EMPLOYMENT PATTERNS BEFORE AND AFTER CHILDBIRTH IN ITALY: A COUNTERFACTUAL STUDY USING ADMINISTRATIVE DATA[1]

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Abstract. This paper investigates the labour market dynamics of parents in Italy, focusing on the impact of motherhood on employment conditions before and after childbirth. Using linked administrative data from the Basic Registry of Individuals (RBI) and the Annual register on earnings, working hours and labour cost for persons and enterprises (RACLI), we analyse a population of parents with children born in 2019 who were employed in the private, non-agricultural sector.

Adopting a longitudinal and counterfactual approach, we track employment trajectories one year before and three years after childbirth, comparing parents with non-parents to isolate the effect of motherhood on labour market participation.

Preliminary results reveal a process of "selection into parenthood," whereby women who become mothers tend to already have a more stable and advantageously compensated work profile before the child's birth.

The study also examines wage differentials and access to support measures such as parental leave. In summary, the research offers a detailed perspective on how job stability influences reproductive decisions and how labor market inequalities impact women's careers during a critical life transition in contemporary Italy.

1. Research objectives

This study adopts a counterfactual approach to examine the impact of motherhood on women's occupational trajectories and conditions, using integrated population-based administrative data. Rather than addressing demographic decline broadly, the research focuses on a specific question: how childbirth affects employment patterns across different family structures, nationalities, and labour market positions.

The main objective is to profile individuals—Italian and foreign nationals—who entered parenthood, analysing their employment conditions before and after childbirth. Key labour market indicators include wage differentials, access to income

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support measures (such as the Wage Guarantee Fund, Cassa Integrazione Guadagni), parental leave uptake, and other relevant variables.

The analysis is anchored in 2019, chosen as the baseline year to assess the interplay between fertility, labour market participation, and external shocks. The study relies on the Basic Registry of Individuals (RBI) to identify parents of children born in 2019, who are then linked to the Annual register on earnings, working hours and labour cost for persons and enterprises (RACLI). This defines the analytical universe: "parents of children born in 2019, employed in the private non-agricultural sector during that year."

2. Background and Context

Italy faces a persistent demographic challenge characterized by low fertility rates and aging population. The total fertility rate (TFR) has steadily declined since the post-war baby boom, reaching a provisional low of 1.18 children per woman in 2024 (Istat, 2024). This decline, combined with increased life expectancy, is reshaping the age structure, increasing the old-age dependency ratio and reducing the working-age population.

Female labour market participation remains low and uneven, influenced strongly by family responsibilities. In 2024, only 53.3% of women were employed compared to 71.1% of men, with a particularly low employment rate among women aged 25–34, where caring for young children often limits workforce engagement (Istat, 2025). This dynamic is central to understanding fertility decisions and labour market outcomes.

Overall, the intersection of low fertility and constrained female employment underscores the demographic and socioeconomic challenges Italy faces, setting the stage for this study's focused investigation.

Projections suggest a modest rise in fertility to 1.38 children per woman by 2050, with births peaking around 404,000 in 2038. Nevertheless, the number of women of childbearing age will continue to decline, while the population aged 65 and over is expected to grow significantly, reaching 34.5% by 2050. These trends will likely intensify demographic and labour market challenges, particularly concerning the balance between dependent and working-age populations.

3. Empirical Strategy

3.1. Data

As already mentioned in the introductory section, our data are derived from the Basic Registry of Individuals (RBI) and encompasses "parents of children born in 2019" as recorded in the Anvis system. This dataset has been integrated with the Annual register on earnings, working hours and labour cost for persons and enterprises (RACLI), thereby defining the population under study as "parents of children born in 2019, who were employed in the private, non-agricultural sector during the reference year."

The Basic Registry of Individuals, Families, and Cohabitations represents the unique reference for official statistics concerning permanent resident population, first of all for the permanent census and the demographic statistics. This registry is compiled annually through the integration of multiple administrative and statistical sources, including:

the administrative archives within the Integrated Microdata System (SIM);

the National Registry of Resident Population (ANPR);

the Virtual Statistical Registry (ANVIS), which is continuously updated with microdata on demographic flows originating from the 2011 Census population;

the Permanent Census, to identify over- and under-coverage within the registry.

To compute the annual demographic balance, the final RBI archive ensures internal consistency between the stock of permanent residents recorded at the beginning and end of the year and the demographic flow data documented in Anvis over the same period.

