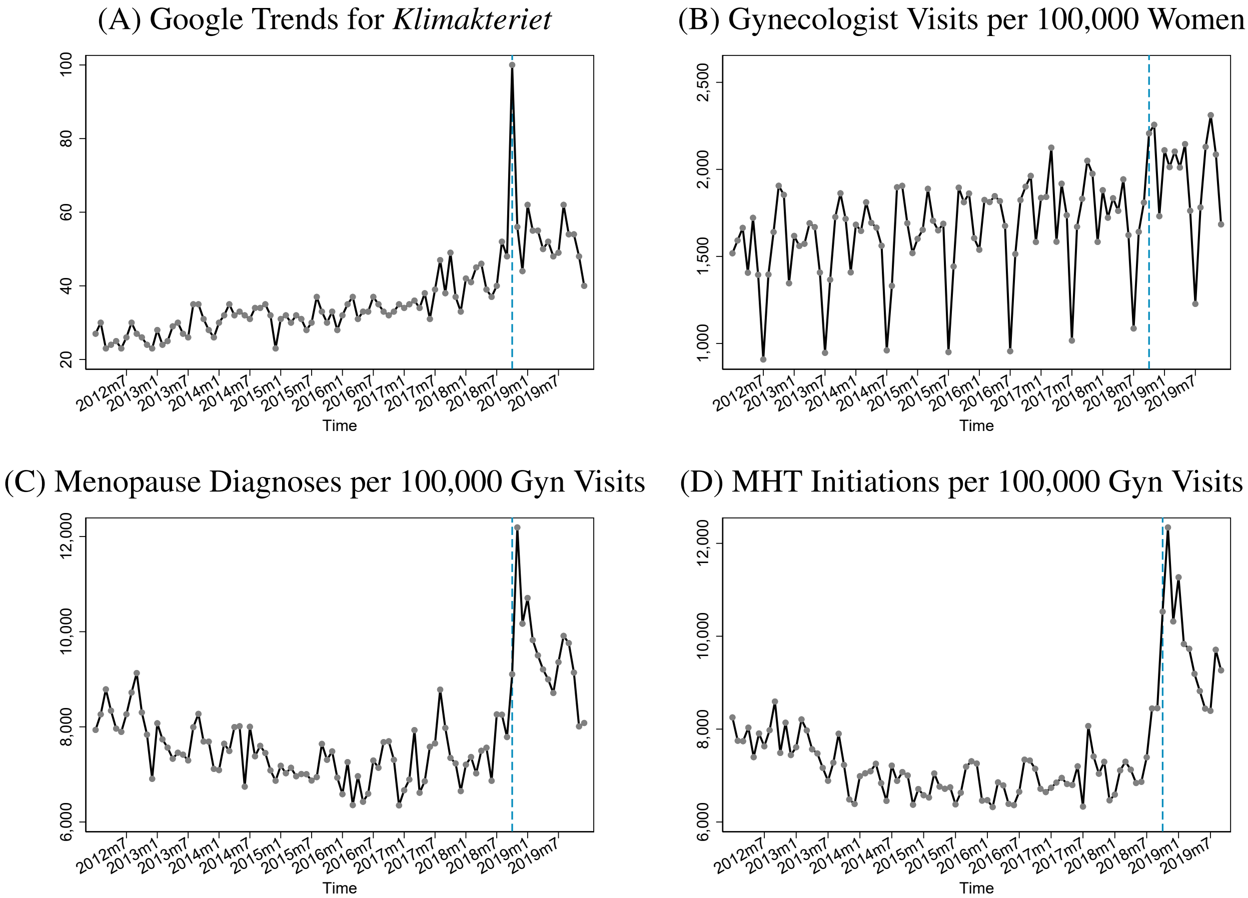
Notes: Each graph presents the estimates of α^{τ} from a separate regression of model 2, along with the 95% confidence intervals (based on standard errors clustered by woman). The sample includes women with a first menopause diagnosis between ages 45 and 55, born between 1961 and 1968, in Norway (where we observe both GP and specialist visits). The x-axis represent years around the menopause diagnosis. Panels (A) and (B) of Appendix Figure A.10 shows an analogue of this figure's Panels (A) and (C) for Sweden (we are unable to observe the other outcomes in the Swedish data), where we use women diagnosed in specialist care only (as we do not observe GP visits in the Swedish data).

Figure 3: Consumption of Prescription Drugs Around Menopause (Sweden)



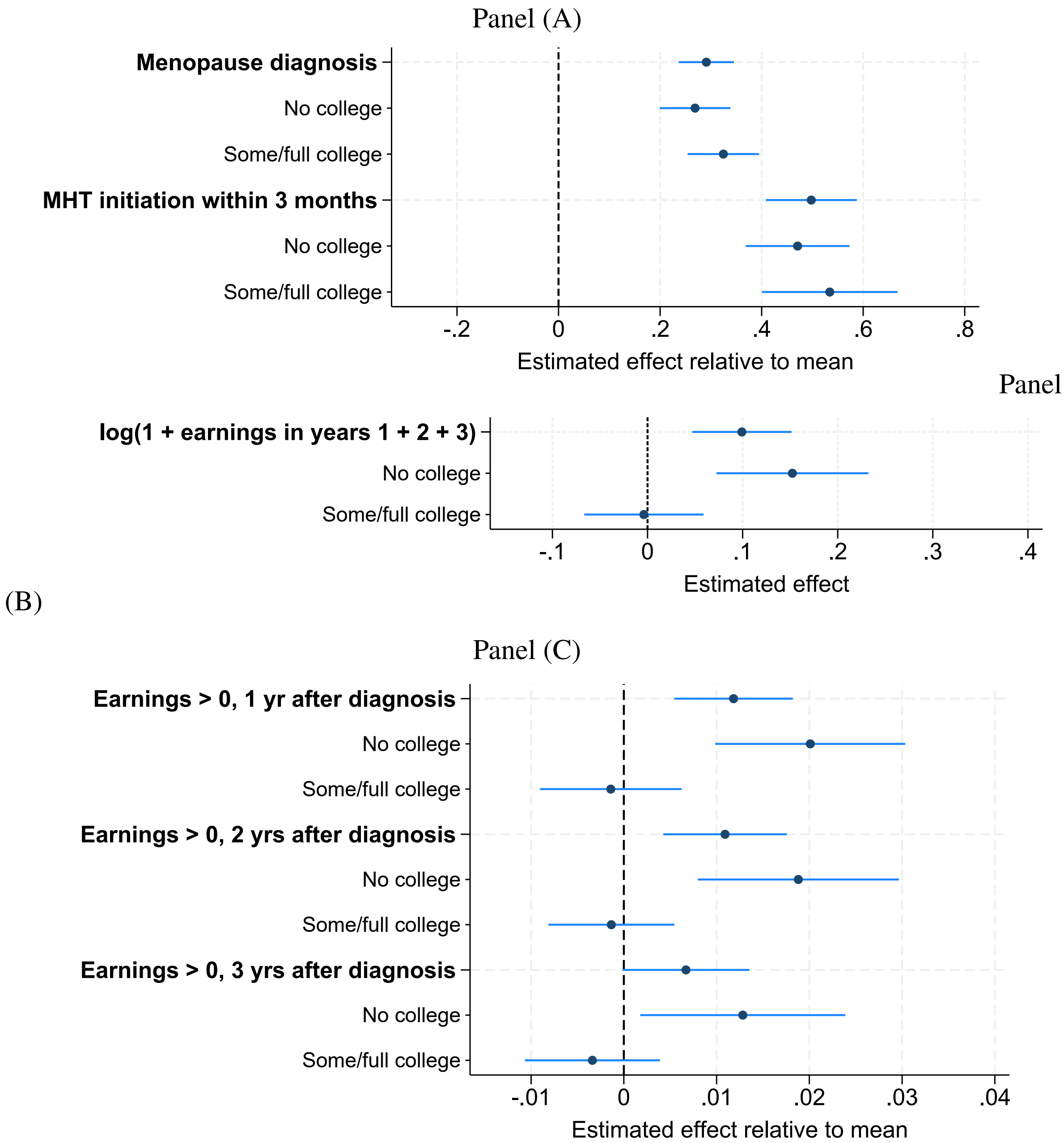
Notes: Each graph presents the estimates of α^{τ} from a separate regression of model 2, along with the 95% confidence intervals (based on standard errors clustered by woman). The sample includes women with a first menopause diagnosis between ages 45 and 55, born between 1961 and 1968, in Sweden (where we observe specialist visits). The x-axis represent quarters around the menopause diagnosis. We do not observe drug measures in our Norwegian data.

Figure 4: Descriptives of Patients and Physicians' Behavior Around the Swedish TV Show



Notes: Panel A shows the Google trends in Sweden for the term "Klimakteriet" (menopause in Swedish). Panel B shows the number of gynecologist (or obgyn) visits per 100,000 women in Sweden aged 45–55. Panel C shows the number of menopause diagnoses per 100,000 gynecologist (or obgyn) visits. Panel D shows the number of MHT initiations within 3 months of the specialist visit per 100,000 gynecologist (or obgyn) visits.

Figure 5: Menopause-Related Care and Labor Market Outcomes



Notes: Panels (A) and (C) of the figure show estimates of β_2 from equation (3) divided by the control mean of the dependent variable. Panel (B) shows estimates of β_2 from equation (3). The sample includes 90 days of gynecologist and obgyn visits—by women in Sweden aged 45–55—before and after the TV show launch. Each line of the figure is based on a separate regression, weighted using a triangular kernel and including age-at-visit fixed effects. We present estimates for three different samples: women with any level of education, women with low education ("no college") and women with high education ("some/full college"). Standard errors are clustered at the level of the running variable (day of the visit centered around October 12). Underlying point estimates and control means are reported in Panel (a) of Appendix Table A.12.

Table 1: D-i-D: Health Care Utilization Around Menopause Diagnosis (Norway)

	(1) Any GP Visit	(2) Any Urgent Care Visit	(3) Medical Reimbursements (NOK)	(4) Reimbursements per Visit (NOK)	(5) Any Specialist Visits	(6) Leave-out GP Visits	(7) Leave-out Specialist Visits
Panel A: Treatment includes Diagnoses by GPs and Specialists							
DiD	0.031***	-0.000	39.117***	9.752***	0.035***	0.022***	0.022***
	(0.001)	(0.000)	(2.194)	(0.395)	(0.001)	(0.001)	(0.001)
Control Mean	0.611	0.062	453.907	122.962	0.113	0.611	0.113
N	39974684						
N individuals	80326						
Panel B: Treatment includes Diagnoses by Specialists							
DiD	-0.009***	-0.002***	36.793***	11.594***	0.078***	-0.006***	0.048***
	(0.001)	(0.001)	(3.312)	(0.574)	(0.001)	(0.001)	(0.001)
Control Mean	0.708	0.068	576.324	148.796	0.147	0.695	0.147
N	22309202						
N individuals	42208						

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the quarter prior to the diagnosis of menopause (in the treated panel). Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by-quarter level. See Table 5 for the corresponding estimates for Sweden. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: D-i-D: Labor Market Outcomes Around Menopause Diagnosis (Norway)

	(1) Log Earnings (+1)	(2) Employed (Earnings > 0)	(3) Weekly Hrs Worked	(4) Sick Leave Days	(5) Social Benefits
	Panel A: Treatment includes Diagnoses by GPs and Specialists				
DiD	-0.033***	-0.002***	-0.105***	-0.019	1112.578***
	(0.010)	(0.001)	(0.035)	(0.211)	(263.802)
Control Mean	11.304	0.886	27.122	23.641	64560.155
N	8425690	8425690	1927710	7260055	8425690
N Individuals	79858	79858	38163	77972	79858
	Panel B: Treatment includes Diagnoses by Specialists				
DiD	-0.082***	-0.006***	-0.132**	-0.753**	2463.144***
	(0.015)	(0.001)	(0.062)	(0.326)	(404.440)
Control Mean	11.226	0.880	22.421	26.166	68112.940
N	4561450	4561450	3035050	3885624	4561450
N Individuals	41484	41484	41409	40509	41484

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year prior to the diagnosis of menopause (in the treated panel). Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year level. See Appendix Table A.10 for the corresponding estimates for Sweden. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: D-i-D: Heterogeneity By Socioeconomic Characteristics and Severity of Symptoms (Norway)

