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Gender Norms and Hysterectomies[*]

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Abstract

We investigate the role of gender norms in explaining variations in the incidence of hysterectomies (i.e., removal of uterus) for benign conditions, the second most common surgical procedure after a cesarean section for women. Using data from Italy—a country with a degree of heterogeneous gender norms—we show that the more traditional the perception of the female role is, the higher the incidence of hysterectomies for benign conditions for women in older cohorts. We attribute these results to the fact that the uterus is associated with reproductive function and not with gender identity. To support this interpretation, we show how gender norms are negatively correlated with the incidence of both mastectomies (i.e., removal of the breast) and prostatectomies for benign conditions (i.e., removal of the prostate) for men. To test the role of gender norms in explaining some of these avoidable procedures, we exploit the impact of the introduction of automatic constraints on healthcare expenditures triggered by the adoption of so-called regional repayment plans. Using a staggered difference-in-differences approach, we show that the introduction of a repayment plan reduced the incidence of hysterectomies for benign conditions by 4–8%, depending on the age group, but less so in regions with more conservative gender norms.

JEL Classification: I11, I18, J16

Keywords: Hysterectomy, Gender Norms

1 Introduction

Hysterectomy involves the removal of the uterus through a surgical procedure and is the second most common elective surgery for women after C-sections (Janda et al., 2018; Stang et al., 2011); as with C-sections, it is considered overutilized (Lawson et al., 2011). Hysterectomy is generally performed to improve quality of life rather than to cure life-threatening conditions.[1] Although several less invasive approaches have been developed in recent decades, these approaches remain underutilized (e.g., Corona et al. (2015)).

The variation in incidence rates of benign hysterectomies cannot be fully explained by differences in population health or clinical needs. Instead, it reflects a complex interplay of healthcare practices, access to health information, socioeconomic conditions, and gender and cultural norms. On the patient side, key determinants include education (Brennand et al., 2024), income (Desai et al., 2017; Kumari and Kundu, 2022), rural versus urban residence (Chen et al., 2017; Kumari and Kundu, 2022), race and ethnicity (Gartner et al., 2021; Jacoby et al., 2010), and health insurance status (Albright et al., 2023). On the side of healthcare providers and the healthcare system, key determinants include physicians' preferences, capabilities and tools availability (e.g., robotic surgery) (Broder et al., 2000; Clayton, 2006; Ferrari et al., 2024; Pillarisetty and Mahdy, 2023). Unexplained differences between individual surgeons in the United States have been identified as the strongest determinant of the surgical approach for benign outpatient hysterectomies (Whiteside et al., 2024). Recent works (e.g., Stoller et al. (2020)) have shown that even after controlling for both patients' needs and the characteristics of the healthcare system, up to two-thirds of the territorial variation in the incidence of benign hysterectomies remains unexplained.

We add to the literature on the drivers of the heterogeneous incidence of hysterectomies for benign conditions (HBC) by investigating the role played by gender norms, which are defined as social expectations on what is acceptable and appropriate for women and men. We build on the assumption that the conception of the female body as primarily reproductive shapes how hysterectomy is perceived and accepted by both healthcare providers and women. As a consequence, the more these social expectations are rooted in traditional gender roles, the higher the incidence of HBC outside of the reproductive age range. Desai (2016) reported that both providers and rural Indian women who have undergone hysterectomies regard women primarily as mothers, with few of the women in the study believing that the uterus has any purpose after the cessation of childbearing.

By outlining what is acceptable and appropriate for women and men within a particular group or society, gender norms are social expectations that shape individuals' behaviors. They are embedded in both formal and informal institutions, internalized in people's minds, and reinforced through social interactions (Cislaghi and Heise, 2020). The effect of gender norms on the psychological costs of hysterectomies has been previously demonstrated, and as such, should be accounted for when considering alternatives to hysterectomy. For example, on the basis of Canadian data, Lalinec-Michaud and Engelsmann (1989) showed that women

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[1] An estimated 90% of all hysterectomies are carried out for nonmalignant indications, primarily to improve quality of life (Edozien, 2005; Prütz et al., 2013; Schaffer and Word, 2002).

of French Canadian and European origin report greater concern about "losing their identity" post hysterectomy than English Canadian women do and that these concerns are influenced by differing societal values around femininity. Removal of the uterus can threaten perceived femininity, body image, and social roles–especially in societies where childbearing is deeply tied to female identity.[2] These psychological burdens and cultural perceptions influence both the decision-making process and incidence of post-surgical regret by the patient and are expected to play a role in providers'decision-making process.[3]

We use data from Italian regions to test the role of gender norms on the incidence of HBC. We proxy gender norms with 5 different indices on the basis of the answers to a set of questions from both the World Values Survey and the European Values Study and a sixth index on the basis of administrative data on the number of operating firms with female leadership. Italy is the ideal setting since there is a high degree of territorial heterogeneity regarding gender norms. We follow a two-step approach. First, we show the correlation between gender norms and the incidence of HBC for the period 2001–2018. Controlling for a variety of characteristics of both the resident population and the local healthcare system, we show that more traditional gender norms are associated with more hysterectomies for benign conditions.

Second, to prove the value of the correlation, we repeat the analysis using data on the incidence of prostatectomies (i.e., partial or total removal of the prostate) and mastectomies (i.e., partial or total removal of the breast) for benign conditions. The incidences of both mastectomies and prostatectomies for benign conditions are much lower in the reference population, and especially in the case of prostatectomies, alternative nonsurgical approaches are considered more often which aligns with the idea of "masculinity" as independent of fatherhood. The expectation is that more traditional gender norms are associated with a lower incidence of prostatectomies since the sexual identity of a man is defined independently of his reproductive chances. Similarly, we expect that mastectomies will be negatively correlated with more traditional gender norms since breasts define gender identity according to a traditional female stereotype. In line with our assumptions, we find a negative correlation between more traditional gender norms and the occurrence of these procedures.

Finally, we exploit the introduction of a repayment plan policy in 2006, which aimed

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[2]African American women have reported that men perceive women who have undergone a hysterectomy more negatively (Richter et al., 2000). More than their Caucasian peers, these women feared that their partner may leave them following the procedure (Augustus, 2002). Marván et al. (2012) explored this relationship in Mexico, a country characterized by patriarchal norms and deeply rooted machismo culture. Machismo views a woman's body as an object for men's pleasure, while marianismo, its complement, idealizes women as self-sacrificing and maternal. The study surveyed married men and women in the city of Xalapa who did not want more children, although neither the women surveyed nor the wives of the men surveyed had undergone a hysterectomy. The respondents' level of machismo/marianismo was assessed on the basis of their agreement with statements regarding female subordination, unilateral decision-making, and men's sexual freedom. Men with above-median machismo/marianismo scores were more likely than women to believe that a hysterectomy would make a woman incomplete and affect her femininity and were less likely to perceive any positive benefits of the procedure. No significant differences were observed between male and female respondents with below-median machismo/marianismo scores.

[3]For a popular version of the topic, see the journal article by Becker (2020) "Who Decides Who Gets a Hysterectomy?" available at `https://www.teenvogue.com/story/who-decides-who-gets-a-hysterectomy`.

to reduce waste in healthcare expenditures at the regional level, to test for heterogeneous responses to the policy driven by the level of gender norms using a staggered difference-in-differences approach. With the adoption of the policy, we expect the incidence of unnecessary and costly procedures to be reduced, but at a slower pace in areas in which gender norms are stronger, and our findings are in line with this expectation.

Although a hysterectomy is often clinically justified, its use for benign conditions remains high across countries. Historically, this procedure has attracted criticism because it is performed too readily, particularly in contexts where male-dominated surgical practices shape women's treatment options (Edozien, 2005). Despite decades of feminist critique and medical reform, hysterectomy remains among the most common surgical interventions worldwide, although its rate has been declining (Figure 1). In Italy, more than 50,000 women undergo a hysterectomy each year, three quarters of whom have benign pathologies (Ciavattini et al., 2022). This persistence reflects both clinical and systemic shortcomings. The absence of clear, evidence-based guidelines for benign conditions continues to create room for variation in practice and potential overuse (Neis et al., 2016). Moreover, informed consent remains unevenly implemented. While modern clinical standards require that patients are clearly informed about the reasons for treatment, its risks, benefits, and alternatives (Edozien, 2005), evidence suggests that women often receive insufficient information (Björkström et al., 2021; Jindal et al., 2021; Khandelwal, 2024a).[4] The persistence of such practices affects both clinical outcomes and the efficiency of the healthcare system, reinforcing the reliance on surgery and limiting investment in alternative approaches.

The paper proceeds as follows: Section 2 presents the Italian institutional setting, whereas Section 3 offers an overview of the different surgical procedures of interest and of their consequences. Section 4 discusses the theoretical expectations and explains the dataset used for the empirical analysis presented in Section 5 with the related results and robustness checks. Section 6 concludes the study.