Variables within the RBI include demographic and socio-economic characteristics such as sex, date of birth, municipality of residence (usual and/or registered), place of birth, citizenship status, marital status, family and/or cohabitation arrangements, and educational attainment.

The Annual Registry on Earnings, Working Hours and Labour costs for persons and enterprises (RACLI) constitutes the employed workers' module of the Thematic Labour Registry, specifically covering the non-agricultural private sector. RACLI currently incorporates administrative sources related to the labour market and serves as an input for integrated statistical production.

Upon full implementation, the Thematic Labour Registry will encompass all job positions—both dependent and non-dependent—across public and private sectors, constituting a comprehensive microdata repository on employment and labour income. This database will facilitate statistical analyses at both individual and economic unit levels and serve as a source for producing additional registers.

The statistical unit of RACLI is the job position, defined as the contractual relationship between a worker and an employer that began on a starting date and is characterized, if the position has ended, by a termination date. The scope of observation includes dependent job positions within companies classified under the ASIA register and belonging to the non-agricultural private sector.

3.2. Methods

Our data integration relies on deterministic record linkage, employing a unique pseudonymized individual identifier to merge information from multiple administrative sources. Specifically, from approximately 420,000 births recorded in 2019 within Anvis, about 390,000 mothers and 358,000 fathers were successfully matched in the Basic Registry of Individuals (RBI). The unmatched subset—around 30,000 mothers—is primarily due to incomplete or missing parental data during integration into the Integrated Microdata System (SIM), as well as the recent implementation of municipal registry transfers to the National Registry of Resident Population (ANPR). Additionally, some parents were non-residents as of December 31, 2019, which affected linkage completeness.

By leveraging these linked administrative data and applying the counterfactual framework, this study aims to provide a refined and precise analysis of the impact of motherhood on women's employment trajectories, overcoming limitations of traditional survey-based approaches.

This study employs a counterfactual approach, a fundamental technique in causal inference within social sciences. The core idea is to compare observed outcomes—such as women's employment trajectories after childbirth—with hypothetical scenarios in which the "treatment," namely motherhood, did not occur. This allows us to estimate the causal effect of motherhood on occupational trajectories and employment conditions by isolating its impact from other confounding factors. Since the counterfactual scenario is by definition unobservable, we approximate it using a combination of deterministic record linkage, longitudinal data, and comparative analyses between groups with different exposure statuses.

4. Results

This integrated database allows us to longitudinally track individuals' demographic and employment trajectories both before and after childbirth (see Section 3.1). For instance, in 2018, the year preceding childbirth, 43.9% of women who gave birth in 2019 held an active dependent employment position in the private, non-agricultural sector, which we define as having performed at least one hour of

paid work. We found that employment rates varied by household composition: 36.7% for mothers living in households with at least one minor child, versus a notably higher 51.7% for those in households without minors. Among women who did not have children in 2019, overall employment incidence was 38.2%, with a rate of 34.4% for those living with minors and 42.2% for those without.

This initial descriptive analysis, while subject to potential compositional effects and selection bias, highlights key distinctions between groups. It is crucial to acknowledge that, to ensure valid causal inference, these descriptive statistics must account for selection bias, as the two groups may not be inherently comparable, and confounding from spontaneous dynamics, where the outcome variable might change independently of the maternity event.

Women who became mothers in 2019 and were employed in the private sector showed a higher concentration in Italy's Center-North (74.3% vs. 63.9% of the total mother population) (Table 1).

Table 1 - *Summary of the linkage outcome. Percentage values. Year 2018.*

Characteristics	Total		Women with a position in the non-agricultural private sector	
	No child in 2019	*At least one child in 2019*	*No child in 2019*	*At least one child in 2019*
Geographic Area				
Center- North	65	63.9	77.3	74.3
South	35	36.1	22.7	25.7
Household Composition				
No minor	75	47.6	80.5	57.2
At least one minor	25	52.4	19.5	42.8
Age Group				
15-25 years old	17.1	7.8	14.3	9
25-35 years old	33.9	54.1	43.5	61.7
35-45 years old	36.8	36.9	36.2	28.8
45-55 years old	11.2	1.1	5.9	0.5
Education Level				
No degree	79.6	79.3	77.2	72.2
Degree	20.4	20.7	22.8	27.8
Position Type				
Non-full time, full-year position	-	-	79.3	73.1
At least one full-time, full-year position	-	-	20.7	26.9

Source: Authors' own calculations based on RBI/Anvis-RACLI data.