	(1) Any GP Visit	(2) Any MH Visit	(3) Any Specialist Visit	(4) Log Earnings	(5) Employed	(6) Hours Worked	(7) Sick Leave	(8) Social Benefits
				Panel A: Education Level				
DiD (β_1)	0.028***	0.005***	0.033***	-0.034**	-0.002**	-0.091*	-0.036	1260.525***
	(0.001)	(0.001)	(0.001)	(0.014)	(0.001)	(0.048)	(0.286)	(335.349)
DiD×College (β_3)	0.009***	-0.000	0.005***	0.003	0.000	-0.033	0.038	-393.078
	(0.002)	(0.002)	(0.001)	(0.019)	(0.002)	(0.070)	(0.422)	(543.161)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.000	0.000	0.019	0.037	0.015	0.994	0.042
N	39974684	39974684	39974684	8425690	8425690	1927710	7260055	8425690
				Panel B: Relative with a Medical Degree				
DiD (β_1)	0.111***	0.013***	0.033***	-0.023**	-0.001*	-0.099***	-0.013	1165.389***
	(0.005)	(0.003)	(0.001)	(0.010)	(0.001)	(0.036)	(0.220)	(275.084)
DiD×Relative MD (β_3)	-0.042**	-0.006	0.007**	-0.099**	-0.008**	-0.057	-0.592	-1572.782
	(0.018)	(0.010)	(0.003)	(0.046)	(0.004)	(0.150)	(0.873)	(1087.972)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.452	0.000	0.006	0.009	0.282	0.471	0.696
N	35934991	35934991	35934991	7898370	7898370	1757850	6823483	7898370
				Panel C: Gender of GP				
DiD (β_1)	-0.019**	0.009*	0.082***	-0.045***	-0.003**	-0.208***	0.239	1250.591***
	(0.009)	(0.005)	(0.001)	(0.014)	(0.001)	(0.049)	(0.296)	(372.286)
DiD×Female GP (β_3)	-0.024	0.001	-0.010***	0.028	0.002	0.202***	-0.215	-688.313
	(0.015)	(0.008)	(0.002)	(0.021)	(0.002)	(0.074)	(0.454)	(565.649)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.120	0.000	0.288	0.344	0.916	0.945	0.187
N	18957482	18957482	18957482	7246060	7246060	1675510	6271559	7246060
				Panel D: Severity of Symptoms				
DiD (β_1)	0.036***	0.010***	0.039***	-0.042**	-0.003	-0.210***	-0.187	2111.517***
	(0.002)	(0.001)	(0.001)	(0.019)	(0.002)	(0.063)	(0.404)	(487.831)
DiD×Less Severe (β_3)	-0.008***	-0.007***	-0.007***	0.019	0.001	0.166**	0.212	-1533.740***
	(0.002)	(0.002)	(0.002)	(0.024)	(0.002)	(0.077)	(0.491)	(594.540)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.002	0.000	0.058	0.118	0.301	0.923	0.072
N	37864236	37864236	37864236	8137120	8137120	1856520	7016333	8137120

Notes: Each cell is an estimate of β_1 or β_3 from a separate regression of the model below:

$$y_{ibta} = \beta_0 + \beta_1 Post_{ibt} \times Treated_{ib} + \beta_2 Post_{ibt} + \beta_3 Post_{ibt} \times Treated_{ib} \times HeteroTerm_i + \delta_{ib} + \gamma_t + \gamma_t \times HE_i + \eta_a + \varepsilon_{ibta}.$$

Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", year (quarter in columns (1) to (3), interacted with an indicator for higher education degree at age 40) and age (interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year (quarter in columns (1) to (3)) prior to the diagnosis of menopause. Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year (quarter in columns (1) to (3)) level. In Panel A $HeteroTerm_i$ takes value 1 if the woman has a college degree at age 40 (0 otherwise). In Panel B $HeteroTerm_i$ takes value 1 if the woman has either a medical degree herself or has at least one direct relative (parent or sibling) with a medical degree (0 otherwise). In Panel C $HeteroTerm_i$ takes value 1 if the woman has a female GP in the two years prior to the diagnosis (0 otherwise). In Panel D $HeteroTerm_i$ takes value 1 if during the visit with a primary care physician or specialist when the women has the fist menopause-related diagnosis, she only had that diagnosis (and it takes value 0 for women that besides the menopause-related diagnosis have other simultaneous complains). Any MH Visit = Any GP Visit with a Mental Health Diagnosis (ICPC-2 P). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: D-i-D: Heterogeneity by Workplace Characteristics (Norway)

	(1) Any GP Visit	(2) Any MH Visit	(3) Any Specialist Visit	(4) Log Earnings	(5) Employed	(6) Hours Worked	(7) Sick Leave	(8) Social Benefits
Panel A: Sector of Work								
DiD (β_1)	0.122***	0.019***	0.037***	-0.244***	-0.017***	-0.168***	-0.103	5335.801***
	(0.008)	(0.004)	(0.001)	(0.013)	(0.001)	(0.052)	(0.341)	(425.838)
DiD×Public (β_3)	-0.007	-0.005	-0.001	0.053***	0.002*	0.097	0.792*	-1743.073***
	(0.010)	(0.005)	(0.002)	(0.018)	(0.001)	(0.070)	(0.460)	(564.956)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.000	0.000	0.000	0.000	0.137	0.020	0.000
N	33681165	33681165	33681165	7029640	7029640	1919750	6539346	7029640
Panel B: Firm Size								
DiD (β_1)	0.101***	0.017***	0.035***	-0.317***	-0.023***	-0.054	0.114	6545.180***
	(0.010)	(0.005)	(0.001)	(0.016)	(0.001)	(0.072)	(0.423)	(503.853)
DiD× Large WP (β_3)	0.021*	0.002	0.003	0.099***	0.008***	-0.076	0.205	-1117.051*
	(0.012)	(0.006)	(0.002)	(0.019)	(0.001)	(0.083)	(0.524)	(624.913)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.000	0.000	0.000	0.000	0.001	0.273	0.000
N	29770196	29770196	29770196	6152940	6152940	1813080	5732701	6152940
Panel C: Fraction of Female Workers								
DiD (β_1)	0.118***	0.017***	0.038***	-0.208***	-0.014***	-0.058	0.313	5315.082***
	(0.007)	(0.004)	(0.001)	(0.012)	(0.001)	(0.048)	(0.331)	(431.881)
DiD×High (β_3)	-0.006	0.003	-0.004**	-0.088***	-0.007***	-0.104	-0.175	1042.773*
	(0.011)	(0.006)	(0.002)	(0.018)	(0.001)	(0.074)	(0.478)	(607.022)
p-value: $H_0 : \beta_1 + \beta_3 = 0$	0.000	0.000	0.000	0.000	0.000	0.005	0.701	0.000
N	29770196	29770196	29770196	6152940	6152940	1813080	5732701	6152940

Notes: Each cell is an estimate of β_1 or β_3 from a separate regression of the model below:

$$y_{ibta} = \beta_0 + \beta_1 Post_{ibt} \times Treated_{ib} + \beta_2 Post_{ibt} + \beta_3 Post_{ibt} \times Treated_{ib} \times HeteroTerm_i + \delta_{ib} + \gamma_t + \gamma_t \times HE_i + \eta_a + \varepsilon_{ibta}.$$

Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", year (quarter in columns (1) to (3), interacted with an indicator for higher education degree at age 40) and age (interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year (quarter in columns (1) to (3)) prior to the diagnosis of menopause. Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year (quarter in columns (1) to (3)) level. In Panel A $HeteroTerm_{ibt}$ takes value 1 if the woman works in the public sector in the year prior to the onset of menopause (0 otherwise). In Panel B $HeteroTerm_{ibt}$ takes value 1 if the woman works in a workplace with more workers than the median workplace (that is, 20 workers) in the year prior to the onset of menopause (0 otherwise). In Panel C $HeteroTerm_{ibt}$ takes value 1 if the woman works in a workplace with a fraction of female co-workers above the median workplace (that is, 73% female co-workers) in the year prior to the onset of menopause (0 otherwise). Any MH Visit = Any GP Visit with a Mental Health Diagnosis (ICPC-2 P). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: D-i-D: Health Care Utilization and Consumption of Prescription Drugs Around Menopause Diagnosis (Sweden)

	(1) Any Specialist Outpatient Visit	(2) Any Specialist Outpatient Visit (Leave-Out)	(3) Total Number of Drugs	(4) Any MHT Drug	(5) Any Antidepressant Drugs
			Panel A		
DiD	0.063***	0.025***	0.243***	0.143***	0.007***
	(0.001)	(0.001)	(0.011)	(0.001)	(0.001)
Control Mean	0.297	0.297	3.195	0.114	0.136
N	33780003	33780003	33780003	33780003	33780003
			Panel B		
	Any Mental Health Drug	Any Contraceptive Drug	Any Pain Killer Drug	Any Anti-Anxiety or Sleep Drug	Any Hyperintensive Drug
DiD	0.006***	-0.004***	-0.001	0.004***	0.006***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Control Mean	0.322	0.018	0.190	0.133	0.122
N	33780003	33780003	33780003	33780003	33780003

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for quarter and age (estimated separately for women with higher and lower education at age 40). Control Mean is measured in the quarter prior to the diagnosis of menopause (in the treated panel). Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by quarter level. * significant at 10%; ** significant at 5%; *** significant at 1%.

The Menopause "Penalty"

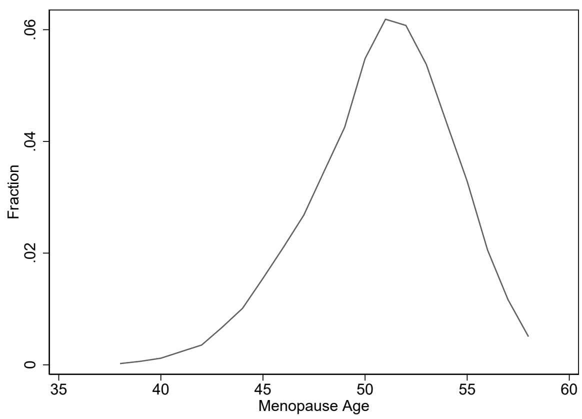
Gabriella Conti, Rita Ginja, Petra Persson & Barton Willage

ONLINE APPENDIX

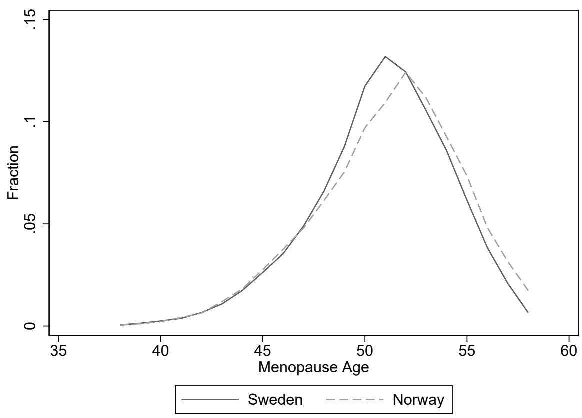
A Additional Figures and Tables

Figure A.1: Distribution of Age At First Diagnosis

(A) By a GP or a Specialist (Norway)



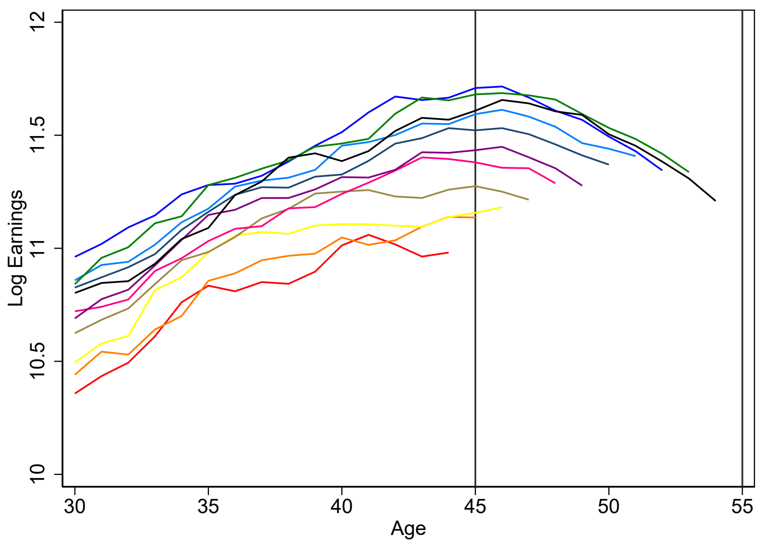
(B) By a Specialist (Norway and Sweden)



