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Compulsory Schooling and Educational Inequalities: Insights from the Italian Fioroni Reform

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Contents

Introduction **3**

1 Relevant Literature **6**
1.1 Foundations of Economics of Education 6
1.2 Evidence of Compulsory Schooling Reforms 9
1.2.1 Non-monetary benefits of education 10
1.3 Education and Socio-Economic Inequalities 12
1.4 Intergenerational Mobility of Education 13

2 Empirical Framework **16**
2.1 Research Design 16
2.2 The Italian Schooling System 18
2.3 The 2007 Compulsory Education Reform 19
2.4 Methodology 23
2.5 Data and Descriptive Statistics 25
2.5.1 Data and Variables Construction 25
2.5.2 Descriptive Statistics 26

3 Results **29**
3.1 Baseline Results 29
3.2 Intergenerational Outcomes 33
3.3 Territorial Disparities 36

Conclusions **39**

Bibliography **40**

Introduction

Education represents one of the main drivers for economic growth and social development. As an investment in human capital, it enhances both individual and collective productivity in the labor market, influencing job performance, career opportunities, and ultimately leading to higher earnings.

Beyond its monetary returns, schooling has a profound impact on many other dimensions of life, generating long-term benefits that extend well beyond the workplace. Education, for example, improves health outcomes and life expectancy by encouraging healthier behaviors, allowing a better understanding and adherence to medical treatments, and increasing the ability to afford healthcare services. In addition, education affects positively civic awareness and political participation, by reducing cognitive and practical costs of political engagement and increasing the perceived benefits of active participation in society. Moreover, increased schooling not only reduces juvenile delinquency, since students have less free time to engage in criminal activities, but also lowers the likelihood of future crime by raising its opportunity cost and by shaping individual preferences toward greater risk aversion and higher levels of patience. Education also influences individuals' relationships and sexuality. By increasing awareness and providing better access to information, it encourages more responsible choices, which can lower the risk of experiencing or committing sexual violence and reduce exposure to sexually transmitted diseases. Related to this topic, also fertility patterns are affected by an increased education. Pregnancy rates become lower as young girls are encouraged to focus on personal development and often decide to postpone childbearing to a more mature age.

Through an improvement of future monetary and non-monetary returns, education represents a key tool in reducing inequalities of opportunities, as it enables individuals to build a meaningful dignified future regardless of the background of origin. In developed nations, it is recognized as a universal right and plays a fundamental role promoting intergenerational mobility. Within this framework, educational policies acquire crucial importance, particularly in countries that continue to display widespread weaknesses and persistent inequalities.

This thesis focuses on the Italian schooling system, which is still characterized by extensive fragility; the country exerts school dropout rates above the European average and profound territorial disparities in educational attainment. In addition to these meaningful vulnerabilities, the Italian society presents low levels of intergenerational mobility, and parental socioeconomic context still largely determines children's future educational opportunities and life outcomes. For these reasons, Italian educational policies, especially those impacting minimum school leaving age can succeed in offering better opportunities for disadvantaged individuals.

With the aim of reducing illiteracy and raising overall education levels, in recent decades the Italian schooling system has undergone several changes regarding compulsory schooling age. The most recent reform in these terms is the so called Fioroni reform, introduced in 2007, which increased minimum school leaving age by two additional years reaching the age of 16. This legislative intervention had the dual objective of aligning the level of compulsory schooling in Italy with that of other European countries and combating the high rate of school dropouts that has long characterized the nation. The aim of this thesis is therefore to assess whether increasing compulsory schooling in Italy has actually contributed to reducing dropout rates and promoting greater equity among students from different socioeconomic backgrounds. The analysis of the Fioroni Reform therefore is carried out focusing not only on the average effect of the intervention, but also on its heterogeneity, to understand whether students from low-income families or with low educated parents have benefited more from the measure compared their peers from more privileged backgrounds.

To address these questions, I use data from the Survey on Household Income and Wealth (SHIW) conducted every two years by the Bank of Italy. The survey provides a rich set of information on the demographic, social, and economic characteristics of Italian households, making it particularly suitable for the analysis. The main outcome of the analysis is upper secondary school completion and the empirical strategy adopted in the study is a Regression Discontinuity in Time (RDiT) design, which allows to credibly estimate the impact of the reform by comparing the educational outcomes of the last birth cohorts subject to the previous compulsory schooling legislation with those of the first cohorts affected by the policy. This approach allows to isolate the causal effect of the reform from other potential confounding factors that usually impact schooling decisions.

Results of the analysis highlight heterogeneous effects of the reform on high school completion rates for men and women. More specifically, evidence suggests that the policy did not alter educational attainment patterns among women while significant

positive impact emerge for men. In this group, individuals from low socioeconomic backgrounds, namely with uneducated or financially constrained parents, show major improvements in educational outcomes, consequently to the policy implementation. In addition, the policy seems to have impacted positively individuals who attended upper secondary school in southern regions of the country, contributing to a reduction in territorial disparities in education. Overall, the policy provided an incentive to complete upper secondary education for vulnerable groups, historically characterized by higher dropout rates.

The contribution of my thesis is twofold. On the one hand, this study provides new evidence on the causal impact of the 2007 Fioroni reform on upper secondary school completion rates, an effect that, to the best of my knowledge, has not been yet evaluated in literature. Second, the thesis sheds light on the heterogeneity of policy effects across gender, socioeconomic background, and geographic location, with particular attention to disadvantaged groups and students residing in southern regions. In doing so, it not only evaluates the overall effectiveness of compulsory schooling reforms in the Italian context but also contributes to the broader debate on how education policies can reduce inequalities and improve social mobility.

The next chapters are structured as follows: Chapter 1 reviews the relevant literature, with particular attention to theoretical models on the economics of education, studies that have exploited compulsory schooling reforms to estimate the returns to education, and research analyzing the role of family conditions and intergenerational mobility. Chapter 2 illustrates the institutional context, describes the characteristics of the Italian school system, and presents in detail the Fioroni reform, the choice of data used, and the econometric methodology adopted. Chapter 3 reports the empirical results of the analysis, with particular emphasis on differences by gender, family background, and geographical area of birth. Lastly, the conclusions summarize the main contributions of the work.

Chapter 1

Relevant Literature

This thesis brings together two different strands of the literature on education. First, it exploits a change in the compulsory schooling age and contributes to the existing literature on how educational policies can serve as sources of quasi-experimental variation. Second, by measuring outcomes separately according to socio-economic background, it provides evidence of the decisive role played by family origins in shaping educational outcomes in Italy. Section 1.1 includes an overview of the foundations of economics of education. Section 1.2 provides evidence on how compulsory schooling reforms have been used in literature as a source of exogenous variation in schooling to measure monetary and non-monetary returns to education. Section 1.3 focuses on the importance of socio-economic conditions on educational outcomes. Finally, Section 1.4 explores research on intergenerational mobility of education.

1.1 Foundations of Economics of Education

Prior to evaluating the impact of the Fioroni Reform on highschool participation and completion rates, it is essential to examine the factors influencing individual schooling decisions and the mechanisms of the decision-making process. The determinants of such decision include individual characteristics as innate abilities, and also familiy background, istitutional factors and labor market incentives.

In one of the seminal contributions to this literature, Becker (1964) suggests that the choice to attend school can be seen as an investment in human capital similar to a how firms invest in technology and machinery, as acquiring skills and expertise generate returns. In addition to labor and consumption activities, the model proposed in his paper allows for the allocation of time and goods to investment in human capital. Each individual can decide to dedicate time and spend some of the available goods to attend school and produce his own human capital. This investment entails both direct

costs of schooling—such as books, tuition fees, and transportation—and opportunity costs, including potential labor market earnings and forgone leisure. Future returns of schooling consist primarily of higher wages once in the labor market. Equation 1.1 shows the total costs borne by individuals who decide to study, namely direct costs plus foregone earnings (marginal product that could be received in the labor market minus effective income during school years).

$$C = k + \big(MP_0 - MP\big) \tag{1.1}$$

On the other hand, the net return to education in each period is defined as the additional earnings obtained by investing in human capital rather than entering the labor market immediately. Formally, in each period $j = 1, \ldots, n$ the net gain is defined as $k_j = Y_j - X_j$, where Y_j denotes earnings with education and X_j earnings without education. As a result, the total gain from investment in human capital is defined as the present value of future net earnings minus the costs of education

$$d = \sum_{j=1}^{n} \frac{k_j}{(1+i)^j} - C = R - C. \tag{1.2}$$

The optimal level of schooling is reached when the present value of future returns equals the present value of the marginal costs of education.

After Becker, Mincer (1974) provided an additional contribution to the schooling model by expanding the understanding of the relationship between human capital investment and future earning through regression analysis. In particular, he estimates the percentage increase in wages Y_i associated with an additional year of school with a regression of the following type:

$$\ln Y_i = \alpha + \beta\, \text{Schooling}_i + f(\text{Experience}_i) + \varepsilon_i, \tag{1.3}$$

where the explanatory variables include the years of completed schooling, a function of labor market experience, and a statistical residual (Deming and Silliman (2024)).

The full discount method and the Mincerian equation are the primary techniques used in literature to estimate monetary returns to education (Psacharopoulos and Patrinos (2018)). These two methodologies have been largely discussed, refined, and exploited for empirical analysis through the decades. Griliches (1977) and Card (2001) draw attention to some econometric limitations deriving from the ordinary least squared estimation. The most serious source of bias in estimating the causal effect of education on earnings arises from the fact that individuals with more education may also possess other attributes linked to higher income, which are not accounted for in the estimation

process. For example, innate ability is correlated both with the chosen level of education, as more talented children are more likely to proceed in the studies, and with the future earnings by directly influencing performances and career progression. Not accounting for important factors such as ability, motivation, organizational skills in the model might lead to upward biased estimates. Highly educated individuals may represent a selected group not only because of observable characteristics, but also due to unobserved traits that may not be accounted for in the statistical analysis.

