

Female innovative entrepreneurship and maternity risk

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Abstract

This article documents the existence of an intensive margin of the gender gap in innovative entrepreneurship. Not only there are fewer women than men who become entrepreneurs, but female entrepreneurs also hold smaller equity stakes, make less substantial investments, and are less frequently appointed as firm executives compared to their male counterparts. Leveraging the context of emergency contraception deregulation in Italy and varying abortion service accessibility, I find that mitigating maternity risk narrows these gaps. Consequently, female-led firms become riskier and more attractive to venture capital investors during their early stages.

Keywords: entrepreneurship; contraception; gender gap; maternity risk; equity holdings.

JEL classifications: L26, J16, G30, M13.

1. Introduction

Women are 40–50 percent less likely than men to become entrepreneurs, generating the widely acknowledged gender gap in entrepreneurship (Halabisky 2018; Bosma and Kelley 2019). This gender gap is particularly pronounced in firms that are innovative and dependent on external finance, since women account for less than 10 percent of the total number of entrepreneurs in these firms (Coleman and Robb 2009; Calder-Wang and Gompers 2017). Despite the importance of innovative start-up firms for job creation and economic growth (Puri and Zarutskie 2012; Decker et al. 2014), there is limited understanding of whether, conditionally on becoming entrepreneurs, women also participate less intensively or commit fewer resources to their firms compared to men (i.e., whether the gender gap has an intensive margin). This could potentially lead to the formation of inefficient founding teams with important repercussions on the firm's prospects (D'Acunto, Tate, and Yang 2020).

Zandberg (2021) shows that access to reproductive care plays an important role in some women's decision to become entrepreneurs, and studies in labor economics show that motherhood can cause women to select out of high-commitment jobs that require more work hours and penalize them more for career breaks (Bertrand, Goldin, and Katz 2010; Goldin 2014). Since entrepreneurs in growth-oriented and innovative firms work more hours per week than salaried employees and the self-employed (Levine and Rubinstein 2017), maternity risk—defined as the chance of unplanned pregnancy—could play an important role for the marginalization of women in innovative entrepreneurship.

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In this article, I provide novel evidence on the intensive margin of the gender gap in high-growth entrepreneurship and investigate the impact of maternity risk on female participation within founding teams. I document that, compared to men, not only do fewer women select into innovative entrepreneurship, but those who do hold less equity, make smaller investments, and are less likely to assume executive roles. Reducing exposure to maternity risk has a large positive effect on the participation of women in innovative entrepreneurship, both in terms of equity owned and roles held. Moreover, while more female-held equity is unconditionally associated with innovative firms being of smaller size and less likely to attract venture capital, I find that female-owned firms founded under lower maternity risk are instead more likely to attract venture capital investment, and also to enter liquidation in their early stages.

For identification, I exploit the deregulation of emergency contraceptive pills (ECPs) in Italy in May 2015 as a natural experiment. The deregulation allowed women to buy ECPs in pharmacies over-the-counter (OTC; i.e., it removed the need to obtain a prescription from a doctor), reducing Italian women's exposure to maternity risk by making it easier for them to avoid unplanned pregnancies and manage their fertility choices. I exploit differences in women's access to abortion services at the local level to obtain cross-sectional variation in exposure to the shock. In fact, even if abortion has been legal in Italy since 1978, women may have a restricted access to abortion services in areas of the country with fewer abortion providers (Autorino, Mattioli, and Mencarini 2020). The number of providers depends on the density of conscientious objectors (COs) gynecologists in public hospitals, who are gynecologists who refuse to perform abortions on the basis of moral or religious grounds. Therefore, I measure women's access to abortion services at the municipality level, combining a novel dataset on the number of CO gynecologists at the hospital level with travel times between hospitals and municipalities.

I use a difference-in-differences (DiD) research design, comparing entrepreneurial outcomes of women across municipalities differing in the ease of accessing abortion services before and after the deregulation of ECPs. The idea is that abortion and an ECP are imperfect substitutes, and while taking an ECP is not equivalent to having an abortion, increased ECP availability makes abortion services less important for avoiding an unplanned pregnancy. As a result, the increase in availability of an ECP reduces maternity risk more for women who face greater barriers to abortion services.

To measure participation in entrepreneurship, I use Bureau Van Dijk ORBIS data from 2013 to 2017 to reconstruct a large sample of newly incorporated and unincorporated business owners in Italy, their initial equity holdings, and the roles held at founding. I combine these with a policy of the Italian government to identify start-ups with an innovative attitude (Hellmann and Puri 2000). Controlling for age and firm characteristics, female founders in innovative firms hold on average between 10 and 20 percent smaller equity holdings compared to men, and they are also from 30 to 50 percent less likely to be executives. Smaller but significant penalties between female and male founders persist in limited liability companies and unlimited liability partnerships.

This intensive margin of the gender gap is exceptionally sensitive to maternity risk. Post-2015, following increased accessibility of ECPs, the average female founder younger than 35 holds 23 percent (6 percentage points - p.p.) more equity in her innovative start-up, and becomes 72 percent (13 p.p.) more likely to be the main owner, and twice as likely (16 p.p.) to be the executive.¹ These results are concentrated among women living in areas with worse access to subsidized public daycare and that experience a more substantial rise in female political representation at the local level post-ECP deregulation. This suggests that improved access to reproductive care not only reduces the risk of costly unplanned pregnancies, such as increased childcare expenses, but also enhances female empowerment.

¹ Main owners are the founders with the largest equity holding in the founding team, and executives encompass managers with executive powers, like CEOs.

Through these mechanisms, it enables female founders under 35 years to undertake more substantial financial risks and higher-level managerial positions, thereby contributing to the mitigation of the intensive gender gap.

Last, I study whether firms with more equity held by women aged 35 years or younger and founded after ECPs became available OTC perform differently from those founded before. Unconditionally, a 10 percent increase in female-owned equity at founding correlates with a 15 percent reduction in the likelihood of attracting venture capital and a 0.6 percent decrease in venture size. However, for firms established post-deregulation, a 10 percent increase of female-owned equity at inception is linked to a 16 percent (0.4 p.p.) higher chance of securing a venture capital investment within three years, alongside a 13 percent (0.4 p.p.) increase in the likelihood of financial distress in the first year. Overall, the results suggest that, when experiencing lower maternity risk, women engage in entrepreneurial firms that are riskier but also have more upside potential, and are more appealing to institutional investors.

Italy represents an ideal setting to study impact of maternity risk on women's entrepreneurial decisions. Italy has the lowest proportion of women who own and manage a new business in the European Union (Halabisky 2018), and the usage of modern contraceptives in Italy is notably low, as only 51.8 percent of women in a relationship use modern contraceptives, compared to 70 percent in the USA (Loghi and Criallesi 2017). Moreover, according to Bearak et al. (2022), Italy has the second highest abortion rate in the EU after Romania (and twice that of the USA). These statistics suggest that Italian women are particularly exposed to the risk of unplanned pregnancies and face higher social costs in avoiding them. I demonstrate the relevance of my identification strategy by showing its predictive ability for the effect of ECP availability on fertility. One standard deviation higher share of CO gynecologists is associated with a 1 percent decrease in the number of births per fertile woman (~2,500 fewer births) after ECPs are more easily available. This evidence substantiates that ECP availability influences fertility decisions, especially among women facing greater barriers to abortion services.

The DiD design allows me to control both for time-varying macroeconomic shocks and for time-invariant economic and cultural differences at the local level. Furthermore, I fail to find an effect of the deregulation in the sample of women above 36 years of age, and, while I find a positive effect on younger men's participation in innovative entrepreneurship over the same period, this is much smaller in magnitude compared to the one on younger women, and less robust across participation measures. This is evidence that maternity risk is especially relevant for participation of younger women in innovative entrepreneurship, and while younger men are still exposed to paternity risk, this is less salient for their entrepreneurial careers.

My results have important policy implications. Policymakers have devoted attention and resources to designing interventions to foster female entrepreneurship (Halabisky 2018), especially in innovative firms (Lerner 2022). My findings suggest the importance of interventions to promote a work-life balance for mothers and access to paid maternity leave for entrepreneurs. While these are factors frequently considered in policies for female employees (Gatewood, Greene, and Thulin 2014), interventions toward female entrepreneurship rather act through development of role models, mentoring and networking activities (Howell and Nanda 2019), and extended financial support. Therefore, efforts of policymakers may be ineffective without also tackling the importance of maternity risk for female entrepreneurs and, more importantly, for women's demand for entrepreneurship.

My article contributes to the recent literature that explains the gender gap in entrepreneurship and why women start different entrepreneurial firms compared to men, as documented by Guzman and Kacperczyk (2019) and Calder-Wang and Gompers (2017). Studies propose two main explanations for the gender gap. On the one hand, female entrepreneurship could be discouraged by psychological factors, such as attitude toward risk

and competition or self-perception of own abilities (Guiso and Rustichini 2018; Jetter and Walker 2018; Del Carpio and Guadalupe 2022). On the other hand, it could also be hindered by external factors, mainly discrimination by capital providers, like venture capitalists (Assenova and Mollick 2018; Gornall and Strebulaev 2020; Hebert 2020; Calder-Wang and Gompers 2021), and angel and crowdfunding investors (Greenberg and Mollick 2015; Ewens and Townsend 2018; Gafni et al. 2021). I contribute to this literature by showing the relevance of maternity risk as one driver of the gender gap, especially in its intensive margin. Furthermore, I also show that maternity effects help explain the gender gap in firm performance (Du Rietz and Henrekson 2000).

Relatively few papers have addressed the relationship between motherhood and entrepreneurship. Gottlieb, Townsend, and Xu (2021) show that women are more likely to become entrepreneurs during longer maternity leaves that protect them from experimentation risk, but they do not directly examine the effect of maternity leave on entrepreneurs. My results speak in favor of an experimentation channel: reducing maternity risk allows women to invest more and commit more resources to their entrepreneurial ventures. Moreover, my work most closely relates to Zandberg (2021), who assesses the importance of access to abortion and reproductive rights for selection of women into entrepreneurship in the USA. My main contribution is to document how maternity risk affects high-growth entrepreneurship, focusing on team formation, namely the split of equity and the balance of power among men and women within the firm, and the firm's performance. My results suggest that maternity risk may help explain gender homophily in entrepreneurial team formation (Calder-Wang, Gompers, and Huang 2017). These contributions are of particular importance in light of the fact that the equity split at founding and the composition of founding teams are key drivers of the success of start-ups (Hellmann and Wasserman 2017; D'Acunto, Tate, and Yang 2020).

By studying the importance of maternity risk for the participation of women in entrepreneurship, I also contribute to the literature on what drives individuals to become entrepreneurs (Evans and Jovanovic 1989; Levine and Rubinstein 2017, 2018). In studying the effect of the availability of ECPs, I contribute to the literature on the policy drivers of entrepreneurship (Mullainathan and Schnabl 2010; Bruhn 2011; Branstetter et al. 2013). Lastly, I contribute to the economics literature that examines the effects of contraceptives on the economic outcomes of women, starting from the seminal work of Goldin and Katz (2002) and Bailey (2006), and more recently Bailey, Hershbein, and Miller (2012) and Bailey and Lindo (2017), by documenting the importance of fertility control for entrepreneurship. Finally, my article provides causal evidence on the role of maternity as a key barrier to the professional success of women (see Bertrand 2017 for a systematic review of this literature).

The rest of the article proceeds as follows. In Section 2, I outline the institutional background. In Section 3, I describe the data and summary statistics. In Section 4, I provide the identification and estimation strategy. In Section 5, I present the main results and robustness checks. I conclude in Section 6.

2. Institutional background

I start by describing the institutional background of emergency contraception, abortion, and conscientious objection in Italy. Two types of ECPs are available: the ulipristal acetate pill (UPA ECP), also known as 5-days-after pill, and the levonorgestrel pill (LNG ECP), the more established morning-after pill. EllaOne (UPA) obtained approval for sale in November 2011, while Norlevo (LNG) received approval in 2000. The key distinction lies in their efficacy window, with UPA ECPs remaining effective up to 120 h post-intercourse, compared to the 72-h efficacy of LNG ECPs (Glasier et al. 2010). In Italy, both ECPs were available in pharmacies before 2015, but a prescription from a general practitioner was

required. Notably, obtaining EllaOne involved an additional layer of complexity; women had to provide a negative pregnancy test, introducing a burdensome step and societal stigma (AOGOI 2012). This precautionary measure stemmed from concerns that, due to its extended efficacy window, EllaOne might be considered capable of inducing early abortions. However, scientific evidence indicates that both UPA and LNG ECPs do not terminate pregnancies (Levy et al. 2014), ruling out any abortive potential.