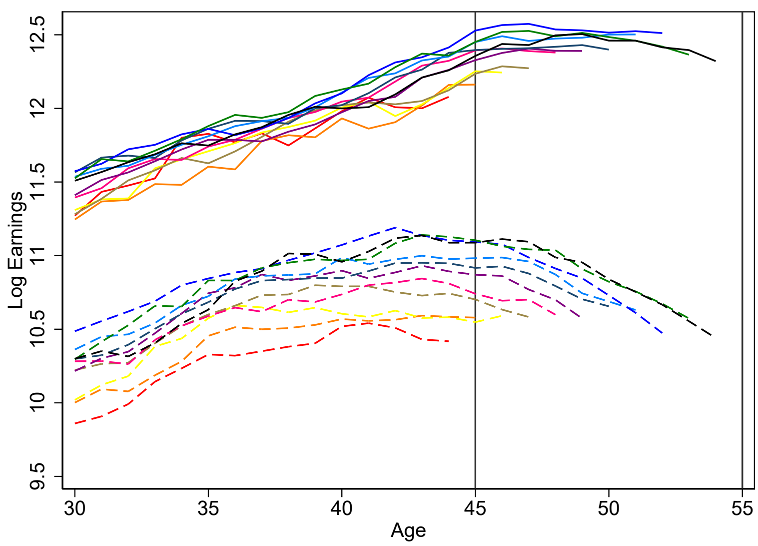
Notes: The sample includes all women in birth cohorts 1961 through 1968 who receive a menopause-related diagnosis, either by a GP (for Norway) or by a specialist (for both Norway and Sweden), from 2006 through 2020. Panel A plots the distribution of the age at the first menopause-related diagnosis, given by either a GP or a specialist, in Norway. Panel B plots the distribution of the age at the first menopause-related diagnosis given by a specialist, which we can observe in both Norway and Sweden.

Figure A.2: Pre-diagnosis trends: Women with diagnosis at different ages, between ages 45 and 55 (Norway)

(A) Log Earnings

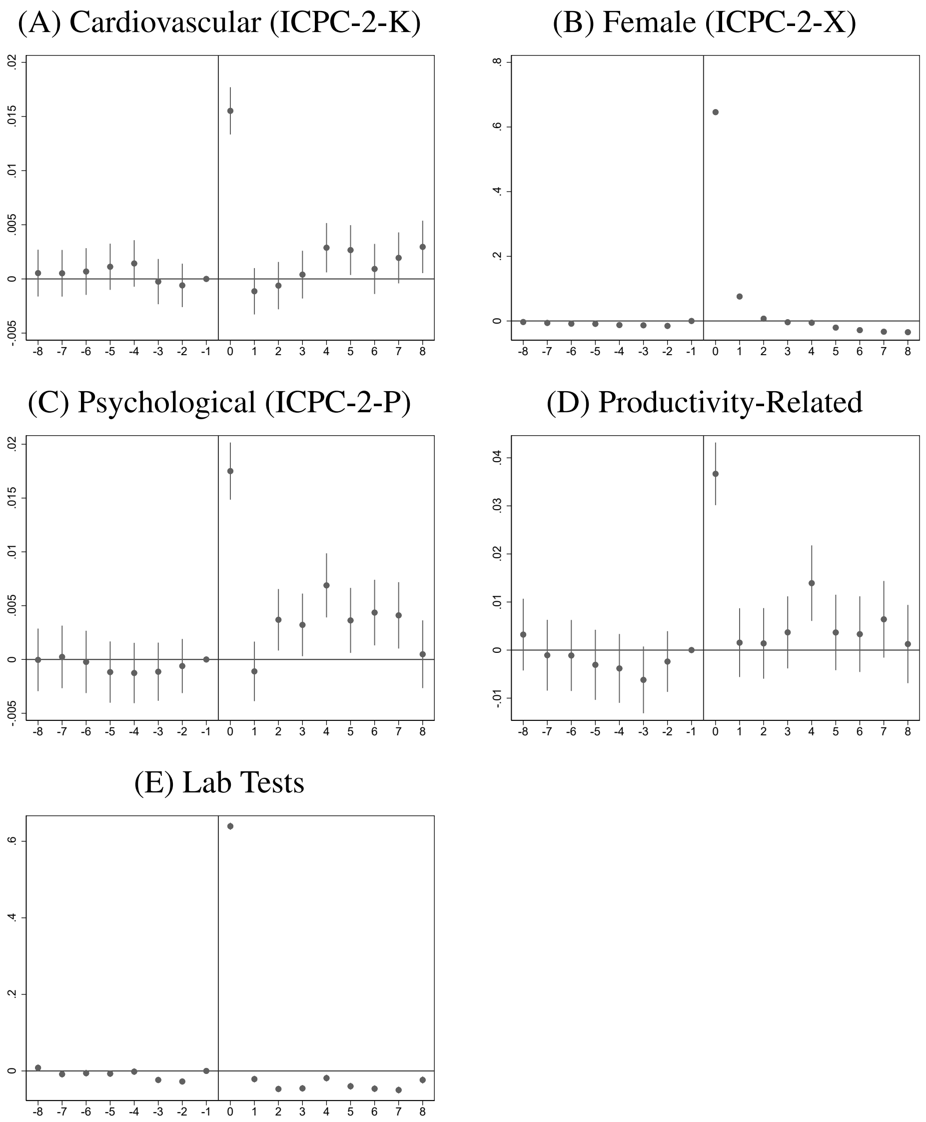


(B) Log Earnings: By Education



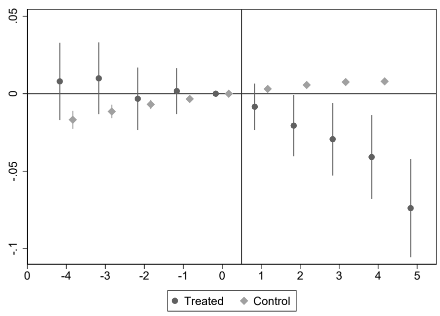
Notes: Birth cohorts 1961-1968. The lines represents the earnings trajectory from age 30 up to the age before the first diagnosis. Each line is for a separate age-of-menopause cohort in our main sample (age of menopause between 45 and 55). The x-axis measures the age of measurement, and the y-axis measures log earnings (left panel) or annual sick leave days (right panel). In Panel B, we present trajectories separately for low educated women (ie, without a college degree; dashed lines) and high educated women (with a college degree; solid lines).

Figure A.3: Specific Diagnoses Around Menopause Diagnosis (Norway)



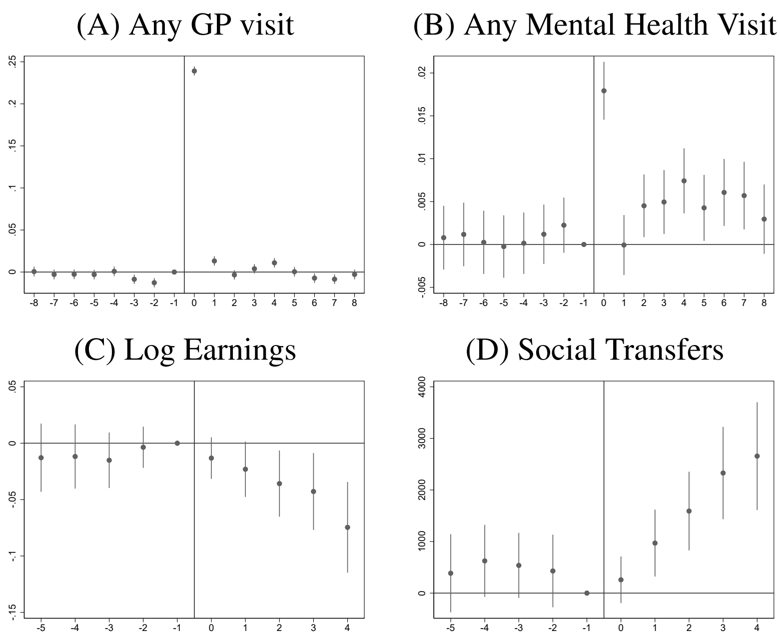
Notes: Each graph presents estimates of α^{τ} from a separate regression of model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Birth cohorts 1961-1968.

Figure A.4: Treatment vs. Control Panels: Earnings (Norway)



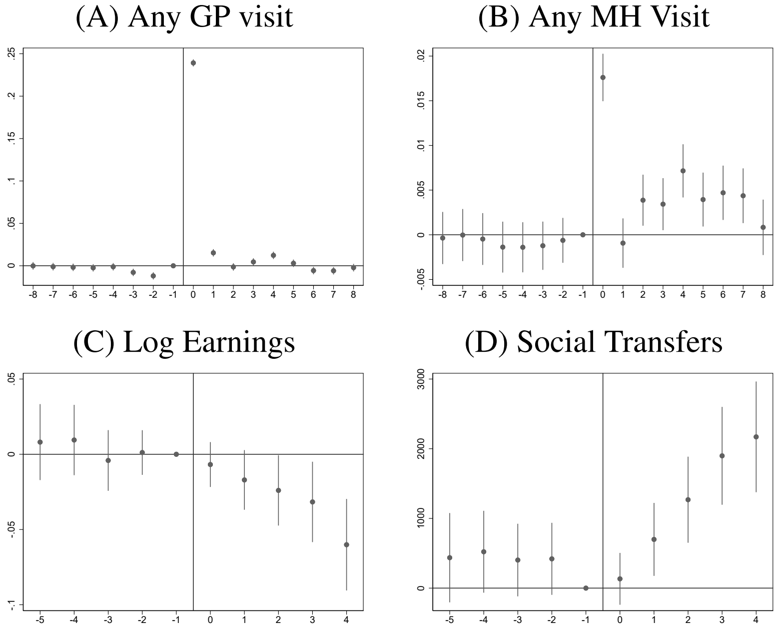
Notes: Each graph presents estimates of α^τ and ζ^τ from model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Birth cohorts 1961-1968.

Figure A.5: Health Care Utilization and Labor Market Outcomes Around Menopause Diagnosis: Cohorts born between 1961 and 1964 (Norway)



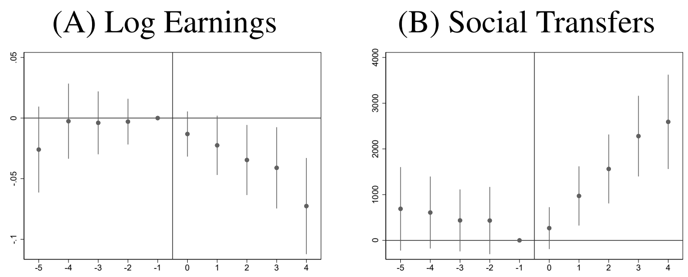
Notes: Each graph presents estimates of α^τ from a separate regression of model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Birth cohorts 1961-1964. The x-axis unit is quarter in Panels A-B and year in Panels C-D.

Figure A.6: Health Care Utilization and Labor Market Outcomes Around Menopause Diagnosis: Expanded Control Group (Norway)



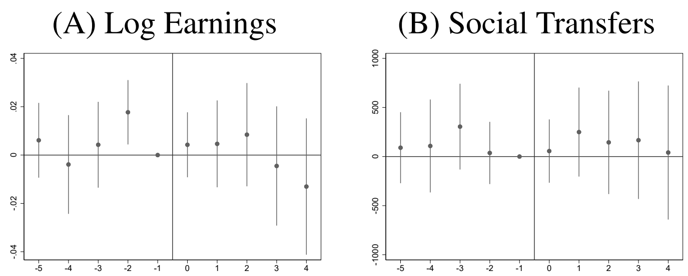
Notes: Each graph presents estimates for α^{τ} from a separate regression of model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Women with the first menopause diagnosis between ages 56 and 60 are also included in the control group. Birth cohorts 1961-1968.