Furthermore, among employed mothers, the proportion with at least one minor child (42.8%) is significantly lower compared to the overall group of mothers (52.4%). This may indicate that stable dependent employment is more common for women having their first child, as the presence of multiple children could complicate

labor market participation. The age distribution is similar across both groups, though the 25-35 age bracket is more predominant among employed mothers. This suggests that the combination of work and motherhood is more frequent at younger, central reproductive ages.

Finally, our findings indicate that employed mothers exhibit a higher incidence of holding a university degree compared to the general population of mothers. This result underscores a strong correlation between higher educational attainment and a greater likelihood of having a stable, dependent employment position before childbirth.

In summary, the women who became mothers in 2019 and were employed in the private sector in 2018 present a more "advantageous" or "structured" profile. They are more concentrated in Italy's Centre-North, have a higher propensity to hold a university degree, and tend to have fewer children in the family unit compared to the general population of mothers.

To effectively isolate the causal effect of parenthood on women's labor market trajectories and attribute observed differences in employment outcomes to the parenthood event, we employed a robust methodological approach: counterfactual analysis. This approach minimizes confounding bias by comparing observed outcomes with a hypothetical scenario where the "treatment"—in this case, motherhood—did not occur (see Section 3.2.).

Specifically, we utilized a non-experimental design combined with a non-parametric matching technique (Marchesi et al., 2011; Morgan et al., 2007). This method, applied to our longitudinal data, allows us to approximate the unobservable counterfactual outcome and conduct comparative analyses between groups with different exposure statuses. To ensure methodological rigor and the robustness of our results, the analysis was structured into four distinct phases:

1. <u>Identification of outcome variables</u>: the initial phase involved defining key labour market indicators to capture dimensions of job quality and employment stability. Specifically, three sets of outcome measures were considered: (a) Differences in job quality indicators preceding the parenthood event, including employment termination rates, hourly wages, labour costs per paid hour, and the prevalence of fixed-term and part-time contracts; (b) Employment continuity, measured by the persistence of job positions throughout the five-year period, essential for understanding medium-term labour market stability; (c) Medium-term effects assessed by examining the same job quality indicators used in (1a) over a five-year observation window post-parenthood, providing insights into sustained employment impacts.

2. <u>Identification of treatment group</u>: this phase involved isolating the "treatment" cohort, defined as women who gave birth in 2019.

3. <u>Selection of covariates for counterfactual construction</u>: to construct an appropriate control group (counterfactual), pre-treatment covariates (X) were selected based on their relevance to labour market outcomes and worker characteristics. These variables were used to generate strata for matching, ensuring comparability between treated and control units. The variables included: (X1) Geographic region, capturing local labour market heterogeneity; (X2) Age categorized in ten-year intervals, to control for age-related labour market effects; (X3) Educational attainment (graduates versus no graduates), reflecting differences in employment prospects; (X4) Family status (presence of minors), representing the pre-parenthood household context; (X5) Country of birth (Italy versus abroad), accounting for origin-related labour market disparities; (X6) Presence of a full-time, full-year (*ftfy*) dependent employment position in the year preceding childbirth, as a proxy for job stability and intensity before the parenthood event.

4. <u>Matching Procedure</u>: The final phase of our analysis implemented a rigorous 1:1 matching protocol. This process was designed to ensure the control group closely mirrored the treatment group across a set of selected, pre-defined characteristics. The matching was specifically applied to the population of women who held at least one dependent employment position in the non-agricultural private sector in 2018 and subsequently gave birth in 2019.

Thanks to these comprehensive data sources, we were able to select a control group that almost perfectly mirrors the treatment group across all pre-event characteristics. The differences in percentage points for key socio-demographic characteristics between the women who had a child in 2019 and the counterfactual group are all negligible (equal to zero).

The high quality of this outcome is directly attributable to the availability of administrative records and microdata on the entire population. This level of detail and coverage allows for a highly precise matching process. The minimal difference confirms that potential confounding factors present before motherhood have been successfully balanced between the two groups. This, in turn, allows researchers to confidently attribute any subsequent differences in labor market trajectories to the causal effect of motherhood.