As of 2013, Loghi and Crialesi (2017) report that 12.5 percent of women in Italy acknowledged using emergency contraception. Notably, women aged 25–29 years exhibit higher ever-use rates (19.6 percent), with the average age of Italian women seeking emergency contraception being 26 (Bastianelli et al. 2016). Additionally, women with a university degree are twice as likely to have ever used ECPs, compared to those without formal education. This is in contrast with statistics on abortions and it is likely due to information frictions surrounding ECPs availability. Last, use of ECPs is more common in central Italy, compared to the north or the south.

In November 2014, prompted by a request by a UPA ECP manufacturer, the European Medicine Agency recommended abolishing the prescription requirement for UPA ECPs in all EU countries. In January 2015, the European Commission issued an implementing decision mandating all EU countries to transition to an OTC regime for UPA ECPs. The Italian Drugs Safety Agency (AIFA) lifted the prescription and pregnancy test requirements for UPA ECPs on May 8, 2015 and for LNG ECPs on March 3, 2016. Importantly, the move to make ECPs available OTC was unlikely without the EU Commission's implementing decision, particularly given domestic political inclinations, as evidenced by a parliamentary question in 2012 seeking to ban the sale of EllaOne and the fact that the president of AIFA at the time of deregulation, appointed in 2009, hailed from a conservative center-right government, traditionally aligned with pro-life perspectives rather than pro-choice.

By removing the need to obtain a prescription, the OTC regime increases the likelihood that women can procure and administer the drug within its efficacy window. Furthermore, by removing the need to involve a physician, the social cost and the likelihood of incurring a social stigma associated with averting pregnancies declined. Lastly, involving a physician could effectively bar the woman's access to ECPs, since the doctor could refuse to prescribe the pill (Ceva and Moratti 2013). In fact, albeit legally ECPs should not be covered by conscientious objection, a controversial ruling of the Italian Bioethics Committee in 2004 generated confusion and uncertainty on the matter.

On the other hand, abortion in Italy was legalized by Law 194 in 1978 (194/78). The law made abortions legal and available in public hospitals throughout the country. The law also accommodates conscientious objection, allowing gynecologists and nurses in public hospitals to refrain from providing abortion services, safeguarding their constitutional rights to religious, moral, and ethical freedom. This conscientious objection is extended to every doctor who seeks it.

2.1 Start-up Italy act

One of the challenges in studying innovative entrepreneurship is defining which firms are potentially innovative (Hellmann and Puri 2000). To identify a sample of innovative firms, I exploit the Start-Up Italy Act (SIA) passed in December 2012 and rolled over in 2016. SIA's goal is to foster innovative entrepreneurship by giving a series of benefits to recently incorporated firms qualifying as innovative.

To qualify as innovative, a firm must satisfy criteria related to size, sector, and age requirements, along with meeting conditions pertaining to patenting and R&D expenses. Additionally, the founding team must fulfill educational requirements. The benefits of qualification are easier access to bank credit, tax breaks for equity investors, and various exemptions from bureaucratic hurdles. I provide an overview of the SIA requirements and incentives in Table A1 in Supplementary Appendix 1.

According to De Angelis et al. (2017), start-ups incorporated under SIA account for 54 percent and 36 percent of the number and total value of VC deals involving Italian firms between 2012 and 2015, respectively. Also, according to the Italian Ministry of Economic Development (MISE), SIA-incorporated start-ups accounted for 26.2 percent of all Italian firms in scientific research and development (NACE code M-72) and for 8.6 percent of those producing software (NACE code J-62) in 2017.

3. Data and summary statistics

3.1 Abortion and conscientious objectors

I obtain detailed hospital-level data for 2014 and 2015 from the Italian Ministry of Health. This dataset contains information for all 440 public hospitals in Italy with a gynecology residency, including the total number of gynecologists and the subset who are COs. I calculate the number of COs among gynecologists in each hospital in 2014 and 2015 and then average it across time, as a measure of CO around the time UPA ECPs were deregulated in mid-2015.

At the municipality level, I construct a comprehensive measure of barriers to abortion, which integrates travel times to hospitals with the proportion of CO gynecologists at the hospital level. The idea is that a woman living in a given municipality will face higher barriers to abortion services if that municipality is far from hospitals and if there are few non-CO gynecologists in the closest hospitals. In essence, this measure reflects the potential challenges a woman may face when accessing abortion services, factoring in both the physical distance to hospitals and the availability of gynecologists willing to provide these services. The associated costs include not only the actual expenses and time required for travel but also encompass the social and psychological costs associated with more complex abortion procedures, as traveling long distances for an abortion may entail a higher social and psychological toll for women.

I measure the access to abortion services for women residing in a given municipality using a weighted share of COs. I calculate a weighted average of the share of CO gynecologists for every municipality using the inverse of travel times between the municipality and the various hospitals as weights.² Since there may be more than one hospital in a municipality, I aggregate the hospital-level data at the municipality level.³ My measure of access to abortion services (W_m) is then calculated as follows:

$$W_m = \frac{1}{\sum_j w_{mj}} \sum_j w_{mj} CO_j, \quad w_{mj} = \frac{1}{t_{mj}}. \quad (1)$$

Subscript m represents the municipality of interest, and subscript j indexes all the municipalities with at least one hospital. CO_j denotes the share of CO gynecologists in the hospitals of municipality j . The weights, w_{mj} , are calculated as $\frac{1}{t_{mj}}$, where t_{mj} is the travel time by car between municipalities m and j . The functional form $\frac{1}{t_{mj}}$ takes into account that the disutility of travel is non-linear in travel time (Koppelman 1981) and that the marginal disutility of travel decreases in travel time (van Cranenburgh, Chorus, and van Wee 2014). A higher value of W_m indicates higher barriers to abortion services in municipality m .

This approach is consistent with previous studies in health economics that show that longer travel distances are associated with a lower probability of seeking abortion services

² To approximate travel time between a municipality and a specific hospital, I use the travel time between the municipality and that of the hospital. Travel times by car between municipalities are from the Italian Statistical Institute (ISTAT).

³ To do so, I calculate the average percentage of COs in the hospitals located within each municipality, weighted by the total number of gynecologists in each hospital.

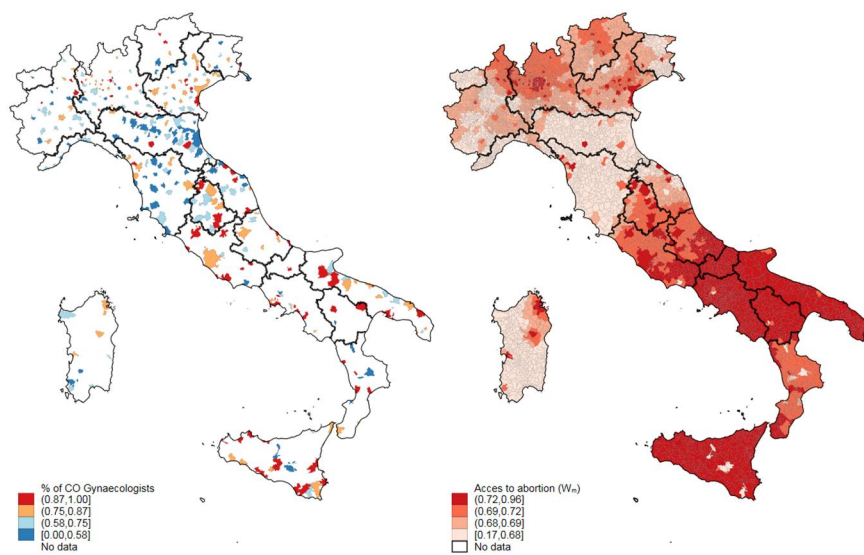


Figure 1. Geographic distribution of access to abortion.

The map on the left shows the average percentage of CO gynecologists in municipalities where hospitals with gynecology residencies are located. The average is weighted by the number of gynecologists in each hospital of the municipality. The map on the right shows the geographical distribution of access to abortion services (W_m) in every municipality, after taking into account travel times to municipalities that have one or more hospitals ($W_m = \frac{1}{\sum_j w_{mj}} \sum_j w_{mj} CO_j$, $w_{mj} = \frac{1}{l_{mj}}$).

(Brown et al. 2020), and measure access to abortion at the local level using travel times to abortion sites (Myers, Jones, and Upadhyay 2019; Lindo et al. 2020; Venator and Fletcher 2021).

Concerning the geographical distribution of barriers to abortion in Italy, Figure 1 displays the percentage of CO gynecologists in all 440 hospitals with a gynecology residency across 311 municipalities. In Italian hospitals, the median of the share of COs among gynecologists is 75 percent, whereas the average is 69 percent. Furthermore, Figure 1 shows the geographical distribution over the 8,092 municipalities in Italy of my measure of barriers to abortion W_m , which has a mean of 0.7, and a median of 0.69. Municipalities where accessing abortion services is more difficult (higher W_m) tend to be clustered in the South (above the 75th percentile) and in the Northeast (above the median).

To explore how barriers to abortion correlate with other municipality characteristics, Table 1 presents the results from regressions of W_m on various indicators of the local economy, including entrepreneurial climate, fertility, and religious and political beliefs. All indicators at the municipality level are measured in 2014, the last year before ECPs became available OTC, and come from a variety of ISTAT databases. Given the pronounced North–South clustering of W_m , I also run the regression including region fixed effects.

Municipalities with higher barriers to abortion services tend to have higher income per-capita, lower employment rates, and be more urban, as measured by the percentage of land not used for agricultural activities. Moreover, barriers to abortion are higher in municipalities in which there are more births, and with stronger religious sentiment and conservative political beliefs, as proxied by the share of weddings celebrated with religious rites and share of votes in favor of center- and far-right parties in 2014 European elections. I find that access to abortion services does not correlate with the size of the municipality, as measured by total population, and with entrepreneurial and innovation outcomes, measured as

Table 1. Barriers to abortion services and municipality characteristics.

Regression of barriers to abortion (W_m) on various measures of employment, income, and population at the municipality level. W_m is defined according to Equation (1): weighted average of the share of COs among gynecologists in Italian hospitals, using the inverse of the travel time between municipality m and each hospital as weights. In column 2, I include region fixed effects. Regressions are cross-sectional and municipality-level variables are measured in 2014, the year before ECPs became available OTC. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) W_m	(2) W_m
Right-wing voting (%)	0.054** (0.022)	0.015** (0.007)
Religious weddings (%)	0.020*** (0.004)	0.005*** (0.001)
Ln(Population)	0.337** (0.154)	0.028 (0.076)
Land use (%)	0.047*** (0.014)	0.038*** (0.009)
Employment rate (%)	-0.147*** (0.029)	-0.027** (0.012)
Per-capita income (Th. €)	-0.135** (0.056)	0.069* (0.036)
Live births per 1,000 women	0.020* (0.010)	0.008** (0.003)
Firms per 1,000 inhabitants	-0.008* (0.004)	-0.003 (0.002)
High-tech workers (%)	0.011 (0.012)	0.006 (0.007)
Observations	7,886	7,886
R ²	0.324	0.713
Fixed effects		
Region	No	Yes
Mean Dep. Var.	0.699	

the number of firms per 1,000 inhabitants and the number of workers in high-tech professions per 100 workers.

3.2 ORBIS and entrepreneurship

I gather information on a large sample of firms founded in Italy from 2013 to 2017. The primary data source is the ORBIS database by Bureau Van Dijk, which compiles administrative information disclosed by firms (Kalemlı-Özcan et al. 2024). For each firm, I collect the date of incorporation, the legal form, the NACE four-digit industry code, the first balance sheet, whether and when the firm has been liquidated, and a unique tax identifier.

I obtain information about firm founders from the ORBIS historical offline database, which contains filings of Italian firms regarding owners of equity and the date of the filing. Members of founding teams are identified as equity owners listed on the first available filing within 20 months from incorporation (i.e., the deadline to file the first balance sheet reporting ownership information). ORBIS provides information about the municipality where each founder lives and their equity holding in the firm, as a percentage of total equity.

Founders are identified by their unique Italian fiscal code. This code, constructed using a deterministic algorithm utilizing biographical information, allows for the recovery of

gender, municipality, and date of birth of the individual (Stazi et al. 2002). From ORBIS, I also obtain information about the first executives of the firm, identified as those who are appointed as either Chief Executive Officer (Amministratore Delegato) or General/Managing Partner (Socio Accomandatario) within 20 months of incorporation.

To identify the start-ups incorporated under the SIA program, I obtain the list of names and unique tax identifiers of firms participating in the program from January 2013 to December 2017 from the Italian MISE. This list includes information on which of the requirements the start-up fulfilled at the time of enrollment. Using the unique tax identifier, I extract information about the start-ups and their founding teams from the ORBIS databases. Last, I obtain data on all venture capital deals involving Italian firms between 2013 and 2020 from CB Insight and Preqin. I then manually match the deal-level data to the list of firms incorporated under the SIA program using firm names.