Figure A.7: Labor Market Outcomes Around Menopause Diagnosis: Same Cohorts as Health Outcomes (Norway)



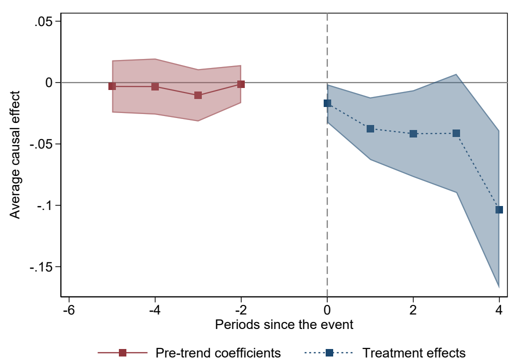
Notes: Each graph presents estimates of α^{τ} from a separate regression of model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Birth cohorts 1961-1968. Data from 2006.

Figure A.8: Sensitivity Analyses: Random Menopause Age at Diagnosis (Norway)



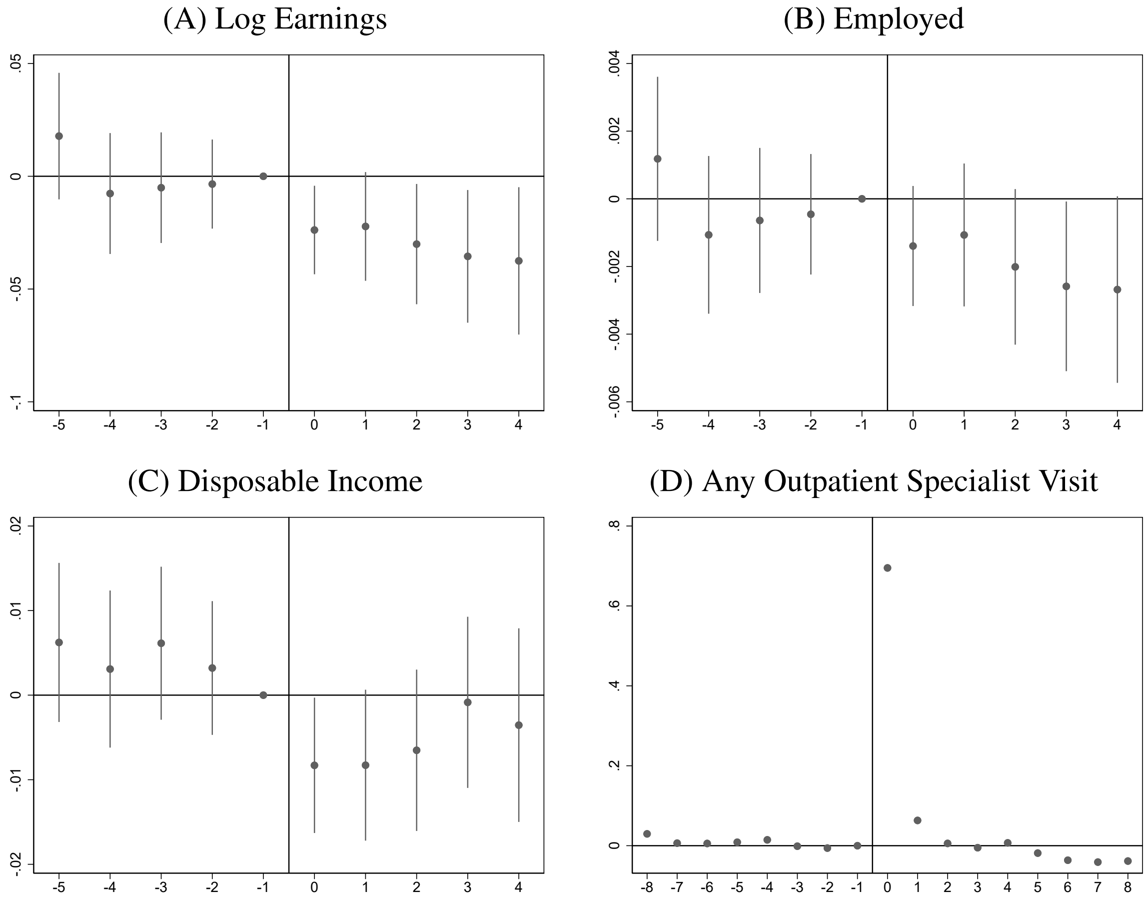
Notes: Each graph presents estimates of α^τ from a separate regression of model (2). The figure includes 95% confidence intervals (obtained from standard errors clustered by woman). The sample includes women born between 1961 and 1968, but who do not have a menopause-related diagnosis before age 45 or between 45 and 55 years of age. The age of the first diagnosis of menopause is randomly assigned to be between 45 and 55 years, based on the distribution observed in the main analysis sample. We then re-estimate model (2) using this sample. Birth cohorts 1961-1968.

Figure A.9: Sensitivity Analyses: Using Callaway and Sant'Anna (2020) Estimation Approach (Norway)



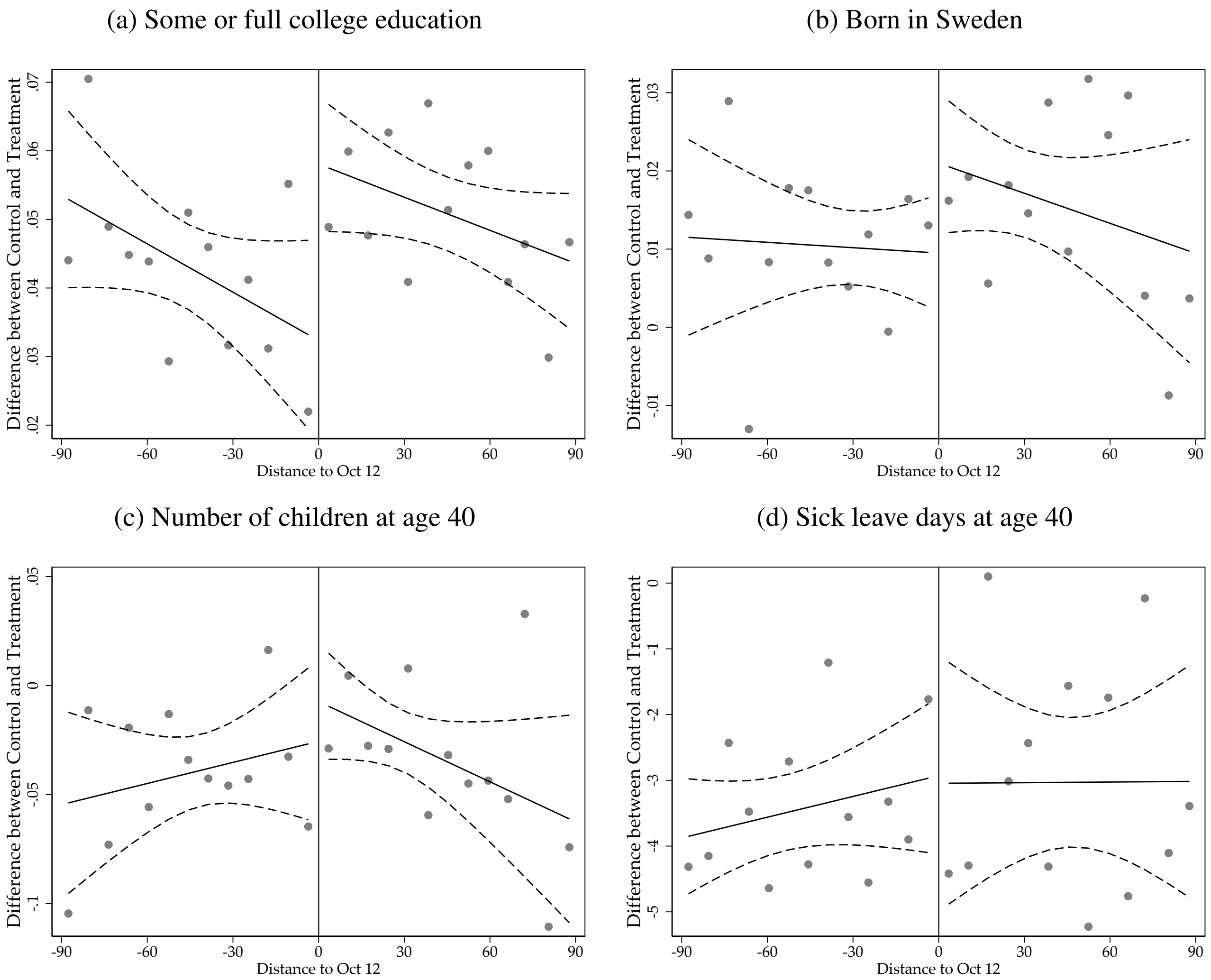
Notes: The graph presents estimates of α^τ from an event-study model following Callaway and Sant'Anna (2020). The figure includes 95% confidence intervals. Birth cohorts 1961-1968.

Figure A.10: Labor Market Outcomes and Health Care Utilization Around Menopause Diagnosis (Sweden)



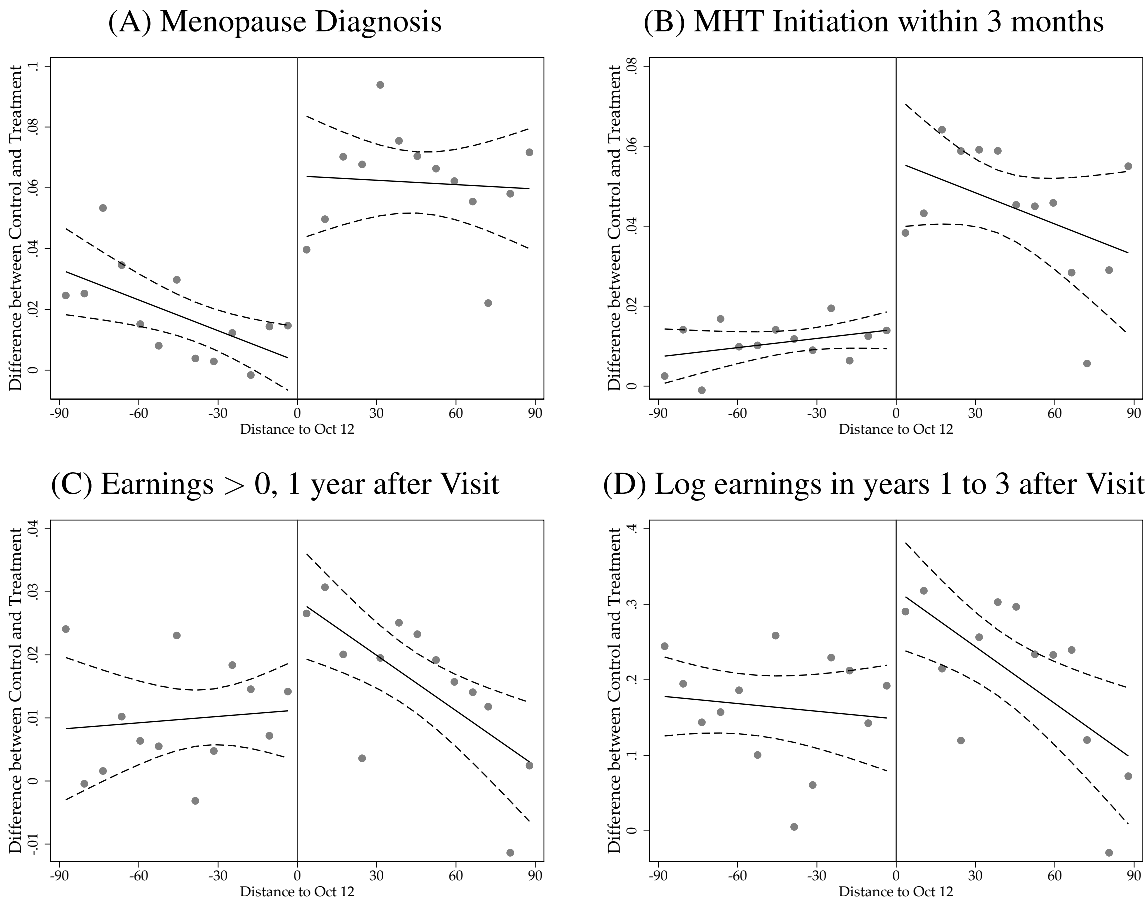
Notes: Each graph presents estimates of α^{τ} from a separate regression of model (2), along with the 95% confidence intervals (based on standard errors clustered by woman). Birth cohorts 1961-1968. The x-axis unit is year in Panels A-C and quarter in Panel D.

