Not the right time for children: unemployment, fertility, and abortion

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Abstract

I analyze the effect of local unemployment rates on fertility rates, abortion rates, and the abortions to pregnancies ratio, combining population statistics and administrative data on induced abortions performed in Italy between 2004 and 2016. This is the first paper to causally investigate the effect of local economic conditions on abortion choice. Using a shift-share instrument measuring labor demand, I exploit demand-driven shocks to unemployment. A one standard deviation (sd) increase in unemployment induces a 0.9 sd decrease in the fertility rate, a 0.27 sd increase in the abortion rate, and a 0.35 sd increase in the abortion ratio. These effects are driven by women above 25 years old, and are particularly large in the 35-49 age group, while young women (15-24) are largely unaffected.

Keywords: fertility choice, abortion ratio, local economic conditions, unemployment rate, shift-share

JEL classification: J11, J13, H75.

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1 Introduction

Economic recessions have a far-reaching impact on individuals, as lower income and widespread economic uncertainty influence their decisions in numerous ways. Bleak economic prospects may thus affect fertility decisions such as contraception effort, the timing of childbearing and induced abortion. Understanding the role of economic factors in fertility choice bears substantial policy relevance for the dependency ratio of a society, public healthcare spending, and labor supply, among others. While several studies have considered the response of contraception effort and timing of childbearing, the same attention has not been dedicated to abortion behavior.

This paper extends our understanding of the importance of local economic conditions in fertility choices. I use administrative, population-level data on abortions and province-level vital statistics to obtain a panel of fertility and abortion rates for Italian provinces between 2004 and 2016. I then exploit the variation in unemployment rates that occurred during the Great Recession and the Sovereign Debt Crisis to investigate the relationship between unemployment, induced abortions, and childbearing.

This is the first paper to causally investigate the effect of local economic conditions on abortion choice. The analysis of abortion patterns cannot be separated from that of fertility, since the number of abortions ultimately depends on the number of pregnancies. As a result, this study adds to the literature by considering the joint response of births and abortions. In addition, I consider the abortion to pregnancies ratio as a dependent variable, which measures the propensity to abortion conditional on pregnancy. While the fertility and the abortion rate measure the incidence of live births and induced abortions among all women, the abortion ratio measures the incidence of abortions among pregnant women. Throughout the analysis, I restrict the sample to women in their childbearing years, between 15 and 49 years old, and of Italian nationality.[1]

Italy provides a setting with homogeneous legislation across regions where induced abortion is covered by the national health insurance, which allows limiting potential confounders and presents a very different scenario compared to countries such as the United States. Although the monetary cost of an abortion is limited to reaching the facilities, women still have to bear the social and personal cost of an abortion, and face hurdles in accessing abortion services due to a geographically heterogeneous supply. Assuming that these costs are

[1] I exclude both foreign residents and Italian residents born abroad.

time-invariant, they will be captured by unit fixed effects. In addition, results are robust to controlling for the time-varying regional share of gynecologists unavailable for abortion.

In this context, unemployment rates proxy for both job loss and societal economic uncertainty, for instance through the perceived risk of unemployment. However, unemployment rates may also reflect changes in labor supply induced by fertility choices, perhaps related to unobserved changes in preferences (Hotz et al., 1997). To isolate fluctuations in the unemployment rate driven by labor demand shocks, I use a shift-share instrument in the spirit of Bartik (1991). In particular, the instrument measures predicted local employment that is unrelated to changes in local labor supply and is based on a weighted average of employment levels across industries. This approach closely relates to recent studies using shift-share instruments to explore the relationship between unemployment rates and fertility (Schaller, 2016; Aksoy, 2016), or other outcomes such as child maltreatment (Brown et al., 2018).

I find that a one standard deviation increase in the unemployment rate decreases the fertility rate by 0.9 standard deviations (95% CI [-1.13, -0.78]) and increases the abortion rate by 0.27 standard deviations (95% CI [0.41, 0.12]); the propensity to abort conditional on being pregnant also increases by 0.35 standard deviations (95% CI [0.53, 0.23]). This implies that a standard recession increasing the unemployment rate by 5 percentage points translates into approximately 3 fewer births and 0.5 more abortions per 1000 women; conditioning only on pregnant women, the effect rises to 12 more abortions per 1000 pregnant women.[2]

These effects are driven by women above 25 years old, and are particularly large in the 35-49 age group, while young women (15-24) are largely unaffected. Such differences in response are potentially mediated by a number of factors, including heterogeneity in childbearing intentions, parity, marriage rates, labor force participation, and career attainment.

From a theoretical standpoint, standard models of fertility suggest that the effect of a rise in the unemployment rate is ex-ante ambiguous. On the one hand, the negative income effect decreases desired fertility; on the other hand, unemployment lowers the opportunity cost of childbearing, and might thus increase desired fertility through a substitution effect (Becker, 1991). The change in childbearing intentions will affect contraception behavior, subject to the budget constraint; pregnant women will then choose between childbirth or

[2]These changes stand at around an 8% change from the mean following a 5 p.p. increase in the unemployment rate, for all three dependent variables.

abortion.[3] Therefore, the unemployment rate might affect the abortion rate through the behavioral response of both contraception effort and the propensity to abort conditional on being pregnant. Additionally, unemployment spells are related to increases in domestic violence (Pallitto et al., 2013; Anderberg et al., 2016; Bhalotra et al., 2021), which might result in increased abortion demand. Moreover, individual characteristics such as age, socioeconomic status, and job characteristics might determine different opportunity costs of childbearing and different exposure to unemployment shocks. Therefore, aggregate fertility responses may mask heterogeneous behavior across groups.

A wealth of research has investigated the relationship between fertility choices and economic fluctuations, both at the aggregate and individual levels. Sobotka et al. (2018) review the literature investigating the effect of economic recessions on fertility in high-income countries. Although the evidence is not uniform, the majority of studies support a pro-cyclical relationship of births to economic fluctuations, though with relatively small and short-lived effects. Among a few, Goldstein et al. (2013), Hofmann and Hohmeyer (2013a), Schneider (2015), Comolli (2017), and Matysiak et al. (2021) show that fertility decreases with higher unemployment rates. Del Bono et al. (2012) estimate that female job loss due to plant closure reduces average fertility by 5–10% in the short and medium-term. By contrast, Schaller (2016) finds that a deterioration of women's labor market conditions is associated with increases in fertility while a deterioration of men's labor market conditions has the opposite effect, suggesting that female unemployment generates positive opportunity cost effects that offset the negative income effects. This discrepancy in results can be attributed to the different context, where plant closures lead to a potentially permanent decrease in income affecting a specific sub-population (Schaller, 2016). Finally, research suggests that short-term parenthood intentions are negatively associated with societal economic uncertainty (Fahlén and Oláh, 2018). Modena and Sabatini (2012) and Modena et al. (2014) estimate that having a temporary job contract in Italy reduces childbearing intentions by about 15 percentage points for childless women and 10 percentage points for mothers, from an average 25%, and being unemployed has a similar effect. The present study adds to this literature by considering the joint response of births and abortion behavior, and brings

[3]While standard economic models often assume that agents have perfect control over their fertility, here I account for the stochastic nature of fertility, i.e. the possibility of unintended pregnancies. Moreover, I leave open the possibility that contraception effort may be sub-optimal or not perfectly effective. Therefore, women are faced with three subsequent choices: their childbearing intentions, contraception effort, and abortion or childbearing choice.

additional evidence of the pro-cyclical behavior of childbearing.

In addition, this study relates to the literature investigating the determinants of abortion demand. Although access to abortion services is a widely discussed topic worldwide, research on the determinants of abortion remains scarce and we lack an understanding of the role of economic factors in this decision. Studies of abortion demand have mostly concentrated on changes in the cost of abortion, particularly in the United States, for instance due to legislative restrictions (Haas-Wilson, 1996; Bitler and Zavodny, 2001; Medoff, 2007; Myers and Ladd, 2020), abortion clinic closures (Fischer et al., 2018; Lindo et al., 2020), insurance coverage (Levine et al., 1996), or the diffusion of oral contraception methods (Ananat and Hungerman, 2012). Some research has explored the role of social welfare policies, such as income support for low-income women (Snarr and Edwards, 2009) or child support enforcement (Crowley et al., 2012). González and Trommlerová (2021) explore the effect of a universal child benefit in Spain, finding that it increased the birth rate both through an increase in conceptions and a decrease in abortions. The role of unemployment has been largely overlooked; it is included as one of many potential determinants of abortion in the classic models of Medoff (1997) and Blank et al. (1996), without accounting for its potential endogeneity with respect to fertility choice. Lima et al. (2016) find that the abortion ratios in 2010-2012 exceeded the predicted trend across several European countries, indicating the economic recession and austerity policies as potential determinants. However, this study only relies on time variation, and the authors cannot make a causal statement nor address the potential heterogeneous response across countries that experienced the recession with different intensity and timing. In this paper, I overcome these issues by taking a causal approach and focusing on a single country, Italy, considering local economic conditions within Italy and using a shift-share instrument that allows reaching causal statements.

The remainder of the paper is organized as follows: Section 2 describes the institutional framework of abortions in Italy; Section 3 presents the data; Section 4 illustrates the empirical strategy. Section 5 presents the main results, while Section 6 covers robustness checks. Section 7 concludes.

2 Institutional framework

Abortion in Italy is regulated by Law 194 of 1978 and since then the Istituto Superiore di Sanità (Italian National Institute of Health) has maintained a surveillance system for legally

induced abortions, based on quarterly reporting by the regional health authorities.

According to Law 194/1978, all women are eligible to request the voluntary interruption of a pregnancy during the first 90 days of gestation. Beyond this 90 days limit, only therapeutic abortions are permitted, i.e. abortions motivated by medical concerns. A woman seeking an abortion must first obtain a certificate attesting to the pregnancy from either her general practitioner, a private physician, or a public family clinic; parental or judge's consent is required for minors. With the exception of urgent cases, there is a mandatory seven-day period of reflection after the certificate. Induced abortions can be performed either in public hospitals, free of charge, or in authorized private clinics; more than 90% take place in public hospitals (Ministero della Salute, 2016).

Article 9 of Law 194/78 regulates the practice of conscientious objection, granting the healthcare personnel the right to refuse to partake in procedures aimed at the termination of a pregnancy, except when these are deemed as life-saving. In 2016, 71% of gynecologists were objectors[4], over 8% of all abortions were sought by women out of their region of residence, and around 13% out of their province of residence (Ministero della Salute, 2016). Autorino et al. (2020) show that a higher prevalence of objecting professionals is associated with a higher share of women having an abortion outside the region and longer waiting times. To account for this interregional mobility, I count abortions based on the province of residence of the woman, rather than the province where they occurred.

Moreover, differences in conscientious objection lead to considerable geographical heterogeneity in the supply of abortion services. Coverage is highest in Umbria, Liguria, and Toscana, where more than 90% of structures with a gynecology ward offer induced abortion in 2016, and lowest in Campania, Bolzano, and Molise, where less than 35% do (Ministero della Salute, 2016). In this study, systematic time-invariant differences in the supply of abortion services across provinces are captured by province dummies, and in the robustness analysis I account for potential changes in the preferences of doctors over time.

Over the years, several regulatory changes have occurred: the legalization of emergency contraception pills in 2000 and 2012[5]; the introduction of medication abortion in 2009; the availability of emergency contraception pills without a medical prescription from 2015. The role of these regulatory changes as potential confounders is addressed in Section 6.

[4]Additionally, in 2016 49% of anaesthesiologists and 44% of non-medical staff were objectors.

[5]Emergency contraception pills were legalized in Italy in 2000 if based on Levonorgestrel, and 2012 if based on Ulipristal acetate.

3 Data and descriptive statistics

In this section, I describe the main sources of data used in this paper and how I select my sample. Moreover, I define the dependent variables and discuss their evolution over time. Further details on the construction of variables are provided in Appendix G.

3.1 Data and construction of the sample

I employ yearly data on Italian provinces between 2004 and 2016 provided by the Italian National Institute of Statistics (ISTAT). The geographical unit of the analysis is a province (NUTS III division), with boundaries fixed to 2004 to keep geography constant.[6] The final sample includes 1339 observations, corresponding to a balanced panel of 103 provinces across the years 2004-2016.

To construct province-level rates, I combine two sources of data: population statistics at the province level and administrative data on induced abortions. Population statistics include data on population and live births from the General Register Office, disaggregated by the province of residence and age of the mother. Data on abortions pertain to administrative data on voluntary interruptions of pregnancies collected by ISTAT.[7] This covers all legal induced abortions performed in Italy, both in public and private facilities. For each procedure, the medical staff compiles a standardized form (module D.12) with details on the procedure and socio-demographic characteristics of the woman. In particular, this form records the age, citizenship, area of residence, marital status, and reproductive history of the woman. Appendix D.2 discusses measurement error in the abortion data and presents several robustness checks.

I focus my analysis on women of Italian nationality and born in Italy between 15 and 49 years old, i.e. in their childbearing years. Women of foreign nationality are excluded from the final sample because they might react differently to economic factors, due to differences

[6]Seven new provinces were established during the observation window: 4 in 2006 and another 3 in 2010. I absorb each of these new provinces into their parent province; the correspondence is one-to-one except for Olbia Tempio, which I assign to Sassari since it was composed of 24 municipalities from Sassari and only 2 from Nuoro. Therefore, from an initial sample of 110 provinces, I remain with 103 provinces. In 2009, seven municipalities moved from the Pesaro to the Rimini province; results are robust to dropping these provinces, as reported in Table D1.

[7]Data analysis was conducted at the Laboratory for Elementary Data Analysis (Laboratorio per l'Analisi dei Dati Elementari) of ISTAT, in compliance with legislation concerning the protection of statistical secrecy and personal data.

in socio-demographic composition, cultural values, access to health services (Spinelli et al., 2006), and labor market exposure.[8] In fact, the abortion rate of foreign citizens is three times higher than that of Italian women (Ministero della Salute, 2016). In addition, I consider only interruptions of pregnancies taking place before the statutory 90 days limit, since abortions performed after this date should only respond to medical concerns and not to economic motives.