To overcome the limitations of the simple OLS model, economists have developed strategies to obtain more accurate estimates of the monetary returns to education. One approach is to address selection bias by including proxies for innate skills, such as IQ test scores, and controlling for background characteristics like race, area of residence, and parental education. Early contributions include Chamberlain (1977) who incorporates Armed Forces Qualification Test scores and other familiy charcteristics as covariate in the model to control for unobserved heterogeneity, while more recently Heckman et al. (2006) include Rotter's Locus of Control Scale results in the analysis and provide evidence of the importance of accounting for non-cognitive abilities too. A different approach to mitigate selection bias is to use a sample composed only of twins. The main assumption is that twins share the same genetic endowment and, consequently, have equal innate cognitive skills. This implies that within-pair differences in schooling levels are unrelated to ability and family background. Isacsson (1999) estimates returns to education using a large set of swedish twins born between 1926 and 1958 and demonstrates that omitting cognitive skills leads to a modest overestimation of the impact of schooling on earnings. Similar conclusions are reached in the study by Bonjour et al. (2003) conducted on a set of monozygotic twins from the United Kindom.

Another approach used by economist consists in estimating returns to education by exploiting exogenous sources of variation in schooling such as compulsory schooling reforms, changes in tuition fees and geographic proximity to educational institutions. These discontinuities are helpful to mitigate ability bias as differences in educational attainment arising between the individuals affected by the policies and the ones not affected are unlikely due to differences in individual cognitive skills. Card (1993) investigates the schooling-earnings relationship using college proximity as an exogenous source of variation in education. In this study, distance from college serves as an instrument for years of education as it is correlated with the decision to attend university but does not have a direct impact on earnings. To instrument for schooling, instead, Chen (2008) employs college tuition fees and shows that omitting relevant factors leads to biased estimates of the variance in wages.

1.2 Evidence of Compulsory Schooling Reforms

This thesis focuses on the impact of compulsory schooling reforms on educational attainment and intergenerational mobility. The choice of using a reform of the education system contributes to the vast existing literature evaluating the impact of compulsory education reforms. For the purpose of estimating human-capital private and public effects, compulsory schooling laws provide an attractive source of quasi-experimental variation, and numerous studies have exploited these legislative changes to investigate the causal relationship between education and private returns. Such laws affect individuals only during childhood and adolescence and therefore are unlikely to be correlated with omitted factors that influence schooling and future wages (Acemoglu and Angrist (2000)). Consequently, schooling reforms have been commonly used as a credible instrument for identification in an instrumental variable framework. In general, a good instrumental variable can overcome the estimation biases that often arise when using OLS as an estimation technique. In this field, returns to education have often been estimated through IVs, such as Card (1993), who uses proximity to college. However, with these types of instruments only a small share of individuals is affected, and the resulting LATE estimates typically exceed OLS (Oreopoulos (2006)). On the contrary, compulsory schooling reforms do not present this problem. This instrument, is in fact likely to be exogenous with respect to the outcome of interest, and affects a large share of population — namely every student that is directly affected by the policy. A practical example of how the schooling reform is used as IV is Brilli and Tonello (2015). In their paper, the authors employ the Berlinguer Compulsory Education Reform of 1999 — which increases the compulsory schooling age from 14 to 15 years — as IV for education. As they explain, the reform is likely to be a valid instrument because *i*) it affects significantly the variation in enrollment, and *ii*) it is not correlated with the unobservables that influence the outcome variable (they evaluate the impact of the schooling reform on youth criminal rates). Encouraging empirical evidence of the advantage of exploiting schooling reforms in an IV framework is also provided by Oreopoulos (2006). The author examines reforms in Canada, the UK, and the US that raised the minimum school-leaving age, and he shows that compulsory schooling laws are a particularly powerful instrument to analyse the causal schooling - wages relationship. In particular, findings suggest that each additional year of education increases earning of about 10% in all of the three countries. Following a similar IV approach, Brunello et al. (2009) study the effects of education on the distribution of earnings, exploiting the variation of minimum school leaving age policies in 12 european countries. First, the authors find that the reforms primarily increased enrollment among the less

able and secondly show that an additional year of education reduces conditional wage inequality, as the returns to schooling are disproportionately higher for individuals with lower ability and for women.

Besides instrumental variables, another extremely popular methodology used to estimate returns to education exploiting compulsory schooling reforms as an exogenous source of variation is the Regression Discontinuity Design (RDD) — closely related to the empirical strategy adopted in this study. The attractiveness of this methodology derives from its ability to convincingly eliminate selection bias. In the case of compulsory schooling reform, the assignment strategy is random and depends on the birth cohort or on the age of an individual at the time of the implementation of the reform. For example, if the reform increases compulsory schooling age from 14 to 16, individuals who turn 14 in the year in which the law is enacted will have to proceed their studies until the age of 16, while older birth cohorts remain subject to the existing legislation. The RD approach consists in comparing outcomes of individuals just prior and just after the policy change. The underlying assumption is that, provided individuals just below and just above the cutoff are comparable in both observable and unobservable characteristics, any discontinuity in outcomes at the threshold can be causally attributed to the policy intervention. In this way, the design allows for the identification of the causal effect of schooling on earnings, since the continuity assumption ensures that the observed discontinuity at the cutoff is not driven by selection bias. An empirical example of this approach is provided in the analysis by Grenet (2013). The author compares two reforms that took place in France and in England during the last century and that raised the minimum school leaving age to 16. Conclusions demostrate that the French reform had hardly no effect, whereas the British one increased hourly salaries by 6% to 7% for every extra year of mandatory education, thereby showing that compulsory schooling reforms are an effective tool to evaluate the monetary returns to schooling.

1.2.1 Non-monetary benefits of education

Increase in labor market productivity, and consequently in earnings, is the most straightforward consequence of education. However, a growing body of research indicates that schooling also leads to many other long-term benefits. Education, for example, improves individuals' health and mortality outcomes though different channels. First, education increases productive efficiency in the production of health, as it enables individuals to use preventive behaviors and available treatments more efficiently, maximizing the benefits, for example though a more optimal management of physical activity or nutrition. Second, education fosters a greater ability to understand health

information and comply to complex treatments. Lastly, education increases individual income, thus raising the ability to afford healthcare and insurance costs (Lochner (2011)). Among the studies that empirically analyze the causal effect of education on health by exploiting changes in compulsory schooling years is the analysis by Kemptner et al. (2011). The study, conducted using reforms that took effect in West Germany between 1949 and 1969, reports interesting conclusions on health outcomes such as long-term illness, body mass index, and work disability. More specifically findings suggest that, especially for males, education significantly reduces the onset of chronic diseases and work-related disabilities. Similarly, Fonseca et al. (2020) conduct a cross-country study across fourteen OECD countries, exploiting reforms that increased the number of mandatory years of education within an IV-probit framework. Findings suggest that each additional year of education decreases the probability of reporting poor health by 6.8 percentage points and reduces the probability of suffering from hearth disease and arthritis in later life.

Education is found to have a positive long-term effect also on civic awareness and political participation. On the one hand, it reduces the cognitive and practical costs of political engagement, facilitating the processing of complex information. On the other hand, it helps increase the perceived benefits of active participation in society, instilling fundamental democratic and pluralistic values Dee (2004).Two studies that examine how additional years of education induced by compulsory schooling laws influence the probability of political participation are Milligan et al. (2004) and Siedler (2010). Results from the first study suggest that, in the United States, more educated citizens are more likely to vote, as they process and receive information on candidates and campaigns more easily. Meanwhile, the study by Siedler (2010) provides evidence of a positive correlation between years of schooling and political outcomes.

The decision to exploit a compulsory schooling reform in this thesis is also motivated by evidence that raising the minimum school-leaving age, beyond generating long-term benefits in terms of earnings, health, and citizenship, has positive direct and immediate effects on students' lives and society. For example, increasing youth's schooling attendance lowers juvenile delinquency as it has an incapacitation effect through the reduction of the available time to engage in criminal activities. Evidence of such research is provided by Brilli and Tonello (2015), who show that the implementation of an Italian reform raising the minimum school-leaving age to 16 reduced adolescent offending rates by 1.3 percent in the northern regions of the country. Moreover, though the same "incarceration effect", education affects teen fertility. Black et al. (2008) argue that an extra year of school is associated with a five to nine percent reduction in teen fertility in the United States, while DeCicca and Krashinsky (2020)

show that each additional year of education leads to a three percentage points reduction in fertility at the age of 18 in Canada.
Together, these results demonstrate that mandatory education reforms improve long-term socioeconomic outcomes while also producing significant non-financial benefits through influencing demographic behaviors like fertility, lowering crime, and improving health. This wide range of findings highlights the importance of mandatory education reforms as a potent tool for policymakers to determine and assess the broader benefits of education.