Figure A.11: Average Characteristics around TV-Show (Sweden)



Notes: Sample is built using Swedish administrative data and includes all visits to a gynecologist or ob-gyn by women aged 45–55 within 13 weeks around October 12 in the years 2013–2018. The x-axis represents the day of the visit, relative to October 12. The outcome in panel (a) is a dummy equal to 1 if a woman has some or full college education by age 40, and 0 otherwise. The outcome in panel (b) is a dummy equal to 1 if a woman was born in Sweden, and 0 otherwise. The outcome in panel (c) is the number of children a woman has had by age 40. The outcome in panel (d) is the number of sick leave days in the year a woman turns 40. Gray dots represent the differences between average outcomes in the control group (data centered around October 12 of 2013–2017) and the treatment group (data centered around October 12 of 2018) in 7-day bins, i.e. the 7-day average in the treatment group minus the 7-day average in the control group. Solid lines plot the predicted values ($\hat{y}_b$) from estimating an RD on the gray dots. We estimate $y_b = \alpha_0 + \alpha_1 \mathbf{1}[d_b \geq c] + f(d_b - c) + \alpha_3 \mathbf{1}[d_b \geq c] \times f(d_b - c) + \varepsilon_b$ where b is the bin, d_b its average distance from October 12, and $f(\cdot)$ is a linear polynomial. The dashed lines indicate 95% confidence intervals of the prediction.

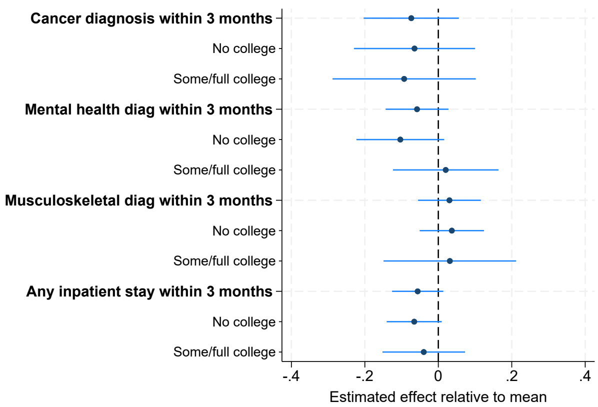
Figure A.12: Menopause Treatment and Labor Market Outcomes Behavior Around the Swedish TV Show



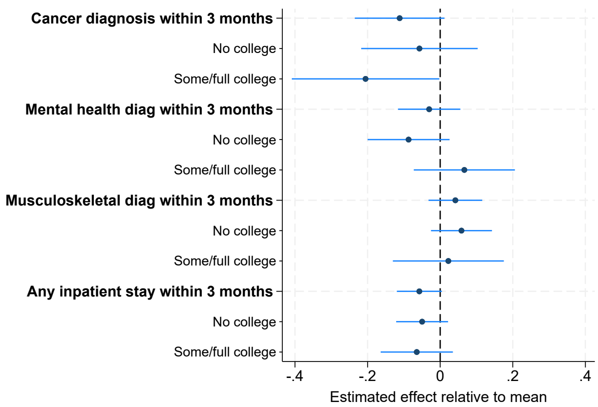
Notes: Sample is built using Swedish administrative data and includes all visits to a gynecologist or ob-gyn by women aged 45–55 within 13 weeks around October 12 in the years 2013–2018. The x-axis represents the day of the visit, relative to October 12. The outcome in panel (A) is a dummy equal to 1 if the visit results in a menopause diagnosis (ICD-10 code N95), and 0 otherwise. The outcome in panel (B) is a dummy equal to 1 if a woman initiates MHT within 90 days of the visit, and 0 otherwise. The outcome in panel (C) is a dummy equal to 1 if a woman has positive income in the calendar year after her visit, and 0 otherwise. The outcome in panel (D) is the log of the sum of a woman's earnings in years 1, 2, and 3 after the visit. Gray dots represent the differences between average outcomes in the control group (data centered around October 12 of 2013–2017) and the treatment group (data centered around October 12 of 2018) in 7-day bins, i.e. the 7-day average in the treatment group minus the 7-day average in the control group. Solid lines plot the predicted values from estimating an RD on the gray dots. We estimate $y_b = \alpha_0 + \alpha_1 \mathbf{1}[d_b \geq c] + f(d_b - c) + \alpha_3 \mathbf{1}[d_b \geq c] \times f(d_b - c) + \varepsilon_b$ where b is the bin, d_b its average distance from October 12, and $f(\cdot)$ is a linear polynomial. The dashed lines indicate 95% confidence intervals of the prediction.

Figure A.13: RD-DD Analysis: Additional Health Outcomes, 90-day bandwidth (Sweden)

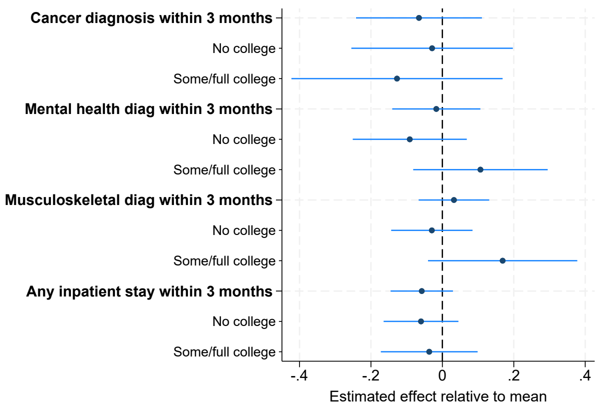
(a) Baseline



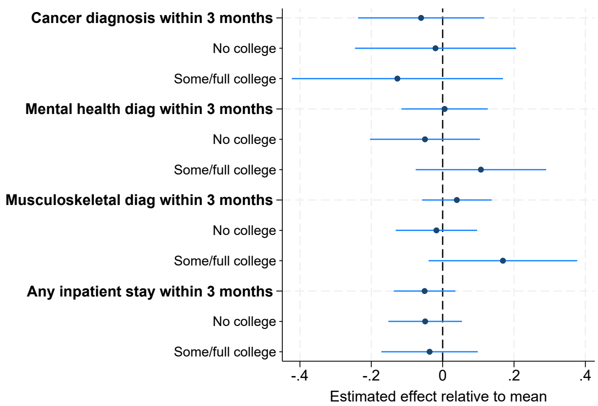
(b) Baseline, without triangular kernel weights



(c) Baseline, with 30 day donut



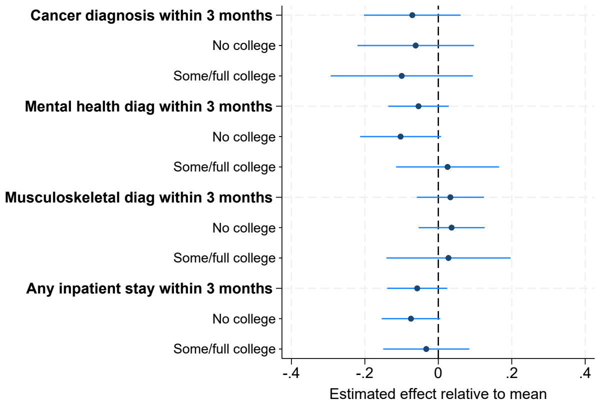
(d) Baseline, with 30 day donut and controlling for prior earnings



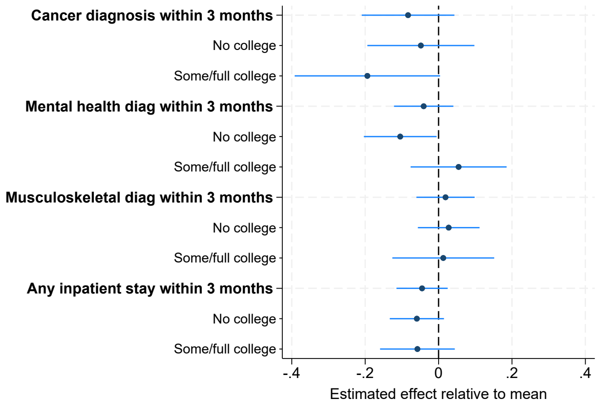
Notes: Each panel of the figure reports estimates of β_2 from equation (3) divided by the control mean of the dependent variable. The sample includes 90 days of gynecologist and obgyn visits—by women in Sweden aged 45–55—before and after the TV show launch. Each line is based on a separate regression. Outcomes are binary indicators equal to 1 if the person receives at least one corresponding diagnosis within 90 days of the focal specialist visit, or has at least one inpatient stay for the last outcome. Corresponding ICD-10 codes are C00–C97 for cancer diagnoses, F01–F99 for mental health diagnoses, and M00–M99 for musculoskeletal diagnoses. We present estimates for three different samples: women with any level of education, women with low education ("no college") and women with high education ("some/full college"). All regressions include age-at-visit fixed effects. Panel (a) shows the baseline specification estimated using triangular-kernel weights. Panel (b) presents results from estimation of the baseline, but without triangular-kernel weights. Panel (c) presents results of the baseline with a 30 day donut on both sides of the cutoff, and panel (d) shows results of the baseline with a 30 day donut and controlling for earnings in the year before the doctor's visit. Standard errors underlying 95% confidence intervals are clustered at the level of the running variable (day of the visit centered around October 12).

Figure A.14: RD-DD Analysis: Additional Health Outcomes, optimal bandwidth (Sweden)

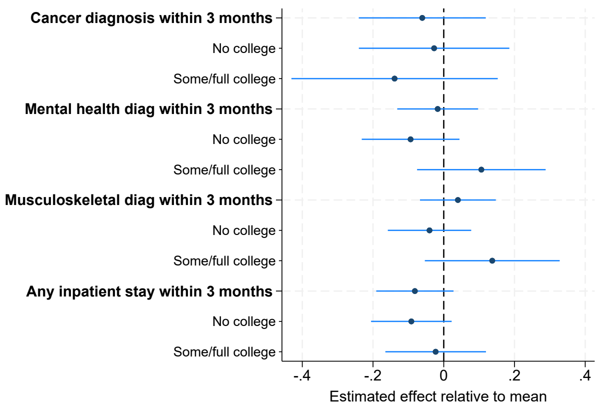
(a) Baseline



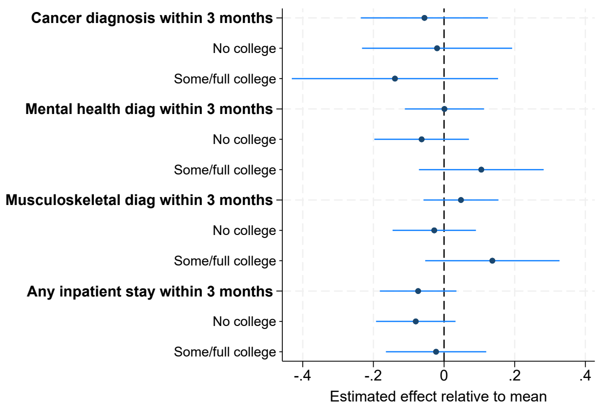
(b) Baseline, without triangular kernel weights



(c) Baseline, with 30 day donut



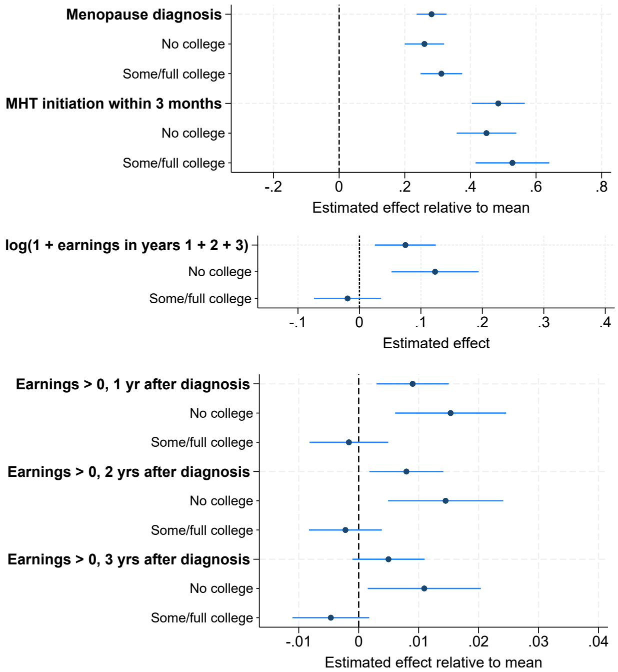
(d) Baseline, with 30 day donut and controlling for prior earnings