After controlling for key socio-demographic characteristics—including age, educational attainment, geographic region, country of birth, and the presence of minors in the household—our analysis reveals that employed women who became mothers in 2019 had a distinctive profile in 2018, the year before they gave birth.

This pattern suggests a process of "selection into parenthood" or "sorting" within the labor market. These prospective mothers were already in a more stable position than their peers: they were more likely to hold permanent employment positions

(+4.6 percentage points) and experienced fewer instances of job activation (-5.2 percentage points) or termination (-0.6 percentage points) (Figure 1).

Furthermore, these women tended to work more hours (+14.3%) and consequently earned a higher annual remuneration (+13.7%) even before the childbirth event (Figure 2). This suggests that the women most likely to enter motherhood were those already in a stronger, more secure labor market position.

This pattern strongly confirms that job stability acts as a key determinant, facilitating reproductive choices among working women. These findings align with the hypothesis that employment security is a crucial factor in fertility decisions, corroborating prior literature emphasizing a positive association between job stability, improved economic conditions, and parenthood (Anderson & Pontusson 2007; Esser & Olsen 2012; Alderotti et al., 2021).

The continuity and security provided by a permanent employment relationship, along with a relatively high salary, likely furnish the necessary economic resources and psychological stability to navigate the challenges of motherhood, thereby mitigating both economic and professional uncertainty.

Figure 1 - *Differences between incidences between study population and counterfactual in work quality indicators in the proximity of childbirth. Percentage points. Year 2018.*
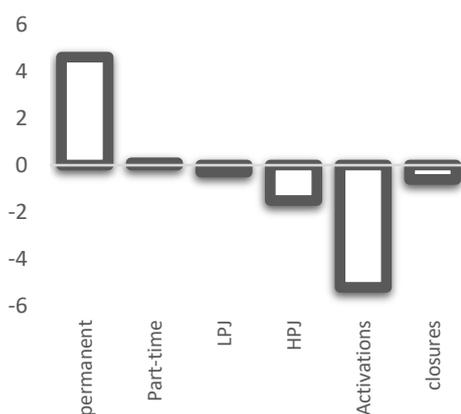
Figure 2 - *Differences between median values (right) between study population and counterfactual in work quality indicators in the proximity of childbirth. Percentage values. Year 2018.*
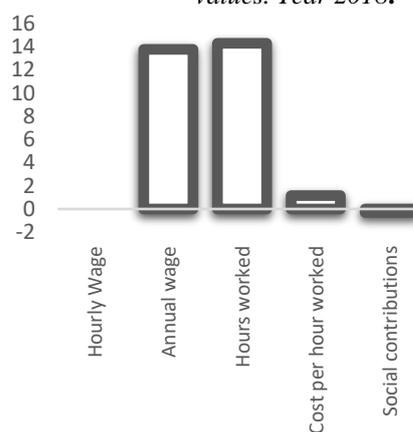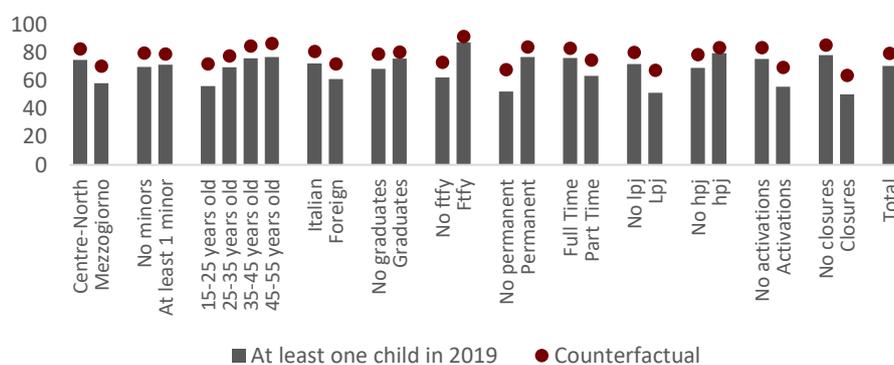

Source: Authors' own calculations based on RBI/Anvis-RACLI data.

Always controlling for initial socio-demographic and professional characteristics, employed women who gave birth in 2019 exhibited lower employment persistence in the non-agricultural private sector through 2022, compared to their childless counterparts. This pattern is particularly pronounced among younger women, those residing in Southern Italy, and individuals who, in 2018, held fixed-term or low pay jobs (Figure 3).