1.3 Education and Socio-Economic Inequalities

Education is the privileged channel through which individuals can improve their socioeconomic condition compared to their starting point. An accessible and high-quality school system provides skills and knowledge that allow access to better jobs, to higher incomes and to a more active participation in society. In this sense, increasing compulsory schooling can have a significant impact on reducing inequalities, especially for individuals coming from disadvantaged families. Reaching equity through education means ensuring that all students have the same learning opportunities, regardless of their socioeconomic or family background (OECD (2018)). A considerable amount of literature has in fact proven that family income significantly influences children's educational choices. On the one hand, parents with higher incomes tend to have greater ability and pass on to their children genetic traits that favor higher academic achievement. On the other hand, liquidity constraints prevent poorer families from covering children's education costs, limiting their opportunities to access and complete schooling (Checchi (2006)). Acemoglu and Pischke (2001) provide evidence that low-income families invest less in their children's education and they show that a 10 percent increase in household income raises the probability of attending post-compulsory education by 1.4 percent in the United States. The situation in developing countries is even more dramatic. Filmer and Pritchett (1999) analyze the relationship between household wealth and educational enrollment and attainment conducting a cross country comparison. Results highlight that especially in Africa and in South Asia the majority of adolescents from poor households hasn't concluded primary education due to a combination of low ever enrollment in school and high dropout rates.
Beyond financial resources wealthier parents favor their children by transmitting social capital such as networks and connections, and cultural capital as knowledge, linguistic skills and values (Bourdieu (2018)). Persistent socioeconomic disadvantage, instead, tends to undermine the developmental opportunities and long-term outcomes of chil-

dren. Ferguson et al. (2007) show how growing up in low-income households underexposes children to cognitive stimulation and socialization experiences creating an academic disadvantage from an early age. For this reason, policy interventions especially in early stages of life can limit the effects of poverty and reduce inequalities in educational and monetary outcomes. An example of such a policy is a Norwegian reform that led to a substantial expansion of subsidized child care provision. Havnes and Mogstad (2015) show how the universal child care program increased the probability of high school completion and college attendance among children from low-income households.

Overall despite the equalizing potential of education, children from disadvantaged backgrounds face stronger financial and cognitive constraints. For this reason, the impact of educational reforms is not uniform among the income distribution and it is important to estimate the effects separately according to the parental background. Universal policies such as child care programs and compulsory education reforms can have stronger effect for the underprivileged groups, thereby contributing to reaching equality of opportunity.

1.4 Intergenerational Mobility of Education

Previous studies have highlighted the detrimental effects of growing up in low-income households on children's academic achievement and future outcomes. However, because family wealth is entangled with other family characteristics that potentially affect school choices, it is unclear exactly how family income shapes a child's educational outcomes. Chevalier and Lanot (2002) disentangle the effects of family characteristics and financial constraints using survey data from Great Britain. They provide evidence that, while family income has only a modest influence on children's educational attainment, other family factors—particularly parental education—exert a much stronger impact. A vast body of research, uses in fact parents' educational attainment as a more precise indicator of socioeconomic status. More educated parents provide their children with advantages that extend beyond financial resources. These comprise social connections, which can facilitate access to jobs and prestigious schools and family culture including values, habits and cultural capital that contribute to shaping children's skills and motivations (Corak (2013)). Empirically, parental education can be used as instrument in an instrumental variable framework to estimate returns to schooling (see Brunello et al. (2000)), as a control variable in regression analysis to account for differences in family background (see Card (1999)) or as a variable of direct interest to link parents' and children's educational attainment. The last methodology is used to analyze inter-

generational mobility of education, namely the extent to which a child's educational attainment depends on his parents' educational level. In origin, intergenerational mobility was measured mainly in terms of income or occupation, studies analyzed to what extent a child's social and economic opportunities depend on his parents' status using measures of relative (Intergenerational income elasticity (IGE)) and absolute mobility (absolute upward mobility (AUM)) following Chetty et al. (2014). As mentioned earlier, family income is not the most accurate indicator of socioeconomic status; hence economists have increasingly analyzed intergenerational mobility in terms of education. This approach has a double advantage, as highlighted by Brunetti (2021): first, education level measures offer very reliable and consistent information compared to income measures that might present higher variability across time, second, survey participants do not consider education-related questions as sensitive and as a consequence the latter present good dependability and low rejection rates.

Measures of intergenerational mobility of education are particularly valuable as they allow meaningful cross-country comparisons, showing how educational institutions, public policies, and social structures can reduce or amplify the transmission of inequalities. Hertz et al. (2008) analyze persistency of educational attainment in 42 countries and document vast differences in this measure across the globe. Their approach is based on comparing the number of years of schooling attained by children with those completed by their parents, though a simple regression model where children's years of education are regressed on parental years of schooling. Findings demonstrate that countries in Latin America exhibit very low intergenerational mobility, conversely Nordic countries such as Denmark, Sweden and Norway present the lowest levels of persistency.

Moreover, intergenerational mobility can also be examined within single-country analyses, for instance to study how institutional reforms or preexisting differences across regions affect the transmission of educational outcomes across generations. In Italy, analyses of this kind have a long-standing tradition, and different methodologies are often employed, sometimes in combination within the same study, to ensure the robustness and reliability of the findings. Checchi et al. (2013) present a decomposition of the correlation coefficient of education to disentangle differential intergenerational mobility of subgroups of the population, reaching the conclusion that children with highly educated fathers are much more likely to earn higher degrees compared to children from low educated parents. Cannari and D'Alessio (2018) evaluate the degree of persistence of education measuring the correlation of the years of education of the parents and that of the children, highlighting a decreasing trend for individuals born until the mid-seventies and an opposite trend for more recent birth cohorts.Brunetti (2021)

conducted the research using transition matrices and demostrated that the intergenerational transmission of education is still highly polarized. Lastly, Sabani et al. (2023) used both the intergenerational regression coefficient (IGR) and the intergenerational correlation coefficient and showed an increasing trend in mobility in almost all areas of the country over the last fifty years, presenting however a slowdown in more recent generations.

Overall, the literature reviewed in this chapter has highlighted that education is a key driver of economic growth, social mobility, and can play an important role in the reduction of inequalities. Several studies have shown that reforms increasing the compulsory schooling age can serve as a credible instrument to analyze the causal effect of education on both educational and labor market outcomes. The aim of this thesis is therefore to contribute to this body of research by examining the effects of an increase in compulsory schooling that took place in Italy in 2007 and potentially shedding a light on the heterogeneous effects of educational policies.

The remaining part of this thesis includes the core of my work. Chapter 2 presents the empirical framework, explains the choice of the data and the methodology used, while Chapter 3 displays the main results of the analysis.

Chapter 2

Empirical Framework

2.1 Research Design

Education plays an essential role in reducing the risks of unemployment, poverty, and social marginalization. As discussed in the previous chapter, individuals with financially constrained or low educated parents are more likely to leave school early, which increases the likelihood of perpetuating their initial disadvantages. Raising the compulsory schooling age is a policy tool intended to encourage students to remain in education and, if effective, to help reduce social and economic inequalities, particularly for those from disadvantaged backgrounds. Yet the actual effectiveness of such policies in preventing early school leaving and improving educational attainment is still uncertain (Raimondi and Vergolini (2019)). To contribute to this debate, this study examines the impact of the 2007 Fioroni Reform, which raised the minimum school leaving age in Italy from 14 to 16 years. The analysis investigates whether the extension of compulsory schooling increased the likelihood of completing upper secondary education, and whether the effects vary across gender, socioeconomic background, and geographical area of birth. A high school diploma provides access to the labor market with greater opportunities for advancement and career development, thus representing a considerable advantage compared to those who only completed lower secondary education. Therefore, if a reform that extends compulsory schooling successfully encourages students to complete upper secondary education, it plays a concrete role in providing them with better life opportunities.

The study of this specific reform is particularly relevant because Italy continues to display lower levels of educational attainment compared to the European average. Unlike other countries where enrollment and completion rates have already reached near-saturation, Italy still shows considerable room for improvement. Moreover, previous studies on earlier reforms found increases in school participation but not in comple-

tion rates. For instance, Raimondi and Vergolini (2019) demonstrate that the previous extension of compulsory schooling age in Italy, which raised minimum school leaving age to 15, led to a rise in participation at the beginning of upper secondary school, but the effect did not persist over time and had no significant impact on completion rates. Importantly, no earlier reform had ever extended compulsory schooling up to the age of 16. The Fioroni Reform, by contrast, brought Italy in line with countries such as the United Kingdom and France, and is therefore expected to exert a stronger impact by raising completion rates to levels more comparable with those of these countries.

From a methodological perspective, as shown in the previous Chapter, compulsory schooling reform provide a valuable opportunity to isolate causal effects, as they introduce exogenous variation in educational attainment that is independent of individual characteristics that might influence schooling decisions. The empirical technique employed in the study is a Regression Discontinuity in Time (RDiT) design, which enables a credible estimation of the reform's impact by comparing the educational results of the last birth cohorts not impacted by the policy and the first cohorts subject to the legislation. More specifically, the control group is composed of the last three cohort subject to the minimum school leaving age of 14 and the treatement group of first five cohorts subject to the Fioroni Reform.

The analysis relies on data from the Survey on Household Income and Wealth (SHIW), conducted by the Bank of Italy. This dataset is particularly well suited to the study, as it collects detailed information on income, employment, and educational attainment for all household members. Since 1993, it has also included information on the educational level of the parents of the reference person in the household (defined as the person responsible for the household's finances) and of those of his or her spouse. SHIW data have already been employed in several studies on education and intergenerational mobility of education in Italy, for example by Brunetti (2021) and Cannari and D'Alessio (2018). Other works in this field, such as Raimondi and Vergolini (2019), rely instead on the Labor Force Survey conducted annually by ISTAT, but these data are not publicly available. Consequently, SHIW data were chosen as the basis for the empirical analysis, given both their accessibility and their rich information content.

To provide context for the reform, this chapter begins with a description of the Italian school system and an overview of the most recent changes to compulsory education. It then offers a detailed explanation of the methodology, the construction of the dataset and variables used in the analysis, and the descriptive statistics of the selected sample. The subsequent chapter presents the results of the analysis, first in general terms and then distinguishing across gender, family socioeconomic background, and the geographical area where upper secondary school was attended to explore potential

heterogeneous effects of the reform.