3.2 Dependent variables

This study considers three dependent variables: the general fertility rate, the abortion rate, and the abortion ratio. The general fertility rate (henceforth GFR) measures the average number of births in a year for every 1000 women who are in their childbearing years, i.e. between 15 and 49 years old. Similarly, the abortion rate indicates the incidence of abortions in the population of reproductive-aged women, i.e. the number of abortions per 1000 women in their childbearing years by the province of residence. Focusing on the province of residence rather than the province of abortion allows establishing a closer connection between local economic conditions and the abortion choice, on top of accounting for cross-province migration to access abortion services (see Section 2). A rise in the abortion rate can be the result of both a higher pregnancy rate (as a result of reduced contraception, for instance) or a larger share of unwanted pregnancies, keeping the pregnancy rate constant. For this reason, I also consider the abortion ratio, which measures the propensity to abort conditional on being pregnant, thus capturing also changes in the pregnancy rate. This ratio is computed as the share of abortions over pregnancies, where the number of pregnancies is proxied by the sum of live births and abortions.[9] As a result, the abortion ratio is increasing in the abortion rate and decreasing in the general fertility rate, as follows:

$$Ab.ratio = \frac{N.Ab}{N.Ab + N.Livebirths} = \frac{Ab.rate}{Ab.rate + GFR} \tag{1}$$

These aggregate measures are affected by the age structure of the population; I therefore replicate the analysis using age-specific rates. For example, I construct group-specific fertility rates by dividing the number of births by the appropriate at-risk population, i.e. women

[8] I also exclude foreign-born women that have acquired Italian citizenship, which constitute around 6% of the sample of Italian women in the abortion data.

[9] I define the abortion ratio as the number of abortions per 1,000 pregnancies, in line with the definition by the Guttmacher Institute, while the CDC defines it as the number of abortions per 1,000 live births.

aged 15-49 in the relevant demographic group.

Finally, I use several indicators to proxy for local economic conditions. My main variable of interest is the aggregate unemployment rate, but I also consider age-specific unemployment rates. To address concerns of endogeneity of unemployment rates, I construct an instrument based on supply-side employment data by industry from the regional accounts, as described in Section 4.

3.3 Descriptive statistics

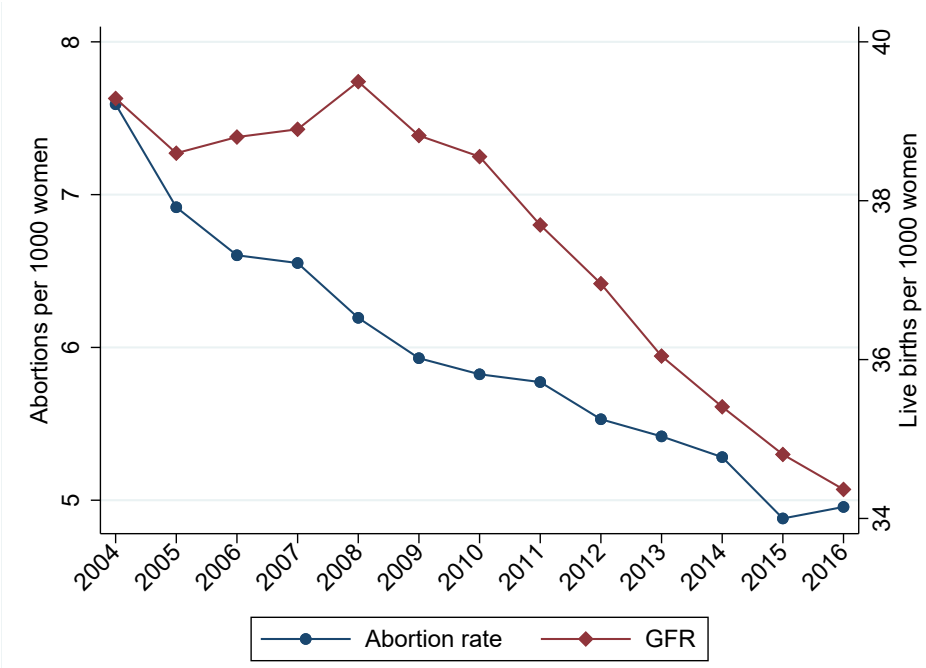
The evolution of the main variables of interest at the national level is presented in Figure 1. The general fertility rate, reported in Panel 1a, is relatively stable in the first half of the sample and reaches its peak in 2008, at around 39 live births per 1000 women of childbearing age. It then starts to rapidly decrease, down to 34 live births per 1000 women of childbearing age in 2016. The abortion rate is decreasing throughout the observation period, but at a slower rate from 2009 onwards; by 2016, it stands at around 5 abortions per 1000 women in their childbearing years. Panel 1b reports the evolution of the abortion to pregnancies ratio and the unemployment rate. The abortion ratio initially decreases steadily, but it almost flattens out from 2008 as a result of the sudden decrease in childbearing and the slower decrease in abortions. Finally, the national unemployment rate shows substantial variation over time, confirming the years between 2008 and 2014 to be a period of prevailing economic instability and underlining the double-dip nature of the recession. Section F of the Appendix elaborates on the evolution of the crisis, and its different impact across age classes and geographical areas. Given the different nature of the two crises, local labor markets were affected heterogeneously depending on their industrial composition.[10]

For summary statistics of the province-level data and the underlying abortion micro dataset, see Table A1 in the Appendix.

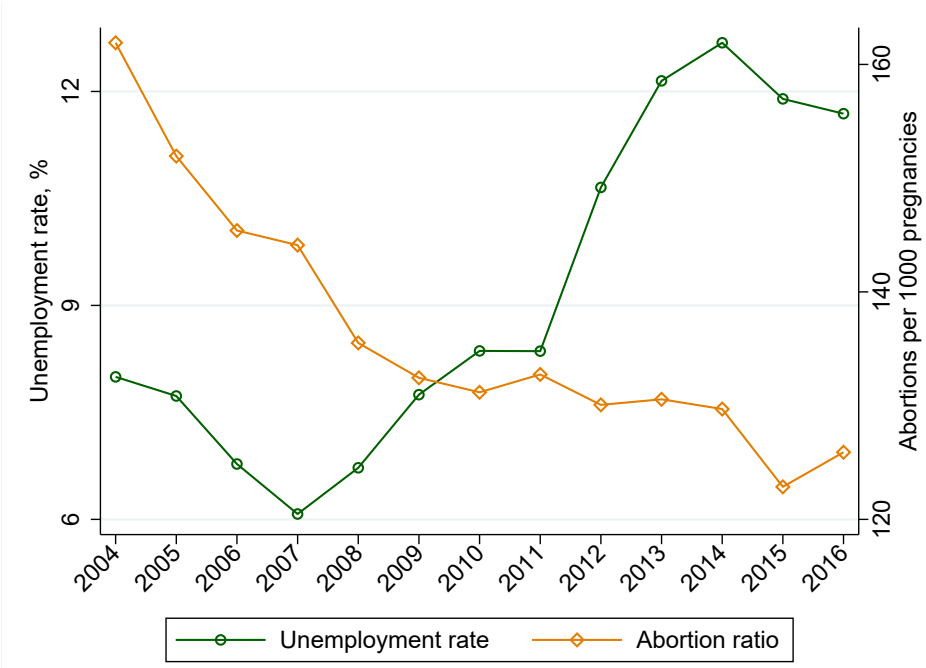
[10]For an overview of changes in employment and the geographical concentration of industries, see Section E.1 in the Appendix.

Figure 1: National trends

(a) Fertility and abortion rates



(b) Propensity to abort and unemployment



4 Empirical strategy

The goal of the analysis is to study the relationship between childbearing, abortion, and local economic conditions, proxied by the unemployment rate. To analyze different aspects of fertility choice, I consider multiple dependent variables: the general fertility rate, the abortion rate, and the abortion ratio. When studying fertility rates I lag the unemployment rate by one year to consider the unemployment rate at the time of conception.[11] All regressions control for province fixed effects and a linear time trend, which capture the confounding effect of unobserved time-invariant local characteristics and linear trends over time that are common to all provinces. For instance, province dummies capture social attitudes towards abortion, i.e. the social cost of induced abortion, and time-invariant supply-side constraints in abortion services.[12] Therefore, the baseline specification is the following:

$$Fert_{p,t} = \alpha_0 + \beta_0 Unempl_{p,t-1} + \gamma_{0,p} + \delta_0 year + \epsilon_{0,p,t} \tag{2}$$

$$Ab_{p,t} = \alpha_1 + \beta_1 Unempl_{p,t} \quad + \gamma_{1,p} + \delta_1 year + \epsilon_{1,p,t} \tag{3}$$

$$Ab.ratio_{p,t} = \alpha_2 + \beta_2 Unempl_{p,t} \quad + \gamma_{2,p} + \delta_2 year + \epsilon_{2,p,t} \tag{4}$$

where $Fert_{p,t}$, $Ab_{p,t}$ and $Ab.ratio_{p,t}$ are the outcomes for province p in year t, $Unempl_{p,t}$ is the local unemployment rate, and γ_p are province dummies. Standard errors are clustered at the province level, and province boundaries are fixed to 2004.

The general fertility and abortion rates are affected by the underlying age composition of the population, as childbearing decisions significantly vary over a woman's lifecycle (Hotz and Miller, 1988; Del Boca and Sauer, 2009). Thus, if the female population of a province is predominantly young, we would expect the fertility rate to be higher than in a province with a predominantly old female population. Moreover, changes in the labor market heterogeneously impact different age groups; for instance, younger women might be more inclined than older women to postpone childbearing when facing adverse job prospects. To address this issue, I replicate the analysis focusing on age-specific fertility and abortion rates as

[11] By definition, three-quarters of the conceptions in year t will be realized in year $t+1$ due to the 9 months gestation period. Since monthly data on live births is not available, I approximate the time of conception with the year preceding the birth.

[12] Moreover, province fixed effects also account for time-invariant measurement error in both the dependent and independent variables. This applies to mismatches between the actual and official place of residence, particularly for students, where province dummies account for the average student outflows from provinces with fewer universities; the average cross-province employment mobility; and misreporting of births and induced abortions.

dependent variables.

Using local unemployment rates as a proxy of local economic conditions allows capturing the effect of both individual job displacement and economic uncertainty, as the rate of unemployment correlates with the perceived risk of unemployment (Anderberg et al., 2016), the job separation rate, and it is negatively related to the job-finding rate. Although unemployment rates can understate the magnitude of a recession by not accounting for discouraged workers, they are the best available proxy to capture changes in the labor market conditions at this level of disaggregation. In addition, the unemployment rate is useful in exploring fertility behavior because it is less likely to be endogenous to childbearing or abortion choices than other variables such as own wages.

However, the results of the OLS estimation cannot be interpreted as causal for a number of reasons. First, there is an issue of reverse causality: an increase in fertility (abortions) can induce more women to drop out (stay in) the labor force (Bloom et al., 2009; Kalist, 2004). Unemployment rates are therefore correlated with fertility-induced changes in the labor supply. Moreover, recent literature shows that fertility indicators lead economic recessions by several quarters (Buckles et al., 2021). Second, there are omitted variables that affect both fertility and unemployment, such as the age composition of the labor force or unobserved preferences (Hotz et al., 1997). A simultaneous increase in childbearing intentions and a decrease in female labor force participation will increase the fertility rate while decreasing the denominator of the unemployment rate, thus leading to upward biased OLS estimates. Viceversa, a change in preferences that induces both a decrease in abortions and labor force participation will lead to downward biased OLS estimates.

To address these concerns of endogeneity, I construct an instrument for the local unemployment rate following the approach developed by Bartik (1991) and employed by Bound and Holzer (2000); Autor and Duggan (2003); Moretti (2013); Schaller (2016). The instrument averages national employment across industries, using local industry employment shares as weights, to produce a measure of predicted local employment that is unrelated to changes in local labor supply. More specifically, this variable interacts predetermined differences in the industrial composition within a local labor market with national industry employment trends over time. Formally, the instrument is constructed as

$$B_{p,t} = \sum_{k=1}^{K} \chi_{p,k,t_0} E_{-p,k,t} \tag{5}$$

where χ_{p,k,t_0} is the employment share of sector k in province p and base period t_0, and $E_{-p,k,t}$ is number of people employed in sector k, period t in Italy, excluding province p. Figure E1 maps the initial shares χ_{p,k,t_0}, which represent the importance of each sector for local employment. To construct age-specific instruments, I adjust the shifts by the contemporaneous employment share of each age group at the national level, respectively.[13]

By exploiting time variation originating only from the national employment level, I focus on aggregate labor demand and abstract from changes in local labor supply. The exogeneity of the instrument then hinges upon the atomic structure of the national industrial composition, and the assumption that single provinces are small enough within each industry not to affect its national employment level. This assumption however is likely to be violated by large provinces, and in fact the four most populous Italian provinces make up for more than 5% of national employment in a variety of sectors.[14] To address the finite sample bias coming from the use of own-observation information, I compute the national employment of each industry excluding own province employment. The first stage relationship is discussed in Section E.2 of the Appendix. Figure E3 shows a strong negative correlation between the observed unemployment rate and the Bartik instrument. The relevance of the instrument is confirmed by the statistical significance of the point estimates of the first stage regression and the magnitude of the Kleinebergen-Paap F-statistic.

Note that to compute the instrument I employ supply-side employment data, which reports the number of workers participating in the production process in each province not accounting for residents that work outside of the province, while it includes non-residents that work in a firm located in the province. This does not pose a threat to the analysis as long as the estimated employment demand is not correlated with unobservables affecting childbearing or abortion.

As a robustness check, I construct alternative versions of the instrument. First, I employ different sets of weights: the local employment share χ_{p,k,t_0} can be the number of employed in a sector and province over either total province employment or the working-age population of the province. Second, I manipulate the base year t_0: in the main estimation I use the first year out of sample (2003); alternatively, I compute it using the year 2000 as a base year.

[13] A similar group-specific weight is implemented by Schaller (2016); see the Data appendix for a formal definition.

[14] Rome, Milan, Naples, and Turin populate the right tail of the distribution of province weights in national industry employment. In particular, Milan and Rome represent more than 5% of all industries except agriculture and manufacturing, respectively. The industry with the highest weight is information and communications, where Rome and Milan make up for around 17% of national employment each.

Finally, I consider industry value-added as an alternative shift; however, this measure is only available at the national level so the resulting instrument is not of the leave-one-out type. Figure E4 illustrates the differences between these alternative instruments, while details on their construction are reported in the Data appendix.