I end up with a list of 9,039 innovative start-ups incorporated under the SIA between 2013 and 2017. I obtain information for 26,454 founders of 8,838 start-ups (98 percent of the list) from ORBIS. Out of 8,838 start-ups with a founding team, information on executives at founding is available for 6,940 start-ups (79 percent of the start-ups with a founding team), for a total of 7,845 executives.

Furthermore, I identify a total of 1,467,051 new firms, founded between 2013 and 2017, with 1,951,295 founders and 1,411,407 executives. Innovative start-ups constitute 0.5 percent of all new firms, and their founders for 1.2 percent of all new entrepreneurs. Summary statistics for the entire population of new founders, categorized by different firm and founder characteristics, are presented in Table 2. In Panel A, I present summary statistics for the full sample of founders. The average founder has an equity stake of 74 percent, for an investment of €5,600.⁴ In addition, the average founder is 41 years old, and 65 percent of all founders are also executives in their firms. Additionally, 81 percent of founders are main owners, while only 32 percent are women, underscoring the presence of a gender gap in entrepreneurship.

Panel B presents summary statistics for the founders of innovative start-ups. Compared to the overall population of founders, the average innovative founder holds a smaller share of equity and is less likely to be main owner or serve as executive of the start-up. This is consistent with innovative start-ups having larger founding teams, where the average number of founders is 6, with a median of 4 members. Moreover, the average innovative founder is slightly older (42 years of age) and much less likely to be a woman. Notably, only 20 percent of innovative founders are women, showing that the gender gap is more severe in innovative start-ups.

Lastly, Panels C and D provide summary statistics for founders who are female and 35 years of age or younger, who are the focus of the main analysis.⁵ In Panel C, all firms are considered, while in Panel D only innovative start-ups are considered. When compared with the average founder of the respective population, women aged 35 years or younger hold less equity, make smaller investments, and are less likely to be main owners and executives.

Regarding sectoral and geographical distribution, Table A2 in Supplementary Appendix 1 offers summary statistics of the NACE sectors and macro-regions (NUTS1) of new firms and innovative start-ups. Innovative start-ups tend to concentrate in ICT and R&D sectors (NACE sectors J and M), which combined account for almost 70 percent of the total.

⁴ Investment is computed by multiplying the percentage of equity held at founding with the book value of equity derived from the first balance sheet. This information is available only for founders of limited liability companies, as unlimited liability partnerships are not required to file balance sheet information.

⁵ According to Bastianelli, Farris, and Benagiano (2005) and Bastianelli et al. (2016), the average Italian women requesting an ECP is 26 years of age, with fewer than 9 percent older than age 30. Moreover, around 70 percent of women who get an abortion in Italy are below 35, while the average age at first child was 30.7 in 2014 (Loghi and Crialesi, 2017). Lastly, Scheffer et al. (1999) estimate that between 35 and 37 women experience a structural shift in the decline rate of antral follicles, a strong predictor of infertility.

Table 2. Summary statistics—entrepreneurship.

Summary statistics for variables from the ORBIS database used in the empirical analysis for different samples of founders. In Panel A, founders of all age, gender, and type of firm are included. Panel B reports summary statistics for founders of innovative start-ups only, irrespective of gender and age. In Panel C, only female founders aged 35 years or younger are included, irrespective of the type of firm. Panel D reports summary statistics for the sample of female founders of innovative start-ups aged 35 years or younger.

	<i>N</i>	<i>Mean</i>	<i>Std Dev.</i>	<i>5th pct.</i>	<i>Median</i>	<i>95th pct.</i>
Panel A: Full population of founders						
Equity %	1,951,295	74.110	34.121	10.000	100.000	100.000
Director	1,951,295	0.646	0.478	0.000	1.000	1.000
Main Owner	1,951,295	0.811	0.391	0.000	1.000	1.000
Investment ('000 €)	615,807	5.592	15.584	0.045	2.500	18.000
Age	1,951,295	40.827	12.739	22.000	40.000	64.000
Female	1,951,295	0.319	0.466	0.000	0.000	1.000
W_m	1,951,295	0.715	0.067	0.607	0.713	0.835
Panel B: Full population of founders of innovative start-ups						
Equity %	22,709	30.459	27.198	1.000	24.880	99.000
Director	22,709	0.184	0.387	0.000	0.000	1.000
Main Owner	22,709	0.467	0.499	0.000	0.000	1.000
Investment ('000 €)	22,709	5.879	20.467	0.020	2.000	19.610
Age	22,709	42.094	12.001	25.000	41.000	64.000
Female	22,709	0.203	0.402	0.000	0.000	1.000
W_m	22,709	0.709	0.065	0.604	0.706	0.827
Panel C: Female founders ≤ 35						
Equity %	234,483	76.659	33.037	10.000	100.000	100.000
Director	234,483	0.639	0.480	0.000	1.000	1.000
Main Owner	234,483	0.826	0.379	0.000	1.000	1.000
Investment ('000 €)	61,603	3.951	9.245	0.020	1.800	10.000
Age	234,483	28.128	4.671	20.000	29.000	35.000
Female	234,483	1.000	0.000	1.000	1.000	1.000
W_m	234,483	0.719	0.069	0.607	0.717	0.840
Panel D: Female founders of innovative start-ups ≤ 35						
Equity %	913	28.504	24.127	1.200	25.000	88.000
Director	913	0.151	0.358	0.000	0.000	1.000
Main Owner	913	0.459	0.499	0.000	0.000	1.000
Investment (€)	913	3.384	6.380	0.030	1.500	10.350
Age	913	29.588	4.128	21.000	30.000	35.000
Female	913	1.000	0.000	1.000	1.000	1.000
W_m	913	0.721	0.072	0.604	0.715	0.841

In contrast, these sectors represent less than 10 percent of all new firms. Among all new firms, the most prominent sectors are wholesale and retail, along with the accommodation and food industry.

Geographically, nearly a third of innovative start-ups are located in the Northwest. However, the remaining portion of the sample is relatively evenly distributed across the other regions of Italy: the Northeast, Center, and South. Notably, innovative start-ups exhibit a higher concentration in the north compared to other new firms, indicating that the south may present a more challenging environment for innovative entrepreneurship.

Given that founder information is derived from administrative sources, I have limited information about their education or work experience. To supplement this, I hand-collect data on prior education and work experience for the sample of female founders of

innovative start-ups younger than 35 years. This information is gathered through web searches and social media, with matching based on name, gender, age, and the name of the firm. Although the full sample of founders cannot be matched, [Figure A1 in Supplementary Appendix 1](#) demonstrates that the matched sample is representative in terms of the year of incorporation, NACE sectors of the firms, and the age and geographic area of the founders.

4. Identification and estimation strategy

[Table 2](#) shows that women tend to hold less equity in their firms compared to men, and they are also less likely to be the main owner or executive of the firm. In order to further investigate this gender gap in participation, I estimate the following regression model:

$$y_{ij} = \alpha + \beta \text{Female}_i + \mu_m + \gamma_i + \Phi_j + \varepsilon_{ij}, \quad (2)$$

where subscript i indexes the founder, and subscript j the firm. Subscript m denotes the municipality where the founder resides, which may differ from the municipality where the firm is located. *Female* is a dummy equal to one if founder i is a woman, and zero otherwise. The unit of observation is a founder–firm pair, and the sample is restricted to founders of firms founded before the deregulation of ECPs. To study how the participation of men and women differs in newly founded firms, I consider a variety of founder–firm-level outcomes (y_{ij}): percentage of total equity held at founding, probability of being the main owner, probability of being an executive, and initial monetary investment.

The regressions control for fixed effects for the founder's municipality (μ_m) and age (γ_i), as well as for a vector of firm characteristics (Φ_j). The firm characteristics considered are: four-digit industry code (NACE), legal form, and number of founders. In alternative specifications, these are substituted with firm fixed effects to directly compare men to women within the same firm.

Next, to study the causal effect of maternity risk on female participation in innovative entrepreneurship, I use a DiD approach. I compare the evolution of several outcomes of female founders around the deregulation of ECPs (May 2015) across municipalities with varying access to abortion services (W_m). In this part of the analysis, I restrict the estimation sample to female founders of age 35 years or younger. I estimate the following regression model:

$$y_{ijmt} = \alpha + \beta(\text{Post}_t \times W_m) + \mu_m + \tau_t + \text{Post}_t \times \rho_r + \Phi_j + \varepsilon_{ijmt}, \quad (3)$$

where subscript i represents the founder, and subscript j the firm. Subscript m denotes the municipality where the founder resides and t denotes the quarter when the firm is incorporated. The unit of observation is a founder–firm pair, and each founder within a firm is observed only at founding. According to [Equation \(1\)](#), W_m measures barriers to abortion services at the municipality of the founder, whereas Post_t is a dummy variable equal to 1 if the firm is founded after the deregulation of ECPs, and 0 otherwise. The coefficient of interest, and DiD estimator, is β .

All regressions include fixed effects for the quarter of incorporation (τ_t) of the firm and for the founder's municipality (μ_m) to fully saturate the model and control for differences between municipalities with high and low W_m . Moreover, I also include fixed effects for the firm's characteristics (Φ_j) as in [Equation \(2\)](#) (four-digit NACE sector code, number of founders, and legal form) and the region of the founder's municipality (ρ_r) interacted with the *Post* dummy. In additional specifications, all the fixed effects for the firm's characteristics are separately fitted for the pre- and post-OTC periods, by also including the fixed effect for the variable interacted with the post-deregulation dummy ($\text{Post} \times \Phi_j$). The reason

for including such a stringent fixed-effect structure is that I am comparing non-randomly drawn cross-sections of new founders before and after the deregulation, rather than observing the same founder before and after the shock (i.e., panel data). This means I have to control for time-varying compositional changes in the pre- and post-deregulation samples, as these can act as omitted variable bias (Cunningham 2021, Zeldow and Hatfield 2021).

The rich set of fixed effects helps to mitigate omitted variable bias. Specifically, the time-varying region fixed effects ($Post_t \times \rho_r$) allow me to compare founders living in different municipalities within the same region, controlling for different trends around the OTC availability of ECPs in municipalities across different regions. In particular, this helps mitigate bias arising from comparing the north to the south of the country when working with Italian data.⁶

Moreover, the set of fixed effects for firm characteristics (Φ_i) is essential to precisely estimate the effect of maternity risk on founder-level outcomes. The inclusion of granular fixed effects for the size of the founding team allows me to interpret any effect on the share of equity as a result of a female founder becoming more important, rather than a female founder potentially joining smaller founding teams after ECPs become available OTC. Similarly, since firms with different legal forms have different requirements in terms of initial capital contributions, the inclusion of fixed effects for different legal forms is essential for the interpretation of investment results (e.g., in Italy, the minimum initial capital contribution is €10,000 for limited companies, but it is €50,000 for joint-stock companies).

Standard errors in all regressions are clustered at the municipality level, as women living in the same municipality might share several common factors besides access to abortion. Also, clustering at the municipality level accounts for serial correlation in the policy variable and time-varying shocks. Furthermore, in all regressions, W_m is standardized to have a mean of 0 and a standard deviation of 1. Consequently, interaction coefficients in the tables can be interpreted as the effect of facing barriers to abortion services that are 1 SD higher around the period of ECP deregulation.

The fundamental identifying assumption in the DiD framework is that outcomes for women in municipalities with higher and lower barriers to abortion services would have followed parallel trends, absent the deregulation of ECPs. While this assumption is not directly testable, I decompose the main effects in half-yearly DiD coefficients to show that municipalities with better and worse access to abortion exhibited parallel trends in women's outcomes prior to the deregulation of ECPs. To achieve this, I include interactions between half-yearly dummy variables and W_m in the following regression equation:

$$y_{ijmt} = \alpha + \sum_{k=2013h1}^{2017h2} \beta_k (\tau_k \times W_m) + \mu_m + \tau_t + Post_t \times \rho_r + \Phi_j + \varepsilon_{ijmt}, \quad (4)$$

where τ_k is the vector of half-yearly dummies interacted with W_m . The choice of half-yearly dummies is aimed at ensuring sufficient observations for precise coefficient estimation while simultaneously providing a compelling argument regarding pre-trends in outcomes. In addition, I include the same set of fixed effects as in the main analysis.