2.2 The Italian Schooling System

Compulsory education in Italy begins at the age of six. The first eight years of the Italian education system are divided into primary school and lower secondary school, the latter lasting three years and concluding with the state examination. At the age of 14, students have the possibility to enroll either in upper secondary school, which lasts 5 years and ends with the state examination (Esame di Maturità), or in a vocational or training program that lasts 3 to 4 years and does not provide access to tertiary education. In the five years of upper secondary school students can attend an academic, a technical or a vocational path. The first offers a theoretical and cultural preparation as a pathway to higher education, while technical and vocational programs offer practical and laboratory training as a more direct entry in the labor market. Following the Bologna Process, from 2001 the Italian tertiary education system was harmonized with international programs and provides, for almost all faculties, a three-year undergraduate degree followed by a two-year master's degree.
In Italy the majority of students attends public schools (in 2023, more than 7 million students were enrolled in one of the 8,089 public institutions), while a smaller proportion is enrolled in private, state-recognized schools (Ministero dell'Istruzione e del Merito (2023)). School attendance in public institutions is guaranteed by the State and, up to the completion of upper secondary school, education is free of tuition fees. Direct costs of books, transportation and additional activities must be covered autonomously by families. Moreover, public tertiary education charges tuition fees based on family income, exempting families with monthly incomes below €1,800 and applying maximum annual fees of €3,000–4,000 for higher-income students. In addition, the state provides scholarships to cover accommodation and book expenses for students from disadvantaged families or for those with outstanding academic performance (Abbiati et al. (2017)).
A high school diploma is considered the minimum level of education required for participation in the labor market with growth and career possibilities. In Italy, in 2022, only 63% of individuals between 25 and 64 years of age possessed a secondary school diploma, a value similar to that of Spain (64.2%), but significantly lower compared to Germany and France and below the average attainment of countries in the European Union, which corresponds to 79.5 % (ISTAT (2023)). Similar results are found when restricting the age bracket to 25–34 year-olds, the group that most closely matches the sample used in this study. For both men and women, the share of upper secondary

graduates is lower than the OECD average: in Italy, it is about 75% for men compared to 85 %, and 80% for women compared to 89% (OECD (2023)).

One of the most pressing issues regarding the Italian education system is posed by the relatively high dropout rates. Dropout rates are defined as the percentage of people aged 18–24 that have attained at most a lower secondary school diploma, that have no regional vocational qualifications obtained through courses lasting at least two years, and that are not enrolled in any education or training program. Italy's dropout rate is about 10.5 %, higher that the EU average of 9.5 %. The analysis of the Fioroni reform can therefore highlight whether the policy helped reduce dropout rates and brought Italy closer to the European average in terms of educational attainment.

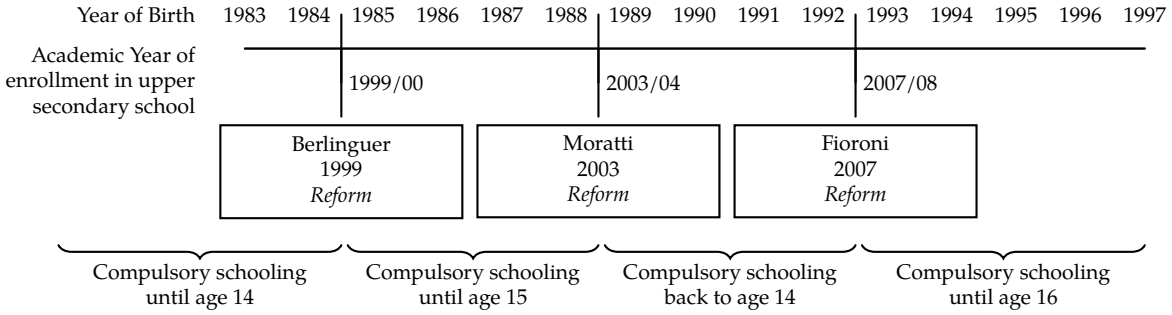
Another challenge to be addressed in the Italian educational system concerns regional differences. Southern areas of the country present higher drop out rates and lower educational attainment. These differences reflect wider social and economic gaps and present a major barrier to an equitable education system. According to the 2024 Censis Report, while the national school dropout rate stands at 10.5%, in Sicily it exceeds 25%. Disparities between northern and southern regions are also related to students' proficiency levels. According to the results of the 2023 Invalsi standardized tests, students in northern regions show higher levels of mathematical skills and Italian language proficiency compared to peers in southern regions such as Calabria, Sicily, and Campania, which record the lowest levels. With notable differences between rural and urban areas, central regions show intermediate results. This spatial trend's persistent gradient in student performance reflects socioeconomic disparities across the country and emphasizes the difficulty of maintaining uniform educational standards nationwide (INVALSI (2023)). In light of these marked territorial disparities in education, Chapter 3 analyzes the reform separately by geographic area. Raising the compulsory schooling age may have affected existing gaps in dropout rates and attainment, and hopefully helped to narrow these preexisting territorial inequalities.

2.3 The 2007 Compulsory Education Reform

With the aim of reducing illiteracy and raising overall education levels, several major reforms have been introduced over the years, reshaping the Italian school system and affecting both participation and dropout rates. The first attempts to introduce compulsory schooling for students were made at the beginning of the last century. In 1904, the Orlando Law extended compulsory schooling to the age of 12, and subsequently, in 1923, it was formally raised to 14. This obligation remained largely unenforced until the enactment of Law No. 1859 in 1962 (Riforma della scuola media unica). The

latter standardized the lower secondary school system, creating a single 3-year curriculum to which students had access after completing the five-year elementary school path. In addition, the reform established effectively the minimum school leaving age of 14, causing a significant increase in the transition rate from lower to upper secondary school (Schizzerotto et al. (2018)). Compulsory schooling was additionaly raised until the age of 15 in 1999 with the Berlinguer reform. The latter required students with regular academic progression to complete at least the first year of upper secondary education and introduced the obligation, from age 16, to remain enrolled in school or vocational training programs until the age of 18 or until the attainment of a post-lower secondary qualification (Raimondi and Vergolini (2019)). Subsequently, Law No. 53/2003 (Moratti Reform) repealed the Berlinguer Reform and reinstated compulsory schooling at age 14. The law still provided for compulsory education or training until the age of 18, but introduced a flexibility that effectively weakened the concept of compulsory schooling. After this abrogation, the minimum school leaving age was finally increased from 14 to 16 years by the enactment of Law No. 296 of 2006, commonly referred to as the Fioroni Reform. These recent interventions on compulsory schooling age in Italy are summarized in Figure 2.1 which includes also the year of birth and the academic year of enrollment in upper secondary school of the students affected by the each reform.

Figure 2.1: Timeline of cohorts and reforms



In this study, I analyze the effects of the most recent intervention on compulsory schooling in Italy and assess whether the Fioroni Reform has led to an increase in high school completion rates. The analysis of this reform is of particular interest for different reasons. First, the policy remains in force today, offering a valuable opportunity to assess its implications for the current education system. In addition, this reform uniformed the compulsory schooling age with that of other advanced economies in Europe, as France and England (Murtin and Viarengo (2011)), hence its analysis allows to understand whether the policy has lead to comparable effects on educational outcomes. Lastly, data from the Bank of Italy's Survey on Household Income and Wealth

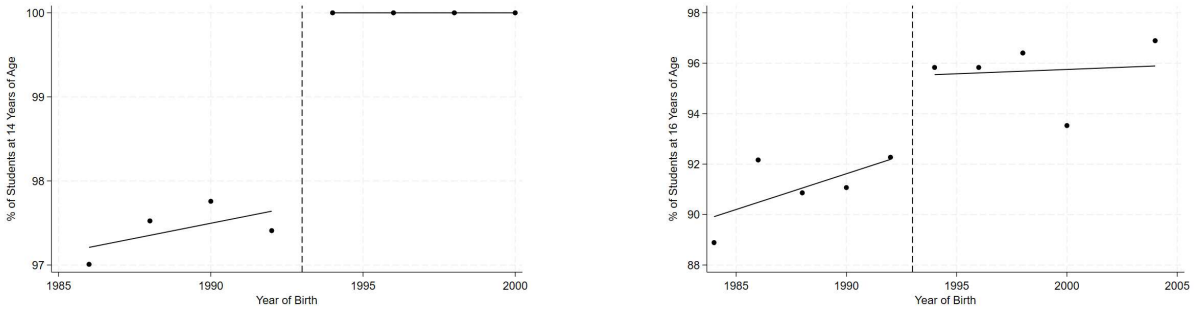
show a clear increase in school participation among individuals aged 14 to 18 after the reform, as reported in Table 2.1 and Figure 2.2. This supports the expectation that the rise in participation will also translate into higher upper secondary completion rates, suggesting that the reform has had a meaningful impact. Precisely, Table 2.1 shows the percentage of young people enrolled and not enrolled in school, divided by birth cohort and age. The first birth cohort affected by the reform is that of 1993. Starting from the 2007/2008 academic year, in fact, individuals of 14 years of age and younger were required to attend school for at least ten years. Accordingly, in this study I define as the control group the three birth cohorts that were still subject to the previous requirement of compulsory education until age 14 (1990, 1991, and 1992), while individuals born in 1993 or later constitute the treatment group. As one can see from the table, individuals born from 1993 onward exhibit higher school participation rates at all ages, including those beyond the minimum school leaving age of 16. The same results are shown graphically in Figure 2.2. These data suggest that requiring students to attend at least two-fifths of the secondary education cycle might offer an important incentive to earn the upper secondary school diploma.