5 Results

Table 1 reports the main results of the paper for the three dependent variables of interest. The reported Kleibergen-Paap LM under-identification test and the Kleibergen-Paap F statistic strongly reject the hypothesis of a weak instrument; additionally, Table E2 of the Appendix reports the first stage estimates attesting to the relevance of the instrument.

Columns (1) and (4) analyze the general fertility rate, reporting respectively the OLS and IV estimates. The OLS results indicate that the unemployment rate has a negative and statistically significant effect on fertility rates, where a one standard deviation increase in the unemployment rate reduces the GFR by 0.21 standard deviations. The IV estimation confirms the direction of the effect and yields larger estimates in magnitude: increasing the unemployment rate by one standard deviation translates into a reduction of the fertility rate by 0.95 standard deviations (95% CI [-1.13, -0.78]). Coefficient estimates from the IV are in absolute value larger than when using OLS, consistently with the expected reverse-causality bias discussed in Section 4: lower fertility induces higher female labor supply, and thus lower unemployment rates, generating attenuation bias in OLS. Moreover, measurement error in unemployment rates could also be causing OLS coefficients to be biased downward in magnitude.

Columns (3) and (5) report the results for the abortion rate. The abortion rate increases with the unemployment rate, and again the IV estimates are almost twice the OLS ones: a one standard deviation increase in the unemployment rate brings about a 0.27 standard deviation change in the abortion rate (95% CI [0.41, 0.12]).

Finally, columns (4) and (6) present the main results for the abortion to pregnancies ratio. The OLS coefficients indicate that a one standard deviation increase in unemployment is associated with a 0.16 standard deviations change in the propensity to abort conditional on being pregnant. This effect however more than doubles when we move to the IV estimation: a one standard deviation increase in unemployment is now associated with a 0.38 standard deviations change in the abortion ratio (95% CI [0.53, 0.23]). Overall, the propensity to

abort conditional on being pregnant increases when unemployment rises, as a result of both the reduced number of births and the increased number of abortions.

Table 1: Main specification - standardized variables

	OLS			IV		
	GFR	Ab.rate	Ab.ratio	GFR	Ab.rate	Ab.ratio
	(1)	(2)	(3)	(4)	(5)	(6)
$Unempl_{t-1}$	-0.212***			-0.956***		
	(0.052)			(0.089)		
$Unempl_t$		0.126***	0.167***		0.267***	0.382***
		(0.032)	(0.037)		(0.073)	(0.077)
Observations	1236	1339	1339	1236	1339	1339
R^2	0.581	0.557	0.574			
KP LM p value				0.000	0.000	0.000
KP F-stat				360	285	285

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend.
* $p < .05$, ** $p < .01$, *** $p < .001$

5.1 Age heterogeneity

Different age groups might experience different substitution effects because labor force participation, wage levels, career expectations, and the probability of having a stable partner change with age. Moreover, focusing on age groups allows disentangling the reaction of women at different points of their childbearing cycle, that have different childbearing intentions, contraceptive use patterns, and number of previous children. In this section I explore the heterogeneity of response by age, dividing women of childbearing age into three groups: from 15 to 24; from 25 to 34; and from 35 to 49 years old.

On the one hand, young women might be the most responsive because youth unemployment was the most affected by the recession (see Table A1), and fertility plans can be revised more easily at younger ages (Goldstein and Cassidy, 2014); on the other hand, younger women are more likely to use contraception[15] and to be out of the labor force. Older

[15]In fact, survey data suggests that, conditional on being sexually active, the share of women using contraception is higher among women younger than 25 (Loghi and Crialesi, 2017). Moreover, survey data suggests that women between 18 and 25 years old are the main users of emergency contraception (Bastianelli et al., 2005, 2016).

women instead are more likely to be in a stable relationship[16]; however economic recessions also affect both divorce and marriage rates (Schaller, 2013; González-Val and Marcén, 2017). Women between 25 and 34 are in the prime of their childbearing years and professional career, and therefore most likely to postpone childbearing. Changes in the behavior of this group will be particularly relevant because the incidence of births is highest in this age class (see Table A1). Women above 35 years old are closest to the end of their reproductive life, but they are also more likely to already have children and face a stronger trade-off between quality and quantity of children.[17] Finally, the recession might have brought about a reduction in births through lower recourse to assisted reproductive treatments such as IVF, as they are only partially covered by national insurance. Since these treatments are used predominantly by women older than 35, such changes are going to affect disproportionately the group of women above 35 years old[18].

Previous literature on fertility has painted a varied picture: Ananat and Hungerman (2012), Goldstein et al. (2013), Schneider (2015), Comolli (2017) find childbearing of younger groups to be the most responsive to changes in the unemployment rate, an effect driven by first births. On the other hand, Schaller (2016) and Del Bono et al. (2012) find older age groups to be more responsive; Comolli (2017) finds women in their late thirties (35-39) to be the second most hit group.

Table 2 replicates the analysis relating age-specific dependent variables to the corresponding age-specific unemployment rates; Figure B1 presents graphically the estimates from Table B2. Age-specific unemployment rates reflect the conditions that women in each age group face in the labor market, particularly if the labor market is segmented.[19] For the IV estimation, I employ age-specific instruments that measure the predicted employment level for each age group, as described in Section 4.

Columns (1-3) report the results for age-specific fertility rates. The OLS estimates in-

[16]Women in a stable couple are less likely to use contraception, even when not intentionally seeking a pregnancy (Loghi and Crialesi, 2017).

[17]In 2016, the average age of the mother at first birth was 32 in Italy(Istat, 2017). Hofmann and Hohmeyer (2013b) show that couples with children respond significantly to economic concerns by reducing fertility, while childless couples do not.

[18]Assisted reproductive treatment in Italy was first regulated in 2004 (L. 40/2004). Only in 2017 assisted reproductive treatment such as IVF became part of the essential services that have to be guaranteed by the National Health Service. In 2016, the average age of women resorting to assisted reproduction was 37, and these treatments accounted for 3% of live births in Italy(Ministero della Salute, 2018)

[19]Relating age-specific dependent variables to the overall unemployment rate yields similar results, reported in section B of the Appendix.

dicate that youth unemployment does not affect the fertility rate of women aged 15-24, as the estimated coefficient is close to zero and not statistically significant, while the response of older women's childbearing to changes of age-specific unemployment rates is negative and statistically significant at the 0.1% confidence level. The IV estimation uncovers an interesting relation: higher youth unemployment slightly increases the fertility rates of younger women, while higher unemployment for the middle-aged groups largely decreases their fertility rates.[20] Specifically, a one standard deviation increase in youth unemployment brings about a 0.15 standard deviation increase in the fertility rate of women aged 15-24, and this effect is statistically significant at the 5% confidence level. For women in the 24-34 age group, a one standard deviation increase in their unemployment rate decreases the general fertility rate by 0.52 standard deviations, and this effect is statistically different from zero at the 0.1% confidence level. The effect is even larger for women between 35 and 49 years old, where the GFR decreases by 1.5 standard deviations per one standard deviation increase in unemployment.

Columns (4-6) consider the relation between age-specific abortion rates and age-specific unemployment rates. The OLS analysis points to a null effect of unemployment rates on the abortion rate of young women, although not precisely estimated, and a limited positive effect for women older than 25 years old, which is statistically different from zero. The IV analysis confirms that unemployment rates do not have a statistically significant impact on the abortion choice of women in the youngest age group, while they have a positive and statistically significant effect on the abortion rates of older women. The IV estimates are larger in magnitude than the OLS ones and indicate that a one standard deviation increase of the respective age-specific unemployment rates brings about a 0.3 standard deviation increase in the abortion rate of women in the 24-34 age group, which rises to a 0.4 standard deviation increase for women older than 35.

Finally, columns (7-9) report the results for the age-specific abortion to pregnancies ratios. Again, the OLS estimation indicates that the behavior of younger women does not

[20]For estimates to be comparable across age groups they should refer to similar changes in unemployment, while here each refers to a one standard deviation change of the age-specific unemployment rate. However, here the standard deviation of the age-specific unemployment rates is decreasing across the age profile (see Table A1), while estimates are increasing over the age profile. Thus, translating the coefficients into a comparable unit change in unemployment would only magnify the result that the response of fertility and abortion increases across age categories. The fact that differences in response are not driven by differences in unemployment units of measurement is confirmed by the estimates relating the age-specific dependent variables to the total unemployment rate, presented in Section B of the Appendix.

correlate with changes in the unemployment rate, while for older women there is a positive and statistically significant correlation between the age-specific unemployment rate and their propensity to abort conditional on being pregnant. The results of the IV estimation confirm the small effect for women in the 15-24 class, and the positive effect for older women, which follows naturally from the decrease in fertility rates and increase in abortion rates attested by the previous columns. A one standard deviation increase in the respective unemployment rate increases the abortion ratio of women in the 25-34 age group by 0.2 standard deviations, as a consequence of the rise in pregnancies induced by the increase in births, but the estimate is not statistically different from zero. For women above 35 years old, their propensity to abort significantly increases by 0.96 standard deviations following a 1 standard deviation increase in their unemployment rate.

Overall, a common thread emerges from this analysis: unemployment rates have a statistically significant effect on childbearing and abortion, and their relevance for fertility choice is increasing over the life cycle. Notably, unemployment rates have a limited positive effect on young women's fertility and no statistically significant impact on the abortion rates of women in the youngest age group, while they decrease fertility rates and increase abortion rates of older women. The fact that the response of childbearing to changes in unemployments is increasing in magnitude across the age profile is consistent with Schaller (2016) and Del Bono et al. (2012). Since the average age at first birth is 32 in Italy (Istat, 2017), the reduction of births from women aged between 25 and 35 is likely to translate into a mere postponement of births. The large response of women between 35 and 49 years old instead suggests a potential permanent reduction in fertility, since these women are closer to the end of their reproductive cycle.

The change in births for the oldest age group also captures changes in assisted reproductive treatment; however, given the limited diffusion of IVF procedures[18], any changes in the use of these treatments are likely only a contributing factor to the observed decrease in births.

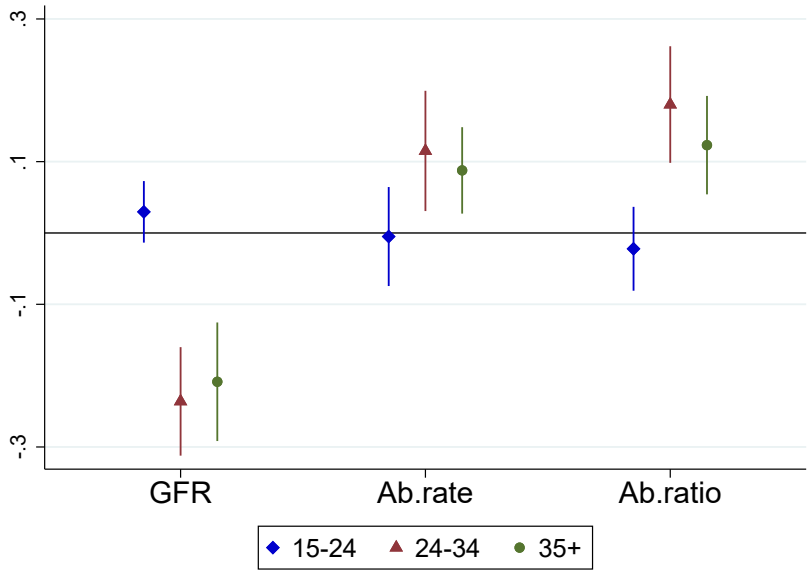
Table 2: Age specific fertility rates - standardized

	GFR			Ab.rate			Ab.ratio		
	15-24	25-34	35-49	15-24	25-34	35-49	15-24	25-34	35-49
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					OLS				
$Unempl_{t-1}$	0.030	-0.236***	-0.209***						
	(0.022)	(0.039)	(0.042)						
$Unempl_t$				-0.005	0.115**	0.088**	-0.022	0.180***	0.123***
				(0.035)	(0.043)	(0.031)	(0.030)	(0.042)	(0.035)
					IV				
$Unempl_{t-1}$	0.155*	-0.525***	-1.511***						
	(0.066)	(0.123)	(0.132)						
$Unempl_t$				0.038	0.314*	0.436***	-0.098	0.224	0.963***
				(0.082)	(0.146)	(0.099)	(0.083)	(0.138)	(0.121)
Observations	1236	1236	1236	1339	1339	1339	1339	1339	1339
R^2	0.368	0.279	0.066	0.484	0.293	0.465	0.197	0.122	0.467
KP LM p value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	97.744	82.949	213.311	113.627	54.553	175.792	113.627	54.553	175.792

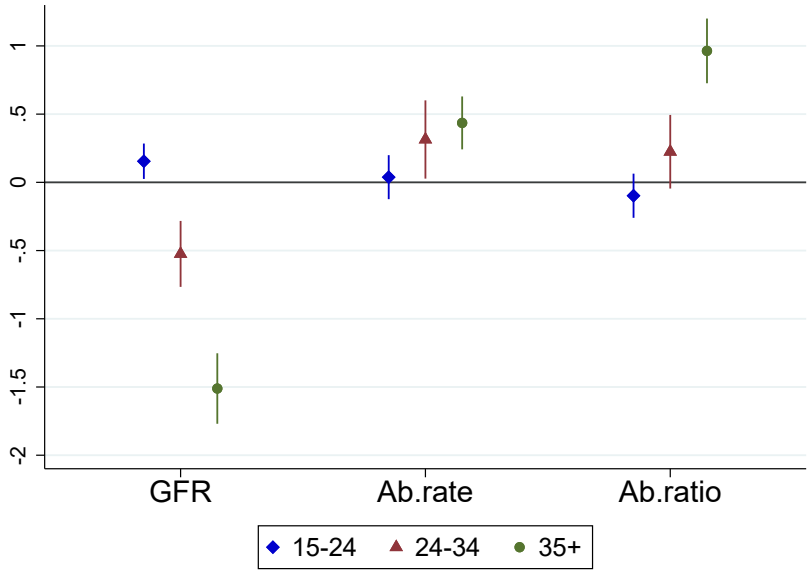
Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights. The R^2 refers to the OLS estimation.
* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2: Regression estimates - age heterogeneity

(a) OLS estimates



(b) IV estimates



Notes: 95% CI reported.