2   Institutions

Italy includes 19 regions and 2 autonomous provinces (the Autonomous Province of Trento and the Autonomous Province of Bolzen), which are responsible for providing medical assistance to their residents. Local governments must comply with national standards (Lisac et al., 2008), but they can freely choose how to regulate and structure healthcare delivery within their area. As a result, there are 21 microhealthcare systems in the country that rely on different combinations of local health authorities (LHAs), independent hospitals (e.g., teaching hospitals) and private institutions, which can be both accredited (or not) to the public system (Anessi-Pessina et al., 2004). Physicians working in public hospitals cannot

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[4]For example, in Sweden, only 25% of the surveyed women who underwent a benign hysterectomy reported receiving information about the possible effects on their sex life, 23% on effects on bladder function, and 17% on effects on bowel function (Pakbaz et al., 2017). In India, 23% of surveyed women admitted for a hysterectomy demonstrated good awareness of the procedure and its consequences, with awareness levels associated with education, urban residence, and socioeconomic status (Jindal et al., 2021).

work in more than one hospital. Patients are covered by health plans provided by the LHAs according to their place of residence, but there is both intra- and interregional mobility.

Hospitals within the public system are reimbursed through diagnosis-related group (DRG) prices since the 1990s, when the Italian government released its DRG tariff list for every patient (Cavalieri et al., 2013).[5] However, national tariffs represented only a benchmark, and regional governments could set their own rates. Consequently, the DRG-based funding mechanism is characterized by extensive differences across regions, which still persist (Assobiomedica, 2002).

Since 2006, the central government has monitored and punished regions with healthcare-related deficits through so-called repayment plans (*Piani di rientro*; National Budget Law 266/2005).[6] These plans are enforced in the form of contractual agreements between national and regional governments and imposed whenever the regional healthcare deficit is equal to or exceeds 7% of the deficit in the previous year (Ministero della Salute, 2006). Under a repayment plan, a region must provide the central government with a credible plan for the reorganization of its healthcare system. In exchange, the central government allows them to access supplementary funds to improve their budget and ensure health assistance to their citizens. One common measure is to reduce the number of hospital beds to induce potential patients to rely more on (less expensive) outpatient clinics or avoid surgical alternatives and encourage the distribution of drugs from hospitals directly to patients with chronic conditions. For more information on the targets of repayment plans, see Table A.1.

Regional governments naturally dislike being under a repayment plan, as it limits their fiscal policy discretion and pushes them to increase regional tax rates.[7] Over time, the central government has imposed repayment plans on ten regions distributed in the northern, central and southern areas of the country: Abruzzo, Campania, Lazio, Liguria, Molise, Sardinia, and Sicily in 2007; Calabria in 2009; and Piedmont and Puglia in 2010.[8]

3   Procedures and Their Consequences

3.1   Hysterectomy

A hysterectomy is the surgical removal of the uterus. It is an invasive procedure associated with surgical risks, prolonged recovery, and potential economic and quality-of-life costs. The median recovery time (i.e., time to full work resumption) was estimated by Dedden et al. (2022) to be in a range between three and eight weeks, with restrictions on the type of activities a woman can perform (mostly weight lifting, sexual activity, and sports) (Hofbauer et al.,

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[5]National tariffs were calculated on the basis of data gathered from eight hospitals located in the northern and central regions without differentiating among hospital types (Fattore, 2006).

[6]Healthcare expenditures account for approximately 90% of regional budgets. Regional governments have concurrent competences with the national government, including in terms of environmental issues and education.

[7]Regions manage an income surcharge rate (*i.e.,addizionale irpef*) and a regional tax on production (*imposta regionale sulle attivitá produttive*).

[8]Liguria and Sardinia completed their recovery plan in 2009, and Piedmont completed theirs in 2015.

2025). Common complications include postoperative infections, venous thromboembolism, injury to the genitourinary or gastrointestinal tract, bleeding, nerve injury, and vaginal cuff dehiscence (Clarke-Pearson and Geller, 2013). Long-term consequences include an increased risk of ischemic heart disease and hypertension, urinary incontinence, and pelvic organ prolapse (Chang et al., 2025; Wang et al., 2022).

Nevertheless, most hysterectomies are elective procedures performed in response to benign conditions. The most common benign indications for a hysterectomy are heavy or irregular uterine bleeding and pelvic pain or pressure. These symptoms are frequently associated with conditions such as leiomyomas (fibroids), endometriosis, adenomyosis, or pelvic organ prolapse (Schaffer and Word, 2002). Although hysterectomy can effectively resolve a range of gynecological conditions, alternative treatment approaches exist.[9]

3.2 Mastectomy

Mastectomy, the surgical removal of all breast tissue, is most commonly performed as a treatment for breast cancer but may also be performed prophylactically in women at high risk of developing the disease (Hartmann et al., 1999). Beyond its physical consequences, the procedure is associated with deterioration in mental health (Arroyo and López, 2011; Maguire et al., 1978; Rubino et al., 2007) and challenges women's sense of identity; breasts are widely regarded as visible symbols of femininity (Koçan and Gürsoy, 2016; Piot-Ziegler et al., 2010; Sukartini and Sari, 2021). Women often report fears of negative partner perceptions, such as concerns about attractiveness and intimacy, as well as discomfort with the reactions of others, perceiving comments, gazes, or gestures as potential signs of rejection (Arroyo and López, 2011; Koçan and Gürsoy, 2016). Because of the visibility of the procedure, some women believe that mastectomy is perceived more negatively by men than is hysterectomy (Richter et al., 2000). Similarly, women who had not undergone a hysterectomy believed that men would show a stronger negative reaction to a more visible surgical procedure, such as a mastectomy (Richter et al., 2000).

3.3 Prostatectomy

The prostate is a gland in the male reproductive and urinary systems that produces part of the seminal fluid, contributing to the formation of sperm. Prostatectomy, the surgical removal of part or all of the prostate gland, is performed primarily for prostate cancer but can also be indicated for benign prostatic hyperplasia (enlarged prostate). Although the procedure is recommended to address life-threatening conditions, the management of prostate cancer has

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[9]For example, Bradley (2009) highlighted the benefits of uterine fibroid embolization as a safe and effective nonsurgical therapy for reducing the symptoms of uterine leiomyomata while preserving the uterus. Various medical therapies, including oral contraceptives with progestogens and gonadotropin-releasing hormone agonists and antagonists, play important roles in managing the pelvic pain associated with endometriosis (Alonso et al., 2024). Furthermore, pelvic floor muscle training and the use of vaginal pessaries can effectively manage pelvic organ prolapse, significantly improving symptoms and quality of life while avoiding surgery (Sansone et al., 2022; Wang et al., 2022).

increasingly shifted toward alternatives to surgery (Costello, 2020; Tzeng et al., 2022). Even if radical prostatectomy remains the gold standard for men with intermediate- and high-risk disease (Costello, 2020), localized prostate cancer is currently managed not only with prostatectomy but also with active surveillance or radiation therapy. Active surveillance is the preferred approach for very low-risk prostate cancer and an option for low-risk and favorable intermediate-risk cases (Tzeng et al., 2022). Radiotherapy achieves favorable long-term outcomes in high-risk prostate cancer patients, including patients at risk of occult nodal disease, and its combination with androgen deprivation therapy further improves outcomes (Golabek et al., 2016; Tharmalingam et al., 2019).

Prostatectomy has a well-documented adverse effect on sexual function. Donovan et al. (2016, 2023) reported that, relative to radiotherapy and active surveillance, prostatectomy is associated with the greatest declines in sexual function and urinary continence. These impairments also contribute to negative mental health outcomes (Lehto et al., 2017). Men with erectile dysfunction often experience a sense of diminished masculinity, which is linked to depression, embarrassment, reduced self-worth, and fears of stigma (Chambers et al., 2017; Rosser et al., 2016; Tsang et al., 2019). Castaldelli-Maia et al. (2024) reported that the experiences and challenges of individuals with prostate cancer are shaped by cultural beliefs and gender norms.