Table 2.1: School participation rates of 14 to 18-year-olds

Year	**14 years old**		**15 years old**		**16 years old**		**17 years old**		**18 years old**	
	Not stud	**Stud**	**Not stud**	**Stud**	**Not stud**	**Stud**	**Not stud**	**Stud**	**Not stud**	**Stud**
1990	2.24	97.76	–	–	8.93	91.07	–	–	19.81	80.19
1991	–	–	4.83	95.17	–	–	14.55	85.45	–	–
1992	2.59	97.41	–	–	7.73	92.27	–	–	16.09	83.91
1993	–	–	6.44	93.56	–	–	11.76	88.24	–	–
1994	0.00	100.0	–	–	4.17	95.83	–	–	12.44	87.56
1995	–	–	2.49	97.51	–	–	10.00	90.00	–	–
1996	0.00	100.0	–	–	4.17	95.83	–	–	10.26	89.74
1997	–	–	3.33	96.67	–	–	6.90	93.10	–	–

Notes: The table displays school participation rates between the ages of 14 to 18 for individuals born between 1990 and 1997. For each birth cohort, it reports the percentages of students and non-students in the 14–18 age groups. Source: Survey on Household Income and Wealth by the Bank of Italy, collected every two years.

Figure 2.2: School Participation Rates



(a) 14 year-olds (b) 16 year-olds

Notes: The figure shows the evolution of school participation rates for people in the 14 (panel a) and 16 (panel b) age groups. The dashed line separetes individuals affected and not affected by the Fioroni Reform. The figures complement Table 2.1. Source: Own eleboration of SHIW data.

In addition, a more in-depth observation of the survey data shows that school participation rates have increased significantly for individuals belonging to the treated cohorts and coming from low-income families. Conversely, no significant changes are observed among children from non-disadvantaged families, whose participation levels were already very close to 100%. In particular, Table 2.2 reports the participation rates in upper secondary education for students whose parents report economic hardship, it is evident that participation has increased at all ages. For individuals born in 1991, for example, the participation rate at age 17 was 80.14%, while for those born in 1993 it reached 84%.

Table 2.2: School participation rates of individuals from low income families

Year	**14 years old**		**15 years old**		**16 years old**		**17 years old**		**18 years old**	
	Non stud	**Stud**	**Non stud**	**Stud**	**Non stud**	**Stud**	**Non stud**	**Stud**	**Non stud**	**Stud**
1990	3.09	96.91	–	–	10.88	89.12	–	–	24.18	75.82
1991	–	–	6.71	93.29	–	–	19.86	80.14	–	–
1992	3.73	96.27	–	–	10.60	89.40	–	–	19.88	80.12
1993	–	–	8.33	91.67	–	–	15.60	84.40	–	–
1994	0.00	100.0	–	–	5.84	94.16	–	–	15.79	84.21
1995	–	–	2.90	97.10	–	–	12.42	87.58	–	–
1996	0.00	100.0	–	–	6.02	93.98	–	–	13.14	86.86
1997	–	–	4.70	95.30	–	–	8.78	91.22	–	–

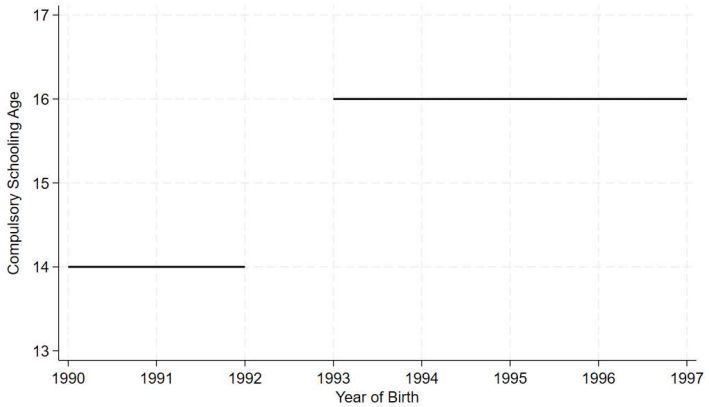
Notes: The table displays school participation rates between the ages of 14 to 18 for individuals from low income families born between 1990 and 1997. For each birth cohort, it reports the percentages of students and non-students in the 14–18 age groups. Source: Survey on Household Income and Wealth by the Bank of Italy, collected every two years.

In light of this information, there are grounds to expect that the policy has contributed to an increase in upper secondary school completion rates. Moreover, the evidence presented in 2.2 suggests that the effects may vary depending on family background. For this reason, the following chapter examines the impacts separately.

2.4 Methodology

The empirical technique employed in the study is a Regression Discontinuity in Time (RDiT) design. This framework is an application of the classical Regression Discontinuity Design, in which the running variable is time and the treatment assignment is based on a specific moment in time. The RDiT approach has been widely used in public economics (see, for example, De Paola et al. (2013)) and environmental economics (see, for example, Auffhammer and Kellogg (2011)) to evaluate policies by comparing the outcomes of interest immediately before and after the policy introduction. In this study, I exploit this framework to study the effects of the Fioroni Reform which, starting from the academic year of 2007/2008, increased minimum school leaving age in Italy to the age of 16. In a typical RDiT framework, the cutoff c between the treatment and control groups coincides with the date of the policy's introduction. All observations with dates $t > c$ are considered treated, while all observations with dates $t < c$ are classified as untreated. In the case of the Fioroni Reform, however, the assignment mechanism differs slightly. Since reforms to the compulsory schooling age do not apply universally but only to individuals who are below the relevant age threshold at the time of implementation, treatment is defined in terms of eligibility. Specifically, I classify as treated the birth cohorts that were eligible for the reform, namely those who were aged 14 or younger at the time of its entry into force in 2007, while older cohorts are considered untreated. As shown in Figure 2.3, individuals born before 1993 are subject to the previous compulsory schooling legislation, while individuals born in 1993 or after are required to complete at least 10 years of schooling reaching the age of 16.

Figure 2.3: Minimum School Leaving Age by Birth Cohort



Consequently, the birth cohort of 1993 represents the cutoff between control and treatment groups in my analysis. This design is particularly suitable for the analysis,

as it allows to isolate the causal effects of the policy from other potential confounding factors that might influence schooling decisions. In an RD framework, it is assumed that individuals around the cutoff are similar in their unobserved characteristics; consequently, any difference between groups in terms of the outcome of interest can be attributed to the exogenous variation introduced by the policy. In this study, the assumption that individuals born a few years before 1993 and those born in 1993 or later are comparable in characteristics affecting educational attainment, such as cognitive ability, is highly credible as the sample is randomly selected. Within this research design, to analyze the impact of increasing compulsory schooling age on high school completion rates, I estimate a linear probability model (LPM). The regression takes the form:

$$y_i = \alpha + \beta_1 \cdot Post_i + \beta_2 \cdot Dist_i + \beta_3 \cdot (Dist_i \times Post_i) + \mathbf{X}_i'\boldsymbol{\gamma} + \varepsilon_i,$$

where *Post* indicates whether the individual is affected by the Fioroni reform (namely, 1 for the treated and 0 for the controls), and *Dist* is a running variable that measures the cohort distance from the cutoff. *Dist* takes negative values and zero for control cohorts and positive values for treated ones. The dependent variable is a binary indicator taking the value 1 if the individual has completed upper secondary education and 0 otherwise. Lastly, $\mathbf{X}_i'$ denotes a vector of demographic control variables, including gender and geographic area of birth. The coefficients of interest are β_1 and β_3, representing the discontinuity in the probability of obtaining a highschool diploma at the cutoff and the differencial slope for the treated group compared to the control group, respectively. I cluster standard errors at the birth cohort level because the reform varies only across cohorts, making the cohort the relevant unit of randomization. This follows (Abadie et al. (2023)), which highlights the need to cluster whenever treatment is assigned at the group and not at the individual level. I run the specification separately for men and women to capture possible heterogenous effects. I then perform the regression stratifying the sample according to parental education, household income level and geographic area of birth.

As shown above, estimating an OLS regression with interaction terms rather than relying only on a local randomization approach in a regression discontinuity design allows to capture not just the discontinuity effect, namely the jump in upper secondary school completion at the cutoff, but also to estimate how the trend evolves across later cohorts. This aspect is particularly relevant for a reform that raised the compulsory schooling age as the discontinuity captures the immediate effect on the first cohort affected, while changes in trends reveal whether the impact persisted or evolved across subsequent co-

horts. Considering both dimensions provides a more complete picture of the reform's true effects.

2.5 Data and Descriptive Statistics

2.5.1 Data and Variables Construction

The analysis is conducted using data from the Survey on Household Income and Wealth (SHIW), conducted by the Bank of Italy. These are sample surveys carried out annually from 1977 to 1986 and every two years thereafter. Each survey is based on a representative sample of the Italian population and comprises about 8,000 households, distributed across approximately 300 Italian municipalities. Starting from the 1989 survey, around 25% of the observed households are reinterviewed in the subsequent survey, thereby generating a rotating panel. The surveys collect various types of personal information as demographic data and include a wide range of queries aimed at investigating the incomes and consumption patterns of Italian households.

More specifically, the samples used for the analysis are constructed using surveys conducted between 2014 and 2022, excluding the survey of 2018, whose data are not publicly available. The entire study is aimed at understanding whether the policy has encouraged individuals to reach upper secondary school graduation and therefore the main outcome of the analysis is high school completion. The latter is calculated at the individual level for the first five birth cohorts affected by the policy (namely from 1993 to 1997 included) and for each previous available birth cohort (1990, 1991 and 1992). To maintain independence between observations and avoid biasing estimates, each individual is observed only once. For simplicity, for subjects in panel households, the information included is the one provided in the first interview. For the main estimates, all individuals are observed between the ages of 23 to 30. This age bracket allows to capture all individuals who have received the upper secondary school diploma with irregular careers up to 4 years after the canonical completion age, and it enables the expansion of the sample size enhancing the reliability and external validity of the results.