6 Robustness checks

This section discusses several robustness checks, presented graphically in Figure 3; the corresponding regression table is reported in Table D1 of the Appendix. Additional robustness checks are reported in the Appendix, in particular addressing measurement error in the abortion data (see Section D.2).

Figure 3 plots regression estimates for each of the dependent variables for a number of robustness checks, respectively using OLS and IV estimation. Notably, the results are rather stable across specifications, though in some cases with a loss of precision. The graph first presents the baseline coefficients of Table 1 and then compares them to alternative specifications.

The second specification includes time dummies for the introduction of potentially confounding national policies: the availability of medication abortion from 2009, a baby bonus policy from 2013, the labor market reform, baby bonus policy, and availability of emergency contraception without prescription from 2015.[21]

The third specification adds regional linear time trends to the baseline specification. Since health services are administered at the regional level, different regions might have been following different trends.

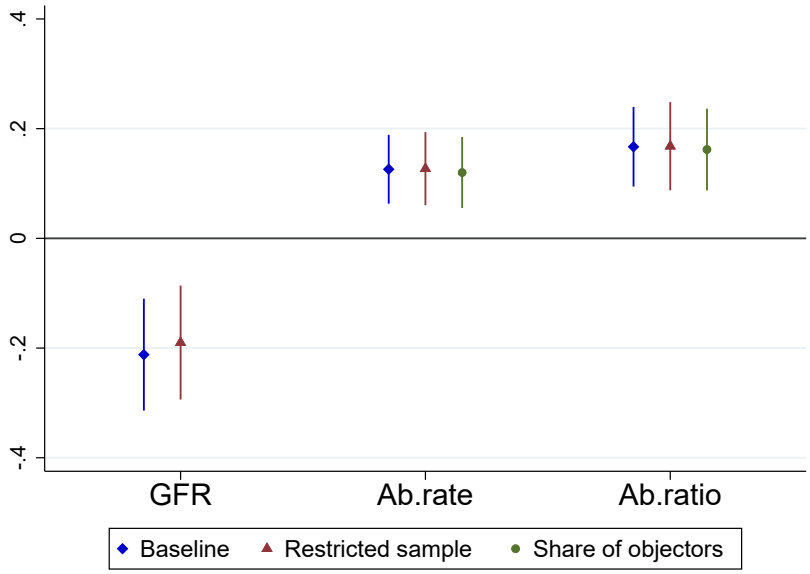
The fourth specification focuses on a restricted sample excluding the provinces of Pesaro, Rimini, and the region of Puglia. Excluding the Pesaro and Rimini provinces allows to more precisely keep geographical boundaries constant over time, since in 2009 seven municipalities changed province as a consequence of a referendum result. In addition, I exclude the region of Puglia because it was the first region to introduce a policy of free hormonal contraception, which might have affected abortion behavior. From 2008 low-dose birth control pills, hormonal patches and vaginal rings have been available for free at family clinics for some groups, including low-income households exempted from medical expenses and, independently of income, women below 24 years old, women with an abortion history, and breastfeeding women. Similar policies have since been adopted by other regions (Emilia Romagna, Lombardia, Piemonte, Toscana) starting from 2018.

Finally, the fifth specification replicated the analysis of the abortion dependent variables controlling for the regional share of objecting gynecologists. While systematic time-invariant differences in the supply of abortion services across provinces are captured by province

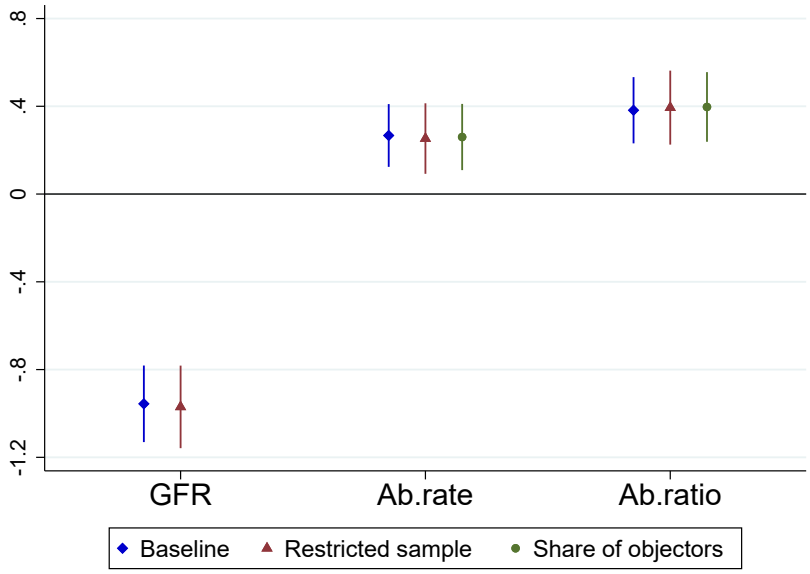
[21] For a more detailed description of these policies, see Section D.1.1.

Figure 3: Robustness checks

(a) OLS estimates



(b) IV estimates



Notes: 95% CI reported.

dummies, changes in the preferences of doctors over time are a potential source of variation in abortion supply. Indeed, the percentage of objectors in Italy has increased over time, from below 60% in 2002 to over 70% in recent years(**?**). The robustness of results to the share of conscientious objectors suggests that the results are not driven by changes in the availability of abortion services.

7 Conclusions

This paper explores the relationship between local unemployment rates and fertility choice, focusing on both childbearing and abortion behavior. The literature has been aware of the role of economic conditions in childbearing, suggesting that fertility behaves procyclically. However, the same attention has not been dedicated to understanding the response of abortion behavior, particularly using causal methods.

I investigate the response of births and abortions to changes in the unemployment rate in the context of the Great Recession and Sovereign Debt Crisis in Italy. The empirical results suggest that as unemployment conditions worsen the general fertility rate decreases, while the abortion rate and the propensity to abort conditional on pregnancy increase. Thus, both childbearing and abortion behave procyclically. The estimated effect on childbearing stands at around 1.4% change in fertility rate following a 1 p.p. change in the unemployment rate and is consistent with previous literature, such as Schaller (2016). This is however relatively limited compared to the estimated effect of job displacement (Del Bono et al., 2012), suggesting that local conditions have a smaller impact on childbearing than individual employment status.

Further analysis indicates that the reaction is increasing over the age profile, where younger women do not adjust their behavior (their childbearing even increases, though marginally) but older women do. Dynamic models of fertility predict that transitory fluctuations in wages might affect the timing of births, inducing a postponement of fertility, but they will not impact expected total fertility in the presence of perfect capital markets and certainty (Happel et al., 1984; Hotz et al., 1997). The reaction of women in the 24-34 age group can be reasonably interpreted as a fertility postponement. However, the reaction of women aged between 34 and 49 is even stronger. These women are the most likely to already have children but are also closer to the end of their reproductive life. A strong reaction from this group might therefore signal changes in their demand for additional children or having

children at all. Future research can delve into this question and explore whether fertility and abortion responses vary by parity, i.e. whether the changes affect the intensive or extensive margin or fertility, and whether the total realized fertility of women exposed to recessions in their last reproductive years is affected.

This study brings supportive evidence to the theory that fertility behaves procyclically, an important factor to be taken into account by policy makers. Public policies may play a key role in fertility decisions during economic downturns, for instance through child subsidies or the provision of abortion and family planning services. Learning about the impact of the business cycle on fertility and abortion rates has therefore important implications in terms of allocation of resources, both financial and human, in particular in the presence of budget cuts to the health sector. Additional policy implications include the design of policies to mitigate the adverse effects of labor market swings, such as free or subsidized contraception during unemployment spells. Similar policies were introduced in Puglia in 2008 and since then other regions have followed; the present study thus leaves scope for future research towards evaluating the impact of these policies.

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APPENDIX

A Summary statistics

Table A1 reports the summary statistics for the province-level data. On average, the fertility rate is highest for women between 25 and 35 years old, but this age class also corresponds to the highest abortion rate. On the other hand, once accounted for the number of pregnancies, the propensity to abort is much higher for the younger (15-24) and older (35+) women. This means that childbirth and abortion are relatively less frequent in the younger and older female population because these age classes have fewer pregnancies but, in the event of a pregnancy, they are more likely to abort.

The mean unemployment rate throughout the sample is around 9%, and it is particularly high for the younger section of the population, with a mean of 29%. Moreover, the share of irregular workers is 12% on average, with a maximum of 25%.

Table A1: Summary statistics - province data

	Mean	Median	Min	Max	SD
Fertility rate by age group, per 1000 women					
GFR	36.21	35.96	27.02	47.90	3.349
GFR 15-24	12.83	11.19	4.77	35.36	5.158
GFR 25-34	76.82	76.32	45.94	106.2	7.822
GFR 35-49	22.55	22.43	14.26	32.86	2.811
Abortion rate by age group, per 1000 women					
Ab.rate	5.82	5.65	0.25	13.59	1.664
Ab.rate 15-24	7.04	6.76	0.22	19.65	2.242
Ab.rate 25-34	8.35	8.17	0.33	22.35	2.419
Ab.rate 35-49	3.67	3.54	0.16	8.39	1.083
Abortion ratio by age group, per 1000 pregnancies					
Ab.ratio	137.67	135.21	7.39	310.80	34.491
Ab.ratio 15-24	363.61	370.37	32.92	639.91	97.300
Ab.ratio 25-34	98.36	97.21	4.04	246.95	27.306
Ab.ratio 35-49	140.67	134.19	6.99	308.60	42.285
Unemployment rate by gender					
Unempl	9.370	8.119	1.873	31.46	5.265
Unempl_f	11.39	9.651	1.865	33.32	5.963
Unempl_m	8.036	6.766	1.023	32.64	5.180
Unemployment rate by age group					
Unempl 15-24	29.20	28.05	2.826	73.94	14.25
Unempl 25-34	13.35	11.08	1.533	45.98	8.598
Unempl 35-64	6.093	5.388	1.103	21.70	3.431
Additional economic indicators					
Empl. rate	57.88	62.30	35.19	74.05	9.787
Irregular workers, %	12.68	10.77	6.460	25.56	4.575
Real GDP per capita (000 €)*	22.13	22.36	12.04	41.90	5.839
Real Value Added per capita (000 €)*	19.89	20.06	10.88	37.65	5.168
Referendum on abortion law (1981)					
Yes votes, %	29.19	29.54	20.42	46.25	5.783
Observations			1,339		
Provinces			103		

Notes: The table provides within cell means for the 103 provinces used in the baseline specification. The share of irregular workers is measured at the regional level.

*GDP and Value Added are CPI adjusted to 2004 Euros.

B Age heterogeneity - response to the aggregate unemployment rate

Table B2 replicates the analysis relating age-specific dependent variables to the aggregate unemployment rate. Results are remarkably consistent with what was reported in Table 2, especially concerning the IV coefficients.

Age-specific unemployment rates reflect the market conditions that women in each age group are facing, particularly if the labor market is segmented. The response of different age groups to changes in the aggregate unemployment rate instead captures the response to overall market uncertainty. We might expect aggregate unemployment to play an important role in particular for young women, who are less likely to be in the labor force and rely on parental employment status.

Columns (1-3) report the results for age-specific fertility rates. Both the OLS and the IV estimates indicate that aggregate unemployment does not have a statistically significant effect on the fertility rate of women aged 15-24, while its effect on older women is negative and statistically significant at the 99.9% confidence level. For women in the 24-34 age group, a one standard deviation increase in the unemployment rate decreases the general fertility rate by 0.57 standard deviations and is statistically different from zero at the 99.9% confidence level. The effect is even larger for women between 35 and 49 years old, where the GFR decreases by 1.4 standard deviations per one standard deviation increase in unemployment.

Columns (4-6) consider the relation between age-specific abortion rates and the aggregate unemployment rates. The OLS analysis points to a positive effect of unemployment rates on the abortion rate for all age groups, though of limited economic significance. The IV analysis instead finds that unemployment rates do not have a statistically significant impact on the abortion choice of women in the youngest age group, while they have a positive and statistically significant effect on the abortion rates of older women. The IV estimates are larger in magnitude and indicate that a one standard deviation increase of the respective age-specific unemployment rate brings about a 0.24 standard deviation increase in the abortion rate of women in the 24-34 age group, which rises to a 0.39 standard deviation increase for women older than 34.

Finally, columns (7-9) analyze the response of age-specific abortion to pregnancies ratios. Again, the OLS estimation indicates that there is a positive and statistically significant correlation between the age-specific unemployment rate and their propensity to abort conditional

on being pregnant for all age groups. The results of the IV estimation uncover an interesting relation: higher unemployment slightly decreases the propensity to abort of younger women, while it increases that of older women. These estimates are statistically significantly different from zero, respectively at the 95% and 99.9% confidence level. In particular, a one standard deviation increase in the unemployment rate decreases the abortion to pregnancies ratio of women in the 15-24 age group by 0.18 standard deviations, and increases that of women in the 25-34 age group by 0.33 standard deviations. For women older than 34, their propensity to abort significantly increases by 0.67 standard deviations following a 1 standard deviation increase in the unemployment rate. The increase in the abortions to pregnancies ratio of older women follows naturally from the decrease in fertility rates and increase in abortion rates attested by the previous columns.