Lastly, I investigate how the increased availability of ECPs for founders affected firms by studying how the level of female-representation affects the firm's outcome. Since explaining firm-level outcomes with founder-level independent variables would result in bias (Foster-Johnson and Kromrey 2018), I aggregate the data at the firm level by summing the shares of equity held by women aged 35 years or younger (Croon and van Veldhoven 2007). Subsequently, by interacting this variable with the *Post* dummy, I compare the performance of firms started before and after the deregulation of ECPs, on the basis of their share of

⁶ For example, Salvati et al. (2020) and Zambon et al. (2020) find that Italian regions show strong heterogeneity in trends and dynamics of fertility, with important repercussions on economic outcomes of individuals.

equity held by female founders younger aged 35 years or younger (female participation henceforth). While the result of this analysis cannot be directly interpreted as the causal effect of increasing female participation on the firm's performance, it is suggestive of how the correlation between female participation and firm outcomes changed in firms founded before and after the deregulation of ECPs. The underlying assumption is that higher female participation in firms established post-deregulation originates from female founders in areas with limited abortion service access holding larger equity shares. The model I estimate is as follows:

$$y_{jt} = \alpha + \beta \text{Female Equity}_j \times \text{Post}_t + \lambda \text{Female Equity}_j + \Phi_j + \text{Post}_t \times \Phi_j + \varepsilon_{jt}, \quad (5)$$

where Φ_j are fixed effects for firm characteristics, as in Equation (3). These are all fitted independently for the pre- and post-OTC periods, with standard errors clustered at the municipality of the firm.

Firm-level outcomes (y_{jt}) are: logarithm of total assets, an indicator for venture capital investment, and an indicator for financial distress. Outcomes are measured at the end of the first, second, and third year of the life of the firm. Moreover, I also consider indicators for each of the requirements fulfilled by the firm upon enrollment in the Start-Up Italy program. These requirements pertain to R&D expenses, patents, and average education level of the employees, as outlined in Table A1 in Supplementary Appendix 1.

5. Results

5.1 Gender gap in participation in entrepreneurship

I document a gender gap in the intensity of women's involvement into the firm conditionally on being a founder, complementing existing literature that has identified analogous gaps in both the prevalence of female entrepreneurs and their propensity to secure funding. Table 3 shows results from estimating Equation (2) on the several aforementioned measures of founders' participation in the sample of innovative start-ups.

I find a consistent gender gap among founders of innovative start-ups across all participation metrics. On average, female founders hold 2.5 percentage points less equity than their male counterparts. Considering that the typical founder in innovative start-ups owns twenty-five percentage points of equity, this translates to a 10 percent reduction in equity held by women compared to their male counterparts. The gap widens to nearly 20 percent (4.4 percentage points) when comparing men and women within the same firm by incorporating firm fixed effects. Similar gaps exist in the probability of being the main owner and the amount invested at founding, with women being up to 20 percent less likely to be a main owner and investing up to €1,000 less than comparable male founders. Notably, a more pronounced gender gap emerges in the probability of holding an executive position at founding, with female founders being 30–50 percent less likely to assume executive roles compared to their male counterparts. Analogous, albeit smaller, gaps are identified in female participation within limited liability companies and unlimited liability partnerships. Further details and results for these types of firms are available in Tables A3 and A4 in Supplementary Appendix 1. These findings underscore that not only do fewer women become entrepreneurs, but when they do, they invest less, own smaller equity shares in their firms, and are less likely to hold executive roles—particularly so in innovative and risky entrepreneurial ventures.

5.2 Maternity risk, contraception, and fertility

I start studying the effect of the introduction of the OTC availability for ECPs, by documenting its impact on sales of different ECPs. As illustrated in Figure 2, the removal of the prescription requirement had a large effect on the sales of EllaOne, the 5-days-after ECP.

Table 3. Intensive margin of the gender gap in entrepreneurship

Regression of individual founder's participation outcomes on a dummy variable equal to one if the founder is a woman. The outcomes considered are equity holdings, probability of being main owner, probability of being executive, and investment (in 000's €). The regressions for columns 1, 3, 5, and 7, include fixed effects for founder's age and municipality as well as for firm's characteristics (number of founders, legal form, quarter of incorporation, and NACE four-digit industry code). In the regressions for columns 2, 4, 6, and 8, fixed effects for firm characteristics are replaced by firm fixed effects. The sample is restricted to founders of innovative start-ups founded before the deregulation of ECPs (i.e., second quarter of 2015). Standard errors are clustered at the municipality level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Equity		Ownership		Executive		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female Dummy	-2.523*** (0.604)	-4.404*** (1.013)	-0.045*** (0.016)	-0.072*** (0.023)	-0.048*** (0.011)	-0.061*** (0.017)	-0.975*** (0.307)	-0.883*** (0.336)
Fixed effects								
Municipality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Founder age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Four-digit industry	Yes	No	Yes	No	Yes	No	Yes	No
Legal form	Yes	No	Yes	No	Yes	No	Yes	No
Number of founders	Yes	No	Yes	No	Yes	No	Yes	No
Firm	No	Yes	No	Yes	No	Yes	No	Yes
Observations	6,892	6,321	6,892	6,321	6,892	6,321	6,852	6,321
R ²	0.631	0.558	0.354	0.560	0.286	0.465	0.427	0.810
Mean Dep. Var.	24.760		0.412		0.148		4.456	

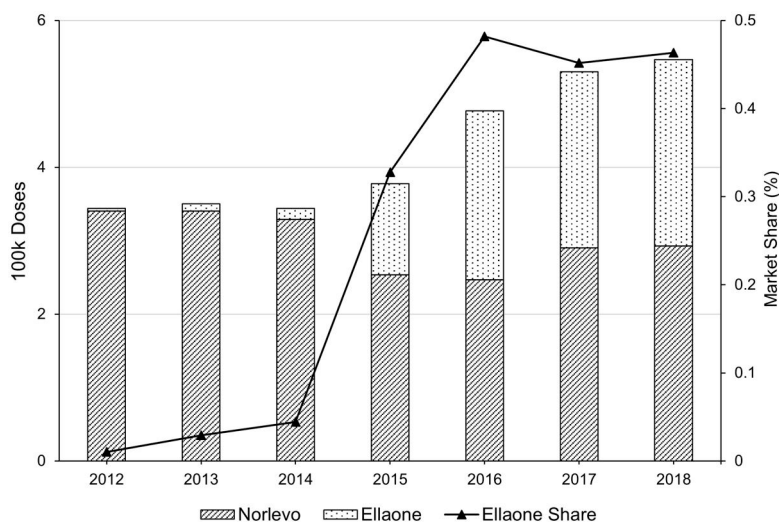


Figure 2. Sales of ECPs.

Evolution of the number of doses sold yearly of EllaOne (dots) and Norlevo (stripes) in Italy between 2012 and 2018. The black line represents the evolution of EllaOne’s market share in the market for ECPs. Source: Federpharma.

Specifically, its sales surged by more than 700 percent in 2015 compared to the preceding year. This pronounced effect can be partially attributed to the substitution between types of ECPs, particularly as the morning-after pill (Norlevo) only transitioned to OTC availability in March 2016. Notably, the market share of EllaOne expanded from 5.5 percent at the beginning of 2015 to almost 50 percent by the end of 2016. Yet, the overall market for emergency contraception experienced a 38 percent growth over the same period. A study by [Nappi \(2019\)](#) estimates that up to 2 percent of all women in their fertile age were able to access emergency contraception in 2015 and 2016 as a result of the deregulation of ECPs.

Next, I show the relevance of the deregulation of ECPs for women’s maternity risk. Given the unobservable nature of maternity risk, I test whether increased accessibility of ECPs affected fertility outcomes. If ECPs are an efficient way to avert pregnancy, the number of births should decrease after their deregulation. Additionally, if unplanned pregnancies are more prevalent where barriers to abortion access are higher, births should decrease more in these municipalities. I use data spanning from 2012 to 2017 on the number of children born per 1,000 women of fertile age (conventionally defined as 49 years or younger) and of younger age (35 years or younger) at the municipality level from ISTAT as an outcome variable of the DiD.

[Table 4](#) shows that a 1 SD higher barrier to abortion services is associated with a nearly 1 percent reduction in fertility during the post-deregulation period, equivalent to a decrease of 0.5 percent annually (translating to 2,500 fewer births). The effect is bigger than what is documented in previous studies on OTC availability of ECPs in the USA, as [Mulligan \(2016\)](#) finds that it led to a decrease of around 0.2 percent per year in fertility, while [Gross, Lafortune, and Low \(2014\)](#) and [Durrance \(2013\)](#) find no effect.

In [Figure 3a](#), I present a visualization of the yearly DiD coefficient. The plot shows that municipalities with different access to abortion had similar fertility levels up to the time ECPs became readily available, conditional on municipality, year, and region \times Post fixed-effects. After the deregulation of ECPs, fertility in lower-access municipalities declined more, but by 2017, the difference in fertility between municipalities is no longer

Table 4. ECPs and fertility.

Effect of the deregulation of ECPs on birth rates of women younger than 49 years and women aged 35 years or younger. The unit of observation is a municipality-year pair, and the sample is the panel of all Italian municipalities between 2012 and 2017. W_m is defined as weighted average of the share of COs among gynecologists in Italian hospitals, using the inverse of the travel time between municipality m and each hospital as weights. Standard errors are clustered at the municipality level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Births (/1,000 women)	(1) ≤49	(2) ≤35
$W_m \times Post$	- 6.580** (2.930)	- 16.517** (6.973)
Observations	48,366	48,359
R^2	0.327	0.317
Fixed Effects		
Municipality	Yes	Yes
Year	Yes	Yes
Region \times (1 + $Post$)	Yes	Yes
Mean Dep. Var.	37.58	86.56

statistically different from zero. This pattern mirrors the dynamics observed in the introduction of the contraceptive pill in the USA (Ananat and Hungerman 2012), and it follows directly from the nature of the identification strategy.

The identification strategy hinges on the premise that enhanced access to ECPs is more crucial for women encountering greater obstacles in accessing abortion services. However, the cost of obtaining an ECP is arguably lower—both physically and psychologically—than that of obtaining an abortion. Consequently, once ECPs are more readily accessible, all women would eventually opt for their use, thereby eliminating differences in the risk of unplanned pregnancies across women with different access to abortion services. Figure 3b illustrates the evolution of the average number of births per 1,000 women under the age of 35 years in municipalities with worse and better access to abortion. For ease of presentation, I categorize municipalities in above and below the median of the mediator W_m . Fertility decreases in all municipalities after the deregulation relative to the pre-deregulation trend. However, the effect materializes from 2015 in municipalities with worse access to abortion, while only manifesting from 2017 in municipalities with more accessible abortion services. Moreover, the dynamic of the effect on fertility aligns with the evolution of the number of abortions in the same period. As illustrated in Figure A2 in Supplementary Appendix 1, the number of abortions experienced its most substantial year-on-year decrease (exceeding 8 percent) in 2015, with subsequent years witnessing more moderate declines. This concordance in patterns suggests that the availability and usage of ECPs played an important role in shaping fertility outcomes during the observed period.

Even if I cannot observe consumption of ECPs across municipalities, the observed trends in fertility in Figure 3b suggest that municipalities with worse access to abortion may experience a larger take up of ECPs when they become available without a prescription. In contrast, municipalities with better access may expand their take up later. As a result, access to abortion may not significantly impact fertility in the medium term. Despite the permanence of the regulatory change, my identification strategy primarily captures a short-term treatment effect. Other plausible mechanisms consistent with the transitory nature of the effects include attention and substitution channels. On the one hand, the attention channel operates through the heightened public debate sparked by the deregulation of EllaOne. It raised

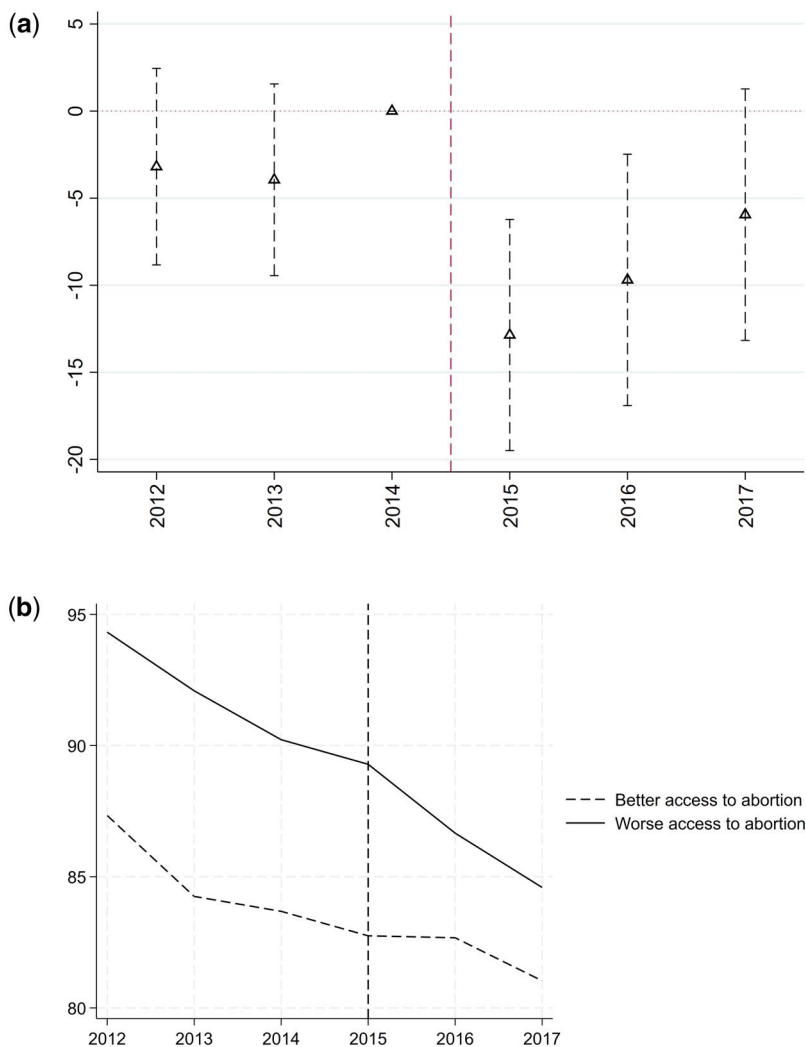


Figure 3. Evolution of births.