4 Theoretical Expectations and Data

The reproductive capacity of the female body has traditionally been regarded as the fundamental basis and defining characteristic of womanhood (Malson and Swann, 2003; Niccolson and Ussher, 1992; Phoenix et al., 1991). As it is a procedure that permanently compromises the possibility of a pregnancy, one could expect that gender norms are more likely to play a role in affecting the probability of an unnecessary hysterectomy (i.e., a hysterectomy for benign conditions) once a woman has fulfilled her reproductive expectations or passed the age of fertility. In the Italian context, this means that benign hysterectomies should have a higher incidence among women aged 40 and older. In fact, according to data from the Italian National Institute of Statistics (ISTAT), the average age at first pregnancy for Italian women in the past three decades is approximately 32 years of age (ISTAT, 2024), while the fertility rate has dramatically decreased, with an average of 1.3 children per woman. Combining this information with the fact that women are typically fertile between 15 and 49 years of age, fertility decisions affect mainly Italian women in the 30–39 age group, while they are likely to be marginally relevant for women in the 40–49 age group and are essentially irrelevant for women over 50 years of age. Hence, our outcome of interest is the HBC rates for women aged 40–49 and women aged 50 and older for the period 2001–2018 using regional data from the Italian Ministry of Health.[10]

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[10]HBC rates are defined as the share of hysterectomies performed for reasons other than the presence of malignant cancer out of the total number of hysterectomies performed. The Ministry computed these rates using hospital discharge records (*SDO – Schede di dimissione ospedaliera*), which have been available since 2001 and refer to all procedures that were paid through the public healthcare system (either performed in a

Gender norms may, of course, impact the performance of other types of surgeries that affect other symbols of womanhood, as well as symbols of manhood. To support our analysis of HBC rates, we use two sets of secondary outcomes from the Ministry of Health. For the sake of consistency with the HBC analysis, the first set of secondary outcomes is the rate of mastectomies for benign conditions for women aged 40–49 and women aged 50 and older during the 2001–2018 period. Women are defined by their uterus until motherhood and/or as long as they remain fertile. In contrast, female breasts are among the most consequential attributes of womanhood (Yalom, 1997; Young, 2005), and given their high visibility, this holds true regardless of a woman's age and motherhood/fertility status to the extent that decisions regarding breast reconstruction are not taken in social isolation nor are considered to be merely affected by one's own preferences/feelings. Rather, they are shaped by social, cultural, and historical contexts (Webb et al., 2018). As a result, one may expect that more traditional gender norms will discourage the performance of unnecessary mastectomies.

The second set of secondary outcomes includes the rate of prostatectomies for benign conditions for the period 2007–2018.[11] Since prostatic problems (i.e., noncancer conditions) tend to develop naturally with aging, we focus on two different age groups: men aged 40–59 and men aged 60 -75.[12] The prostate does not have the same reproductive meaning for men as the uterus has for women, but its removal challenges traditional notions of masculine identity, as it often leads to erectile dysfunction, loss of ejaculation and incontinence, undermining a man's sense of control and agency over his body (Gannon et al., 2010; Kong et al., 2017; Oliffe, 2005). Therefore, we expect stronger gender norms to decrease the incidence of benign prostatectomy.

Overall, we employ a regional-level panel dataset of hysterectomies and mastectomies performed from 2001–2018 and prostactectomies performed from 2007–2018. Through the Ministry of Health, we also use regional data on the rate of heavy smokers and obesity, which we use to control for the overall health of the regional population, which may be related to the rate of hysterectomy. Since the number of surgical procedures may be affected by the capacity of hospitals to accommodate patients, we recover data on the characteristics of the local healthcare systems, including the rates of hospital beds and doctors per 1,000 residents and the so-called attractiveness index, which captures patient mobility between regions and proxies for the quality of the local healthcare system (see Table A.2 for the definitions of the variables used). Finally, since hysterectomies are expensive procedures that threaten female fertility, we also collect data on regional GDP and the fertility rate, as well as the adoption of a regional DRG system as an alternative to the national system.

As shown in Table 1, 89% of hysterectomies performed on women aged 40–49 and approximately 71% of those on women aged 50 and older are for benign conditions. In contrast, only 3.3% of women aged 40–49 underwent a mastectomy for a condition other than malignant cancer, and this figure becomes even smaller (2.3%) when women aged 50 and older are

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public hospital or in a public accredited hospital).

[11]Owing to changes in the recording of SDO for prostatectomies, the Ministry could provide the related rate only for a shorter time frame.

[12]Guidelines recommend life expectancy of at least ten years to justify prostatectomies. Males' life expectancy is around 82 years in Italy for the considered period.

considered. In terms of prostatectomies, 24.1% and 22.4% of men aged 40–59 and men aged 60-75, respectively, underwent the procedure a condition other than malignant cancer.

4.1   Measuring Gender Norms

There is no global standard for identifying and measuring gender norms, but gender norms can be captured through explicit or implicit scores. Explicit gender norm scores are derived from self-report questionnaires, surveys or scales that directly ask individuals about their beliefs, attitudes and associations regarding the role of gender and related social expectations. For instance, participants in the second wave of the World Values Survey (WVS)[13] were asked to express their level of agreement using a 4-point Likert scale (from strongly agree to strongly disagree) to the statement *"A preschool child is likely to suffer if his or her mother works"*.

In contrast, implicit gender norm scores are based on psychological assessments such as the Gender–Science Implicit Association Test (IAT), which is a computer-based test that assesses unconscious associations between gender (e.g., woman and man) and particular traits, fields or roles via a timed categorization task. For example, in the case of education, participants are asked to rapidly sort female and male names into subjects related to arts and humanities or science and math (e.g., Anghel et al. (2020); Carlana (2019)). As implicit gender norm scores should capture inner thoughts and attitudes, which the respondent should not be able to hide, they are considered to reveal one's true position on gender norms. However, these implicit scores are detectable only through computer-based tests, and there are no extensive and reliable data capturing either territorial representativeness or variations over time.

In contrast, explicit gender norm scores have the advantages of being observable in time and for specific geographical areas. Nevertheless, they capture only the lower bound of gender norms because replies to survey questions tend to suffer from social desirability bias. As a consequence, explicit scores tend to systematically underrepresent the true level of gender norms as far as conservative attitudes toward gender roles are concerned. In other words, one can only account for respondents who, for instance, strongly agree with the statement *"A preschool child is likely to suffer if his or her mother works"*, but among those respondents who state their disagreement, there are many who honestly think that a mother working results in her child suffering (Alan et al., 2018).

To exploit both time variation and geographical representativeness, we rely on explicit gender norm scores leveraging two well-known surveys that were administered in Italy, among other countries, at different points in time during our observational period. Specifically, we use the WVS (specifically, the 1999 and 2004 waves, which included Italy) and the European Values Study (EVS, the 2009 wave).[14] Both surveys include several questions related

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[13]The WVS is a survey coordinated by the World Values Survey Association and currently includes seven national sample surveys administered in more than 90 countries since 1981. The surveys are based on a common questionnaire covering several topics, such as individual beliefs and values, subjective well-being, religion and democratization.

[14]The EVS is a large-scale, cross-national, repeated cross-sectional survey research program. Since 1981, it has administered a standardized questionnaire every 9 years to determine what Europeans think about several topics, such as family, work, religion and society. At the Italian level, there is no comparable survey

to women's roles and social expectations surrounding family and children. However, among them, only one question is common to all three waves that overlap with our observation period. This is the question asking respondents to express their level of agreement/disagreement with the following statement: "Being a housewife is just as fulfilling as working for pay". This question captures the prescriptive stereotype that female aspirations are oriented toward family and the domestic sphere in a way that is equivalent to any other fulfillment outside the household. Family is seen as a defining element of womanhood, and women are believed to be naturally more suited and capable of handling family and domestic responsibilities (Gaunt and Benjamin, 2007; Lee, 2006, 2009) to the extent that housework may be idealized as offering "*more opportunities for self-realization than would going out to work*" (Ferree, 1976). Afterward, we use this question to construct our main measure of gender norms: the *Housewife index*, which is computed by taking the z score value of the share of respondents in any given Italian region who agree or strongly agree with the related statement.

To exclude the possibility that our results are driven by the selection of the question on female gender roles, we construct four alternative indices. We leverage all the questions related to female gender roles and expectations with respect to family and children in each wave of the EVS and the WVS we use. In addition to the statement about fulfillment from being a housewife, the 1999 WVS wave and the 2009 EVS wave asked respondents to express their agreement/disagreement with 2 statements on the mother–child relationship and on the female need to have children.[15] Then, we created four cultural indices using different combinations of all the questions, as shown in Table 2. In terms of the 2005 wave of the WVS, we relied only on the question about fulfillment from being a housewife, as this was the only question in the survey related to female roles and social expectations.

To decrease the problems associated with the use of this explicit index, we also leveraged a proxy for gender norms based on administrative data, namely, the regional rate of firms run by a female entrepreneur (*Female entrepreneurship*). This index represents the best administrative proxy for the gender norms. Over time, housework has to be more frequently combined with office work; thus, female labor participation does not properly account for women's self-realization through a career and its acceptance (Gornick and Meyers, 2003). In contrast, the rate of female entrepreneurship captures female empowerment in the labor market at a different level because it considers not only female participation in the labor

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to either the EVS or the WVS. The existing ones (e.g., the 2014 survey on violence against women run by the ISTAT) have not included questions on female roles and expectations and/or have not ensured regional representativeness or sufficient variation.