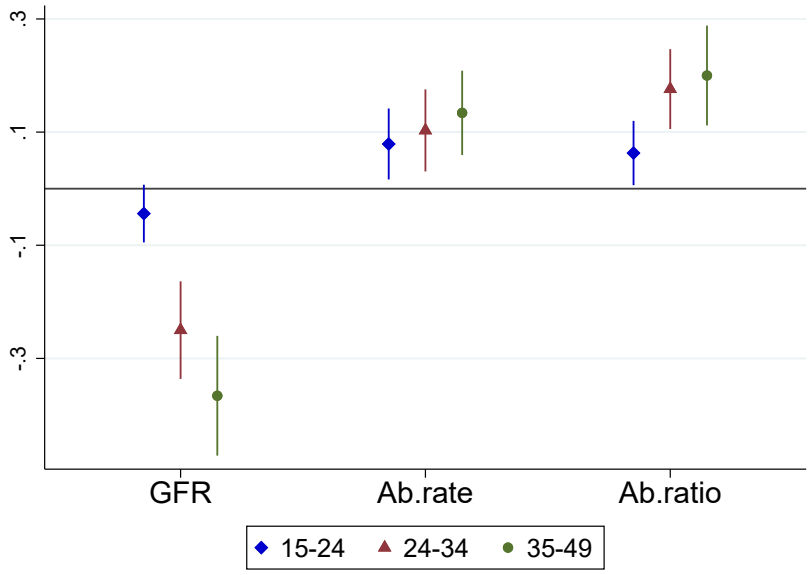
Table B2: Age specific fertility rates - standardized - total unemployment

	GFR			Ab.rate			Ab.ratio		
	15-24	25-34	35-49	15-24	25-34	35-49	15-24	25-34	35-49
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					OLS				
$Unempl_{t-1}$	-0.044	-0.250***	-0.366***						
	(0.026)	(0.044)	(0.054)						
$Unempl_t$				0.079*	0.103*	0.134***	0.063*	0.176***	0.200***
				(0.032)	(0.037)	(0.038)	(0.029)	(0.036)	(0.045)
					IV				
$Unempl_{t-1}$	0.024	-0.569***	-1.413***						
	(0.051)	(0.077)	(0.106)						
$Unempl_t$				-0.027	0.244**	0.393***	-0.181*	0.334***	0.674***
				(0.085)	(0.085)	(0.091)	(0.084)	(0.083)	(0.099)
Observations	1236	1236	1236	1339	1339	1339	1339	1339	1339
R^2	0.369	0.279	0.094	0.486	0.290	0.467	0.124	0.194	0.473
KP LM p value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	360.531	360.531	360.531	285.542	285.542	285.542	285.542	285.542	285.542

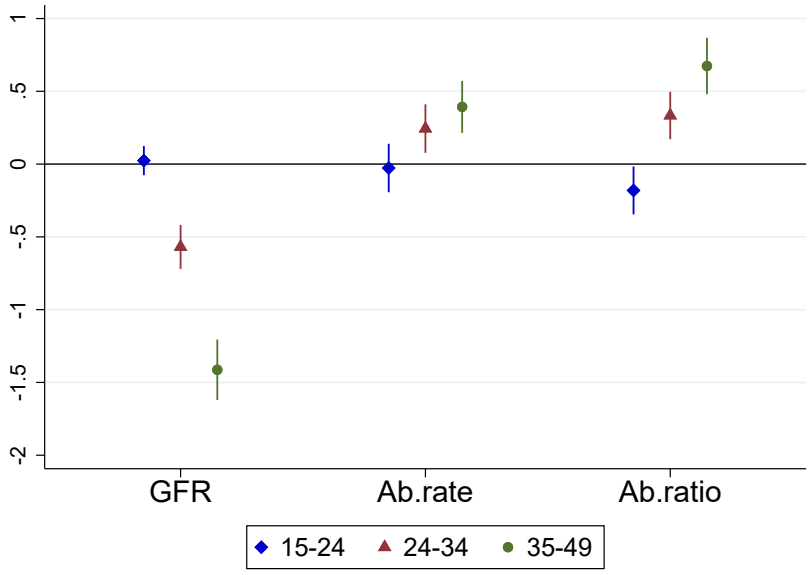
Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights. The R^2 refers to the OLS estimation.
* $p < .05$, ** $p < .01$, *** $p < .001$

Figure B1: Regression estimates - age heterogeneity - aggr. unemployment

(a) OLS estimates



(b) IV estimates



Notes: 95% CI reported.

C Geographic heterogeneity

This section considers a different margin of heterogeneity in the response to change in unemployment rates, distinguishing by geographical area. Figure C1 presents the standardized effects disaggregating by geographical area; Table C1 reports the corresponding estimates. Dependent and independent variables are standardized at the national level, to preserve the comparability of the estimates.

The direction of the estimated coefficients is homogeneous across geographical areas, while there is a noticeable pattern in the magnitude of the effects. Both fertility and abortion outcomes are less responsive to changes in the unemployment rate in Southern provinces, and the effect for the abortion rate and ratio is not significantly different from zero in the IV estimation. According to the IV estimation results, the general fertility rate responds similarly to a 1 standard deviation increase in unemployment in Central and Northern provinces, while the reaction of the abortion rate is clearly driven by Central Italy.

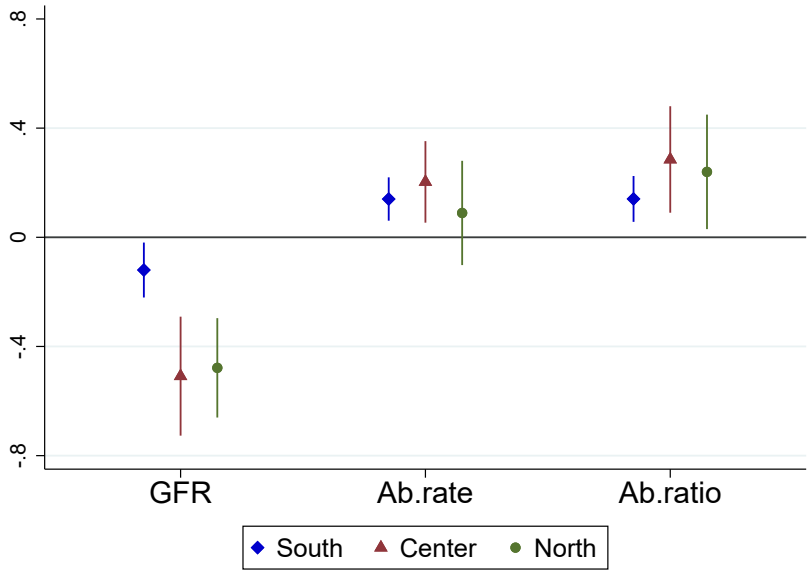
I explore two potential mechanisms behind this heterogeneity, which in particular might explain the low response from Southern areas. First, in more religious or abortion averse provinces the social cost of abortion might be higher, resulting in lower responsiveness to economic factors. Second, higher informality in the labor market might translate into less salience of unemployment rates for agents' choices. In Table C2, I proxy for these two channels using respectively the vote share against Law 194/78 in the 1981 referendum[22] and the share of irregular workers. The coefficients for the response to unemployment rate are stable across specifications and close to the baseline estimate, particularly in the IV estimation., indicating that Columns (1), (4), (7) suggest that views against abortion do not have a statistically significant effect on neither fertility nor abortion choice; though the OLS coefficient for the fertility rate is marginally significant and positive, this is not confirmed by the IV estimation. The share of irregular workers instead has a statistically significant effect on all dependent variables in the IV estimation. The coefficients on the interaction term between unemployment and the share of irregular workers suggest that a context of labor informality makes unemployment rates less relevant for fertility choice, as expected. In fact, the estimates for the interaction consistently go in the opposite direction of the main coefficient of interest, therefore reducing its magnitude in absolute terms. Labor informality

[22]More specifically, I consider the share of favorable votes to the fifth referendum question, opposing the legalization of induced abortion.

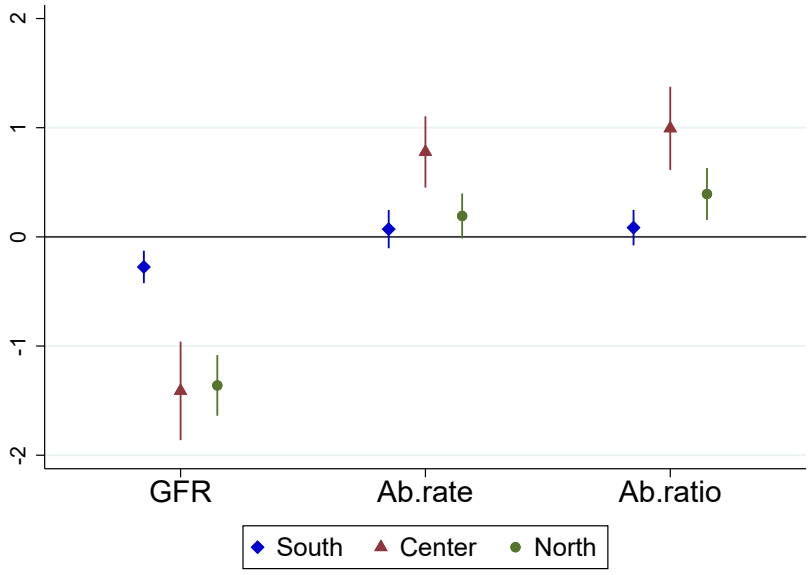
might therefore a contributing factor to the zero effect found in Southern provinces, though the limited size of the estimates indicates that this channel alone does not explain this result entirely.

Figure C1: Regression estimates - geographical heterogeneity

(a) OLS estimates



(b) IV estimates



Notes: 95% CI reported.

Table C1: Geographic heterogeneity - standardized

	GFR			Ab.rate			Ab.ratio		
	South	Center	North	South	Center	North	South	Center	North
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					OLS				
$Unempl_{t-1}$	-0.122*	-0.520***	-0.488***						
	(0.052)	(0.111)	(0.093)						
$Unempl_t$				0.140**	0.203*	0.089	0.141**	0.285**	0.240 *
				(0.040)	(0.076)	(0.097)	(0.043)	(0.099)	(0.107)
					IV				
$Unempl_{t-1}$	-0.281***	-1.411***	-1.390***						
	(0.077)	(0.235)	(0.145)						
$Unempl_t$				0.071	0.778***	0.192	0.085	0.994***	0.393 **
				(0.089)	(0.167)	(0.105)	(0.083)	(0.194)	(0.122)
Observations	432	252	552	468	273	598	432	252	598
R^2	0.539	0.523	0.673	0.491	0.712	0.560	0.302	0.521	0.321
KP LM p value									
KP F-stat	192.9	83.88	274.6	145.8	67.35	259.0	145.8	67.35	259.0

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights. The R^2 refers to the OLS estimation.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table C2: Heterogeneity - attitudes towards abortion and informal labor markets

	GFR			Ab. rate			Ab. ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					OLS				
Unempl	-0.214***	-0.354***	-0.354***	0.125***	0.141**	0.145**	0.169***	0.201***	0.183***
	(0.048)	(0.049)	(0.050)	(0.033)	(0.050)	(0.049)	(0.036)	(0.050)	(0.048)
$Ref._{1981}$*Unempl	0.128*		0.084	0.024		0.0427	-0.06		-0.045
	(0.053)		(0.05)	(0.044)		(0.047)	(0.045)		(0.047)
%Irreg			0.154			0.131			0.120
			(0.98)			(0.089)			(0.089)
%Irreg *Unempl		0.124***	0.108**		-0.013	-0.020		-0.029	-0.015
		(0.035)	(0.366)		(0.030)	(0.032)		(0.032)	(0.034)
					IV				
Unempl	-0.957***	-0.917***	-0.916***	0.264***	0.233***	0.224***	0.386***	0.336***	0.342***
	(0.088)	(0.079)	(0.078)	(0.072)	(0.067)	(0.066)	(0.076)	(0.0701)	(0.069)
$Ref._{1981}$*Unempl	0.018		-0.005	0.037		0.055	-0.055		-0.037
	(0.049)		(0.046)	(0.038)		(0.038)	(0.045)		(0.046)
%Irreg		0.216***	0.214**		0.105	0.121		0.108	0.097
		(0.065)	(0.067)		(0.064)	(0.064)		(0.064)	(0.064)
%Irreg *Unempl		0.267***	0.267***		-0.064*	-0.072*		-0.097*	-0.091**
		(0.029)	(0.030)		(0.029)	(0.029)		(0.030)	(0.031)
Observations	1236	1236	1236	1339	1339	1339	1339	1339	1339
R^2	0.589	0.597	0.602	0.557	0.557	0.560	0.348	0.347	0.351
KP LM p value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	176.918	254.518	169.645	139.050	197.915	132.467	139.050	197.915	132.467

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. With GFR as dependent variable, all time varying controls are lagged by one year. The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights. The R^2 refers to the OLS estimation.

* $p < .05$, ** $p < .01$, *** $p < .001$

D Robustness checks

This section reviews various robustness checks, first reporting the estimates of alternative specifications considered in the main text, and second discussing potential measurement error in the abortion dependent variables.

D.1 Confounding policies and others

Table D1 reports the estimates for several robustness checks for each dependent variable; these are the same presented graphically in Figure 3. Results are fundamentally unchanged, as coefficients remain close to the benchmark in Table 1.

Columns (1-2) include time dummies for the introduction of potentially confounding national policies: the availability of medication abortion from 2009, a baby bonus policy from 2013, the labor market reform, baby bonus policy, and availability of emergency contraception without prescription from 2015. These policies are described in detail in the next subsection. Columns (3-4) add regional linear time trends to the baseline specification of Equation 2. Since health services are administered at the regional level, different regions might have been following different trends. Columns (5-6) present the results when excluding from the sample the provinces of Pesaro, Rimini, and the region of Puglia. Finally, columns (7-8) control for the share of objecting gynecologists for the abortion dependent variables, accounting for potential changes in the preferences of doctors over time.

D.1.1 Confounding national policies

Several important policy changes were implemented between 2004 and 2016, which potentially had an impact on fertility behavior. Birth allowances and childcare vouchers have been implemented in different forms and magnitudes over the years, as they are approved and fine-tuned yearly in the national budget plan. In 2009, a "Fund for loans to families with newborns" was launched to incentivize access to credit for households with newborns in 2009-2014, by offering loans at a subsidized rate with a State guaranty amounting to 50% of the amount in case of insolvency [23]. Since 2012, the government introduced a monthly voucher for babysitting and childcare services targeted at full-time working mothers with ba-

[23] By end 2011, the participation rate of banks stood at 82% and 70% of the allocated funds had been employed; however, only 1% of households eligible in 2009 participated (Bartiloro et al., 2012). The remaining funds were used to extend the initiative, which was originally planned only for births between 2009 and 2011.

Table D1: Robustness

(a) GFR

	Policy dummies		Regional time trends		Restricted sample	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Unempl_{t-1}	0.011	-1.173***	-0.254***	-0.868***	-0.190***	-0.970***
	(0.055)	(0.181)	(0.042)	(0.065)	(0.053)	(0.096)
Observations	1236	1236	1236	1236	1164	1164
R^2	0.630		0.647		0.570	
KP F		108.564		499.754		328.6
KP LM pval		0.000		0.000		0.000

(b) Abortion rate

	Policy dummies		Regional time trends		Restricted sample		% objectors	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unempl_t	0.093**	0.307*	0.119***	0.262***	0.127***	0.253**	0.120***	0.260***
	(0.035)	(0.134)	(0.031)	(0.051)	(0.034)	(0.082)	(0.033)	(0.077)
Obs	1339	1339	1339	1339	1261	1261	1301	1301
R^2	0.561		0.616		0.546		0.536	
KP F		101.869		481.319		254.420		255.389
KP LM pval		0.000		0.000		0.000		0.000

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. * $p < .05$, ** $p < .01$, *** $p < .001$
The restricted sample in columns (1-2) excludes the provinces of Pesaro-Urbino, Rimini, and the region of Puglia from the sample.
The policy dummies used in columns (3-4) control for the introduction of medication abortion from 2009, a baby bonus policy from 2013, a labor market reform in 2015, and emergency contraception without prescription from 2015.
The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights.