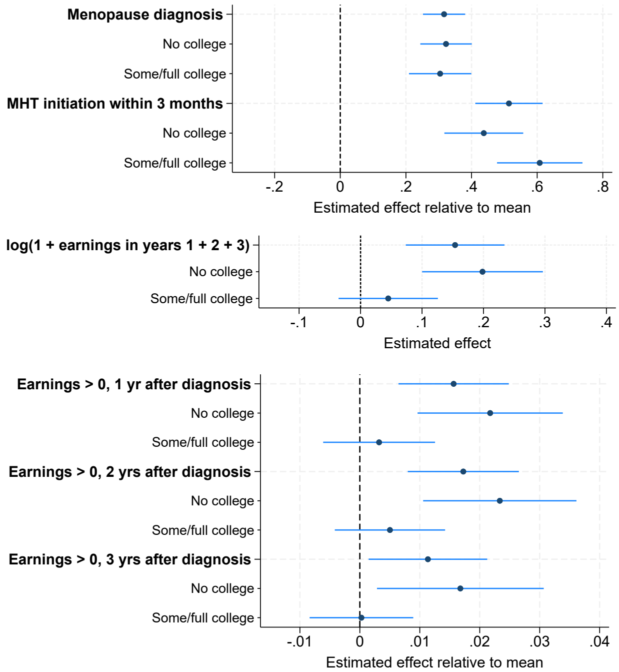
Notes: The four panels replicate results presented in Appendix Figure A.13 but using optimally chosen bandwidths as opposed to a 90-day bandwidth. Analogously to Appendix Figure A.13, each panel of the figure reports estimates of β_2 from equation (3) divided by the control mean of the dependent variable. Each line is based on a separate regression. Outcomes are binary indicators equal to 1 if the person receives at least one corresponding diagnosis within 90 days of the focal specialist visit, or has at least one inpatient stay for the last outcome. Corresponding ICD-10 codes are C00–C97 for cancer diagnoses, F01–F99 for mental health diagnoses, and M00–M99 for musculoskeletal diagnoses. We present estimates for three different samples: women with any level of education, women with low education ("no college") and women with high education ("some/full college"). All regressions include age-at-visit fixed effects. Panel (a) shows the baseline specification estimated using triangular-kernel weights. Panel (b) presents results from estimation of the baseline, but without triangular-kernel weights. Panel (c) presents results of the baseline with a 30 day donut on both sides of the cutoff, and panel (d) shows results of the baseline with a 30 day donut and controlling for earnings in the year before the doctor's visit. Standard errors underlying 95% confidence intervals are clustered at the level of the running variable (day of the visit centered around October 12).

Figure A.15: RD-DD Analysis: Alternative Specifications (Sweden)

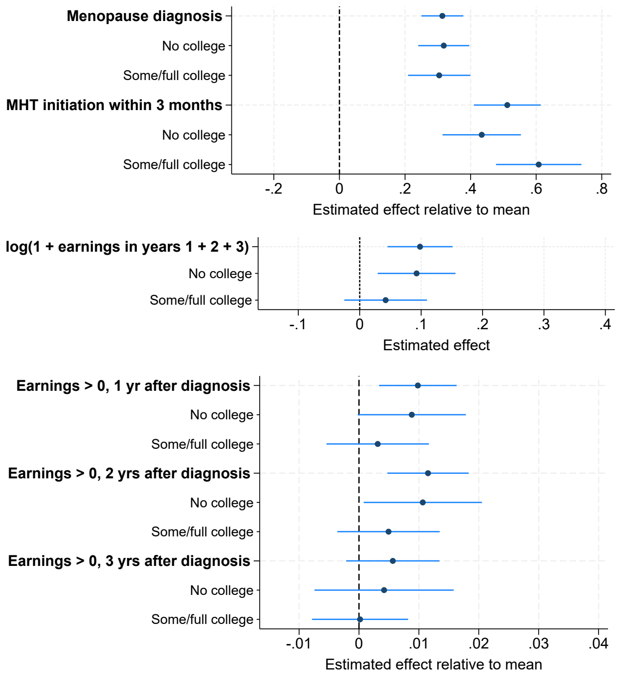
(a) Baseline, without triangular kernel weights



(b) Baseline, with 30 day donut



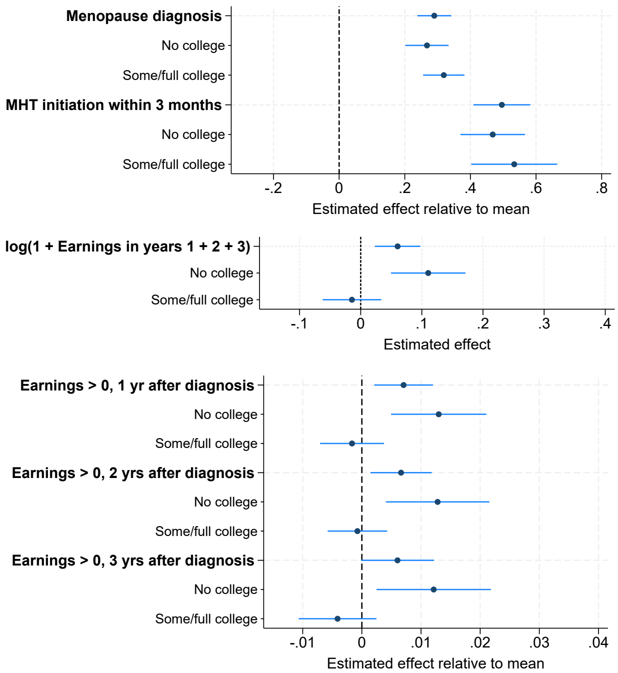
(c) Baseline, with 30 day donut and controlling for prior earnings



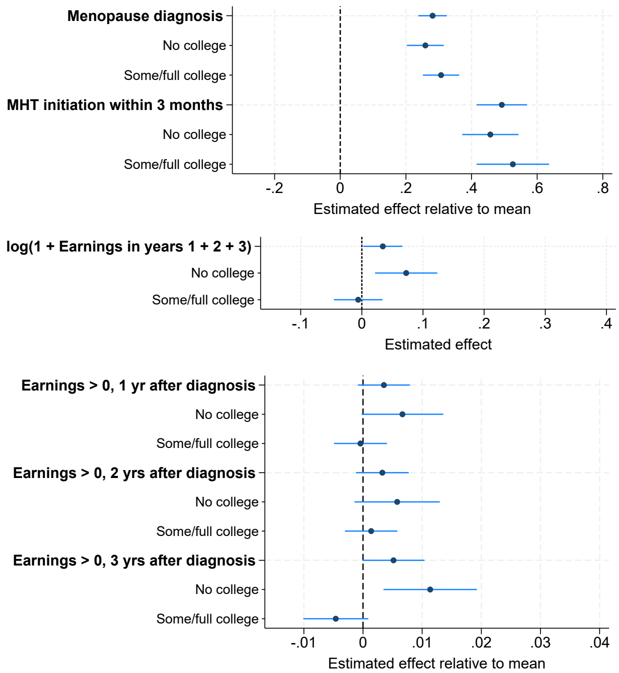
Notes: The three panels replicate results presented in Figure 5 (baseline specification) for three alternative specifications: Panel (a) presents results from estimation of the baseline but without triangular kernel weights, panel (b) presents results of the baseline with a 30-day donut on both sides of the cutoff, and panel (c) shows results of the baseline with a 30-day donut and controlling for earnings in the year before the doctor's visit. Analogously to Figure 5, the top and bottom subpanels show β_2 from equation (3) divided by the control mean of the dependent variable. The subpanel in the middle shows estimates of β_2 from equation (3). The sample includes 90 days of gynecologist and obgyn visits—by women in Sweden ages 45–55—before and after the TV show launch. Each line of the figure is based on a separate regression and includes age at diagnosis fixed effects. We present estimates for three different samples: women with any level of education, women with low education ("no college") and women with high education ("some/full college"). Standard errors are clustered at the level of the running variable (day of the visit centered around October 12). Underlying point estimates and control means are reported in panels (b), (c), and (d) of Table A.12.

Figure A.16: RD-DD Analysis: Optimal Bandwidth (Sweden)

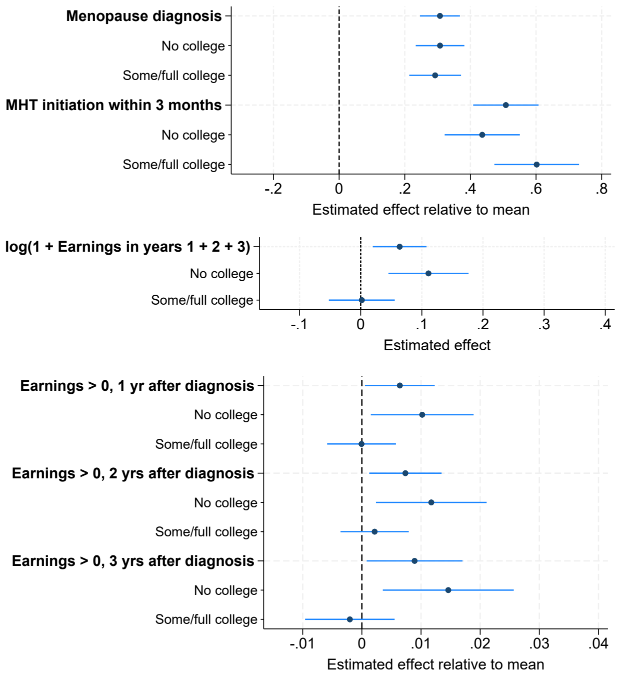
(a) Baseline specification



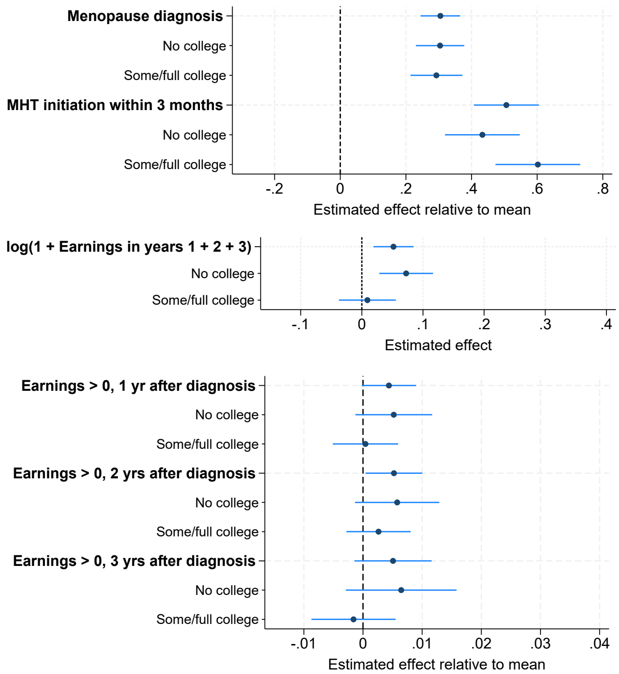
(b) Baseline, without triangular kernel weights



(c) Baseline, with 30 day donut



(d) Baseline, with 30 day donut and controlling for prior earnings



Notes: The four panels replicate results presented in Figure 5 and Figure A.15 but with optimally chosen bandwidths as opposed to a 90-day bandwidth. Analogously to Figures 5 and A.15, the top and bottom subpanels show β_2 from equation (3) divided by the control mean of the dependent variable. The subpanel in the middle shows estimates of β_2 from equation (3). The sample includes b days of gynecologist and obgyn visits—by women in Sweden ages 45–55—before and after the TV show launch where b is the optimal bandwidth selected using a MSE-optimal bandwidth selector for the RD-DD treatment-effect estimator. Each line of the figure is based on a separate regression and includes age at diagnosis fixed effects. We present estimates for three different samples: women with any level of education, women with low education ("no college") and women with high education ("some/full college"). Standard errors are clustered at the level of the running variable (day of the visit centered around October 12). Underlying point estimates and control means are reported in Table A.13.