Such evidence aligns with the well-documented concept of the "motherhood penalty," which emphasizes the adverse effects of childbirth on the continuity and stability of maternal employment (Rosina, 2024; Freguja, Romano, Sabbadini, 2025).

Figure 3 - *Share of female employees with an active job position in 2018 and 2022 in the non-agricultural private sector by characteristics observed in 2018.*

Source: Authors' own calculations based on RBI/Anvis-RACLI data.

Moreover, among women who maintained active employment in the non-agricultural private sector both in 2018 and 2022, those who became mothers in 2019 women experience a lower growth in hourly remuneration (+5.5%) compared to their counterparts. The gap, however, becomes abysmal when considering total annual earnings (inclusive of income-replacement benefits), which grew by only +1.5% for mothers versus a substantial +27.0% for non-mothers. (Table 2). Notably, the diminished growth in annual wages appears largely driven by a reduction in hours worked (+19% vs -6%). This significant discrepancy is a direct consequence of the utilization of maternity and parental leave. While these periods of absence from work are legally protected and provide benefits, the allowances do not fully equate to a regular salary. As a result, the number of hours worked is reduced, leading to a corresponding negative impact on the total annual remuneration received. This highlights how the use of such benefits, while essential for family support, can

contribute to a significant "motherhood penalty" in career progression and lifetime earnings.

Table 2 – *Differences between median values in various indicators calculated on a longitudinal panel for the study and counterfactual populations (2022 vs. 2018). Percentage values. Years 2018 and 2022.*

	Counterfactual	At least one child in 2019
Annual gross earnings	+32.52%	-2.81%
Annual gross earnings (inclusive of allowances)	+26.98%	+1.53%
Hourly Wage	+8.00%	+5.48%
Hours worked	+18.88%	-8.67%
Hourly labor cost	+9.60%	+6.63%

Source: Authors' own calculations based on RBI/Anvis-RACLI data.

These observations corroborate insights from the literature, which consistently highlights the robust penalization of mothers and pregnant women in the labour market across many international experimental studies (El Haj et al., 2024), along with evidence of discrimination in promotions and, though less frequently studied, in dismissals.

5. Conclusions and Discussion

This study provides a detailed analysis of the impact of motherhood on women's labour market trajectories in Italy, leveraging comprehensive administrative data and a robust counterfactual methodology. Our findings confirm the persistent challenges that women face in balancing employment and parenthood, revealing a clear "motherhood penalty" in terms of employment continuity, wage growth, and job stability.

The counterfactual approach highlights that women who gave birth in 2019, despite often entering parenthood from relatively stable and well-paying employment positions, experience a significant decline in labour market participation and slower wage progression compared to childless peers. This penalty is especially acute among younger mothers, those living in Southern Italy, and those holding less stable or lower-paid jobs before childbirth. These results reinforce the notion that employment security and job quality are critical enablers of reproductive decisions and that their absence can intensify economic and professional uncertainties linked to motherhood.

Furthermore, the persistence of wage differentials and slower career advancement for mothers underscores the ongoing structural inequalities within the Italian labour market. These gaps not only affect individual women and their families but also have broader demographic and socioeconomic implications in a context marked by low

fertility and an aging population. Our analysis confirms that labour market disadvantages are a crucial factor contributing to women's reduced employment rates and may indirectly influence fertility decisions.

This study also sheds light on the role of institutional support measures, such as parental leave and the Wage Guarantee Fund (CIG), although further research is needed to assess their effectiveness in mitigating the motherhood penalty and fostering gender-equal labour market outcomes.

Policy implications emerging from these findings include the urgent need to improve employment stability and career progression opportunities for women of childbearing age, particularly in vulnerable regions and job categories. Enhancing access to affordable childcare, promoting flexible work arrangements, and strengthening protections against discrimination can help reduce the economic and professional costs associated with motherhood.

Future research should extend the analysis to more recent birth cohorts and examine the long-term effects of the COVID-19 pandemic on female employment and fertility. Additionally, qualitative investigations into employer practices and workplace cultures could complement our quantitative findings, offering a more holistic understanding of barriers to women's labour market participation post-childbirth.

In conclusion, tackling the motherhood penalty is essential not only for advancing gender equality in the labour market but also for addressing Italy's demographic challenges and supporting sustainable economic growth. Our study provides empirical evidence to inform targeted interventions and contribute to policy debates aimed at fostering inclusive and family-friendly labour market environments

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