Robustness (cont.)

(a) Abortion ratio

	Policy dummies		Regional time trends		Restricted sample		% objectors	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unempl_t	0.093*	0.349*	0.162***	0.409***	0.168***	0.394***	0.162***	0.397***
	(0.040)	(0.142)	(0.034)	(0.057)	(0.041)	(0.086)	(0.038)	(0.081)
Obs	1339	1339	1339	1339	1261	1261	1301	1301
R^2	0.368		0.401		0.328		0.328	
KP F		101.869		481.319		254.520		255.389
KP LM pval		0.000		0.000		0.000		0.000

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. * $p < .05$, ** $p < .01$, *** $p < .001$
The restricted sample in columns (1-2) excludes the provinces of Pesaro-Urbino, Rimini, and the region of Puglia from the sample.
The policy dummies used in columns (3-4) control for the introduction of medication abortion from 2009, a baby bonus policy from 2013, a labor market reform in 2015, and emergency contraception without prescription from 2015.
The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights.

bies born between 2013 and 2016[24]. Moreover, in 2014 a means-tested benefit for medium-low income family households with newborns was approved, consisting of a minimum 80E/month allowance paid up to the age of three, with larger amounts for lower-income households[25]. Although demographic experts have not reached a consensus as to whether such short-term measures are effective to redress the population imbalance, they might have provided temporary support for mothers in uncertain economic times (Drago et al., 2011; Malak et al., 2019).

In addition, the 2014 Jobs Act (Law 78/2014) implemented a wide-ranging reform of the Italian labor market, reducing firing costs and eliminating restrictions on the use of temporary contracts with the aim of reducing unemployment and labor market dualism. The changes induced by the reform might have affected both the unemployment rate and job security and consequently fertility and abortion through unobserved factors.

Finally, some regulatory changes interested the abortion procedure directly. Medication abortion was introduced in 2009, but its use remains rather limited and there is no evidence that it has induced an increase in abortion incidence. The share of medication abortions increased over time, from 5% in 2010 to 16% in 2016, particularly in the North and Center regions (Ministero della Salute, 2016). Moreover, from 2015 emergency contraception can be purchased in pharmacies without medical prescription, except in the case of minors[26].

To control for such policies, in Table D1 I replicate the analysis including an indicator variable for years from 2009 onwards to account for the availability of medical abortion; a time dummy from 2013 onwards to account for the kindergarten voucher; and a time dummy for years from 2015 onwards to capture the effect of the baby bonus policy, the labor market reform and emergency contraception access.

[24]The value of the kindergarten voucher was initially set to 300 €/month, and increased to 600 €/month from 2015. The voucher can be used as an alternative to optional parental leave for a maximum of 6 months, reduced to 3 months for self-employed mothers.

[25]A similar lump-sum baby bonus of 1,000 Euros was in place between 2004 and 2006, but limited to second and higher parity births in 2004 and 2006. Consequently, this measure received only a limited number of requests. For its limitations, this measure is not considered in the present study; nevertheless, note that in 2004 it is captured by the constant, in 2005 it should have no effect on fertility choice because it was approved retroactively.

[26]This regulatory change initially applied to the Ellaone, Stromalidan, and Escapelle emergency contraception drugs; the same provision was extended to Norlevo in 2016.

D.2 Measurement error in the abortion data

Although the filing of Modello D12 is compulsory for all induced abortions performed in public or private hospitals, there are various sources of missing data in the number of abortions per province of residence. Table D3 presents estimates for the abortion outcomes taking into account different sources of measurement error.

First, this data will only reflect the number of legally performed abortions. According to the Ministry of Health, covert abortions accounted for 20% of total abortions by Italian women in 2016 (Ministero della Salute, 2016), which means that the data used in this analysis captures the vast majority of the phenomenon. Moreover, covert abortions are partially measured by miscarriages, accounted for in Table D3.

Second, women can choose not to share their personal data, in which case the abortion is recorded in the data but all information regarding the province of residence and birth is omitted. This appears to be a minor concern since only 1% of observations do not report the province of residence.

Third, there are inconsistencies in the transmission of data from regions to the National Statistics Agency. Underreporting the number of abortions leads to a downward measurement error in the abortion rate and the abortion ratio. Comparing the number of reported abortions to official regional estimates, which integrate the incomplete data with hospital discharge data, I find that incomplete reporting affects 17% of region-year cells and that incomplete observations have on average 5% of total abortions missing. Incomplete data affects almost all regions at least once in the observed period, but only Campania and Sicilia report incomplete data for most years in the sample[27]. Columns (1-4) of Table D3 report the estimation results when excluding region-year cells with incomplete data from the analysis. The estimates maintain their statistical significance and are larger in magnitude than in the full sample: a one standard deviation increase in the unemployment rate brings about a 0.38 standard deviation increase in the abortion ratio and a 0.54 standard deviation increase in the abortion ratio.

Finally, the benchmark abortions to pregnancies ratio measure suffers from measurement error because it proxies the number of pregnancies only with live births and abortions.

[27]The region-years affected by incomplete data transmission, according to ISTAT, are: Abruzzo (2009, 2012), Basilicata (2009, 2014), Calabria (2008), Campania (2002-2003, 2005-2014), Friuli-Venezia Giulia (2005, 2006), Liguria (2013), Lombardia (2014), Marche (2014), Molise (2005), Puglia (2012,2013), Sardegna (2008,2009, 2013-2015), Sicilia (2004-2012, 2014, 2015), Umbria (2010-2012), Veneto (2015,2016).

The estimated number of pregnancies is downward biased since it does not account for stillbirths and miscarriages, leading to an upward biased estimate of the abortion ratio. This measurement error is non-random insofar as the number of miscarriages is related to economic instability, for instance through maternal stress; Bruckner et al. (2016) show that unexpected increases in the unemployment rate correlate with a rise in the number of spontaneous abortions one month later. Therefore, failing to account for spontaneous abortions might lead to an upward biased estimate of the effect of unemployment rates on abortion ratios. Columns (5-8) of Table D3 report the estimation results when including the number of spontaneous abortions in the calculation of the abortion ratio. Data on miscarriages is extracted from the yearly reports from the ISTAT data archive[28]. Columns (5-6) measure the estimated number of pregnancies as the sum of live births and induced abortions for Italian women by the province of residence, and miscarriages of Italian women by the province of abortion; columns (7-8) consider the number of miscarriages by the province of residence, but independent of citizenship. Since both corrections remain subject to some measurement error, the preferred proxy for the number of pregnancies remains the sum of live births and induced abortions. Coefficients remain statistically significant at the 0.1% confidence level and suggest that the effect of a 1 standard deviation increase in the unemployment rate ranges between 0.38 and 0.41 abortion ratio standard deviations.

E Bartik instrument

E.1 Industry sectors

Table E1 reports the list of sectors included in the analysis; in total, these are 10 sectors from the ATECO 2007 classification, which corresponds to the NACE Rev.2. Some industries are only available as a group, for example the manufacturing and extraction industries.

Figure E1 presents the initial geographical variation of the local employment shares for different industries, i.e. the shares used to compute the Bartik instrument. There is substantial variation across provinces in the importance of each sector for the local labor market, with Northern provinces concentrating on industrial production and services, and Southern areas concentrating on public administration and agriculture. Figure E2 shows the year-to-year growth of industry employment across the main sectors. The shaded area

[28] Indagine sulle dimesse dagli istituti di cura per aborto spontaneo, ISTAT.

Table D3: Measurement error in abortion data

	Incomplete region-years				Miscarriages			
					Ita		Tot	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ab.rate	0.104**	0.382***						
	(0.038)	(0.075)						
Ab.ratio			0.140**	0.539***	0.156***	0.387***	0.151***	0.412***
			(0.045)	(0.080)	(0.037)	(0.076)	(0.037)	(0.075)
Obs	1094	1094	1094	1094	1339	1339	1339	1339
$\bar{Y}$	5.93	5.93	140.92	140.92	123.96	123.96		
R^2	0.629		0.421		0.350		0.375	
KP LM		0.000		0.000		0.000		0.000
KP F-stat		238.972		238.972		285.542		285.542

Columns (5-6) measure the estimated number of pregnancies as the sum of live births and induced abortions for Italian women by province of residence, and miscarriages of Italian women by province of abortion; columns (7-8) consider the number of miscarriages by province of residence, but independent of citizenship. The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights.

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. * $p < .05$, ** $p < .01$, *** $p < .001$

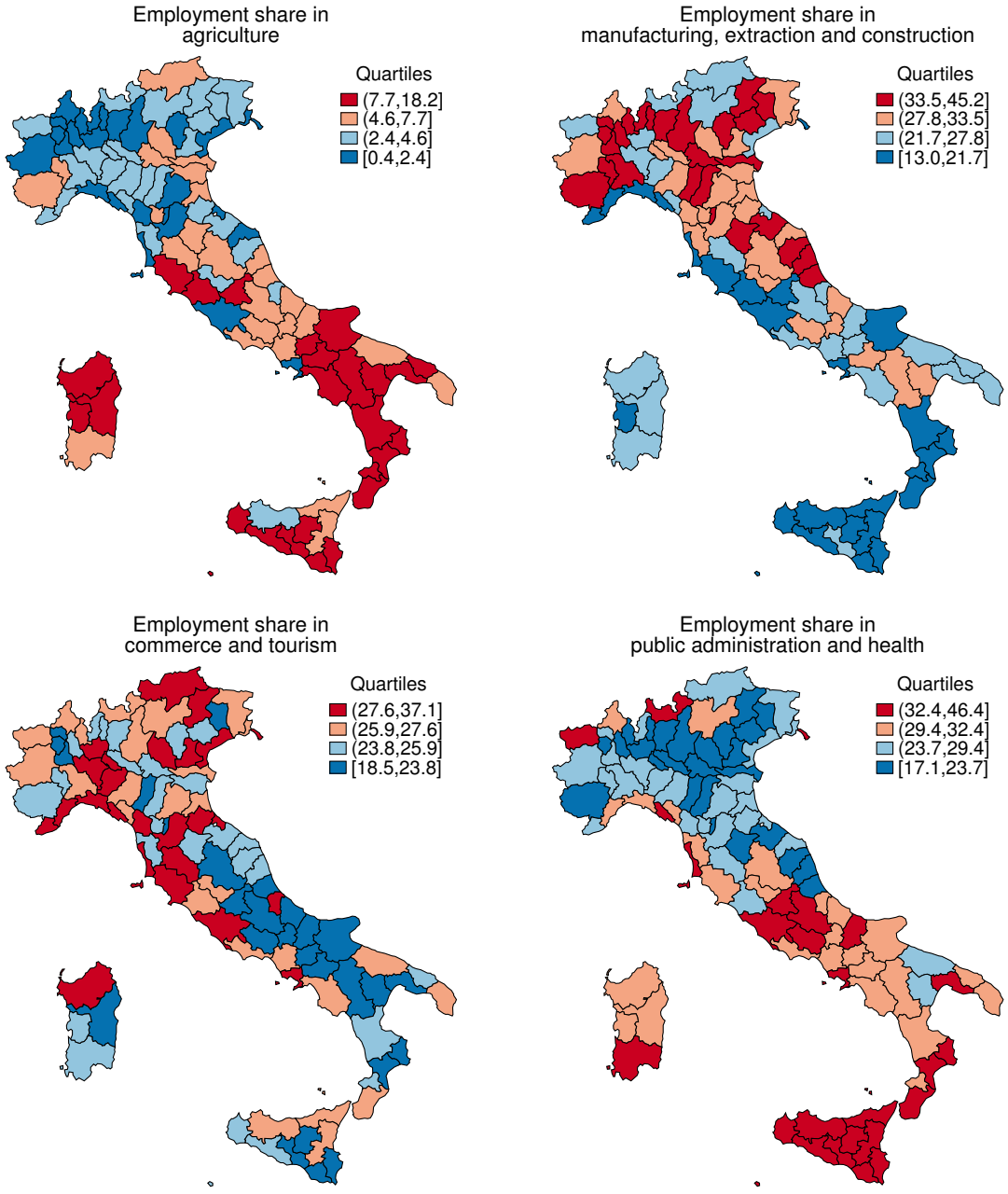
represents the years of crisis. The contraction during the crisis appears to encompass the majority of industries, especially in 2013, and manufacturing and construction stand out as the most affected sectors.

Table E1: Sectors used for the Bartik instrument

NACE code, Rev. 2	**Sector**
A	Agriculture, forestry and fishing
B-E	Mining and quarrying; manufacturing; electricity, gas, steam and air-conditioning supply; water supply, sewerage, waste management and remediation
F	Construction
G-I	Wholesale and retail trade, repair of motor vehicles and motorcycles; Transportation and storage; Accommodation and food service activities
J	Publishing, audiovisual and broadcasting activities; Telecommunications; IT and other information services
K	Financial and insurance activities
L	Real estate activities
M-N	Professional, scientific and technical activities; Administrative and support service activities
O-Q	Public administration and defence, compulsory social security; Education; Human health services; Residential care and social work activities
R-U	Arts, entertainment and recreation; Other services

Notes: Industries are aggregated to match the industry data available at the province level.

Figure E1: Industry shares in 2003



Industry shares in 2003 (cont.)