[15]Specifically, the respondents were asked to express their agreement/disagreement using a 4-point Likert scale with the following two statements: (i) "A preschool child is likely to suffer if his or her mother works" and (ii) "A working mother can establish just as warm and secure a relationship with her children as a mother who does not work". In addition, the respondents could choose between two answers, i.e., "She must have children" or "It is not necessary," to answer the following question: "Do you think that a woman, to be fully fulfilled, must have children, or is it not necessary for her to have any?" Following the approach used to construct the *Housewife index*, we computed the z score value of the share of respondents who agreed/strongly agreed with the first statement, those who disagreed/strongly disagreed with the second statement and the share of respondents who believed that women must have children. Afterward, we average these z scores values using different combinations of these questions, as shown in Table 2.

market but also women in a leadership/business position (Ince-Yenilmez, 2021). Moreover, since women have lower self-confidence and are more risk averse than men are (Niederle and Vesterlund, 2007), this information is more indicative of the cultural environment toward women and their ungendered aspirations.

5   Empirical Analysis and Results

5.1   Baseline Analysis

We first estimate the model defined by Equation 1, where *Index* is our *Housewife index*, which is measured at the regional level r and yearly level t, and *Hysterectomy* is the rate of HBC at the regional and year levels. $X1$ groups all the controls for population characteristics, whereas $X2$ accounts for elements of the regional healthcare system, as described in Table A.2. ma are macroarea fixed effects that include 5 macro areas (i.e., NUTS1 level), and t are yearly fixed effects.

$$Hysterectomy_{rt} = \alpha Index_{rt} + \beta_1 X1_{rt} + \beta_2 X2_{rt} + \rho_{ma} + \gamma_t + \epsilon_{rt} \tag{1}$$

As shown in Table 3, an increase of one standard deviation of the *Housewife index* is equal to an increase of 0.9% (i.e., 0.008/0.889) in the HBC rate for the sample of women aged 40–49 (Column 2) and by 1.6% (i.e., 0.011/0.707) for women aged 50 and older (Column 4). The effect is greater when *Female entrepreneurship* is considered: an increase of one standard deviation of the female entrepreneur variable (i.e., 0.029) is associated with a decrease of 2.1% (i.e., (-0.636*0.029)/0.889, Column 2) in the HBC rate for women aged 40–49 and by 4.7% (i.e., (-1.136*0.029)/0.707, Column 4) for women aged 50 or older. The difference in the magnitude of the detected correlation appears to align with the lower bound interpretation discussed concerning explicit gender norm scores. As shown in Table 4, regardless of the cultural index considered, we observe positive and statistically significant results for the HBC rate in both age groups, with a slightly stronger magnitude in the sample of women aged 50 and older.

We also test the robustness of our baseline results to the inclusion of further controls, which could explain the high incidence of HBC. First, we control for the rate of C-sections among low-risk patients, moving from the assumption that the higher the incidence of C-sections among low-risk patients is, the higher the degree of inappropriateness in the healthcare system at the local level and, consequently, the greater the likelihood of a hysterectomy in the absence of malignant cancer. In a way, C-sections and HBC can be considered substitutes in terms of inappropriate procedures that are costly both for the healthcare system and for the patient. Moreover, C-sections have been found to be associated with an increased risk of peripartum hysterectomy (Stivanello et al., 2010).[16] Second, a well-known nonmedical

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[16]The correlation between the rate of C-sections among low-risk patients and the rate of HBC among women 40–49 years of age is -0.329 and -0.444 for women aged 50 years and older.

driver of the performance of elective surgeries is economic incentives, which also play a role in determining whether an elective surgery is triggered by reimbursement fees (Khandelwal, 2024b) or disability insurance payment (Fan et al., 2019). In the Italian context, economic incentives are represented by the level of reimbursement hospitals receive for a hysterectomy. Hence, we test the robustness of our baseline results to the inclusion of the DRG tariff for a hysterectomy following the assumption that a higher level of reimbursement may increase the likelihood of HBC. Finally, we control for the number of Da Vinci surgical systems in each region. The Da Vinci surgical system uses robotic technology to perform minimally invasive surgical procedures. It is mainly used for prostatectomies and hysterectomies and ensures faster recovery with a lower risk of blood loss during surgery and of blood transfusion after-ward surgery (Misal et al., 2021). A higher availability of this surgical system may induce surgeons to more frequently opt for surgical solutions, as they are easier to perform and, at the same time, less invasive and risky for patients. The results of estimating Equation 1 with these additional controls are shown in Table 5, which reports the coefficient of interest adding the controls one at a time (Columns 1–3) and including them jointly (Column 4; our preferred specification). Our baseline results are confirmed, and if any, their magnitude is increased (i.e., *Female entrepreneurship*).

The observed association of stronger gender norms, as proxied by the *Housewife index*, with higher incidences of HBC can be explained by the fact that the uterus stops defining womanhood once fertility decisions are no longer crucial, whereas the breast continues to define femininity as women age. Our results show a negative correlation between the rates of mastectomies for benign conditions and gender norms, as reported in Table 6 (Columns 1–4); the table also shows the results of estimating Equation 1 on the rate of prostatectomies. Specifically, an increase of one standard deviation of the *Housewife index* decreases the rate of mastectomies by 33.3% for women aged 40–49 (i.e., -0.011/0.033, Column 2) and by 13% for women 50 and older (i.e., -0.003/0.023, Column 4), whereas prostatectomies for benign conditions on males aged 40–59 decrease by 17.8% (i.e., -0.043/0.241, Column 6) and by 13.8% for males aged 60-75 (i.e., -0.031/0.224, Column 8). Using the proportion of female entrepreneurs does not significantly affect the mastectomy results, whereas an increase of one standard deviation increases the incidence of prostatectomies for benign conditions by 9.7% (i.e., (0.803*0.029)/0.241, Column 6) among men aged 40–59 and by 8.9% (i.e., (0.688*0.029)/0.224, Column 8) for men aged 60 -75.

5.2 Differential Effects of Repayment Plans

As discussed in Section 2, repayment plans are implemented to contain regional deficits and directly target healthcare expenses. The second part of our analysis first checks whether these plans are effective in reducing the number of HBC, which are considered unnecessary since alternative and less expensive treatments exist. Second, it examines whether such a decreasing effect differs depending on the degree of existing gender norms.

To determine the effect of the adoption of repayment plans on the incidence of HBC, we leverage the quasi-experimental variation triggered by the staggered adoption of these plans, as shown in Equation 2.

$$Hysterectomy_{rt} = \sum_y \tau^{ATE} d_{rt} \beta_1 X1'_{rt} + \beta_2 X2'_{rt} + \rho_{ma} + \gamma_t + \epsilon_{rt} \tag{2}$$

where d_{rt}^y d_{rt} is a region–year-level estimator of treatment indicating whether a repayment plan was adopted in region r before year t, and τ^{ATE} identifies the average effect of the adoption of the plan on the incidence of HBC.

As shown by several recent works, the two-way fixed effects estimator does not provide consistent estimates whenever treatment effects are heterogeneous across treated groups and/or time (Borusyak et al., 2024; Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021). To overcome this problem, we follow Borusyak et al. (2024)'s three-step estimation procedure.

According to Table 7, the adoption of a repayment plan decreases the incidence of HBC by 4.3% for women aged 40–49 (i.e., -0.039/0.900) and by 7.9% (i.e., -0.057/0.725) for women aged 50 and older. Table 8 shows the coefficient of the event study to investigate the dynamics of the effects. Considering 4 years before and 4 years after the adoption of a repayment plan, we see that the effects persist in time and that there are no anticipatory effects.

The differential impact of the adoption of the plans conditional on gender norms is shown in Table 9. In regions where there are stronger gender norms, as measured by our *Housewife index*, the effect of the policy on the reduction in HBC is weaker for both age groups. However, if a region has a less traditional vision of gender roles, as captured by a greater number of female entrepreneurs, the effect of the policy is stronger. These results are in line with the idea that repayment plans are effective at reducing unnecessary and costly procedures, but the presence of stronger gender norms slows such a reduction.

6 Conclusion

There are many non-medical rationales that explain the use of medical treatments: the reimbursement system of healthcare providers (i.e., the *money driver* (Shen et al., 2004; Wagenschieber and Blunck, 2024)), the experience and training of the healthcare professionals (i.e. *medical skills driver* (Currie et al., 2016; Gruppen et al., 1988)), the liability system (i.e., *legal driver* (Bertoli and Grembi, 2018; Kessler, 2011)), and the overall environment within which healthcare workers act (i.e., the *context driver* (Landon et al., 2001; McKinlay et al., 2002)). Any time that one of these drivers is outweighs the objective health needs of a patient (i.e., *medical driver*), a distortion is introduced into the system, with potential adverse consequences for both the patient and the sustainability of the healthcare system.

Within the *context driver*, we address the role of gender norms, which define, within a community, the role of gender according to predefined beliefs: the stronger the gender norms are, the more traditional the role of women is conceived in a certain community. This means women are expected to have a family and take care of it and not have a leading position in society. We focus on hysterectomy, the surgical removal of the uterus, which, as such, threatens the gender role of women as mothers. Still, this is the second most performed

elective surgery on women after C-sections, often used for conditions such as fibroids and menstrual irregularities, for which less invasive alternatives exist.