Panel A shows the visual representation of the DiD framework for the number of births per 1,000 women in fertile age. Each triangle represents the coefficient (β_k), plotted with 95 percent confidence intervals, of the interaction between a yearly dummy and W_m from estimation of equation $y_{mt} = \alpha + \sum_{k=2012}^{2017} \beta_k (\tau_k \times W_m) + \mu_m + \tau_t + Post_t \times \rho_t + \varepsilon_{mt}$. The last pre-deregulation interaction (2014) is dropped. Panel B shows the evolution of the average number of births per 1,000 women younger than 35 in municipalities with better (dashed line) and worse (solid line) access to abortion. Municipalities are considered having better (worse) access to abortion if w_m is below (above) median. The vertical dashed line indicates the deregulation of EllaOne. (a) Annual DiD coefficients—Births per 1,000 women in fertile age. (b) Group averages—Births per 1,000 women ≤ 35 .

awareness of these contraceptives, particularly among women more exposed to maternity risk. This is corroborated by Figure A3 in Supplementary Appendix 1, illustrating that both mentions in newspapers, as reported in Down Jones Factiva database, and Google interest for the term “EllaOne” spiked following the deregulation in 2015, suggestive of an increase in public attention toward the drug, and then decreased. On the other hand, the substitution channel acts through women’s easier access to EllaOne compared to Norlevo,

before its deregulation in 2016. Since EllaOne has a higher and longer efficacy (Glazier et al. 2010), this would lead to fewer pregnancies. Indeed, Arisi (2017) estimates that substituting LNG with UPA ECPs helped preventing 5,132 unplanned pregnancies in Italy in 2015, the year in which the most substantial effect is observed. In the medium term, following the deregulation of Norlevo in 2016, the market share of EllaOne begins to decline (as depicted in Fig. 2), and the substitution channel wanes.

Since data on fertility at the municipality level are not available by women's characteristics, it is not clear that the reduction in fertility caused by the deregulation affects the specific demographic group of women likely to become founders of innovative start-ups. Importantly, prospective founders may be less inclined to require emergency contraception (e.g., they may be more prone to use regular contraceptives) or more likely to be able to obtain it even before the deregulation.

According to Loghi and Crialesi (2017), the typical user of emergency contraception in Italy in 2013 (i.e., before the deregulation) was 25–29 years old and possessed some formal education (i.e., a high-school degree or higher). Specifically, while 12.5 percent of Italian women declared to have ever used emergency contraception, this proportion was higher for younger and more educated women. While 18.3 percent of women aged 18–24 years ever used it, 19.6 percent of women aged 25–29 years did, and 15.6 percent of women aged 30–34 years. Furthermore, 16.6 percent of women with a university degree used emergency contraception, compared to 13.2 percent for women with a high-school diploma and 8.4 percent of those without education. Overall, before the liberalization, the typical user of emergency contraception in Italy was a woman between 18 and 29 years of age with a university degree—characteristics that resemble those of potential innovative female founders.

The observation that potential prospective founders were already using emergency contraception even before the deregulation raises questions about whether this specific demographic group of women has been significantly affected by the regulatory change. If the deregulation affected more women in other groups, I should observe a shift in the composition of consumers of ECPs after the deregulation. From ISTAT, I obtain estimates of the ever-use of ECPs by women's educational attainment and professional status as of 2019, post-deregulation. These estimates are derived from the European Health Interview Survey, the main survey used to assess the health status and health care use of the population in the European Union. Table A5 in Supplementary Appendix 1 compares the ever-use estimates in 2013 and 2019. I find that the profile of the average ECP user did not undergo significant changes from 2013 to 2019. Specifically, the ever-use frequencies as of 2019 were 16.4 percent for university-educated women, 12.6 percent for women with a high-school diploma, and 8.1 percent for women without formal education. Regarding geography, women in Northern Italy, where more than half of innovative start-ups are located according to Table A2, became more likely to use ECPs (13.9 percent versus 16.7 percent), while those in Central Italy decreased their use (14.7 percent versus 12.9 percent). Conversely, women in Southern Italy, those facing stricter barriers to accessing abortion services did not significantly changed their ever-use (8.2 percent versus 8.1 percent). Last, women in full employment are the most likely to have ever-used an ECP (13.9 percent), followed by unemployed women (11.1 percent), students (10.8 percent), and domestic workers (8.3 percent).

The evidence presented in this section indicates that women with characteristics compatible with those of prospective founders of innovative start-ups were already using emergency contraception before its deregulation, and they continued to be the primary users of these drugs thereafter. Consequently, it is likely that the reduction in fertility caused by the deregulation ECPs effectively impacted this group of women. To further substantiate this conclusion, I show that, at the national level, groups of women comparable to prospective founders experienced a larger decrease in fertility following the deregulation. In Table A6

in Supplementary Appendix 1, I regress births per 1,000 women in an age-bin \times professional status cluster on the interaction of a dummy *Post* (equal to one after 2015) and a dummy *Treated_{AP}*, equal to one for women aged 20–39 years and in full employment. Following the deregulation, there are 4 fewer births per 1,000 women among women in full employment aged 20–39, almost 25 percent of the cross-sectional mean. Additionally, I use data on births by educational attainment of the woman to perform a similar analysis. I define a dummy *Treated_E* equal to one for women with a bachelor degree or higher and zero otherwise. Then, I regress the number of births per 1,000 women by educational attainment on the interaction of *Treated_E* and *Post*. Following the deregulation, the group of women with at least a bachelor degree records 1.5 fewer births per 1,000 women, or 10 percent of the cross-sectional mean.

Therefore, following the deregulation of ECPs, births decreased more among women similar in age, education level, and professional status to the founders in my sample. Unfortunately, due to the lack of geographical variation in the data, I cannot test whether these effects are more pronounced in areas of the country with worse access to abortion. Nonetheless, in the absence of microdata on consumption of ECPs by individual founders, this section provides evidence of a “first-stage” for the effect of the deregulation of ECPs on fertility, most likely among women similar to the founders in the sample.

5.3 Maternity risk and participation in entrepreneurship

I next examine how maternity risk affects participation of women in entrepreneurship, focusing on innovative start-ups. I consider the four measures of involvement for which I document a gender gap: percentage of equity held, probability of being the main owner, probability of being an executive, and initial monetary investment. I compare these various measures at founding for women living in municipalities with different access to abortion services in firms founded in the pre- and post-deregulation periods. I restrict the sample to female founders aged 35 years or younger in innovative start-ups. Table 5 presents the estimates of Equation (3), both excluding and including interactions between fixed effects for firm’s characteristics and the *Post* dummy. I illustrate the results in Figure 4 by plotting half-yearly DiD coefficients from Equation (4).

Panel A of Figure 4 shows that the average equity stake of female founders of innovative start-ups living in areas with worse access to abortion services increases more once ECPs become available OTC. The effect is stronger in the first 12 months and gradually diminishes, consistently with the dynamics of the effect on fertility shown in Figure 3. According to columns 1 and 2 of Table 5, a 1-SD increase in W_m corresponds to a 4.5 to 6 percentage point increase in the average equity stake of younger women following the deregulation of ECPs.⁷ The increase corresponds to 23 percent of the average founder’s holdings and 120 percent of the average pre-deregulation gender gap in equity holdings. This shows that providing young women with effective means to manage maternity risk contributes to a more equitable participation of both genders in innovative start-ups.

While holding more equity and achieving a more equitable split at founding are important, what ultimately matters is whether a founder will be more involved in running and managing the start-up. Therefore, I investigate whether female founders aged 35 years or younger also become more likely to be the main owner and the executive of the firm at founding. Columns 3 and 4 of Table 5 present the estimates of the effect of ECPs availability on the probability of the average female founder being the main owner. A 1 SD higher W_m is associated with a 10–13 percentage point increase in the likelihood of being main owners for female founders of innovative start-up aged 35 years or younger, corresponding to an increase of 72 percent of the pre-deregulation average probability. As depicted in Panel B of Figure 4, the effect is concentrated in the first two years of the post-deregulation

⁷ For reference, a woman in Milan ($W_m = 0.706$, 70th percentile) faces barriers to abortion that are two standard deviations lower than one in Naples ($W_m = 0.801$, 82th percentile).

Table 5. Maternity risk and participation in entrepreneurship.

DiD estimation at the founder level of the effect of ECP becoming available OTC on measures of participation for female founders. The sample is restricted to female founders of innovative start-ups aged 35 years or younger between 2013 and 2017. The outcomes variables considered are: equity holding (columns 1 and 2), probability of being main owner (columns 3 and 4), probability of being executive (columns 5 and 6), and investment (columns 7 and 8). W_m is defined as weighted average of the share of COs among gynecologists in Italian hospitals, using the inverse of the travel time between municipality m and each hospital as weights. Standard errors are clustered at the municipality level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Equity		Ownership		Executive		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$W_m \times Post$	4.548* (2.559)	6.013** (2.872)	0.104* (0.060)	0.135** (0.061)	0.120* (0.069)	0.159** (0.064)	1.788* (1.029)	2.413** (1.202)
Fixed effects								
Municipality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region $\times Post$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Four-digit industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Four-digit industry $\times Post$	No	Yes	No	Yes	No	Yes	No	Yes
Legal form	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Legal form $\times Post$	No	Yes	No	Yes	No	Yes	No	Yes
Number of founders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of founders $\times Post$	No	Yes	No	Yes	No	Yes	No	Yes
Observations	913	913	913	913	913	913	913	913
R^2	0.716	0.740	0.520	0.569	0.393	0.430	0.439	0.500
Mean Dep. Var.	28.50		0.460		0.151		3.383	

period and it gets smaller in 2017, aligning with the pattern of the effect on births. Importantly, this result shows that the increase in equity holdings previously documented is meaningful when compared to other founders' holdings, implying that younger women become more important within the founding team.

I next examine the likelihood of being an executive, a role of particular importance as 75 percent of innovative start-ups, and 95 percent of all firms, have only one executive. Panel C of Figure 4 and columns 5 and 6 of Table 5 report the estimates for the probability of female founders aged 35 years or younger holding an executive position. In municipalities where W_m is 1 SD higher than the mean, OTC availability of ECPs implies a twelve to almost sixteen percentage point increase in the probability of being an executive in innovative start-ups for women aged 35 years or younger. With a pre-deregulation mean of 13 percentage points in the same group of founders, the economic magnitude of the coefficient is larger than 100 percent, suggesting that the probability of being the executive for a female founder aged 35 years or younger more than doubled after the deregulation of ECPs. The pattern of this effect (Panel C of Figure 4) is consistent with those observed for other measures of female participation. These results highlight that lowering maternity risk significantly increases the likelihood of younger women assuming leadership roles in the start-up, emphasizing that the participation of younger women in innovative entrepreneurship is substantially bolstered when more effective and affordable means for managing fertility choices are made available.

Next, I examine whether female founders make larger monetary investments at founding. While the previous analysis shows that equity holdings of younger female founders

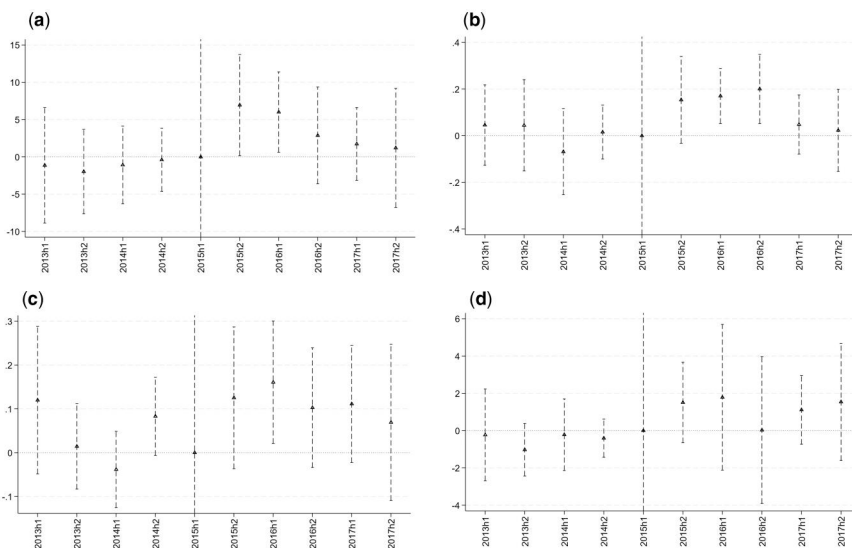


Figure 4. Semi-annual DiD coefficients—participation in entrepreneurship.