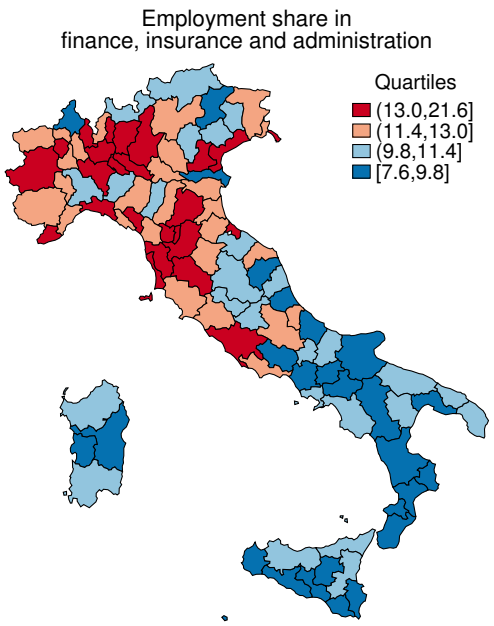
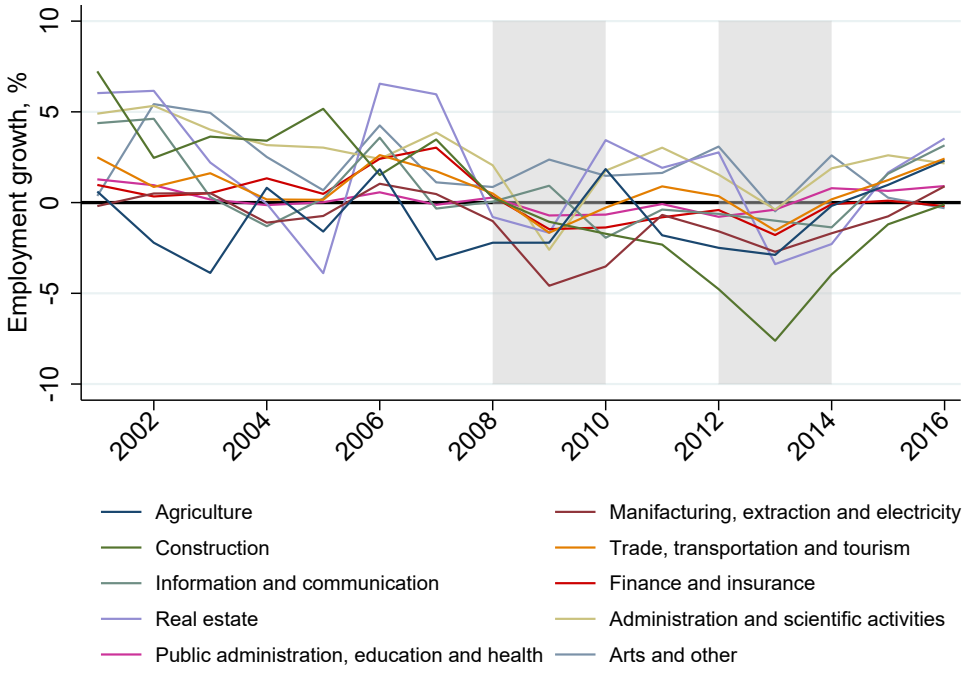


Figure E2: Employment growth



E.2 First stage relationship

The first stage estimates the relation between the province unemployment rate and the constructed shift-share instrument, which measures the predicted province employment level. If the labor force were constant, the number of employed individuals would perfectly determine the unemployment rate, so this index of employment and the unemployment rate would be almost inversely proportional. In the presence of changes in labor force participation, the level of employment will be informative of the unemployment rate insofar as changes in the labor force are not fully absorbed by only one of these two variables.

Figure E3 presents the first stage relationship graphically. Intuitively, the unemployment rates are negatively correlated with the employment level predicted by the Bartik instrument.

Table E2 reports the first stage estimates of the IV analysis, corresponding to the following regressions:

$$Unempl_{p,t-1} = \zeta_0 + \eta_0 Bartik_{p,t-1} + \theta_{0,p} + \chi_0 year + \mu_{0,p,t} \tag{6}$$

$$Unempl_{p,t} = \zeta_1 + \eta_1 Bartik_{p,t} + \theta_{1,p} + \chi_1 year + \mu_{1,p,t} \tag{7}$$

where the coefficients of interest are η_0, η_1. The large Kleibergen-Paap F-statistic informs us that the instrument is relevant, and the Kleibergen-Paap LM test rejects the null hypothesis of under-identification.

Figure E3: First stage relationship

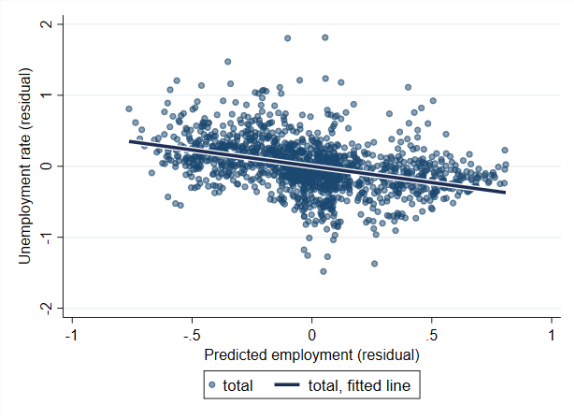


Table E2: First stage estimates - standardized

(a) Main specification

	GFR	Ab.rate & Ab.ratio
	(1)	(2)
	$Unempl_{t-1}$	$Unempl_t$
$Bartik_{t-1}$	-0.511***	
	(0.027)	
$Bartik_t$		-0.460***
		(0.027)
Observations	1236	1339
KP LM p-value	0.000	0.000
KP F-stat	360	285

(b) Age specific rates

	GFR			Ab.rate & Ab.ratio		
	15-24	25-34	35-49	15-24	25-34	35-49
	(1)	(2)	(3)	(4)	(5)	(6)
$Bartik_{t-1}$	-0.889***	-0.659***	-1.008***			
	(0.090)	(0.072)	(0.069)			
$Bartik_t$				-0.740***	-0.479***	-0.871***
				(0.069)	(0.065)	(0.066)
Observations	1236	1236	1236	1339	1339	1339
KP LM p-value	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	97	82	213	114	54	176

Standard errors in parentheses. All regressions include province fixed effects and a linear time trend.
The local unemployment rates are instrumented for using a leave-one-out Bartik instrument based on the number of employed individuals in each sector, using 2003 weights.
* $p < .05$, ** $p < .01$, *** $p < .001$

E.3 Alternative Bartik instruments

This section presents alternative versions of the shift-share instrument and discusses their performance in the main specification 2). For details on the construction of each measure, see the Data appendix below.

Figure E4 presents the evolution over time of different versions of the Bartik instrument, taking the (population-weighted) average instrument and changing the initial shares, the contemporaneous shifts, or adjusting the shifts to be gender or age-specific. The benchmark measure used in the main analysis considers the number of employed in each industry, weighted by the industry employment share in 2003. Panel E4a illustrates what happens when using different shifts, specifically comparing the index based on employment level versus value-added. Notably, the instrument based on value-added rebounds quickly after the crisis, while employment remains depressed. A quick comparison with Figure 1b suggests that the value-added based index is less reflective of the extent of the crisis in the labor market. Moreover, value-added data is only available at the national level, so the resulting instrument cannot feature a leave-one-out correction. Panel E4b compares alternative instruments by changing the initial provincial shares, both in terms of content and base year, which results in a simple rescaling of the instrument. I consider as benchmark share the province-industry employment share, as in Schaller (2016), and alternatively the ratio of local industry employment to the working-age population, as in Brown et al. (2018)[29]. Panel E4c presents the gender-adjusted instruments, that reflect the different evolution over time of female and male employment by accounting for national demographic composition within industry (following Schaller, 2016). Male employment appears to be more affected by the double-dip recession, which is consistent with manufacturing and construction being the hardest hit industries (see Figure E2). Finally, Panel E4d illustrates the differences across instruments adjusted for age classes. Predicted employment evolves with stark differences across age groups, driven by the evolution of the employment share of each group. The share of employed individuals between 35 and 65 years old increases from 65% in 2004 to 77% in 2016, while the share of younger workers decreases correspondingly.

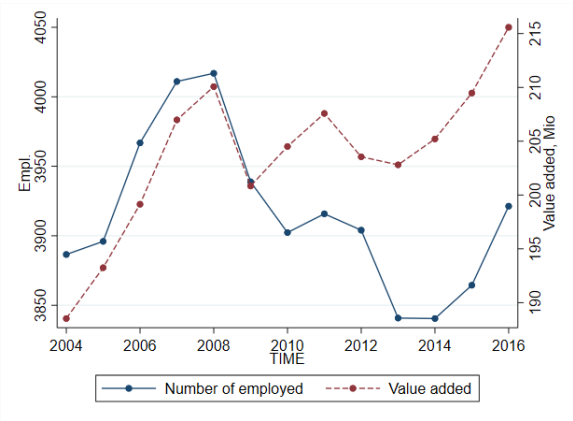
Finally, Table E3 reports on how estimates vary when employing different versions of the

[29]Unfortunately, data on the working-age population is not available at the province level for the year 2000. Moreover, the ratio of local industry employment to the working-age population by definition does not sum up to 1 within a province. This motivates the choice of the employment share as the benchmark in the main analysis.

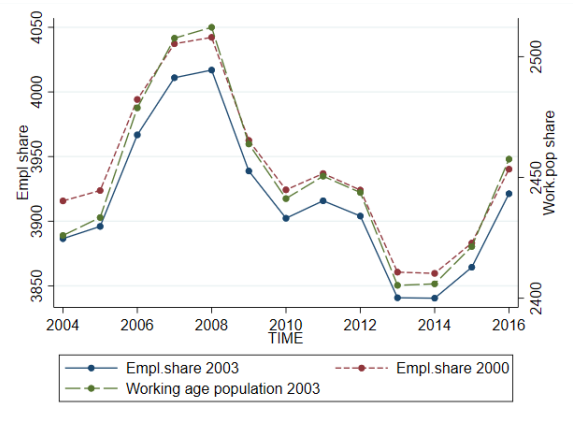
Bartik instrument.

Figure E4: Bartik instrument alternatives - average province

(a) Changing shifts

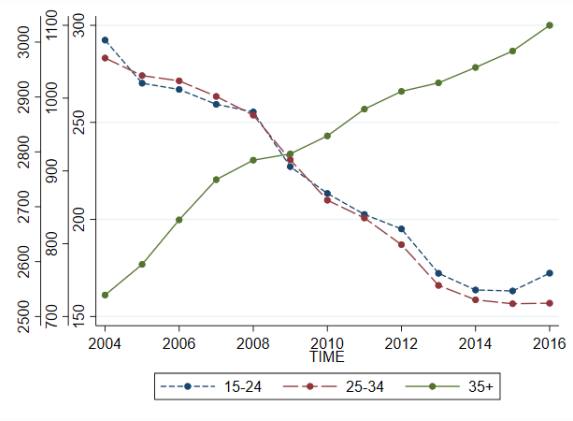


(b) Changing shares



(c) By gender

(d) By age



Notes: the figure plots the predicted value of different versions of the instrument for the median province (in terms of the distribution of the benchmark instrument), Cuneo. Panel E4a shows the predicted number of employed individuals and the predicted value added, while all other panels show the predicted number of employed individuals using different weights.

Table E3: Alternative Bartik estimators - standardized

(a) Second stage

	(1) E_$empl_{03}$	(2) E_$empl_{00}$	(3) E_wp_{03}	(4) VA_$empl_{03}$	(5) VA_$empl_{00}$	(6) VA_wp_{03}
	Dependent variable: GFR					
$Unempl_{t-1}$	-0.956***	-0.974***	-1.124***	-0.777***	-0.784***	-0.804***
	(0.085)	(0.091)	(0.102)	(0.061)	(0.061)	(0.060)
Observations	1236	1236	1236	1236	1236	1236
	Dependent variable: Abortion rate					
$Unempl_t$	0.267***	0.268***	0.305***	0.186***	0.181***	0.170***
	(0.070)	(0.075)	(0.077)	(0.050)	(0.050)	(0.048)
Observations	1339	1339	1339	1339	1339	1339
	Dependent variable: Abortion ratio					
$Unempl_t$	0.382***	0.372***	0.440***	0.324***	0.319***	0.328***
	(0.074)	(0.079)	(0.083)	(0.053)	(0.053)	(0.052)
Observations	1339	1339	1339	1339	1339	1339

(b) First stage

	(1) E_$empl_{03}$	(2) E_$empl_{00}$	(3) E_wp_{03}	(4) VA_$empl_{03}$	(5) VA_$empl_{00}$	(6) VA_wp_{03}
	Dependent variable: GFR					
$Bartik_{t-1}$	-0.511***	-0.524***	-1.642***	-0.575***	-0.606***	-1.472***
	(0.027)	(0.030)	(0.101)	(0.025)	(0.026)	(0.066)
Observations	1236	1236	1236	1236	1236	1236
KP LM pvalue	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	360.531	310.931	264.509	537.680	525.489	504.050
	Dependent variable: Abortion rate and ratio					
$Unempl_t$	-0.460 ***	-0.465***	-1.500***	-0.567***	-0.595***	-1.467***
	(0.027)	(0.030)	(0.098)	(0.025)	(0.026)	(0.063)
Observations	1339	1339	1339	1339	1339	1339
KP LM pvalue	0.000	0.000	0.000	0.000	0.000	0.000
KP F-stat	285.542	242.509	233.017	526.748	513.950	533.836

Columns (1)-(3) refer to the leave-one-out Bartik instrument measured using the employment level, weighting industries by their employment share in 2003, 2000 and the working population in 2003, respectively. Column (1) corresponds to the preferred Bartik instrument used in the main text. Columns (4)-(6) refer to the leave-one-out Bartik instrument measured using industry real value added, weighting industries by their employment share in 2003, 2000 and the working population in 2003, respectively.
Standard errors in parentheses. All regressions include province fixed effects and a linear time trend. * $p < .10$, ** $p < .05$, *** $p < .01$

F Descriptive analysis

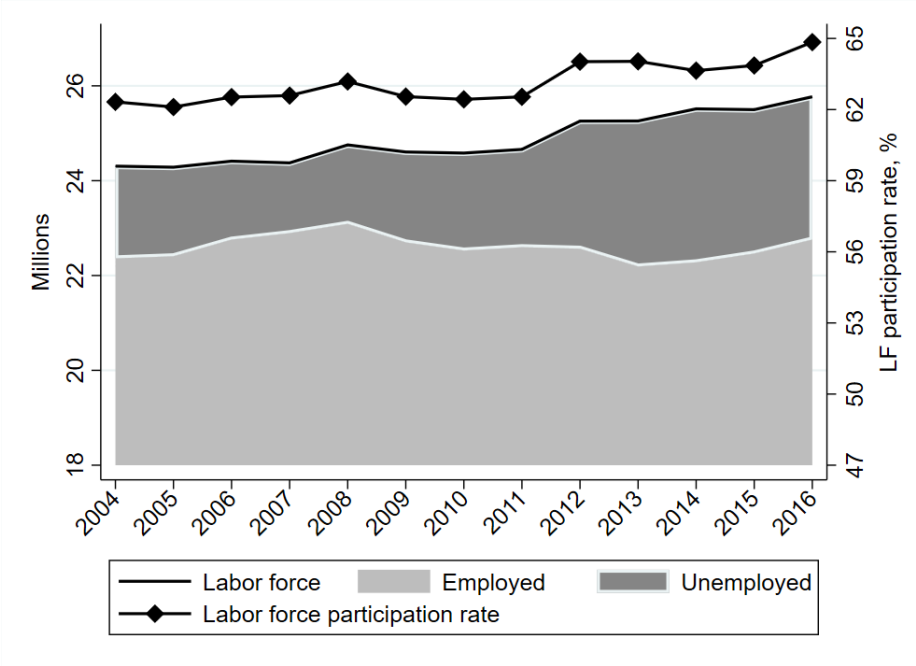
This section describes the recession in Italy, pointing out its different impact on different age classes and geographical areas.