By proxying gender norms through explicit indexes constructed using questions regarding social expectation on women in the WVS and the EVS, we show that stronger gender norms are associated with higher rates of HBC among those age groups for which fertility decisions are no longer crucial (i.e., women aged 40 and older); thus, the uterus may no longer be regarded as a defining element of womanhood and femininity. These results shed light on the potential influence of gender norms in treatment selections and highlight the importance of accurate information about the reasons, risk and benefits of different treatments, including alternative options.

References

Alan, S., S. Ertac, and I. Mumcu (2018, 12). Gender stereotypes in the classroom and effects on achievement. *The Review of Economics and Statistics 100*(5), 876–890.

Albright, B. B., Q. D. Heyward, A. Erkanli, A. P. Loehrer, E. R. Myers, L. J. Havrilesky, and H. A. Moss (2023). Geographic variation in the rate and route of hysterectomy for benign disease in the usa: a retrospective cross-sectional study. *BJOG: An International Journal of Obstetrics & Gynaecology 130*(12), 1502–1510.

Alonso, A., K. Gunther, S. Maheux-Lacroix, and J. Abbott (2024). Medical management of endometriosis. *Current Opinion in Obstetrics and Gynecology 36*(5), 353–361.

Anessi-Pessina, E., E. Cant, and C. Joninii (2004). Phasing out market mechanisms in the italian national health service. *Public Money and Management 24*(5), 309–316.

Anghel, B., N. Rodríguez-Planas, and A. S. de Galdeano (2020). Is the math gender gap associated with gender equality? only in low-income countries. *Economics of Education Review 79*, 102064.

Arroyo, J. M. G. and M. L. D. López (2011). Psychological problems derived from mastectomy: a qualitative study. *International journal of surgical oncology 2011*(1), 132461.

Assobiomedica (2002). I sistemi tariffari per le prestazioni di assistenza ospedaliera. Un esame della normativa Nazionale e regionale in vigore. Technical report.

Augustus, C. E. (2002). Beliefs and perceptions of african american women who have had hysterectomy. *Journal of Transcultural Nursing 13*(4), 296–302.

Bertoli, P. and V. Grembi (2018). Medical malpractice: how legal liability affects medical decisions. In *Health econometrics*, Volume 294, pp. 235–261. Emerald Publishing Limited.

Björkström, L. M., N. B. Wodlin, L. Nilsson, and P. Kjølhede (2021). The impact of preoperative assessment and planning on the outcome of benign hysterectomy–a systematic review. *Geburtshilfe Und Frauenheilkunde 81*(02), 200–213.

Borusyak, K., X. Jaravel, and J. Spiess (2024, 02). Revisiting event-study designs: Robust and efficient estimation. *The Review of Economic Studies 91*(6), 3253–3285.

Bradley, L. D. (2009). Uterine fibroid embolization: a viable alternative to hysterectomy. *American journal of obstetrics and gynecology 201*(2), 127–135.

Brennand, E. A., N. V. Scime, B. Huang, and P. McDonagh Hull (2024). Education level is associated with the occurrence and timing of hysterectomy: A cohort study of canadian women. *Acta Obstetricia et Gynecologica Scandinavica 103*(11), 2211–2220.

Broder, M. S., D. E. Kanouse, B. S. Mittman, and S. J. Bernstein (2000). The appropriateness of recommendations for hysterectomy. *Obstetrics & Gynecology 95*(2), 199–205.

Callaway, B. and P. H. Sant'Anna (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics 225*(2), 200–230.

Carlana, M. (2019, 03). Implicit stereotypes: Evidence from teachers' gender bias*. *The Quarterly Journal of Economics 134*(3), 1163–1224.

Castaldelli-Maia, J. M., I. K. Blaas, G. K. Gimenes, C. V. Suartz, A. Okassova, A. Ventriglio, and J. Torales (2024). Masculinity stigma and metastatic prostate cancer: A review with a focus on latin america. In *Urologic Oncology: Seminars and Original Investigations*, Volume 42, pp. 321–330. Elsevier.

Cavalieri, M., L. Gitto, and C. Guccio (2013). Reimbursement systems and quality of hospital care: an empirical analysis for italy. *Health Policy 111*(3), 273–289.

Chambers, S. K., E. Chung, G. Wittert, and M. K. Hyde (2017). Erectile dysfunction, masculinity, and psychosocial outcomes: a review of the experiences of men after prostate cancer treatment. *Translational andrology and urology 6*(1), 60.

Chang, O. H., I. J. Saldanha, D. Encalada-Soto, R. J. Jalloul, S. Rozycki, M. Orlando, A. White, L. C. Yang, J. C. Thompson, M. Nihira, et al. (2025). Associations between hysterectomy and pelvic floor disorders: a systematic review and meta-analysis. *American journal of obstetrics and gynecology Article in Press.*

Chen, I., M. R. Wise, S. Dunn, G. Anderson, N. Degani, G. Lefebvre, and A. S. Bierman (2017). Social and geographic determinants of hysterectomy in ontario: a population-based retrospective cross-sectional analysis. *Journal of Obstetrics and Gynaecology Canada 39*(10), 861–869.

Ciavattini, A., J. Di Giuseppe, C. Marconi, L. Giannella, G. Delli Carpini, M. Paolucci, M. Fichera, R. P. De Vincenzo, G. Scambia, M. T. Evangelista, G. Bogani, F. Bertolina, F. Raspagliesi, B. Gardella, A. Spinillo, M. Dominoni, E. Monti, C. A. Liverani, P. Vercellini, M. Iorio, D. Vitobello, R. Portuesi, G. Bresciani, M. Origoni, F. Cantatore, A. M. Pellegri, L. Moriconi, M. Serri, A. Chiari, F. Sopracordevole, M. Barbero, F. Parazzini, and the Italian Society of Colposcopy and Cervico-Vaginal Pathology (SICPCV) (2022). Hysterectomy for cervical intraepithelial neoplasia: A retrospective observational multi-institutional study. *International Journal of Gynecology & Obstetrics 159*(3), 679–688.

Cislaghi, B. and L. Heise (2020). Gender norms and social norms: differences, similarities and why they matter in prevention science. *Sociology of Health & Illness 42*(2), 407–422.

Clarke-Pearson, D. L. and E. J. Geller (2013). Complications of hysterectomy. *Obstetrics & Gynecology 121*(3), 654–673.

Clayton, R. D. (2006). Hysterectomy. *Best practice & research Clinical obstetrics & gynaecology 20*(1), 73–87.

Corona, L. E., C. W. Swenson, K. H. Sheetz, G. Shelby, M. B. Berger, M. D. Pearlman, D. A. Campbell Jr, J. O. DeLancey, and D. M. Morgan (2015). Use of other treatments before hysterectomy for benign conditions in a statewide hospital collaborative. *American journal of obstetrics and gynecology 212*(3), 304–e1.

Costello, A. J. (2020). Considering the role of radical prostatectomy in 21st century prostate cancer care. *Nature Reviews Urology 17*(3), 177–188.

Currie, J., W. B. MacLeod, and J. Van Parys (2016). Provider practice style and patient health outcomes: The case of heart attacks. *Journal of health economics 47*, 64–80.

de Chaisemartin, C. and X. D'Haultfœuille (2020, September). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review 110*(9), 2964–96.

Dedden, S. J., E. V. Bouwsma, P. M. Geomini, M. Y. Bongers, and J. A. Huirne (2022). Predictive factors of return to work after hysterectomy: a retrospective study. *BMC surgery 22*(1), 84.

Desai, S. (2016). Pragmatic prevention, permanent solution: Women's experiences with hysterectomy in rural india. *Social Science & Medicine 151*, 11–18.

Desai, S., O. M. Campbell, T. Sinha, A. Mahal, and S. Cousens (2017). Incidence and determinants of hysterectomy in a low-income setting in gujarat, india. *Health policy and planning 32*(1), 68–78.

Donovan, J. L., F. C. Hamdy, J. A. Lane, M. Mason, C. Metcalfe, E. Walsh, J. M. Blazeby, T. J. Peters, P. Holding, S. Bonnington, et al. (2016). Patient-reported outcomes after monitoring, surgery, or radiotherapy for prostate cancer. *New England Journal of Medicine 375*(15), 1425–1437.

Donovan, J. L., F. C. Hamdy, J. A. Lane, G. J. Young, C. Metcalfe, E. I. Walsh, M. Davis, T. Steuart-Feilding, J. M. Blazeby, K. N. Avery, et al. (2023). Patient-reported outcomes 12 years after localized prostate cancer treatment. *NEJM evidence 2*(4), EVIDoa2300018.

Edozien, L. C. (2005). Hysterectomy for benign conditions. *Bmj 330*(7506), 1457–1458.