To capture whether the Fioroni Reform has contributed to reducing social inequalities and has encouraged individuals from disadvataged backgrounds to reach upper secondary school graduation the main analysis is then conducted stratifing the sample according to parental education, household income and geographic area of birth.
Parental education is defined as the highest educational attainment of either parent, to avoid excluding single-parent families, which account for a significant share of the

sample. The variable is coded in two categories, considering parents with at most lower secondary school participation as low educational level and parents with a high school diploma or higher degree as high educational level. Due to data limitations, information on parental education is accessible only in two circumstances: (i) when the individual still resides with their parents, in which case the parent themselves provide the information directly though the questionnaire; (ii) when the individual has left the parental household and is identified as either the household head or their spouse, in which case the information on parents' educational attainment is collected retrospectively. Moreover, if as in the first case the individual lives with two adults, it is possible to distinguish whether he is the child of both, or only of one of them. In the latter case, as in the former, I rely on the educational attainment of both adults, in line with the theory of educational assortative mating - the tendency for persons with similar amounts of schooling to marry one another (Mare (1991)) - and select the highest level as the reference measure.

The measure of household income is derived from a survey question in which families are asked whether they are able to afford monthly expenditures easily, or if they encounter difficulties. This self-reported assessment serves as a simple but important indicator of family income levels, as it allows the identification of financially constrained households while avoiding some of the limitations of raw income measures. Reported income alone may not fully capture household economic conditions, since it excludes other sources of wealth such as inherited wealth or transfers, and does not account for differences in consumption habits, expenditure patterns, or household size, all of which affect living standards. Moreover, perceived financial strain is more easily comparable across surveys and time, as it does not require adjustments for inflation or other macroeconomic indicators. For these reasons, I classify families with perceived economic difficulties as "low income" and families that do not face important economic constraints as "high income" and conduct the analysis separately for the two subsamples, investigating whether parental financial limitations impact children's schooling decisions.

The socioeconomic background analysis, performed using these measures of parental education and financial possibilities of the household is presented in Section 3.2.

2.5.2 Descriptive Statistics

In Section 2.3, I described the Fioroni Reform and provided evidence that trends in participation in upper secondary school have changed significantly after the implementation of the policy (see Table 2.1). In the following section, I present general de-

scriptive statistics of the dependent and control variables used in the analysis. Table 2.3 summarizes educational outcomes, background information and personal characteristics of the individuals considered in the study. The sample used for the main empirical specification is composed of 1,878 individuals, 768 of which compose the control group and 1,110 compose the treatment group. The two groups present similar characteristics for gender and geographical origins. The average upper secondary school completion rate is 74% in the control group and 80% in the treatment group, demonstrating that the latter is more educated. This difference adds to the empirical evidence shown in the previous section, and further justifies a causal analysis of the Fioroni reform. Similarly, the treatment group presents more educated parents than the control group, suggesting that the treatment group might have benefited not only from the reform but also from wealthier familiar backgrounds.

Overall, the descriptive statistics suggest that while the treatment and control groups look similar on many fronts, the treatment group comes from slightly more advantaged backgrounds, particularly when it comes to parental education and household income.

Table 2.3: Descriptive Statistics by Group

	Control Group			Treatment Group			P-value
Variable	**Obs**	**Mean**	**Sd. Dev**	**Obs**	**Mean**	**Sd. Dev**	
Highschool Completion Rate	768	0.745	0.436	1,110	0.803	0.398	0.0029
Female	768	0.480	0.499	1,110	0.473	0.499	0.792
Highly Educated Parent	727	0.541	0.499	1,035	0.655	0.476	0.000
North	768	0.404	0.491	1,110	0.357	0.480	0.043
Centre	768	0.175	0.379	1,110	0.126	0.332	0.004
South and Islands	768	0.422	0.494	1,110	0.516	0.499	0.000
Single Parent Household	768	0.122	0.328	1,110	0.130	0.336	0.639
Low Income Household	348	0.706	0.459	584	0.438	0.497	0.000

Notes: Means and standard deviations are shown for both control and treatment groups. P-values reflect the test for differences in means across groups.

To account for heterogeneous impact between more and less advantaged families, in addition to the general specification, in section 3.2 I perform the analysis separately according to the family's economic possibilities. This information could only be retreived for individuals still living with their parents and couldn't be collected retroactively, differently from information on parental education. For this reason, the analysis focuses exclusively on individuals identified as children in the household structure and excludes individuals who already left the family unit of origin and are identified as Reference Person or Spouse of the Reference Person in a new household. To avoid excessive and unbalanced losses of observations in the control and the treatment groups, I restrict the analysis to individuals aged between 23 and 26. As shown in Table 2.4,

up to age 26 around 80% of individuals still lives with their parents. Therefore, the selected sample (children only) remains broadly representative of the total sample and the risk of selection bias is consequently limited.

Table 2.4: Position in the household by age group

Age	Reference Person	Spouse/Partner of RP	Child of R.P. and present spouse/partner	Child of R.P. or spouse/partner from previous relationship	Other
23	6.52	1.81	81.52	5.07	5.07
24	9.13	2.28	75.67	7.60	5.32
25	7.72	3.22	78.78	4.50	5.79
26	10.74	4.07	74.44	5.19	5.56
27	12.79	8.72	65.12	7.56	5.81
28	12.29	8.94	68.72	3.91	6.15
29	15.81	16.74	58.60	6.51	2.33
30	22.40	15.62	47.40	8.85	5.73
Total	11.50	6.87	70.39	6.02	5.22

The next chapter presents the results of the empirical analysis, first by considering the overall effect of the reform and then by examining its impact across different subgroups of the population.

Chapter 3

Results

3.1 Baseline Results

In this section, I present the baseline results of the empirical analysis. The aim is to evaluate the overall effect of the Fioroni reform on upper secondary school completion rates by estimating the regression model on the full sample of individuals. Starting from this aggregate perspective allows me to identify the average impact of the policy before moving to more detailed analyses by gender and other subgroups.

Table 3.1: Full Sample Regression Results

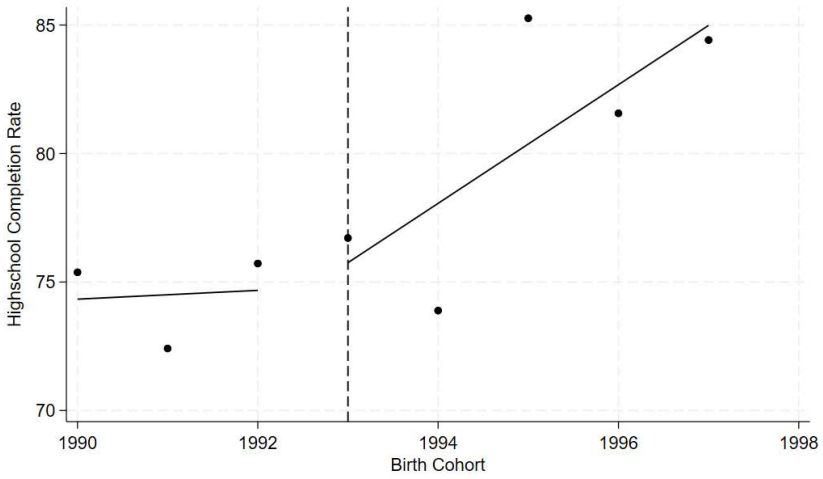
	High School Completion	
	No Controls	With Controls
Post	-0.00725	-0.00512
	(0.0234)	(0.0239)
Dist	0.00126	0.00201
	(0.00808)	(0.00944)
Dist × Post	0.0206*	0.0203*
	(0.00890)	(0.00992)
Observations	1878	1878

Notes: This table reports estimated coefficients with clustered standard errors in parentheses. Column (1) includes no additional controls. Column (2) includes controls for sex and area of birth.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.1 presents the estimated coefficients from the regression on the entire sample of individuals with and without demographic controls (gender and geographic area of birth). The coefficient for the *Post* variable is negative and suggests a slight decline in upper secondary school completion rates for the first treated cohorts, as also shown in Figure 3.1. However, the coefficient is not statistically significant and the effect at the cutoff can therefore be considered negligible. Moreover, simply focusing on the threshold effect is not sufficient to draw conclusions about the policy's impact, since the com-

pletion rates of the control cohorts may also have been inflated by the earlier Berlinguer reform (1999), which raised compulsory schooling to 15 years and was later repealed. For this reason, it is important to also look at the coefficient for the *Dist* × *Post* interaction, which measures the change in the trend in completion rates between treated and control cohorts. In this case, we observe that, both in the analysis without controls and after adding demographic controls, the coefficient is positive and significant, implying that upper secondary school completion rates increase more steeply among the treated cohorts, as shown in Figure 3.1. Specifically, an estimated coefficient of 0.02 suggests that, over time, each subsequent treated cohort exhibits an additional increase of 2 percentage points on average in completion rates compared to the control cohorts. Overall the effects seem modest but the statistical significance of the interaction coefficient indicates that the reform has further accelerated the already increasing trend in high school completion rates.