F.1 The recession in Italy

Figure 1 in the main text illustrates the evolution of the unemployment rate over time, showing evident spikes between 2008 and 2014. The first increase in the unemployment rate corresponds to the Great Recession, which mostly affected employment in manufacturing firms (CNEL, 2009). The second increase relates to the Sovereign debt crisis, from the second half of 2011 to 2013, which caused a credit crunch and drop in internal demand, affecting mostly the construction and mechanic industry (CNEL, 2014).

The effect of recessions on the unemployment rate is partially mediated by changes in labor force participation. Figure F5 illustrates the evolution of the labor force over time, underlying the relationship between employed and unemployed. While labor force participation decreased slightly in 2009, it increased significantly in 2012 as inactive workers re-entered the labor market; as a consequence, the observed increase in the unemployment rate in 2009 is relatively small compared to the one in 2013. The Great Recession in 2009 thus induced change both along the extensive and intensive margin: the labor force participation rate decreased slightly, and the number of unemployed increased. In 2012 instead, participation in the labor market increased, but only to the benefit of unemployment, which further increased in 2013.

Figure F5: Employment, unemployment and labor force participation



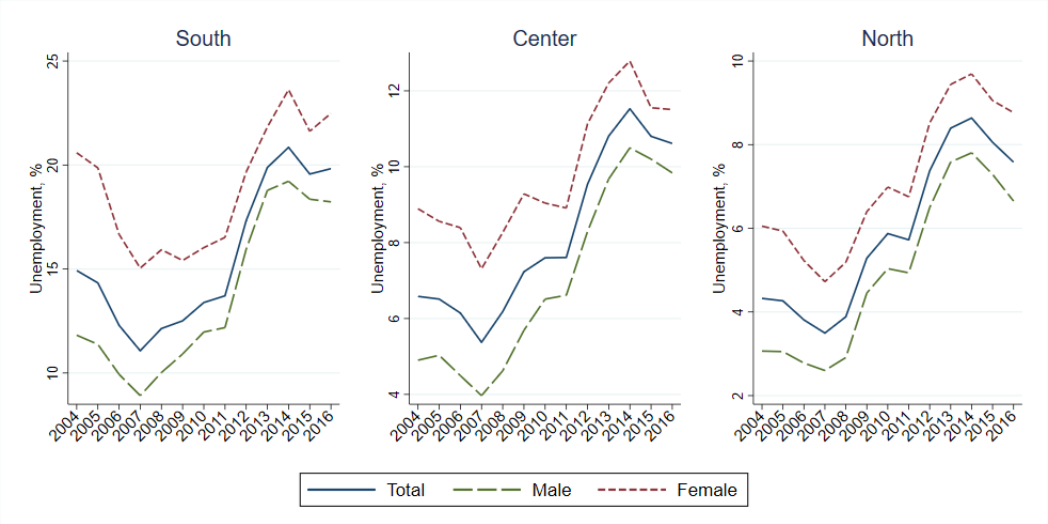
F.2 North and South

Figure F6 illustrates the evolution over time of unemployment rates in the average (population-weighted) province in Southern, Central, and Northern Italy. Noticeably, the female unemployment rate is consistently higher than that of males. Moreover, unemployment rates in the Southern provinces seem to respond less strongly to the Great Recession, while in the Center and North they increase in correspondence of both crises. This can be partially traced back to the different industrial composition of these macro-areas, as the export-oriented manufacturing industry that was greatly impacted by the Great Recession concentrated in Northern provinces, as illustrated by Figure E1. Moreover, the response of labor supply was also geographically heterogeneous: in Southern Italy, the increase of the unemployment rate during the first recession was partially offset by a large increase in inactive workers, while in the Central and Northern regions most of the reduction in employment translated directly into a rise of unemployment (CNEL, 2011).

Figure F7 maps the before-after change of unemployment rates across provinces. Although there is a slight prevalence of increase of unemployment rates in Northern provinces, a glance at the map does not reveal a clear North-South divide in terms of the labor market effects of the crises.

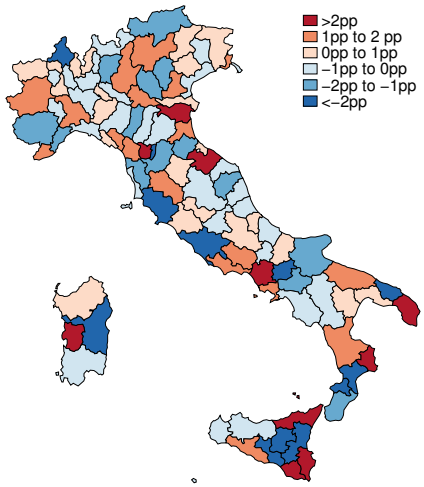
Finally, Figure F8 presents the distribution of the three dependent variables across regions. In general, Central Italy has lower fertility and abortion rates than the other areas. However, at a glance, there is no clear relation between fertility and abortion: high abortion rates are found in regions both in the top and bottom quartile of the fertility distribution. At the regional level, significant differences in the rates of fertility and abortion can be observed, but a clear pattern cannot be discerned.

Figure F6: Unemployment by macro-areas and gender



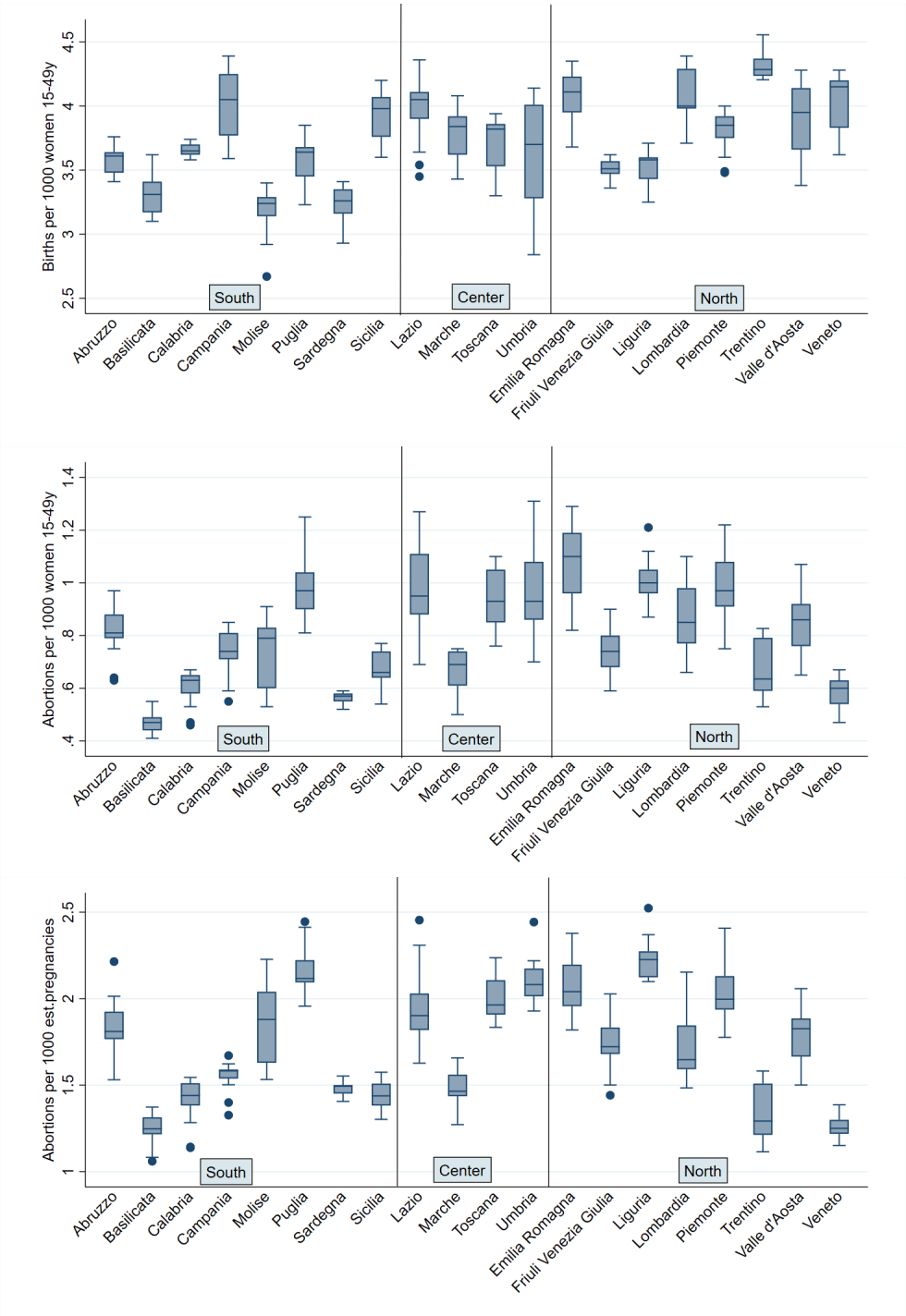
Notes: The figure plots the unemployment rate for the average (population weighted) province in the Center-North and South macroareas.

Figure F7: Changes in unemployment



Notes: This map presents the change in the unemployment rate before and after the recession. I regress the unemployment rate on region-specific time trends and calculate the average residuals for the pre-recession period 2004-2007 and for the post-recession period 2015-2016. I then subtract the pre-recession average from the post-recession average.

Figure F8: Distribution across regions



Notes: Abortion rates and ratio refer to the region of abortion, extracted from Ministero della Salute (2016).

G Data appendix

Table G4: Data appendix

Variable	**Source**	**Method**
General fertility rate; population and live births	ISTAT, General Register Office	The GFR measures the number of live births for 1000 women in their childbearing age (15-49), considering only women of Italian nationality.
Abortion rate	ISTAT , Rilevazione sulle Interruzioni Volontarie di Gravidanza (Laboratorio ADELE)	The abortion rate measures the number of voluntary abortions for 1000 women in their childbearing age (15-49), considering only women of Italian nationality.
Abortion ratio	ISTAT, Rilevazione sulle Interruzioni Volontarie di Gravidanza (Laboratorio ADELE)	The abortion ratio measures the share of voluntary abortions over the number of estimated pregnancies in childbearing age, i.e. the sum of voluntary abortions and live births, considering only women of Italian nationality.
Miscarriages	ISTAT, Indagine sulle dimesse dagli istituti di cura per aborto spontaneo	Number of spontaneous abortions by province of abortion, 2010-2016.
Unemployment rate	ISTAT, Rilevazione sulle Forze di Lavoro	Computed using employment and unemployment counts from the LFS
Share of irregular workers	ISTAT, European System of Accounts	Share of employed individuals with irregular work per region, 2004-2016.
Referendum 1981	Ministry of Internal Affairs, Historical Archive of Elections	Share of yes votes to question 5 of the 17/05/1981 Referendum.

Table G5: Bartik instrument, data and formulas

Data and source	**Method**	**Formula**
Employment Bartik Employment by industry and province of work - ISTAT, Regional accounts	I take a weighted average of the national-level number of employed individuals added in each of the 10 sectors considered (see Table E1), where the weights are the local employment shares of each industry in 2003. The employment data measures the number of workers by place of work, i.e. it measures the workers that participate in the production process in each province: it does not account for residents that work outside of the province, while it includes non-residents that work in a firm located in the province. An alternative measure uses the number of employed by industry weighted by the share of working age population employed in each industry and province in 2003.	$B_{p,t} = \sum_{k=1}^{K} \chi_{p,k,t_0} E_{-p,k,t}$ $\chi_{p,k,t_0} = \frac{E_{p,k,t_0}}{E_{p,t_0}}$ Alternative weight: $\chi_{wp,p,k,t_0} = \frac{E_{p,k,t_0}}{Pop_{15-65,p,t_0}}$
Value Added Bartik VA by industry, Italy - ISTAT	I take a weighted average of the national-level real value added in each of the 10 sectors considered (see Table E1), where the weights are the local employment shares of each industry in 2003. Real value added by industry is measured in thousands of 2004 Euros.	$B_{AV,p,t} = \sum_{k=1}^{K} \chi_{p,k,t_0} VA_{IT,k,t}$

Gender-specific Bartik	For the gender-specific Bartik instrument I weight each industry by its gender concentration, i.e. the share of female (male) employees in the industry at the national level[30].	$B_{g,p,t} = \sum_{k=1}^{K} \chi_{p,k,t_0} \xi_{g,IT,k,t} E_{-p,k,t}$ $\xi_{g,IT,k,t} = \frac{E_{g,IT,k,t_0}}{E_{IT,k,t}}$
Age-specific Bartik	For the age-specific Bartik instrument, I rescale the standard Bartik instrument by the share of employed of each age class at the national level over the total number of employed.	$B_{a,p,t} = \psi_{a,IT,t} \sum_{k=1}^{K} \chi_{p,k,t_0} E_{-p,k,t}$ $\psi_{a,IT,t_0} = \frac{E_{a,IT,t}}{E_{IT,t}}$

[30]When the shift measure is national employment in an industry, adjusting for industry gender concentration translates into using directly the gender-specific national employment in an industry as the shift.