Fan, E., H. Lien, and C.-t. A. Ma (2019). Uterus at a price: Disability insurance and hysterectomy. *Journal of Health Economics 66*, 1–17.

Fattore, Giovanni; Torbica, A. (2006). Health Service Benefit Catalogoues in Europe. Country Report: Italy. Technical report, Health Basket Project.

Ferrari, A., N. Bellè, A. Giannini, T. Simoncini, and M. Vainieri (2024). Determinants of women's preferences for surgical versus conservative management for pelvic organ prolapse: a survey-based study from italy. *BMJ open 14*(7), e084034.

Ferree, M. M. (1976). Working-class jobs: Housework and paid work as sources of satisfaction. *Social Problems 23*(4), 431–441.

Gannon, K., M. Guerro-Blanco, A. Patel, and P. Abel (2010). Re-constructing masculinity following radical prostatectomy for prostate cancer. *The Aging Male 13*(4), 258–264.

Gartner, D. R., P. L. Delamater, R. A. Hummer, J. L. Lund, B. W. Pence, and W. R. Robinson (2021). Patterns of black and white hysterectomy incidence among reproductive aged women. *Health Services Research 56*(5), 847–853.

Gaunt, R. and O. Benjamin (2007). Job insecurity, stress and gender: The moderating role of gender ideology. *Community, Work & Family 10*(3), 341–355.

Golabek, T., J. Belsey, T. Drewa, A. Kołodziej, I. Skoneczna, P. Milecki, J. Dobruch, M. Słojewski, and P. L. Chłosta (2016). Evidence-based recommendations on androgen deprivation therapy for localized and advanced prostate cancer. *Central European journal of urology 69*(2), 131.

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics 225*(2), 254–277.

Gornick, J. C. and M. K. Meyers (2003). *Families that work: Policies for reconciling parenthood and employment.* Russell Sage Foundation.

Gruppen, L. D., F. M. Wolf, C. Van Voorhees, and J. K. Stross (1988). The influence of general and case-related experience on primary care treatment decision making. *Archives of Internal Medicine 148*(12), 2657–2663.

Hartmann, L. C., D. J. Schaid, J. E. Woods, T. P. Crotty, J. L. Myers, P. Arnold, P. M. Petty, T. A. Sellers, J. L. Johnson, S. K. McDonnell, et al. (1999). Efficacy of bilateral prophylactic mastectomy in women with a family history of breast cancer. *New England Journal of Medicine 340*(2), 77–84.

Hofbauer, F., L. Strobel, C. Marth, and A. Widschwendter (2025). Behavioral recommendations following gynecological surgery. *Wiener klinische Wochenschrift*, 1–7.

Ince-Yenilmez, M. (2021). Women entrepreneurship for bridging economic gaps. In *Engines of economic prosperity: Creating innovation and economic opportunities through entrepreneurship*, pp. 323–336. Springer.

ISTAT (2024). Natalitá e fecónditá della popolazione residente - anno 2023. Technical report. https://www.istat.it/comunicato-stampa/natalita-e-fecondita-della-popolazione-residente-anno-2023/, accessed October 2025.

Jacoby, V. L., V. Y. Fujimoto, L. C. Giudice, M. Kuppermann, and A. E. Washington (2010). Racial and ethnic disparities in benign gynecologic conditions and associated surgeries. *American journal of obstetrics and gynecology 202*(6), 514–521.

Janda, M., N. R. Armfield, K. Page, G. Kerr, S. Kurz, G. Jackson, J. Currie, E. Weaver, A. Yazdani, and A. Obermair (2018). Factors influencing women's decision making in hysterectomy. *Patient Education and Counseling 101*(3), 504–510.

Jindal, M., V. R. Naik, M. Sahasrabhojanee, J. Cacodcar, M. s. Kulkarni, and S. Naik (2021). Study on awareness, perceptions, experiences in decision process of hysterectomy in women presenting to goa medical college. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology 10*(3), 1089–1094.

Kessler, D. P. (2011). Evaluating the medical malpractice system and options for reform. *Journal of Economic Perspectives 25*(2), 93–110.

Khandelwal, S. (2024a). Comprehending unwanted hysterectomies in developing nations: an analysis of women's decision-making processes, underlying causes, and subsequent consequences. *Annals of Medicine and Surgery 86*(11), 6404–6406.

Khandelwal, S. (2024b). Comprehending unwanted hysterectomies in developing nations: an analysis of women's decision-making processes, underlying causes, and subsequent consequences. *Annals of Medicine & Surgery 86*(11), 6404–6406.

Koçan, S. and A. Gürsoy (2016). Body image of women with breast cancer after mastectomy: a qualitative research. *The journal of breast health 12*(4), 145.

Kong, E.-H., J. A. Deatrick, and C. K. Bradway (2017). Men's experiences after prostatectomy: A meta-synthesis. *International Journal of Nursing Studies 74*, 162–171.

Kumari, P. and J. Kundu (2022). Prevalence, socio-demographic determinants, and self-reported reasons for hysterectomy and choice of hospitalization in india. *BMC Women's Health 22*(1), 514.

Lalinec-Michaud, M. and F. Engelsmann (1989). Cultural factors and reaction to hysterectomy. *Social Psychiatry and Psychiatric Epidemiology 24*(3), 165–171.

Landon, B. E., J. Reschovsky, M. Reed, and D. Blumenthal (2001). Personal, organizational, and market level influences on physicians' practice patterns: results of a national survey of primary care physicians. *Medical care 39*(8), 889–905.

Lawson, E. H., M. M. Gibbons, A. M. Ingraham, P. G. Shekelle, and C. Y. Ko (2011). Appropriateness criteria to assess variations in surgical procedure use in the united states. *Archives of Surgery 146*(12), 1433–1440.

Lee, K. (2006). Gender beliefs and the meaning of work among okinawan women. *Gender & Society 20*(3), 382–401.

Lee, K. (2009). Labor markets, breadwinning, and beliefs: How economic context shapes men's gender ideology. *Gender & Society 23*(2), 215–243.

Lehto, U.-S., H. Tenhola, K. Taari, and A. Aromaa (2017). Patients' perceptions of the negative effects following different prostate cancer treatments and the impact on psychological well-being: a nationwide survey. *British Journal of Cancer 116*(7), 864–873.

Lisac, M., K. Blum, S. Schlette, H. Maarse, Y. Bartholomée, D. McDaid, A. Oliver, I. Abásolo, B. G. Lopez-Valcarcel, G. Fiorentini, et al. (2008). Health systems and health reform in europe. *Intereconomics 43*(4), 184–218.

Maguire, G., E. Lee, D. Bevington, C. Küchemann, R. Crabtree, and C. Cornell (1978). Psychiatric problems in the first year after mastectomy. *Br med J 1*(6118), 963–965.

Malson, H. and C. J. Swann (2003). Re-producing "woman's" body: Reflections on the (dis)place(ments) of "reproduction" for (post)modern women. *Journal of Gender Studies 12*(3), 191–201.

Marván, M. L., V. Quiros, E. López-Vázquez, and Y. Ehrenzweig (2012). Mexican beliefs and attitudes toward hysterectomy and gender-role ideology in marriage. *Health Care for Women International 33*(6), 511–524.

McKinlay, J. B., T. Lin, K. Freund, and M. Moskowitz (2002). The unexpected influence of physician attributes on clinical decisions: results of an experiment. *Journal of Health & Social Behavior 43*(1).

Ministero della Salute (2006). Patto per la salute su proposta del ministro della salute e del ministro dell'economia e finanze condiviso dalla conferenza delle regioni e delle province autonome di trento e di bolzano. Technical report.

Ministero dell'Economia e delle Finanze (2009). La relazione unificata sull'economia e la finanza per il 2009. Technical report. `https://www.dt.mef.gov.it/export/sites/sitodt/modules/documenti_it/analisi_progammazione/documenti_programmatici/RUEF_2009.pdf`, accessed October 2025.

Misal, M., P. Magtibay, and J. Yi (2021). Robotic less and reduced-port hysterectomy using the da vinci sp surgical system: A single-institution case series. *Journal of Minimally Invasive Gynecology 29*(5), 1095–1100.

Neis, K. J., W. Zubke, M. Fehr, T. Romer, K. Tamussino, and M. Nothacker (2016). Hysterectomy for benign uterine disease. *Deutsches Arzteblatt International 113*(14), 242–249.

Niccolson, P. and J. Ussher (1992). *The Pshychology of Women's Health and Health Care*, Volume 1. Macmillan.

Niederle, M. and L. Vesterlund (2007). Do women shy away from competition? do men compete too much? *The quarterly journal of economics 122*(3), 1067–1101.

OECD (2025). Oecd health statistics: Surgical procedures (indicator) – hysterectomy. `https://data-explorer.oecd.org/`. Accessed: 2025-06-27.

Oliffe, J. (2005). Constructions of masculinity following prostatectomy-induced impotence. *Social Science & Medicine 60*(10), 2249–2259.