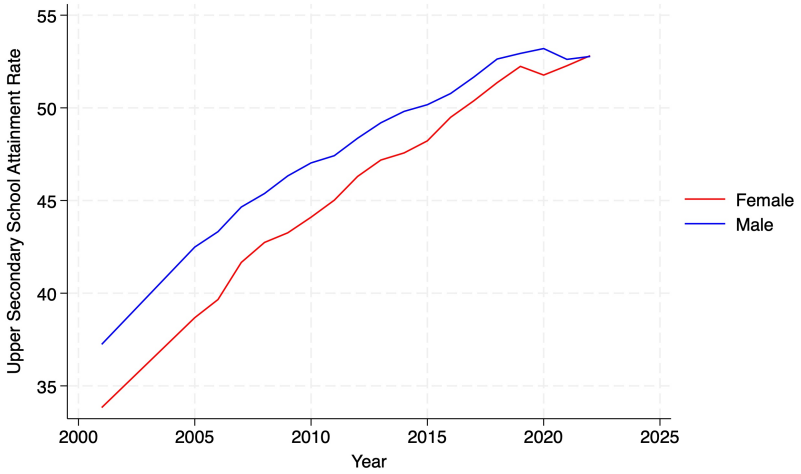
Figure 3.1: Highschool Completion Rate Full Sample



Having identified a moderate but significant impact of the reform on the complete sample, I next take into account the gender gap in education in order to provide a more comprehensive analysis. This term refers to the systematic differences between men and women in educational attainment, skills, school performance, and drop-out rates. While throughout the last century women were generally disadvantaged in terms of access to education and completion rates, more recent international evidence points to a consolidated inverse trend, at least in middle- and high-income countries. In these contexts, female students are now more likely to complete both secondary and tertiary education, and they tend to achieve higher average scores in reading, whereas male students remain more exposed to the risk of dropping out and, if anything, tend to perform better in subjects such as mathematics and science (Marta and Michelle (2023)).

Italy is no exception to this picture. As shown in Figure 3.2, the gender gap in favor of men has narrowed substantially over the years, and today young Italian women are more likely than young men to hold an upper secondary school diploma. At the same time, around 70% of early schoool leavers (adults who are not enrolled in education and do not hold a secondary school degree) between the age of 18 and 24 are men.

Figure 3.2: Italian Upper Secondary School Attainment Rate



Notes: The graph shows the percentage of Italian population ages 25 and over with an upper secondary diploma. Source: World Bank (World Development Indicators)

In light of these data and the divergent trends in secondary school completion rates between men and women, I decided to conduct the analysis separately by gender to assess whether the reform had different effects across the two groups. Consequently, Table 3.2 presents the estimated effects of the Fioroni reform on high school completion rates, separately for men and women.

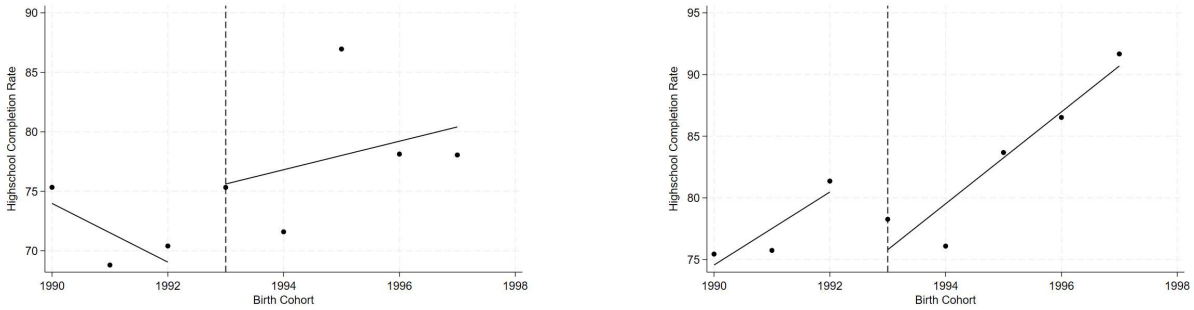
Table 3.2: Regression Results

	High School Completion		
	(1)	(2)	(3)
Panel A. Men			
Post	0.0561	0.0611*	0.0535*
	(0.0299)	(0.0277)	(0.0246)
Dist	-0.0258**	-0.0225*	-0.0246***
	(0.00971)	(0.0107)	(0.00375)
Dist × Post	0.0365**	0.0327**	0.0187*
	(0.0111)	(0.0115)	(0.00823)
Observations	985	985	932
Panel B. Women			
Post	-0.0762**	-0.0761**	-0.0219
	(0.0269)	(0.0267)	(0.0227)
Dist	0.0298***	0.0303***	0.0186***
	(0.00745)	(0.00749)	(0.00136)
Dist × Post	0.00594	0.00545	-0.00126
	(0.00950)	(0.00967)	(0.00686)
Observations	893	893	830

Notes: This table reports estimated coefficients and standard errors (in parentheses) from regressions run separately for men (Panel A) and women (Panel B). Column (1) includes no additional controls. Column (2) adds demographic controls. Column (3) further includes parental education controls; the number of observations is lower due to missing data on parental background. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The analysis reveals clear gender heterogeneity in the reform's effects. For men, a positive and statistically significant impact is observed, while for women the results appear less defined. In particular, for the male sample the reform leads to an immediate increase in high school completion rates. The estimated jump at the threshold is between 5.3 and 6.1 percentage points for the first treated cohorts compared to the controls. This suggests that the policy induced an immediate increase in the probability of completing high school for men. The positive effect is further confirmed by the significance of the interaction coefficient, which indicates a change in the trend of completion rates after the reform and demonstrates that the impact is not spurious but reflects a genuine, long-lasting causal effect (see Figure 3.3a). For the female subsample, by contrast, the negative and significant coefficient of the *Post* variable indicates a lower completion rate for the first treated cohorts compared to the controls. However, the positive interaction coefficient (*Dist* × *Post*) signals a reversal of the trend: after an initial decline, completion rates tend to increase markedly for the treated cohorts (see Figure 3.3b). Because of this contrasting dynamic, an initial reduction in upper secondary completion rates for the first treated cohorts followed by a positive trend for the subsequent ones, it is not possible to draw solid conclusions on the impact of the reform on women, despite the statistical significance of the estimated coefficients.

Figure 3.3: High School Completion Rates by Gender



(a) Men (b) Women

Notes: The figure reports the evolution of upper secondary school completion rates separately for men (panel a) and women (panel b). The dashed line separates individuals affected and not affected by the Fioroni Reform. Source: Own elaboration on SHIW data.

Overall, the evidence suggests that the reform did not substantially alter completion patterns among women, in contrast to the stronger effects found for men. For women, participation and completion rates were already very high before the reform, leaving little room for improvement and resulting in a negligible effect. By contrast, for men, who were more exposed to the risk of early school leaving, the extension of compulsory schooling to 10 years resulted in an incentive to obtain the upper secondary school diploma.

In light of these results, the next section examines whether, in addition to gender differences, the effects of the reform also vary by social class.

3.2 Intergenerational Outcomes

As explained in Chapter 1, a vast body of literature has shown how parental education and family income influence children's educational choices. On the one hand, more educated parents provide their children with social connections and genetic traits that may favor them both in academic and labor market environments (Corak (2013)). On the other hand, wealthier parents are more able to finance and encourage longer academic paths. Consequently, children from more educated and wealthier families exhibit higher levels of educational attainment and are less exposed to the risk of dropping out of school. For these reasons, there are grounds to expect that the policy may have had different effects depending on students' socioeconomic background of origin, particularly exerting stronger impacts on the educational attainment of disadvantaged students and, in doing so, reducing social inequalities. To test this, I first stratified the sample by parental education and then by household financial resources. Since the results reported above suggest heterogeneous effects on high school completion rates for

men and women, the following analyzes are conducted separately by gender.
In the first specification, individuals whose parents completed at most lower secondary school are classified as having a low educational background, while those with parents holding at least a high school diploma or higher degree are classified as high educational background. I find that for individuals with low educated parents the policy has increased the probability of completing upper secondary school, while a null effect of the reform emerges for individuals with educated parents.

Table 3.3: Regression Estimates by Gender and Parental Education

	Men		**Women**	
	Low Education	High Education	Low Education	High Education
Post	0.184**	-0.0187	0.0196	-0.0501**
	(0.0633)	(0.0366)	(0.0693)	(0.0211)
Dist	-0.0683***	0.00836	-0.00441	0.0343**
	(0.00811)	(0.0149)	(0.0157)	(0.0111)
Dist × Post	0.0252	0.00241	0.0182	-0.0146
	(0.0250)	(0.0156)	(0.0261)	(0.0116)
Observations	361	571	330	500

Notes: Due to data limitations and attrition the sample suffers from a negligible and balanced loss of observations. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

More specifically, men with low educated parents who were exposed to the policy are about 18 percentage points more likely to complete upper secondary school compared to those with the same background who were not subject to the reform. By contrast, for individuals with highly educated parents I do not find any significant change in the probability of completing upper secondary school between the treatment and control groups. Similarly for women, the results point to some heterogeneity by parental background. Women with less educated parents seem to experience a slight and positive increase in the probability of obtaining a high school diploma, while for those from high educated families no meaningful change emerges. Overall, the findings indicate a limited effect of the reform for students with highly educated parents, whose upper secondary school completion rates were already close to saturation prior to its implementation. For those with low educated parents, however, the reform played a more important role, reducing drop-out rates.
These results are consistent with prior research on educational inequalities, which shows that children from more educated households are more likely to pursue and complete higher academic paths compared to their disadvantaged peers (see Ballarino et al. (2006) and Checchi et al. (2013)). Consequently, a policy that raised the compulsory schooling age by two additional years had a larger impact on students from less

educated families, who were at greater risk of early school leaving.

Besides parental education, household economic resources may also play a role in shaping children's educational choices. Financially constrained families might require their children to enter the labor market earlier and end their academic careers sooner compared to their more privileged counterparts. For this reason, I conduct the analysis by household economic resources, expecting that the policy encouraged children from more disadvantaged families to complete their upper secondary education. The measure used as a proxy for family economic resources is based on a survey question regarding perceived financial strain of the family of origin. The latter cannot be observed for individuals who have already left the parental household, so the analysis is restricted to those still living with their parents. As individuals who leave their household of origin earlier may differ significantly from those who remain longer, an issue of endogenous selection could arise, potentially biasing the results. Therefore, Table 3.4 first reports the overall estimates for the new sample by gender and then presents the stratified results by parental economic resources.