Visual representation of the DiD framework for different outcomes of female participation in innovative entrepreneurship. The estimation sample is restricted to female founders aged 35 years or younger. The graphs show coefficients (β_{mt}) of interactions between half-yearly dummies and W_m , according to estimation of equation $Y_{ijmt} = \alpha + \sum_{k=2013h1}^{2017h2} \beta_k (\tau_k \times W_m) + \mu_m + \tau_t + Post_t \times \rho_r + \Phi_j + \varepsilon_{ijmt}$, with 95 percent confidence intervals. The last pre-deregulation interaction (2015h1) is dropped. (a) Equity holdings (%). (b) Probability of being main own. (c) Probability of being executive. (d) Investment (1000 €).

increase, it is crucial to assess whether this is a result of women selecting smaller entrepreneurial ventures. If the reduction in maternity risk enables women to allocate more time and resources to their start-ups, there should be an observable increase in the monetary value of their equity holdings. In Panel D of Figure 4, I plot half-yearly DiD coefficients, while columns 7 and 8 in Table 5 collect estimates for the effect of maternity risk on monetary investments made by female founders aged 35 years or younger. For founders residing in municipalities where W_m is 1 SD higher than the mean, the value of their investment increases by up to €2,413 following the deregulation of ECPs. This means that female founders aged 35 years or younger invest 60 percent more in the post-OTC period compared to the pre-OTC period. Notably, while equity holdings increase by 20 percent, the monetary value of these holdings rises by almost 60 percent. This implies that female founders not only hold more equity but also engage in more capital-intensive entrepreneurial projects.

These findings suggest that participation by younger women in innovative start-ups increased more in areas where maternity risk decreased more. Furthermore, the effects of reducing maternity risk are consistently larger than the gender gaps documented in Table 3. This means that mitigating maternity risk is an important factor for narrowing the gender gap in participation in innovative entrepreneurship.

5.3.1 Discussion and mechanism

To provide a causal interpretation of my results, I use a DiD framework where the identifying assumption is that entrepreneurial outcomes of women in municipalities with different levels of access to abortion services would have exhibited similar trends without the deregulation of ECPs (i.e., parallel trends). To assess the plausibility of parallel trends, Figures 3 and 4 present the estimates of Equation (4) for all outcomes of interests. If the parallel

trends assumption is likely to be satisfied, all the coefficients should be insignificant before the second half of 2015. Indeed, I find no evidence of pre-trends in the outcomes between municipalities with different barriers to abortion services. The absence of pre-trends also helps rule out the potential endogeneity of the deregulation to local-specific factors correlated with a lack of access to abortion. However, the difference in the outcomes of interest across municipalities grows right after the deregulation but then decreases over time. This pattern aligns with the effect on fertility described in [Figure 3](#) and the evolution of abortions in [Figure A2](#). Nonetheless, it underscores the need for a meticulous investigation of the mechanism through which maternity risk affects female participation in entrepreneurship.

Since I compare different women over time, the results could be driven by women selecting into different entrepreneurial ventures or different women selecting into innovative entrepreneurship due to the reduction in maternity risk. To address potential selection issues, the empirical specification includes fixed effects for the industry, the legal form, and the number of founders in the start-up. First, controlling for industry is important as [Hebert \(2020\)](#) shows that female-led start-ups have better access to finance in female-dominated industries. In response to ECPs becoming available OTC, women might enter more into either male- or female-dominated industries. Controlling for a granular level of industry specialization (four-digit NACE codes) addresses this concern. Second, innovative start-ups could be incorporated as limited liability companies or joint-stock companies. Since the two legal forms have different requirements in terms of governance and reporting rights, the fixed effects eliminate the effect of women selecting into start-ups with different legal forms. Last, controlling for the number of founders is essential for interpreting results related to equity holdings and monetary investments. This control ensures that the findings are not confounded by variations in the size of founding teams.

To further mitigate concerns regarding potential selection biases, [Table 5](#) includes estimates from a specification that incorporates fixed effects independently fitted for the pre- and post-OTC periods (odd columns). This approach effectively compares women incorporating their start-ups before and after the deregulation of ECPs, but within the same industry, with the same legal form and number of founders. The results suggest that reducing maternity risk increases female participation in innovative entrepreneurship not because it alters the types of firms women select into, but rather because it enables women to dedicate more effort and resources to their ventures.

Additionally, I also rule out that the results may be driven by different women selecting into innovative entrepreneurship. In [Tables A7 and A8 in Supplementary Appendix 1](#), I show that the characteristics of women entering innovative entrepreneurship, in terms of education and job experience, did not change following the deregulation of ECPs. Furthermore, in line with findings by [Zandberg \(2021\)](#), who observes that access to reproductive care increases the chances of female-led business survival, I find that women tend to list their start-up experience for longer periods on their CVs after ECPs become available OTC.

Aligned with the impact on fertility and the transient reduction in abortion numbers, a potential mechanism is that the deregulation of ECPs enabled prospective founders to effectively prevent and reduce the risk of unplanned pregnancies (i.e., fertility channel). While I cannot observe ECP consumption in the sample of innovative entrepreneurs to measure actual prevention of unplanned pregnancies, if the lower risk or occurrence of unplanned pregnancies drives the results, then the effects should be more pronounced among founders for whom such an event could be more detrimental. In particular, lack of childcare can impact prospects of female entrepreneurs ([Estrin and Mickiewicz 2011](#); [Wang, 2015](#)), making unplanned pregnancies more costly where childcare is less available or more expensive. To explore this, I split the sample of female founders in those living in municipalities with better and worse access to childcare and estimate the effect of maternity risk separately in the

Table 6. Fertility channel—access to childcare.

DiD estimation at the founder level of the effect of ECP becoming available OTC on measures of participation for female founders, splitting the estimation for founders residing in municipalities with worse access to public daycare (Panel A), and better access to daycare (Panel B). The sample is restricted to female founders of innovative start-ups aged 35 years or younger between 2013 and 2017. The outcomes variables considered are: equity holding (column 1), probability of being main owner (column 2), probability of being executive (column 3), and investment (column 4). W_m is defined as weighted average of the share of COs among gynecologists in Italian hospitals, using the inverse of the travel time between municipality m and each hospital as weights. Standard errors are clustered at the municipality level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Panel A	(1)	(2)	(3)	(4)
Worse access to daycare	Equity	Ownership	Executive	Investment
$W_m \times Post$	8.634** (3.897)	0.181** (0.0781)	0.239** (0.0941)	3.756*** (1.401)
Observations	403	403	403	403
R ²	0.824	0.741	0.605	0.676
Mean Dep. Var.	28.25	0.474	0.146	3.290
Panel B	(1)	(2)	(3)	(4)
Better access to daycare	Equity	Ownership	Executive	Investment
$W_m \times Post$	3.143 (3.987)	0.00978 (0.196)	0.121 (0.0912)	0.504 (2.691)
Observations	415	415	415	415
R ²	0.733	0.538	0.421	0.498
Mean Dep. Var.	28.99	0.438	0.159	3.419
Fixed effects				
Municipality	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
Region $\times Post$	Yes	Yes	Yes	Yes
Four-digit industry $\times (1 + Post)$	Yes	Yes	Yes	Yes
Legal form $\times (1 + Post)$	Yes	Yes	Yes	Yes
Number of founders $\times (1 + Post)$	Yes	Yes	Yes	Yes

two samples using my identification strategy. A municipality is defined as having worse (better) access to childcare if the share of children aged 0–3 years in the municipality who can access public daycare is below (above) the median.⁸ Results are presented in Table 6 and indicate that the effects are indeed concentrated in municipalities where access to daycare is lower.

In Supplementary Appendix 2, I provide a back-of-the-envelope calculation to further support the significance of the fertility channel. The calculation demonstrates that the consumption of ECPs alone can generate effects consistent in magnitudes with those observed in the main analysis. Specifically, the calculation illustrates that, to produce the effects observed in the main analysis, the share of ECPs consumed by founders of innovative start-ups (0.013 percent of 191,736 ECPs consumed by women in the same demographic group) aligns with their weight in the reference population (0.018 percent of the Italian population of women with similar age and education). Consequently, the magnitudes of the effects on innovative entrepreneurs are consistent with this group consuming a fraction of the excess

⁸ Data on daycare availability are from the Ministry of Interior and are measured as of 2015. In Italy, all children between age 0 and 3 can access public daycare, which is subsidized, but in the average municipality, only 7 percent of eligible children can be accommodated.

ECPs sold due to the deregulation equal to or smaller than its weight in the reference population (i.e., its expected share).

The importance of the fertility channel notwithstanding, there could be alternative mechanisms consistent with the observed pattern and magnitude of effects in the main analysis, such as attention and empowerment. On the one hand, the OTC availability of ECPs and the associated public debate might have altered women's perception of their ability to avoid unplanned pregnancy, encouraging them to take more risks in the workplace without necessarily changing fertility decisions (attention). On the other hand, the debate around the deregulation of ECPs could have raised awareness of women's rights and the significance of female leadership, particularly in the start-up ecosystem (empowerment).

I provide evidence of the vibrant public debate sparked by the deregulation in [Figure A3a](#) in [Supplementary Appendix 1](#). The figure demonstrates that mentions in national newspapers of the terms *EllaOne* and *Norlevo* spiked in the years of their respective deregulations (2015 and 2016, respectively), as well as in 2012 for *EllaOne*, shortly after that the drug was approved for sale by AIFA (November 2011). Additionally, [Figure A3b](#) shows that public interest, as measured by Google searches for the term *EllaOne* also increased from 2015, potentially supporting an attention mechanism.

To explore a potential empowerment channel, I examine the evolution of female political representation in municipalities with different levels of access to abortion following the deregulation. Using data from the Ministry of the Interior on local elections at the municipality level between 2011 and 2019, I show in [Table A9](#) that municipalities with lower access to abortion experience an increase, after the deregulation of ECPs, in the probability of electing a female mayor, as well as in the share of women—especially younger ones—in municipal councils.⁹ Mirroring the analysis on the importance of childcare, I measure changes in female political representation as the average share of women among municipal council members in 2016 and 2017, minus the average share of women among municipal council members between 2013 and 2015. I then divide municipalities in above and below the median change in the average share of women in municipal councils (8.5 percent), and define a municipality as having a large (small) change in female political representation if it is above (below) median. Lastly, I estimate the effects on entrepreneurial outcomes separately for women living in the two groups of municipalities, and the results are presented in [Table 7](#). While the heterogeneity in effects is weaker than in the case of access to childcare, effects are generally larger in municipalities where female political representation increased more.

The findings in this section support the conclusion that the deregulation of ECPs contributed to the participation of women in innovative entrepreneurship. This effect is primarily channeled through a reduction in fertility-related concerns but also exhibits an influence via empowerment dynamics.

5.4 Maternity risk and firm performance

Mitigating maternity risk could potentially influence the power dynamics within the firm, favoring young female founders. Previous studies on gender and entrepreneurship conclude that, on the one hand, women get involved in particular entrepreneurial ventures ([Guzman and Kacperczyk 2019](#)) and, on the other hand, firms with higher female representation experience discrimination by capital providers ([Assenova and Mollick 2018](#); [Hebert 2020](#)). Consequently, the reduction in maternity risk, leading to an increase in female representation, may have implications for overall firm performance.

⁹ I use data at the municipality × election level to study the probability of electing a female mayor, and data at the municipality × year level to study the share of women in municipal councils, since councils can change in composition in between elections. The coefficient is not significant for the likelihood of electing a female candidate younger than 35, likely because of the small number of younger candidates that run as mayors.

Table 7. Empowerment channel—female political representation.