Pakbaz, M., E. Rolfsman, and M. Löfgren (2017). Are women adequately informed before gynaecological surgery? *BMC women's health 17*(1), 68.

Phoenix, A., A. Woollett, and L. E (1991). *Motherhood: meanings, practices and ideologies*, Volume 1. Sage.

Pillarisetty, L. S. and H. Mahdy (2023). Vaginal hysterectomy. In *StatPearls [internet]*. StatPearls Publishing.

Piot-Ziegler, C., M.-L. Sassi, W. Raffoul, and J.-F. Delaloye (2010). Mastectomy, body deconstruction, and impact on identity: a qualitative study. *British journal of health psychology 15*(3), 479–510.

Prütz, F., H. Knopf, E. v. d. Lippe, C. Scheidt-Nave, A. Starker, and J. Fuchs (2013). Prevalence of hysterectomy in women 18 to 79 years old. *56*, 716–722.

Richter, D. L., R. E. McKeown, S. J. Corwin, C. Rheaume, and J. Fraser (2000). The role of male partners in women's decision making regarding hysterectomy. *Journal of Women's Health & Gender-Based Medicine 9*(2, Supplement 2), 51–61.

Rosser, B. S., B. Capistrant, B. Torres, B. Konety, E. Merengwa, D. Mitteldorf, and W. West (2016). The effects of radical prostatectomy on gay and bisexual men's mental health, sexual identity and relationships: qualitative results from the restore study. *Sexual and Relationship Therapy 31*(4), 446–461.

Rubino, C., A. Figus, L. Lorettu, and G. Sechi (2007). Post-mastectomy reconstruction: a comparative analysis on psychosocial and psychopathological outcomes. *Journal of plastic, reconstructive & aesthetic surgery 60*(5), 509–518.

Sansone, S., C. Sze, A. Eidelberg, M. Stoddard, A. Cho, S. Asdjodi, J. Mao, D. S. Elterman, K. C. Zorn, and B. Chughtai (2022). Role of pessaries in the treatment of pelvic organ prolapse: a systematic review and meta-analysis. *Obstetrics & Gynecology 140*(4), 613–622.

Schaffer, J. I. and A. Word (2002). Hysterectomy—still a useful operation. *New England Journal of Medicine 347*(17), 1360–1362.

Shen, J., R. Andersen, R. Brook, G. Kominski, P. S. Albert, and N. Wenger (2004). The effects of payment method on clinical decision-making: physician responses to clinical scenarios. *Medical care 42*(3), 297–302.

Stang, A., R. M. Merrill, and O. Kuss (2011). Hysterectomy in germany: a drg-based nationwide analysis, 2005–2006. *Deutsches Ärzteblatt International 108*(30), 508.

Stivanello, E., M. Knight, L. Dallolio, B. Frammartino, N. Rizzo, and M. P. Fantini (2010). Peripartum hysterectomy and cesarean delivery: a population-based study. *Acta Obstetricia et Gynecologica Scandinavica 89*(3), 321–327.

Stoller, N., M. Werli, T. Zaugg, A. Haynes, A. Chiolero, N. Rodondi, R. Panczak, and D. Aujesky (2020). Regional variation of hysterectomy for benign uterine diseases in switzerland. *PLoS ONE 15*(5), e0233082.

Sukartini, T. and Y. I. P. Sari (2021). Women with breast cancer living with one breast after a mastectomy. *Central European Journal of Nursing and Midwifery 12*(2), 366.

Sun, L. and S. Abraham (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics 225*(2), 175–199.

Tharmalingam, H., A. Choudhury, M. Van Herk, A. McWilliam, and P. J. Hoskin (2019). New approaches for effective and safe pelvic radiotherapy in high-risk prostate cancer. *Nature Reviews Urology 16*(9), 523–538.

Tsang, V. W., C. Skead, R. J. Wassersug, and J. L. Palmer-Hague (2019). Impact of prostate cancer treatments on men's understanding of their masculinity. *Psychology of men & masculinities 20*(2), 214.

Tzeng, M., S. P. Basourakos, M. Davuluri, H. Nagar, A. Ramaswamy, E. Cheng, G. DeMeo, and J. C. Hu (2022). Evolving trends in the management of low-risk prostate cancer. *Clinical Genitourinary Cancer 20*(5), 423–430.

Wagenschieber, E. and D. Blunck (2024). Impact of reimbursement systems on patient care–a systematic review of systematic reviews. *Health Economics Review 14*(1), 22.

Wang, T., Z. Wen, and M. Li (2022). The effect of pelvic floor muscle training for women with pelvic organ prolapse: a meta-analysis. *International urogynecology journal 33*(7), 1789–1801.

Wang, Z., X. Li, and D. Zhang (2022). Impact of hysterectomy on cardiovascular disease and different subtypes: a meta-analysis. *Archives of Gynecology and Obstetrics 305*(5), 1255–1263.

Webb, C., N. Jacox, and C. Temple-Oberle (2018). The making of breasts: Navigating the symbolism of breasts in women facing cancer. *Plastic surgery (Oakv) 27*(1), 49–53.

Whiteside, J. L., D. Tumin, J. P. Hildebrand, and A. Harris (2024). Determinants of surgical approach for benign outpatient hysterectomy. *Journal of Minimally Invasive Gynecology 31*(2), 123–130.

Yalom, M. (1997). *A History of the Breast*, Volume 1. Alfred A. Knopf.

Young, I. (2005). *On Female Body Experience*, Volume 1. NY: Oxford.

Tables and Figures

Figure 1: **Hysterectomies in OECD countries (2000-2022)**
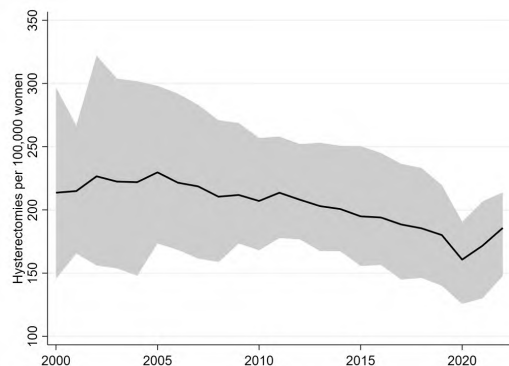
Notes: Annual average number of hysterectomies of any type per 100,000 women across OECD countries, with the shaded area representing the interquartile range (25th to 75th percentile). The number of countries per year ranges from 16 to 32, as available in OECD (2025).

Table 1: **Descriptive statistics**

	Observations	Mean	Std. dev.	Min	Max
Housewife index	378	-0.009	0.692	-1.640	2.980
Female entrepreneurship	378	0.270	0.029	0.214	0.355
Cultural index 1	378	-0.028	0.487	-1.103	1.539
Cultural index 2	378	-0.023	0.526	-1.517	1.617
Cultural index 3	378	-0.022	0.458	-1.103	1.539
Cultural index 4	378	-0.034	0.512	-1.103	1.539
% Benign hysterectomies 40-49 yrs	378	0.889	0.050	0.575	1.000
% Benign hysterectomies ≥50 yrs	378	0.707	0.079	0.279	0.835
% Benign mastectomies 40-49 yrs	378	0.033	0.042	0.000	0.364
% Benign mastectomies ≥50 yrs	378	0.023	0.021	0.000	0.121
% Benign prostatectomies 40-59 yrs	252	0.241	0.121	0.000	0.714
% Benign prostatectomies 60-75 yrs	252	0.224	0.091	0.017	0.611
Heavy smokers	378	6.493	2.593	1	15.040
Obese	378	10.060	1.610	5.790	14.700
Fertility rate	378	1.319	0.139	1.02	1.760
Density of doctors	378	1.773	0.523	0.590	2.722
Beds	378	3.465	0.628	1.961	5.416
Attraction index	378	1.059	0.664	0.200	3.000
GDP	378	74,831.940	78,574.960	3,543.247	390,331.200
Right-wing	378	0.386	0.488	0	1
Own DRGs	378	0.381	0.486	0	1
Da Vinci	378	5.381	4.978	0	19
DRG tariff - Hysterectomy	378	8.794	0.199	8.447	9.440
DRG tariff - Mastectomy	378	8.158	0.185	7.454	8.608
DRG tariff - Prostatectomy	252	8.202	0.111	7.953	8.444
% C-sections	378	0.322	0.057	0.160	0.500

Notes: The discrepancies in the number of observation is due to the fact that data for prostatectomies cover the period 2007-2018, while data for hysterectomies and mastectomies cover the period 2001-2018.

Table 2: **Cultural indexes**

	Cultural index 1	Cultural index 2	Cultural index 3	Cultural index 4
Being a housewife just as fulfilling	✓	✓	✓	✓
Pre-school child suffers with working mother	✓	✓		✓
A woman has to have children to be fulfilled	✓		✓	✓
Worse relationship if working mother	✓	✓	✓	

Notes: All four questions are included in the 1999 WVS wave and in the 2009 EVS wave, while the 2005 WVS wave includes only the first question related to "Being a housewife just as fulfilling".