Table 3.4: Regression Results by Gender and Household Income

	Men			**Women**		
	Full Sample	Low Income	High Income	Full Sample	Low Income	High Income
Post	0.275***	0.309***	-0.0338	0.0343	-0.0453	0.0191
	(0.0600)	(0.0212)	(0.0762)	(0.0436)	(0.0864)	(0.109)
Dist	-0.101***	-0.159***	0.0316	0.0248*	0.0199**	-2.58e-15
	(0.00106)	(0.00722)	(0.0205)	(0.0115)	(0.00705)	(0.0453)
Dist × Post	0.100***	0.157***	-0.0259	-0.00304	0.0118	0.0247
	(0.0131)	(0.00793)	(0.0246)	(0.0143)	(0.0210)	(0.0499)
Observations	524	279	245	408	223	185

Notes: Clustered standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Although the estimates for the full new sample differ slightly from those reported in the main analysis (see Table 3.2), the results remain consistent with the earlier findings. The reform appears to have increased high school completion among men, with no significant impact for women. The table further indicates that the main beneficiaries were men from lower income families, who show the largest improvement in upper secondary completion rates. While these estimates may not fully capture the true effects of the reform, being restricted to individuals under 26 who still live with their parents, they clearly suggest that men with financially constrained parents benefited more than those with wealthier backgrounds.

Considering both the estimates from Table 3.3 and Table 3.4, I can conclude that the policy raised the probability of completing high school for men from disadvantaged socioeconomic contexts, thereby reducing educational inequalities across social classes.

3.3 Territorial Disparities

Besides parental background, there are other factors that have major influence on students' educational attainment and school performance, these include, for example, characteristics of school infrastructure such as safety of school buildings, availability of adequate educational spaces, and the location of the facility within the urban context. The proximity of school facilities to public transportation, along with classrooms that are bright, quiet, and kept at an appropriate temperature, are particularly important for creating an academic environment that supports learning and encourages the continuation of studies. Unfortunately, Italy continues to experience substantial regional disparities in this regard (Legambiente (2025)). Despite ongoing investments, not all areas are equipped with safe, adequate, and well-connected schooling facilities, and the South and the Islands remain disadvantaged. Even today, about one-third of schools in Southern Italy are located in areas exposed to noise pollution, and one-fifth of upper secondary school buildings are situated far from local public transportation (Bucci et al. (2023)). Such conditions hinder the learning process and foster absenteeism and early school dropout. The evident regional disparities in infrastructure translate into inequalities in school attendance and completion rates. This section therefore presents the analysis of the policy by geographic area, in order to examine whether the Fioroni reform had heterogeneous impacts across the country. To capture the geographical dimension, I used the variable indicating respondents' place of birth, since the survey did not include information on where they had attended high school. Because data on high school completion were collected at age 23 or later, I consider birthplace a more reliable proxy for the area of schooling than current residence. In Italy, it is quite common to move to another region to attend university or to find employment opportunities, so using residence at the time of the survey would not be a good indicator of where high school was actually completed.

Following the territorial classification adopted by ISTAT, the northern area includes Piemonte, Valle d'Aosta, Lombardia, Veneto, Trentino-Alto Adige, Friuli-Venezia Giulia, Emilia-Romagna, and Liguria. The central area consists of Toscana, Lazio, Umbria, and Marche, while the remaining regions are grouped under the South and Islands zone. Table 3.5 presents the estimates separately for men and women.

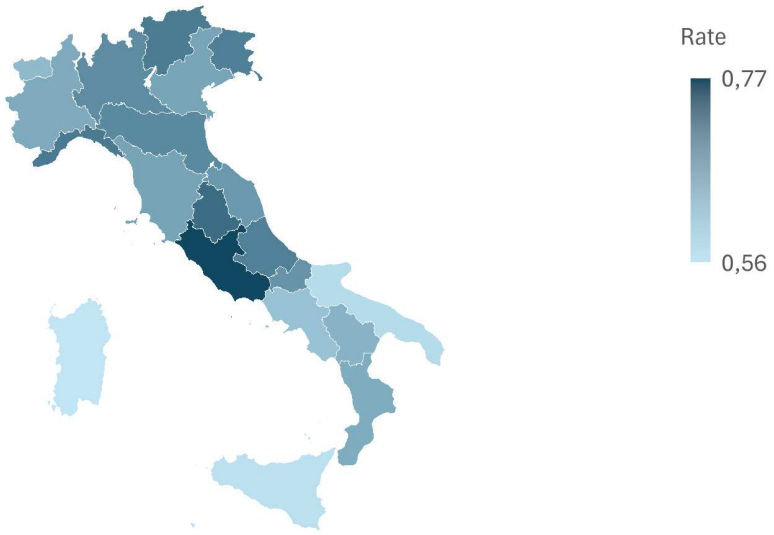
Table 3.5: Regression Results

	High School Completion		
	North	Centre	South and Islands
Panel A. Men			
Post	0.0444	0.0239	0.0958*
	(0.0740)	(0.0716)	(0.0434)
Dist	0.0202	-0.0311	-0.0603***
	(0.0116)	(0.0328)	(0.00399)
Dist × Post	-0.0150	0.0398	0.0740***
	(0.0275)	(0.0375)	(0.0125)
Observations	382	138	465
Panel B. Women			
Post	-0.0634	-0.0444	-0.0909***
	(0.0479)	(0.0779)	(0.0188)
Dist	0.0152***	0.0587	0.0340***
	(0.000593)	(0.0466)	(0.00208)
Dist × Post	0.0162	-0.0329	0.00747
	(0.0139)	(0.0521)	(0.00567)
Observations	325	136	432

Notes: This table reports estimated coefficients and standard errors (in parentheses) from regressions run separately for men (Panel A) and women (Panel B).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The policy exerts a larger effect on males who attended upper secondary school in Southern Italy or the Islands. Among southern cohorts exposed to the reform, upper secondary completion increases by 9.5 percentage points. Beyond this immediate positive discontinuity in completion probability, subsequent cohorts exhibit a significant upward trend, as indicated by a positive and statistically significant interaction term. Conversely, I detect no significant effect on the probability of completing upper secondary school for males residing in Northern or Central regions. These findings align with prior expectations, given the lower educational attainment in the South and in the Islands. As shown in Figure 3.4, which indicates the share of residents aged 9 and over holding at least an upper secondary school diploma in each region, even nowadays, Southern regions and Sicilia and Sardegna, remain less educated than those in the North and Centre of the country. For the subsample of females, no regional differences emerge and, as shown previously, the policy hasn't induced any change in the probability of completing high school for this group.

Figure 3.4: Italian Upper Secondary School Attainment Rate by Region in 2023



Notes:The map shows the share of residents (aged 9 and over) holding at least an upper secondary school diploma in each region in the year 2023. Source: Own elaboration of demographic ISTAT data.

Overall, this territorial analysis provides further evidence that, for the group of men, for whom the policy was shown to have an effect, the impact was stronger in socially and economically disadvantaged areas, reducing the risk of early school leaving. To complete the picture, it would have been useful to examine differences between rural and urban contexts, as the former are generally more disadvantaged in terms of transport and facilities throughout the whole nation. However, the lack of municipal level information limited the analysis to a broader geographical distinction.

In general, the results presented in this chapter show significant progress in high school completion rates for men, particularly for those whose parents are not educated, who come from economically disadvantaged families or attend schools in regions with inadequate educational services. At the same time, the latest data on Italian educational attainment confirm lower level of education compared to the most advanced European economies and consistently below the OECD average. To bridge the current gap, compulsory schooling laws, such as the Fioroni Reform, must be complemented by additional educational policies targeting students at highest risk of dropping out. Such measures could include personalized guidance and school counseling, with particular attention to supporting students experiencing complex or difficult family situations (Raimondi and Vergolini (2019); Bifulco et al. (2010)).

Conclusions

This thesis has examined the impact of the 2007 Fioroni Reform, which raised the compulsory school age in Italy from 14 to 16 years, on the probability of completing upper secondary education. The analysis focused on whether the reform effectively increased completion rates and whether its effects varied across gender, socioeconomic background, and geographical area of birth. The study was motivated by the crucial role of education not only in enhancing economic growth, but also as a fundamental driver of equality of opportunity and intergenerational mobility.

Despite these ambitions, the Italian education system still appears more fragile than those of many other European countries and continues to suffer from marked territorial inequalities. These weaknesses result in lower levels of educational attainment compared to countries such as Germany and France, as well as in higher dropout rates relative to the EU average. Within this context, every reform in the field of education plays a crucial role in narrowing the gap.

The results of this thesis show that the Fioroni Reform contributed to strengthening the already increasing trend in high school completion. The evidence suggests that the reform had the strongest impact on students most vulnerable to early school leaving, namely, males, individuals from lower socioeconomic backgrounds, and those enrolled in schools in southern areas of the country. In this sense, the reform has contributed to reducing inequalities across social groups and regions, representing an important step forward to achieve a more equitable education system.

At the same time, preliminary evidence suggests that even for the groups for which the reform increased the probability of completing upper secondary school, this did not translate into higher rates of tertiary graduation. This leaves open the question of whether the reform has had longer-term effects on labor market performance, income, and career opportunities. At present, however, such outcomes cannot be fully assessed, as the affected cohorts are still relatively young. This limitation leaves space for future research to explore the long-run consequences of the policy.

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