Table A.1: Characteristics of Women With and Without a Menopause Diagnosis (Norway)

	(1) Main Sample Menopause 45 - 55	(2) Menopause < 45	(3) No Menopause Visits (up to 55)	(4) All Women
Panel A: Health Variables at Age 40				
Any Primary/Specialist Outpatient Care	0.864	0.913	0.793	0.819
Any GP Visits	0.815	0.870	0.747	0.773
Any Urgent Care Visits	0.222	0.264	0.208	0.215
Annual GP Visits	5.438	7.112	4.549	4.915
Any Mental Health Visit	0.221	0.278	0.182	0.198
Any Outpatient Specialist visit	0.256	0.302	0.175	0.205
Medical Reimbursements (NOK)	1056.8	1405.2	847.8	932.4
Reimbursements per Visit (NOK)	119.8	128.7	105.5	110.7
N	32,594	3,671	68,416	104,681
Panel B: Other Variables at Age 40				
Less than College	0.640	0.712	0.638	0.641
Earnings (NOK)	298938.7	271367.2	293671.0	294838.7
Sick Leave Days	22.25	24.26	18.71	20.03
Married	0.571	0.545	0.567	0.568
Contracted Weekly Hours	20.05	18.19	19.52	19.65
Employed	0.901	0.860	0.886	0.890
Nb. Children by 40	2.052	1.990	2.062	2.056
N	88,350	6,952	170,799	266,101

Notes: We identify all women who seek healthcare for a menopause-related symptom, either at a GP office or at a specialist visit, and take the date of the first such healthcare visit with a menopause-related diagnosis code. This table presents summary statistics for the characteristics, at age 40, for all women born between 1961 and 1968. Column (1) presents summary statistics for our main sample, women with a first menopause diagnosis from age 45 through 55. Column (2) includes women with early menopause diagnosis (prior to age 45). Column (3) includes all women who never have a menopause-related diagnosis; for these women, we do not observe a menopause diagnosis in our data up to age 55 (i.e., they either seek healthcare for a menopause-related symptom for the first time after age 55, or never seek healthcare for a menopause-related symptom).

Table A.2: Characteristics of Women With and Without a Menopause Diagnosis (Sweden)

	(1) Main Sample Menopause 45 - 55	(2) Menopause < 45	(3) No Menopause Visits (up to 55)	(4) All Women	(5) RD Sample
Panel A: Health Variables at Age 40					
Any Outpatient Specialist Visit	0.458	0.619	0.353	0.367	0.472
Number of drug claims	7.569	11.728	5.757	6.006	7.489
N	18,551	1,576	152,457	172,584	89,171
Panel B: Other Variables at Age 40					
Less than College	0.642	0.737	0.666	0.663	0.629
Earnings (SEK)	233419.6	195767.3	226280.6	227105.9	240433.8
Sick Leave Days	23.15	31.88	17.52	18.43	18.85
Married	0.506	0.498	0.504	0.504	0.511
Employed	0.899	0.845	0.905	0.903	0.903
Nb. Children by 40	1.966	2.006	2.008	2.002	2.019
N	65,375	3,047	384,427	452,849	171,778

Notes: We identify all women who seek healthcare for a menopause-related symptom from a specialist, and take the date of the first such healthcare visit with a menopause-related diagnosis code. This table presents summary statistics for the characteristics, at age 40, for all women born between 1961 and 1968. Column (1) presents summary statistics for our main sample, women with first menopause diagnosis from age 45 through 55. Column (2) includes women with early menopause diagnosis (prior to age 45). Column (3) includes all women who never have a menopause-related diagnosis by a specialist; for these women, we do not observe a menopause diagnosis in our data up to age 55 (i.e., they either are diagnosed by a GP, or they seek healthcare for a menopause-related symptom for the first time after age 55 or they never seek healthcare for a menopause-related symptom). Column (5) presents summary statistics at age 40 (not restricted to birth cohorts 1961 to 1968) for the sample used in the RD analysis, i.e., for women with a gynecologist or obgyn visit within 90 days of October 2013, 2014, 2015, 2016, 2017, or 2018.

Table A.3: Characteristics at Age 40 of Women with First Menopause Diagnosis by GP or a Specialist (Norway)

	(1) GP	(2) Specialist	(3) (1)-(2)	(4) p-value
Panel A: Health Variables at Age 40				
Any Primary/Specialist Outpatient Care	0.880	0.876	0.004	0.330
Any GP Visits	0.848	0.808	0.040	0.000
Any Urgent Care Visits	0.218	0.225	-0.007	0.182
Annual GP Visits	5.824	5.417	0.407	0.000
Any Mental Health Visit	0.235	0.211	0.024	0.000
Any Outpatient Specialist Visit	0.230	0.367	-0.136	0.000
Medical Reimbursements (NOK)	1063.9	1161.1	-97.2	0.000
Reimbursements per Visit (NOK)	117.4	131.1	-13.7	0.000
Panel B: Other Variables at Age 40				
Less than College	0.648	0.613	0.035	0.000
Earnings (NOK)	297260.1	303773.8	-6513.7	0.000
Sick Leave Days	22.25	21.80	0.451	0.332
Married	0.567	0.590	-0.023	0.000
Hours	20.04	20.10	-0.056	0.673
Employed	0.899	0.902	-0.003	0.140
Nb. Children by 40	2.048	2.011	0.037	0.000

Notes: This table includes the characteristics at age 40 for women with the first menopause diagnosis by GP or a specialist. Birth cohorts 1961-1968.

Table A.4: Pre-Menopause Characteristics of Women in the Main Analysis Sample (Norway)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Sample:	45 to 55	45 & 46	46 & 47	47 & 48	48 & 49	49 & 50	50 &51	51 & 52	52 & 53	53 & 54	54 & 55	45 & 48	50 & 53	45 & 49	50 & 54
Annual GP Visits	-0.0190***	-0.0022**	-0.0010	0.0005	-0.0024**	0.0007	-0.0013	-0.0003	-0.0011	-0.0000	0.0011	-0.0064**	-0.0078***	-0.0165***	-0.0057
	(0.0024)	(0.0009)	(0.0012)	(0.0010)	(0.0009)	(0.0010)	(0.0009)	(0.0010)	(0.0010)	(0.0009)	(0.0011)	(0.0026)	(0.0030)	(0.0036)	(0.0037)
Any Specialist Visit	-0.0378	0.0097	0.0114	-0.0080	-0.0148	0.0143	0.0123	-0.0275**	0.0023	0.0018	0.0169	0.0291	-0.0319	-0.0180	-0.0323
	(0.0372)	(0.0208)	(0.0186)	(0.0168)	(0.0158)	(0.0150)	(0.0141)	(0.0136)	(0.0138)	(0.0139)	(0.0174)	(0.0521)	(0.0428)	(0.0674)	(0.0571)
Reimbursements per Visit (NOK)	-0.0003**	-0.0001	-0.0000	-0.0001	-0.0001	0.0000	-0.0000	0.0001**	-0.0000	-0.0000	0.0000	-0.0004**	0.0000	-0.0007***	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0002)	(0.0002)	(0.0003)	(0.0002)
Less than College	-0.2150***	-0.0104	0.0054	-0.0145	0.0011	-0.0049	-0.0272**	0.0088	-0.0166	-0.0162	0.0210	-0.0569	-0.1102***	-0.0745	-0.1744***
	(0.0315)	(0.0188)	(0.0166)	(0.0147)	(0.0137)	(0.0126)	(0.0120)	(0.0116)	(0.0115)	(0.0114)	(0.0142)	(0.0452)	(0.0361)	(0.0585)	(0.0475)
Labor Earnings (1000NOK)	0.0003***	0.0000	0.0000	0.0000	-0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002*	0.0001	0.0002	0.0002
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Sick Leave Days	-0.0002	0.0000	-0.0000	0.0000	0.0000	-0.0001	-0.0000	-0.0000	0.0001	-0.0001	0.0001	0.0001	0.0002	0.0002	-0.0004
	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0004)	(0.0004)
Married	0.0969***	-0.0174	0.0183	-0.0193	0.0021	0.0191	-0.0049	0.0164	0.0010	-0.0066	0.0067	-0.0500	0.0376	-0.0566	0.0324
	(0.0307)	(0.0178)	(0.0159)	(0.0141)	(0.0131)	(0.0125)	(0.0118)	(0.0114)	(0.0114)	(0.0116)	(0.0145)	(0.0436)	(0.0357)	(0.0559)	(0.0475)
Contracted Weekly Hours	0.0009	0.0006	-0.0002	-0.0005	0.0004	0.0001	0.0000	-0.0005	0.0008**	-0.0005	0.0003	-0.0001	0.0016	0.0013	-0.0001
	(0.0011)	(0.0006)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0015)	(0.0012)	(0.0019)	(0.0016)
Nb. Children by 40	0.0786***	0.0075	-0.0016	0.0091	-0.0126**	0.0144**	0.0077	-0.0010	0.0032	0.0045	-0.0049	0.0398**	0.0288*	0.0083	0.0362*
	(0.0142)	(0.0076)	(0.0070)	(0.0064)	(0.0060)	(0.0057)	(0.0054)	(0.0052)	(0.0052)	(0.0053)	(0.0065)	(0.0197)	(0.0166)	(0.0257)	(0.0219)
p-value	0.000	0.257	0.888	0.624	0.057	0.138	0.166	0.283	0.107	0.395	0.521	0.001	0.000	0.000	0.000
N	32270	3337	4313	5472	6378	7096	7985	8657	8680	6714	3507	4496	8008	4696	6320

Notes: The dependent variable is the age of first menopause-related diagnosis. The table displays the coefficient estimates regressions between a set of characteristics at age 40 and the age of first menopause diagnosis, controlling for year of birth fixed effects. Each column is estimated on a different sample of age at the first diagnosis. The *p-value* in the bottom of the table refers to a Wald test for the joint significance of the variables included in the model. Sample of women born between 1961 and 1968.

Table A.5: D-i-D: Specific Health Diagnoses Around Menopause Diagnosis (Norway)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Unspecified	Digest.	Cardiovas.	Musculosk.	Neurolog.	MH	Respir.	Skin	Endoc./ Metabolic	Female
	ICPC-2 A	ICPC-2 D	ICPC-2 K	ICPC-2 L	ICPC-2 N	ICPC-2 P	ICPC-2 R	ICPC-2 S	ICPC-2 T	ICPC-2 X
DiD	0.001*	0.000	0.002***	0.003***	0.001	0.005***	-0.001	-0.000	0.003***	0.078***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Control Mean	0.227	0.068	0.057	0.231	0.056	0.133	0.117	0.068	0.082	0.065
N	39974684									
N Individuals	80326									

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the quarter prior to the diagnosis of menopause (in the treated panel). Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by quarter level. MH = Mental Health. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.6: D-i-D: Use of Social Benefits Around Menopause Diagnosis (Norway)

	(1) Any Social Benefits	(2) All Benefits	(3) Any UI Benefits	(4) UI Benefits	(5) Any DI Benefits	(6) DI Benefits
	Panel A: Norway (Treatment includes Diagnoses by GPs and Specialists)					
DiD	0.009***	1112.578***	-0.001*	-22.398	0.005***	1062.722***
	(0.002)	(263.802)	(0.001)	(63.970)	(0.001)	(192.454)
Control Mean	0.682	64560.155	0.034	2296.088	0.124	22159.261
N	8425690	8425690	8425690	8425690	8425690	8425690
N Individuals	79858	79858	79858	79858	79858	79858
	Panel B: Norway (Treatment includes Diagnoses by Specialists)					
DiD	0.013***	2463.144***	-0.003***	-199.661**	0.007***	1437.796***
	(0.002)	(404.440)	(0.001)	(92.087)	(0.001)	(296.505)
Control Mean	0.672	68112.940	0.031	2198.666	0.135	24759.146
N	4561450	4561450	4561450	4561450	4561450	4561450
N Individuals	41484	41484	41484	41484	41484	41484