DiD estimation at the founder level of the effect of ECP becoming available OTC on measures of participation for female founders, splitting the estimation for founders residing in municipalities with large changes in female political representation (Panel A), and small changes in female political representation (Panel B). The sample is restricted to female founders of innovative start-ups aged 35 years or younger between 2013 and 2017. The outcomes variables considered are: equity holding (column 1), probability of being main owner (column 2), probability of being executive (column 3), and investment (column 4). W_m is defined as weighted average of the share of COs among gynecologists in Italian hospitals, using the inverse of the travel time between municipality m and each hospital as weights. Standard errors are clustered at the municipality level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Panel A	(1)	(2)	(3)	(4)
Large Δ female representation	Equity	Ownership	Executive	Investment
$W_m \times Post$	15.01* (7.633)	0.283 (0.244)	0.296 (0.184)	5.647 (6.638)
Observations	375	375	375	375
R-squared	0.762	0.553	0.430	0.564
Mean Dep. Var.	28.32	0.458	0.148	3.118
Panel B	(1)	(2)	(3)	(4)
Small Δ female representation	Equity	Ownership	Executive	Investment
$W_m \times Post$	2.708 (5.780)	0.0560 (0.135)	0.165 (0.114)	-1.557 (1.448)
Observations	439	439	439	439
R-squared	0.806	0.707	0.567	0.668
Mean Dep. Var.	28.38	0.456	0.160	3.823
Fixed effects				
Municipality	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
Region $\times Post$	Yes	Yes	Yes	Yes
Four-digit industry $\times (1 + Post)$	Yes	Yes	Yes	Yes
Legal form $\times (1 + Post)$	Yes	Yes	Yes	Yes
Number of founders $\times (1 + Post)$	Yes	Yes	Yes	Yes

I study three firm-level outcomes measured within 3 years from the incorporation of the start-up: logarithm of total assets, an indicator for venture capital investment, and an indicator for financial distress. Additionally, I also investigate the requirements innovative start-ups satisfy when enrolling in the SIA program (R&D expenses, patents, and education level of the workforce). The results of the estimation of Equation (5) are presented in Table 8 and visualized in Figure 5. I find that the amount of female-held equity negatively correlates with both the size of the firm and its likelihood of attracting venture capital over the first 3 years. A ten percentage point increase in female-held equity is associated with a 15 percent decrease in the probability of attracting venture capital and a 0.6 percent reduction in the size of the venture. However, firms founded after the deregulation of ECPs and with higher female participation are more likely to secure venture capital within each of the first three years of life, but they also exhibit a higher likelihood of facing liquidation in the first year. Specifically, in the post-deregulation period, firms with ten percentage points more female equity become, within one year from founding, 16 percent of the cross-sectional mean (0.027, or 2.7 p.p.) more likely to attract venture capital and 13 percent of the cross-sectional mean (0.03, or 3 p.p.) more likely to end up in liquidation. Taking into account the average 6 p.p. increase in younger women's equity stakes in Table 5 and the

Table 8. Female participation and firm outcomes.

Cross-sectional regressions at the firm level of several firm outcomes on the amount of equity held by women aged 35 years or younger and its interaction with a dummy equal to 1 if the firm is founded after the deregulation of ECPs (*Post_t*). The outcomes considered are log(total assets), an indicator for venture capital investment, and an indicator for liquidation (all measured at the end of the first, second, and third year of the firm's life), and indicators for the requirements met under SIA. All regressions include fixed effects for firm characteristics (number of founders, municipality, industry, legal form, and quarter of incorporation) all fitted independently for the pre- and post-deregulation periods. The unit of observation is a firm and the sample is restricted to innovative start-ups started between 2013 and 2017. Standard errors are clustered at the municipality of the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Log(Total Assets)	T = 1	T = 2	T = 3
Female Equity × <i>Post</i>	0.217 (0.238)	0.000 (0.248)	-0.081 (0.253)
Female Equity (%)	-0.582*** (0.209)	-0.427** (0.212)	-0.347* (0.179)
R ²	0.303	0.290	0.297
Mean Dep. Var.	10.327	11.218	11.644
Panel B: VC Deal	T = 1	T = 2	T = 3
Female Equity × <i>Post</i>	0.044** (0.021)	0.053* (0.028)	0.044 (0.029)
Female Equity (%)	-0.043*** (0.011)	-0.050** (0.024)	-0.051** (0.024)
R ²	0.167	0.173	0.177
Mean Dep. Var.	0.027	0.038	0.046
Panel C: Liquidation	T = 1	T = 2	T = 3
Female Equity × <i>Post</i>	0.039* (0.021)	0.019 (0.038)	0.007 (0.053)
Female Equity (%)	0.000 (0.004)	0.027 (0.021)	0.113 (0.033)
R ²	0.192	0.176	0.197
Mean Dep. Var.	0.030	0.077	0.114
Panel D: SIA Requirement	R&D	Education	Patent
Female Equity × <i>Post</i>	0.083 (0.059)	0.012 (0.061)	-0.048 (0.054)
Female Equity (%)	-0.026 (0.045)	0.023 (0.049)	-0.048 (0.050)
R ²	0.238	0.218	0.272
Mean Dep. Var.	0.631	0.277	0.201
Observations	6,940	6,940	6,940

number of firms in sample (6,940), I estimate that the deregulation of ECPs is associated with $0.044 \times 0.06 \times 6940 = 18$ more female-owned firms attracting venture capital. This aligns with the number of affected founders (26). Additional details of this calculation are provided in [Supplementary Appendix 2](#).

Importantly, since the increase in female equity is measured at the firm level, the previous analysis does not allow me to ascribe the effect to the empowerment of individual female founders. To better understand which founding teams are driving the result, I explore the heterogeneity in results by dividing the sample of firms. While maintaining the set of firms without female founders younger than 35 years as a control group, I separately estimate [Equation \(5\)](#) for treated groups consisting of firms with one, two, or three and more female

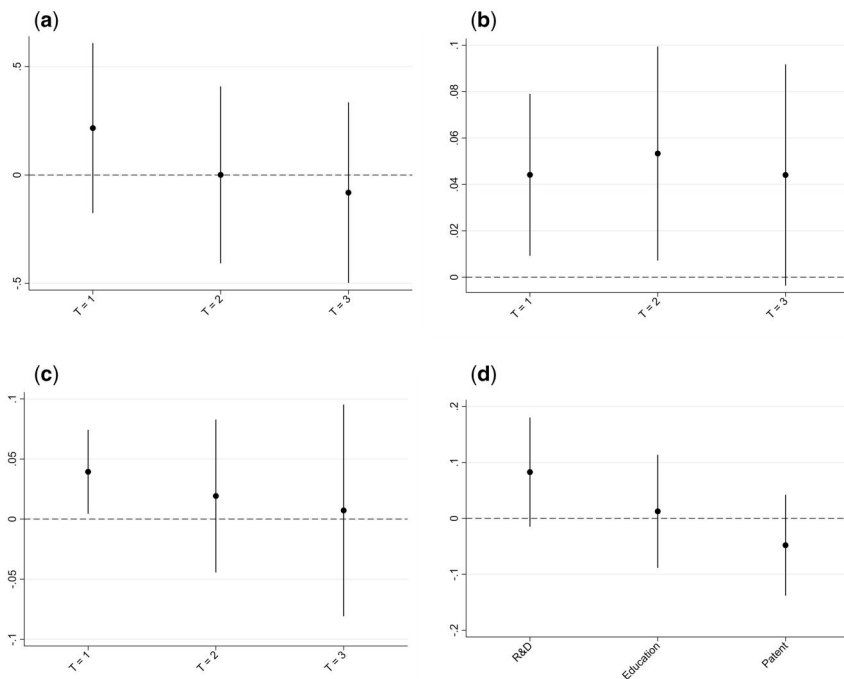


Figure 5. Female participation and firm outcomes.

Each dot represents the coefficient obtained regressing firm’s outcomes on the amount of equity held by women aged 35 years or younger interacted with a dummy equal to 1 if the firm is founded after the deregulation of ECPs ($Post_t$). The outcomes, measured at the end of the first, second, and third year of the firm’s life, are: log(total assets), an indicator for attracting VC, one for liquidation, and indicator variables for which SIA requirement the firm met at founding. The regression equation is as follows: $y_{it} = \alpha + \beta Female\ Equity_j \times Post_t + \gamma Female\ Equity_j + \Phi_j + Post_t \times \Phi_j + \varepsilon_{it}$. Φ_j are fixed effects for firm characteristics (number of founders, municipality, industry, legal form, and quarter of incorporation) all fitted independently for the pre- and post-deregulation periods. (a) Log(Total Assets). (b) Venture Capital. (c) Liquidation. (d) SIA Requirement.

founders younger than 35 years, respectively. In Panel A and B of Figure 6, I present coefficients for the effect of female-owned equity on attracting venture capital and entering liquidation within the first year of a firm’s life, respectively. The effects are predominantly observed among firms with either one or two female founders, suggesting that these founders play a crucial role in determining the success and riskiness of the entrepreneurial project. The deregulation of ECPs, by allowing them to hold more equity, appears to enhance both the success and the risk profile of these ventures.

Building on the findings presented earlier, I investigate whether individual founders, rather than equity holdings, are driving these effects. If the observed effects are indeed driven by one or two critical female founders in the team, their ability to become entrepreneurs due to the deregulation should be the primary treatment. Consequently, I re-estimate Equation (5), replacing the share of equity held by female founders younger than 35 years with dummy variables representing one, two, and three or more female founders younger than 35 years in the team. In Panels C and D of Figure 6, I illustrate that having one or two female founders in the team increases the likelihood of attracting venture capital or entering liquidation within the first year, whereas having three or more does not exhibit a significant effect. This analysis underscores the crucial role played by individual female founders within the founding team.

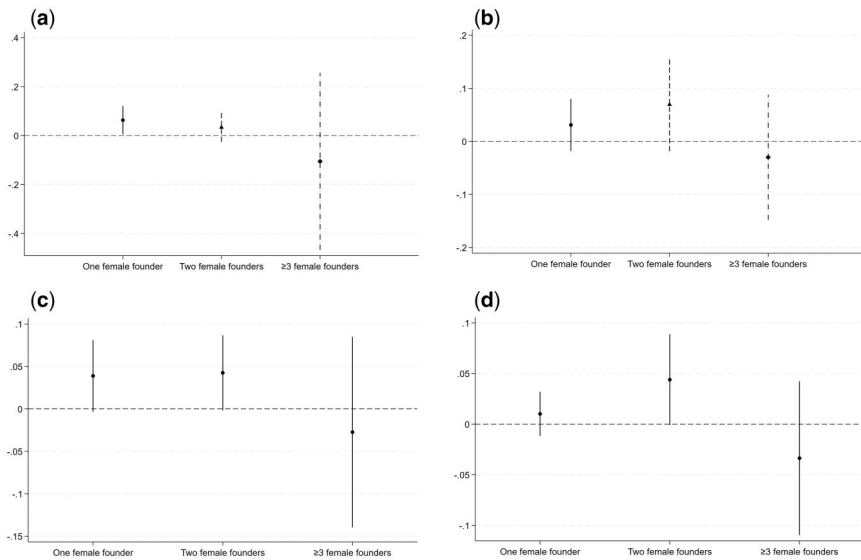


Figure 6. Female participation, firm outcomes, and number of founders.

Heterogeneity analysis of the relationship between female participation and firm outcomes, by number of female founders younger than 35 in the firm. In Panels A and B, the analysis in Table 8 is repeated including only firms without female founders (control) and firms with either 1, 2, or 3 or more female founders younger than 35 (i.e., each coefficient represent a separate regression on a different sub-sample). In Panels C and D, the analysis in Table 6 is replicated substituting the share of equity held by female founders younger than 35 with dummies for one, two, and three or more female founders younger than 35 (i.e., all coefficients are from the same regression). The outcomes considered are dummy variables equal to one if the firm obtains VC or is liquidated, within one year from founding. Fixed effects are as in Equation (5). (a) Venture capital and equity share by number of founders. (b) Liquidation and equity share by number founders. (c) Venture capital and number of founders. (d) Liquidation and number of founders.

In conclusion, entrepreneurial firms with younger female founders founded after the deregulation of ECPs appear to be riskier yet more attractive to professional investors. This implies that reducing maternity risk empowers women to participate in ventures that carry both heightened risk and potential for greater success. Additionally, individual female founders play a critical role in these firms. On the other hand, the increase in female-owned equity is not associated with differences in firm size, as measured by the logarithm of total assets, for post-deregulation firms. While firms with higher female participation are marginally more likely to meet the R&D requirements to qualify as innovative under SIA, they do not exhibit a higher likelihood of having filed a patent at inception. This suggests that women under the age of 35 years, when afforded more efficient control over fertility choices, are empowered to take greater risks and commit more substantially to ventures in which they hold central roles.

5.5 Robustness

5.5.1 Contraception substitution

As a first robustness test, I explore the possibility of substitution between regular and emergency contraception around the deregulation of ECPs. If women started substituting regular contraception with ECPs, particularly in areas with higher barriers to abortion, the increased availability of ECPs might not effectively reduce maternity risk. Data from the Italian Ministry of Health provide information on the consumption of regular oral contraceptives (defined daily dose—DDD—per 1,000 inhabitants) at the regional level from 2014 to 2018, as municipality-level data are not available.