Table 3: **Results**

	40-49 yrs		≥50 yrs	
	(1)	(2)	(3)	(4)
Housewife index	0.009**	0.008**	0.013***	0.011**
	(0.004)	(0.004)	(0.005)	(0.005)
Female entrepreneurship	-0.376***	-0.636***	-0.651***	-1.136***
	(0.106)	(0.121)	(0.134)	(0.139)
Obs	378	378	378	378
Mean	0.889	0.889	0.707	0.707
Control 1	Yes	Yes	Yes	Yes
Control 2	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Macroareas FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. *Control 1* includes the following information at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system; *Control 2* includes a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for hysterectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: **Robustness: Alternative indicators**

	40-49 yrs		≥50 yrs	
	(1)	(2)	(3)	(4)
Cultural index 1	0.014***	0.015***	0.019***	0.018***
	(0.005)	(0.004)	(0.006)	(0.006)
Cultural index 2	0.011**	0.010**	0.012**	0.010*
	(0.004)	(0.004)	(0.006)	(0.006)
Cultural index 3	0.016***	0.017***	0.022***	0.022***
	(0.005)	(0.005)	(0.007)	(0.007)
Cultural index 4	0.015***	0.016***	0.021***	0.020***
	(0.004)	(0.004)	(0.006)	(0.006)
Obs	378	378	378	378
Mean	0.889	0.889	0.707	0.707
Control 1	Yes	Yes	Yes	Yes
Control 2	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Macroareas FE	Yes	Yes	Yes	Yes

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. *Control 1* includes the following information at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system; *Control 2* includes a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for hysterectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: **Robustness checks: Alternative specifications**

	40-49 yrs				≥50 yrs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housewife index	0.008**	0.008**	0.009***	0.010***	0.011**	0.010*	0.012**	0.012**
	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
Female entrepreneurship	-0.639***	-0.630***	-0.887***	-0.954***	-1.147***	-1.121***	-1.411***	-1.487***
	(0.122)	(0.121)	(0.119)	(0.120)	(0.139)	(0.138)	(0.135)	(0.135)
Obs	378	378	378	378	378	378	378	378
Mean	0.889	0.889	0.889	0.889	0.707	0.707	0.707	0.707
% C-sections	Yes	No	No	Yes	Yes	No	No	Yes
DRG tariff	No	Yes	No	Yes	No	Yes	No	Yes
Da Vinci	No	No	Yes	Yes	No	No	Yes	Yes

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. All specifications include years and macroareas FE and the following controls at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system, a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for hysterectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6: **Results - Mastectomies & Prostatectomies**

	Mastectomies				Prostatectomies			
	40-49 yrs		≥50 yrs		40-59 yrs		60-75 yrs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housewife index	-0.010***	-0.011***	-0.003**	-0.003**	-0.031**	-0.043***	-0.021*	-0.031**
	(0.004)	(0.004)	(0.002)	(0.001)	(0.015)	(0.016)	(0.011)	(0.012)
Female entrepreneurship	-0.052	-0.067	0.031	0.001	0.900*	0.803*	0.813**	0.688**
	(0.123)	(0.140)	(0.050)	(0.054)	(0.464)	(0.449)	(0.369)	(0.345)
Obs	378	378	378	378	252	252	252	252
Mean	0.033	0.033	0.023	0.023	0.241	0.241	0.224	0.224
Control 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control 2	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macroareas FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the share of mastectomies/prostatectomies for benign conditions in all mastectomies/prostatectomies performed in the age group. *Control 1* includes the following information at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system; *Control 2* includes a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. The discrepancies in the number of observation is due to the fact that data for prostatectomies cover the period 2007-2018, while data for mastectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 7: **Results - Difference-in-Difference**

	40-49 yrs	$\geq$50 yrs
	(1)	(2)
DD	-0.039*	-0.057**
	(0.020)	(0.026)
Obs	378	378
Mean	0.900	0.725
All controls	Yes	Yes
Year FE	Yes	Yes
Macroareas FE	Yes	Yes

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. All controls include the following information at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system, a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for mastectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: **Results - Event study**

	40-49 yrs	≥50 yrs
	(1)	(2)
year - 4	-0.010	-0.003
	(0.008)	(0.015)
year - 3	-0.018	-0.017
	(0.013)	(0.021)
year - 2	-0.023	-0.010
	(0.014)	(0.019)
year - 1	-0.017	-0.026
	(0.016)	(0.024)
year 0	-0.022**	-0.031
	(0.011)	(0.020)
year +1	-0.029**	-0.031*
	(0.014)	(0.018)
year +2	-0.028**	-0.040**
	(0.014)	(0.018)
year +3	-0.029	-0.047**
	(0.019)	(0.019)
year +4	-0.028**	-0.042**
	(0.013)	(0.017)
Obs	378	378
All controls	Yes	Yes
Year FE	Yes	Yes
Macroareas FE	Yes	Yes

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. All controls include the following information at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system, a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for hysterectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9: **Heterogeneity analysis**

	40-49 yrs		≥50 yrs	
	Housewife index	Female entrep.	Housewife index	Female entrep.
	(1)	(2)	(3)	(4)
Above-median	-0.016**	-0.059***	-0.023**	-0.086***
	(0.006)	(0.012)	(0.009)	(0.015)
Below-median	-0.078***	-0.020***	-0.119***	-0.032***
	(0.015)	(0.014)	(0.017)	(0.010)
p-value H_o: coefficient identical	0.000	0.000	0.000	0.002
Obs	378	378	378	378

Notes: The dependent variable is the share of hysterectomies for benign conditions in all hysterectomies performed in the age group. All specifications include macroareas and year FE and the following controls at the regional level: the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, fertility rate, the share of heavy smokers out of the population aged 15 and above, the share of obese individuals out of the population aged 18 and above, the index of attraction of the healthcare system, a dummy indicating if the regional governor is right-wing, a dummy indicating if the region applies its own DRG tariffs and the regional GDP. Data for hysterectomies cover the period 2001-2018. Standard errors in parenthesis are clustered at the regional level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix A: Additional Tables and Figures

Table A.1: **Targets and measures included in a repayment plan**

Targets	Planned Measures
Hospital beds and hospitalization rates	Reorganization of the hospital network Reduction of hospital beds and incentives to use outpatient clinics
Pharmaceutical expenditures	(Hospital) Direct distribution of drugs New reimbursement mechanisms for less expensive drugs
Personnel expenditures	Hiring freezing and turn-over stop
Volume and expenditure for private provided services	Set budget targets for private providers Adjusting the reimbursement system to the national level
Expenditures for consumption goods and services	Centralized buying Monitoring to avoid inefficiency
Appropriate prescriptions	Use of health identification cards

Notes: Source: Ministero dell'Economia e delle Finanze (2009).

Table A.2: **Variable definitions**

Main Indexes	Definition
Housewife index	Z-score of the share of respondents agreeing/strongly agreeing agree with: "Being a housewife just as fulfilling" (1999 and 2005 waves of the WVS and 2009 wave of the EVS)
Female entrepreneurship	Share of female sole business owners out of total sole business owners in a region
Cultural index 1	Average z-scores of the share of respondents agreeing/strongly agreeing with all four questions of the 1999 WVS and 2009 EVS
Cultural index 2	Average z-scores of the share of respondents agreeing/strongly agreeing with all questions of the 1999 WVS and 2009 EVS with the exception of "A woman has to have children to be fulfilled"
Cultural index 3	Average z-scores of the share of respondents agreeing/strongly agreeing with all questions of the 1999 WVS and 2009 EVS with the exception of "A pre-school child is likely to suffer if his or her mother works"
Cultural index 4	Average z-scores of the share of respondents agreeing/strongly agreeing with all questions of the 1999 WVS and 2009 EVS with the exception of "A working mother can establish just as warm and secure a relationship with her children as a mother who does not work"

Control 1	
Attraction index	Ratio between hospital migration and immigration indexes
Beds	Number of hospital beds per 1,000 inhabitants in a region
Doctor density	Number of doctors per 1,000 inhabitants in a region
Fertility rate	Average number of children per woman of childbearing age (generally between 15 and 49 years)
Heavy smokers	Share of heavy smokers out of the regional population aged 15 and above
Obese	Share of obese individuals out of the regional population aged 18 and above

Control 2	
GDP	Regional per capita gross domestic product (in euros)
Own DRGs	Dummy=1 if the region has its own DRG tariffs
Right-wing	Dummy=1 if the regional governor is right-wing

Controls for robustness checks	
Da Vinci	Number of Da Vinci surgical systems in a region
DRG tariff	DRG tariff for the related procedure in a region (in euros)
% C-sections	Share of C-sections on low-risk patients in a region