NOTE: Each cell is an estimate of β_1 from a separate regression of model 1. Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year prior to the diagnosis of menopause. Standard errors clustered at woman level in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year level. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.7: D-i-D: Hospitalizations Around Menopause Diagnosis (Norway)

	(1) Any Hospitalization	(2) Any Inpatient Hospitalization	(3) Any Outpatient Hospitalization
DiD	0.006***	0.000	0.006***
	(0.001)	(0.000)	(0.001)
Control Mean	0.175	0.029	0.148
N	29536446	29536446	29536446
N Individuals	75751	75751	75751

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the quarter prior to the diagnosis of menopause (in the treated panel). Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by quarter level. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.8: D-i-D: Household Outcomes Around Menopause Diagnosis (Norway)

	(1)	(2)	(3)	(4)	(5)
		Spouse Outcomes			
	Divorced	Employed	Log Earnings	Annual GP Visits	Any Specialist Visits
DiD	-0.003***	-0.002*	-0.022**	0.012	0.004
	(0.001)	(0.001)	(0.011)	(0.024)	(0.012)
Control Mean	0.199	0.930	12.299	5.287	0.572
N	8425690	5968245	5968245	3323870	3323870
N Individuals	79858	61071	61071	58348	58348

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year prior to the diagnosis of menopause. Standard errors clustered at woman level in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year level. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.9: D-i-D: Health and Labor Market Outcomes Around Menopause Diagnosis, Controlling for Contemporaneous Shocks (Norway)

	(1) Any GP Visit	(2) Any MH Visit	(3) Any Specialist Visit	(4) Log Earnings	(5) Employed	(6) Hours Worked	(7) Sick Leave	(8) Social Benefits
Panel A: Controlling for Municipality-Year Effects								
DiD	0.031***	0.005***	0.035***	-0.033***	-0.002***	-0.090***	0.029	1030.706***
	(0.001)	(0.001)	(0.001)	(0.010)	(0.001)	(0.034)	(0.211)	(262.342)
Control Mean	0.611	0.133	0.113	11.304	0.886	27.122	23.641	64560.155
N	39974532	39974532	39974532	8425623	8425623	1927681	7259988	8425623
Panel B: Controlling for Mental Health Diagnosis/Symptoms								
DiD	0.029***		0.035***	-0.035***	-0.002***	-0.105***	-0.217	1085.216***
	(0.001)		(0.001)	(0.010)	(0.001)	(0.035)	(0.213)	(264.500)
Control Mean	0.611		0.113	11.304	0.886	27.122	23.641	64560.155
N	39974684		39974684	6243187	6243187	1797708	5281000	6243187
Panel C: Controlling for Annual Number of GP Visits								
DiD			0.034***	-0.039***	-0.003***	-0.109***	-1.274***	1157.810***
			(0.001)	(0.010)	(0.001)	(0.035)	(0.204)	(264.751)
Control Mean			0.113	11.304	0.886	27.122	23.641	64560.155
N			39974684	6243187	6243187	1797708	5281000	6243187

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", year (quarter in columns (1) to (3), interacted with an indicator for higher education degree at age 40) and age (interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year (quarter in columns (1) to (3)) prior to the diagnosis of menopause. In Panel A, we expand the baseline model to include municipality-year fixed effects. In Panel B, we expand the baseline model to control for an indicator for whether the woman has a mental health diagnosis/symptom at any primary care visit during the year. In Panel C, we expand the baseline model to control for the annual number of GP visits. Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year (quarter in columns (1) to (3)) level. Any MH Visit = Any GP Visit with a Mental Health Diagnosis (ICPC-2 P). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.10: D-i-D: Labor Market Outcomes Around Menopause Diagnosis (Sweden)

	Panel A			
	(1) Log Earnings (+1)	(2) Employed (Earnings > 0)	(3) Sick Leave Days	(4) Log Disposable Income (+1)
DiD	-0.029*** (0.010)	-0.002** (0.001)	0.187 (0.244)	-0.009*** (0.003)
Control Mean	11.151	0.888	18.004	12.404
N	7144220	7144220	7144220	7144220
	Panel B			
	(5) Any UI Benefits	(6) UI Benefits	(7) Any DI Benefits	(8) DI Benefits
DiD	-0.001 (0.001)	70.920 (88.155)	0.003*** (0.001)	503.693*** (95.778)
Control Mean	0.087	5309.577	0.117	12747.803
N	7144220	7144220	7144220	7144220

Notes: Each cell is an estimate of β_1 from a separate regression of model (1). Controls included in the model, but excluded from the table, are fixed effects for "woman-base age", and fixed effects for year and age (both interacted with an indicator for higher education degree at age 40). Control Mean is measured in the year prior to the diagnosis of menopause. Standard errors clustered by woman in parentheses. Birth cohorts 1961-1968. Data at the women-by-base-age-by year level. See Table 2 for the corresponding estimates for Norway. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.11: RD-DD Density Test (Dependent Variable: Number of Ob/Gyn Visits) (Sweden)

	Sample All		No college		Some/full college	
$\hat{\beta}_2$	209.6*** (57.5)	224.3** (87.7)	94.4*** (36.1)	98.5** (46.3)	113.6*** (31.5)	125.3*** (48.0)
Triangular kernel weights	Yes	No	Yes	No	Yes	No

Notes: This table presents estimates from a version of model (3), with data collapsed into week-of-visit bins. The dependent variable is the number of visits. The running variable is the week of the visit normalized relative to the week of October 12 in every period. A 13-week bandwidth around the cutoff is used. We report coefficients from RD-DD models for the full sample, as well as separately for women with and without college. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.12: RD-DD Results (90 day bandwidth) (Sweden)

Panel A: Baseline specification

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.047***	0.041***	0.052***	0.036***	0.032***	0.039***	0.099***	0.177***	−0.017
	(0.004)	(0.006)	(0.006)	(0.003)	(0.004)	(0.004)	(0.027)	(0.047)	(0.028)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.010***	0.020***	−0.003	0.010***	0.018***	−0.002	0.006*	0.014***	−0.006*
	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel B: Baseline without triangular kernel weights

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.045***	0.040***	0.050***	0.035***	0.031***	0.038***	0.075***	0.145***	−0.022
	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.025)	(0.041)	(0.025)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.008***	0.016***	−0.002	0.007**	0.014***	−0.002	0.004	0.012***	−0.005*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel C: Baseline with 30 day donut

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.051***	0.050***	0.051***	0.037***	0.031***	0.042***	0.154***	0.231***	0.046
	(0.005)	(0.007)	(0.007)	(0.004)	(0.005)	(0.004)	(0.041)	(0.057)	(0.037)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.014***	0.022***	0.003	0.015***	0.024***	0.003	0.010**	0.017**	0.000
	(0.004)	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.007)	(0.004)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel D: Baseline with 30 day donut and prior earnings

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.050***	0.050***	0.051***	0.037***	0.031***	0.042***	0.098***	0.126***	0.031
	(0.005)	(0.007)	(0.007)	(0.004)	(0.005)	(0.004)	(0.027)	(0.033)	(0.030)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.009***	0.011***	0.002	0.010***	0.014***	0.002	0.005	0.006	−0.001
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Notes: The table shows estimates from versions of model (3) for three different samples (all, no college, some/full college). The samples are built using Swedish administrative data, see the text or Figure 5 for more detail. Sample "HE" indicates individuals with at least some college education; sample "No HE" indicates individuals with no college education. Each $\hat{\beta}_2$ comes from a separate regression that includes age at visit fixed effects. Panel (A) is weighted using a triangular kernel, panel (B) is unweighted, panels (C) and (D) are weighted using a triangular kernel and exclude 30 days of visits on each side of Oct 12 and the latter additionally controls for earnings in the year before the visit. Standard errors are clustered at the level of the running variable. *, **, and *** denote significance at the 10, 5, and 1% level, respectively.

Table A.13: RD-DD Results (optimal bandwidth) (Sweden)

Panel A: Baseline specification

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.047***	0.041***	0.051***	0.036***	0.032***	0.039***	0.060***	0.120***	−0.018
	(0.004)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)	(0.019)	(0.033)	(0.019)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.006***	0.013***	−0.003	0.006**	0.011***	−0.002	0.005*	0.013***	−0.006*
	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.002)	(0.003)	(0.005)	(0.003)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel B: Baseline without triangular kernel weights

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.045***	0.041***	0.049***	0.036***	0.033***	0.038***	0.034**	0.068**	−0.006
	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)	(0.016)	(0.027)	(0.017)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.003	0.006*	−0.004*	0.003	0.006*	−0.002	0.005*	0.012***	−0.005**
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel C: Baseline with 30 day donut

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.049***	0.048***	0.048***	0.037***	0.032***	0.042***	0.064***	0.117***	0.003
	(0.005)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.022)	(0.034)	(0.021)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.006**	0.010**	−0.000	0.006**	0.011***	0.000	0.008**	0.014***	−0.001
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)	(0.004)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Panel D: Baseline with 30 day donut and prior earnings

	All	No HE	HE	All	No HE	HE	All	No HE	HE
	Menopause diagnosis			MHT Initiation within 3 months			Log earnings in years 1 + 2 + 3		
$\hat{\beta}_2$	0.049***	0.047***	0.048***	0.037***	0.031***	0.042***	0.052***	0.092***	0.005
	(0.005)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.017)	(0.022)	(0.019)
Mean before Oct 12	0.160	0.159	0.162	0.072	0.071	0.073	8.254	7.712	8.918
	Employed in year 1			Employed in year 2			Employed in year 3		
$\hat{\beta}_2$	0.004*	0.006**	−0.000	0.005**	0.008**	0.000	0.004	0.008**	−0.002
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Mean before Oct 12	0.884	0.838	0.941	0.882	0.835	0.941	0.878	0.830	0.937

Notes: The table shows estimates from versions of (3) for three different samples (all, no college, some/full college) using optimal bandwidths obtained following Calonico, Cattaneo and Titiunik (2014). The samples are built using Swedish administrative data, see the text or Figure 5 for more detail. Sample "HE" indicates individuals with at least some college education; sample "No HE" indicates individuals with no college education. Each $\hat{\beta}_2$ comes from a separate regression that includes age at visit fixed effects. Panel (A) is weighted using a triangular kernel, panel (B) is unweighted, panels (C) and (D) are weighted using a triangular kernel and exclude 30 days of visits on each side of Oct 12 and the latter additionally controls for earnings in the year before the visit. Standard errors are clustered at the level of the running variable. *, **, and *** denote significance at the 10, 5, and 1% level, respectively.

B Construction of Diagnoses and Medication Outcome Variables

B.1 Construction of Diagnoses and Procedures (Norway)

Productivity-related diagnoses include the following ICPC-2 codes obtained from the KUHR data: tiredness (ICPC-2 A04), headaches (ICPC-2 N01), migraine (ICPC-2 N89), feeling anxious/nervous/tense (ICPC-2 P01), acute stress reaction (ICPC-2 P02), feeling depressed (ICPC-2 P03), irritable/angry (ICPC-2 P04), sleep disturbance (ICPC-2 P06), memory disturbance (ICPC-2 P20).

Laboratory tests that are performed during a primary care visit visit include, for example, blood testing of total cholesterol, analyses of creatinine, potassium, glycosylated hemoglobin for the determination of long-term blood sugar or rapid test for the detection of helicobacter pylori infection, CPR test, pregnancy test, test for bacterial antigen for streptococci and mononucleosis or glucose chemical analysis.

B.2 Construction of Medication Use Measures (Sweden)

Table B.1: ATC Prescription Drugs Codes

	ATC Codes
Contraceptives	G03AA01, G03AA03, G03AA05, G03AA07, G03AA09, G03AA10, G03AA11, G03AA12, G03AB03, G03AB04, G03AB05, G03AB06, G03HB, G03AC01, G03AC02, G03AC03, G03AC09, G03AC08
Mental Health	Codes starting with N
Antidepressants	Codes starting with N06A
Anti-anxiety, Sleep	Codes starting with N05B, N05C
MHT	G03CA03, G03CA57, G03CX01, G03FA01, G03FA12, G03FA15, G03FA17, G03FB05, G03FB06, G03FB09
Pain Killers	Codes starting with M01A, N02A, N02B
Antihyperintensive	Codes starting with C02, C03, C07, C08, C09

Notes: The list of MHT drugs is obtained from Lindh-Åstrand et al. (2015).