If women substituted regular contraception with ECPs in regions where accessing abortion services was more difficult, I would expect consumption of regular contraceptives in these regions to fall more after the deregulation of ECPs. To test this hypothesis, I aggregate access to abortion services at the region level (W_r), using the share of women aged 18–49 years in each municipality of the region as weights:

$$W_r = \frac{1}{FF_r} \sum_m FF_m W_m \quad \forall m \in r, \quad (6)$$

where FF_r and FF_m represent the number of women aged 18–49 years living in the region and municipality in 2014, respectively. I estimate a regression of the consumption of regular contraceptives on W_r , an indicator for the post-deregulation period, and their interaction. The results, presented in [Table A10 in Supplementary Appendix 1](#), indicate that the coefficient of the interaction term is not significant and, if anything, positive. This suggests no differential substitution between contraceptive methods in regions with varying access to abortion services.

To further investigate whether the deregulation of ECPs led to a substitution effect, I examine changes in the popularity of Google searches related to contraceptive pills and condoms. In [Figure A4 in Supplementary Appendix 1](#), I illustrate the Google interest for searches of the most popular contraceptive pills sold in Italy (*Yaz*, *Yasminelle*, and *Yasmin*), as well as the Italian word for condom (*preservativo*). The figure shows that the popularity of these search terms did not meaningfully decrease after the deregulation of ECPs. Furthermore, even though the medical literature deems ECPs as safe ([Trussell, Raymond, and Cleland 2014](#)), the label for EllaOne recommends not taking more than one dose during the same menstrual cycle. Moreover, survey evidence indicates that over 50 percent of Italian women perceive ECPs as either very dangerous or rather dangerous, suggesting that women may view ECPs as a last resort ([SWG 2017](#)). These factors support the idea that women may not be substituting regular contraceptives with emergency contraception as a primary method.

5.5.2 Regular entrepreneurship and self-employment

I also explore whether similar effects are observed among founders of limited-liability companies (LLCs) and unlimited-liability partnerships (ULPs). In [Table A11 in Supplementary Appendix 1](#), I find a positive and statistically significant effect on equity holdings among female founders aged 35 years or younger of LLCs. However, the economic magnitude of this effect is relatively small, with a 1 SD higher W_m corresponding to an increase in the equity stake of only 0.5 percentage points. On the other hand, the effect is positive but not statistically significant for founders of ULPs. Moreover, I do not observe comparable effects for other entrepreneurial outcomes of female founders, either in LLCs or ULPs. Overall, these results suggest that maternity risk is especially critical for the participation of young female founders in riskier and more growth-oriented entrepreneurial projects.

5.5.3 Placebo test: men and older women

I investigate whether the increase in the availability of ECPs has a differential impact on older women and younger men, as a placebo test. The rationale is that older women might be less sensitive to the deregulation due to being generally less exposed to maternity risk, while the effect on younger men is less certain. On the one hand, younger men may be less impacted than younger women because existing evidence suggests that men do not experience a “child penalty” in the labor market. On the other hand, younger men could still adjust their occupational choices, avoiding or committing less to certain professions such as innovative entrepreneurship, which may require strong commitments and involve potentially more volatile income streams. [Table A13 in Supplementary Appendix 1](#) shows that male founders aged 35 years or

younger experience larger equity holdings in innovative start-ups in the post-deregulation period, showing an increase of almost two percentage points of equity for a 1-SD increase in W_m . However, the effect on younger women is more than three times higher, representing a substantial increase in equity holdings of 23 percent, compared to only 7 percent for men. Moreover, equity holdings of women aged 35 years or older are not significantly affected. This provides additional evidence that the impact of the ECP deregulation is particularly pronounced among younger women in the context of innovative entrepreneurship.

In addition to equity holdings, I examine other outcomes related to entrepreneurial involvement. [Table A13 in Supplementary Appendix 1](#) reveals that OTC availability of ECPs did not significantly impact the probability of women aged 35 years or older being either main owners or executives in their start-ups, nor the amount invested in the firm. For male founders, the availability of ECPs did not lead to an increased likelihood of being executives in their start-ups, nor did it result in higher initial investments following the deregulation. However, there is a small but positive and significant effect on the probability of male founders aged 35 years or younger being the main owners of the start-up. Specifically, for a 1-SD increase in W_m , the probability of a male founder aged 35 years or younger being a main owner increases by three percentage points in the post-deregulation period. This corresponds to 19 percent of the pre-deregulation average probability. In comparison, female founders in the same age category experience a more substantial increase of thirteen percentage points, representing 72 percent of the pre-deregulation average probability. This suggests that, while there is an effect on male founders' ownership, the impact is more pronounced for female founders.

5.5.4 Sample selection and measurement

I next investigate the sensitivity of the main results to sample selection, in particular with respect to the threshold of 35 years of age. Specifically, I expand the sample to include all women aged 40 years or younger and, conversely, restrict it to only women aged 30 years or younger. The results, presented in [Figure A5 in Supplementary Appendix 1](#), indicate that as the sample is restricted, the estimates generally become larger in magnitude but, consistent with a smaller sample size, also noisier. Conversely, when expanding the sample, the coefficients tend to become smaller in magnitude and less significant. This pattern is consistent with the notion that women are predominantly affected by the reduction in maternity risk when they are younger than 35 years old.

I also test whether results are robust to alternative specifications for access to abortion services. First, I introduce a categorical treatment by creating a dummy variable, *Median*, which takes a value of 1 if a municipality's W_m is above the median (0.69) and 0 otherwise. I then interact this dummy with the *Post* variable and use the interaction as the main regressor. The results, presented in [Table A14 in Supplementary Appendix 1](#), show that the findings are qualitatively and quantitatively robust. The effect on the probability of being an executive becomes noisier, while the effect on investment grows larger. This suggests that the former is stronger for founders residing in areas where barriers to abortion services are not exceptionally high, whereas the latter is more pronounced for women in areas with particularly low access to abortion services.

Additionally, I examine an alternative specification for measuring access to abortion services, denoted as W_L , which uses linear weighting in calculating access to abortion services:

$$W_L = \frac{1}{\sum_j w_{mj}} \sum_j w_{mj} CO_j, \quad w_{mj} = \frac{t_{max} - t_{mj}}{t_{max}}, \quad (7)$$

where t_{max} is the maximum travel time between municipality m and any hospital j . Additionally, I calculate $W_{m,4h}$ by measuring access to abortion services using [Equation \(1\)](#) but excluding all hospitals located farther than four hours by car from municipality m .

Lastly, I measure access to abortion services as the number of gynecologists available to perform abortions per 1,000 women in a given municipality, denoted as G_m . To calculate G_m , I assign each municipality m to the closest hospital and then divide the number of non-CO gynecologists in that hospital by the population of women of fertile age (i.e., ≤ 49 years) in all the municipalities assigned to that hospital. This results in all municipalities assigned to a specific hospital having the same level of access to abortion services G_m . Importantly, since this measure reflects access to abortion services rather than barriers, coefficients are expected to be negative. [Table A15 in Supplementary Appendix 1](#) demonstrates that results obtained using alternative measures of access to abortion services are consistent, both in magnitude and significance, with those of the main analysis.

5.5.5 Omitted variables and geography

Since access to abortion services is not randomly assigned to municipalities, it correlates with other characteristics at the local level. To address concerns related to potential omitted variable bias, I include controls for municipality characteristics that correlate with W_m in [Table 1](#) and use them to create placebo interactions with the *Post* dummy. These characteristics include the share of votes in favor of conservative parties in the 2014 European elections, the percentage of weddings celebrated with religious rites, the percentage of land used for non-agricultural purposes, the employment rate, and income per capita. These characteristics serve as proxies for conservative and religious beliefs, urban environments, and economic opportunities, respectively. [Table A16 in Supplementary Appendix 1](#) shows that the main coefficients remain significant when including interactions between the additional characteristics and the *Post* dummy as controls. These results shed light on the mechanism through which the deregulation of ECPs affects women, indicating that the most affected women are those facing impaired access to abortion services, beyond the associated social stigmas, proxied by religious and political beliefs. Additionally, [Table A17 in Supplementary Appendix 1](#) provides the results of using interactions of individual characteristics with *Post*, revealing that none of these alternative characteristics consistently replicate significant results across different measures of female participation in innovative entrepreneurship.

Additionally, I investigate whether the main results may be driven by specific areas in the Southern Italy catching up to the rest of the country. Although this concern is partly addressed by the absence of pre-deregulation trends in the effects documented in [Figure 4](#), I conduct a split-sample analysis, estimating the effects separately for the north and south of the country.¹⁰ [Table A18 in Supplementary Appendix 1](#) shows that the effects are heterogeneous but consistent across the two samples. In the north, female founders aged 35 years or younger become more likely to be executives of their start-ups, whereas the effect on the probability of being the main owner and on monetary investments is stronger in the south. This analysis helps alleviate concerns that results in [Tables 6](#) and [7](#) could be driven by differences in access to childcare and female political representation between the north and south of Italy. Additionally, I re-run the main analysis, excluding observations from each of the twenty Italian regions one at a time, and show in [Figure A6 in Supplementary Appendix 1](#) that the coefficients are robust to sample selection.

5.5.6 Concurrent policy interventions

Lastly, I investigate whether the results could be driven by concurrent policy interventions. In particular, the Italian MISE introduced the Smart&Start (SS) program in 2013 and the Smart&Start Italia (SSI) program in February 2015.¹¹ These programs allow innovative

¹⁰ Regions located in the Northwest, Northeast, and Central Italy are in the North sample, while the South sample comprises regions located in Insular and South Italy.

¹¹ Smart&Start was a program specifically designed for innovative start-ups located in the south, and it was rolled-over into the SSI program, open to all innovative start-ups.

start-ups incorporated under SIA to obtain an interest-free loan for up to 80 percent of admissible expenses, like capital expenditures, salaries, and R&D. Importantly, for start-ups that have 100 percent of their equity held by individuals under the age of 36 years or by women, the loan amounts to 90 percent of the expenses. In addition, innovative start-ups located in the south have 30 percent of the amount of the loan forgiven. These policy interventions would encourage firm creation by younger individuals and women located in the south, potentially confounding the results. To rule this out, I collect data on all the innovative start-ups that accessed the SS or SSI programs and check for correlation between a founder's access to abortion and her likelihood of taking up the incentives. I regress a dummy variable equal to 1 if the founder took the incentive on W_m , including fixed effects as in the main specification. [Table A19 in Supplementary Appendix 1](#) shows that the founder's access to abortion services does not meaningfully correlate with her likelihood of taking up the incentive.¹² I also re-estimate the main analysis excluding all founders that took an SS or SSI incentive, and the results, provided in [Table A20 in Supplementary Appendix 1](#), are qualitatively and quantitatively unaffected.

6. Conclusion

In this article, I document a previously unexplored dimension of the gender gap in entrepreneurship, focusing on the intensity of participation, measured by equity ownership and the likelihood of assuming leadership roles. I then investigate the influence of maternity risk on women's engagement in innovative entrepreneurship.

I leverage the deregulation of ECPs, combined with access to abortion services, as a shock to maternity risk for women. I find that, following the reduction in the cost and likelihood of unplanned pregnancies, women exhibit increased participation in innovative entrepreneurial ventures. Specifically, women aged 35 years or younger, facing higher barriers to abortion services, hold significantly more equity in innovative start-ups. They are also more likely to serve as main owners and executives, making more substantial monetary investments at the founding stage. These effects are pronounced in areas with limited access to childcare, suggesting that the deregulation enables women to avoid more costly unplanned pregnancies. Additionally, an increase in female political representation further supports the notion of enhanced female empowerment resulting from the deregulation.

Last, firms with higher equity held by younger women, founded post-deregulation, are more likely to attract venture capital investment within three years. However, these firms also face a higher likelihood of experiencing financial distress. Notably, these effects are concentrated in firms with fewer but pivotal female founders. In conclusion, this study suggests that maternity risk significantly contributes to the gender gap in entrepreneurship in Italy, particularly within innovative firms. Moreover, maternity risk plays a crucial role in determining the nature and risk profile of entrepreneurial ventures in which women participate. Addressing the challenges associated with maternity risk by providing women with more accessible and affordable means of managing it could substantially enhance their involvement in entrepreneurial ventures, especially in innovative and riskier ones.

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¹² The results do not change if I restrict the dummy to be equal to 1 only if the incentive has been taken within one year from founding, as a way to isolate founders for which the founding decision could be motivated by the incentive.

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Supplementary material

[Supplementary material](#) is available at *Review of Finance* online.

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Data availability

The data on the number of CO gynecologists cannot be shared publicly due to a non-disclosure agreement with the Italian Ministry of Health. The data will be shared on reasonable request to the corresponding author.

The data on individual firms and founders are from ORBIS, provided by Moody's under license at the London School of Economics and at the Erasmus School of Economics. Data will be shared on request to the corresponding author with permission of Moody's.

All other data underlying this article are available in I.Stat, at <https://esploradati.istat.it/databrowser/#/en>.

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