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Unequal effects of the economic cycle on human capital investment. Evidence from Italian panel data

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Abstract

Human Capital Theory considers individuals' education as an investment in terms of money, time, effort, and the renouncement of income opportunities that they expect will be compensated during their working life. While these benefits are mainly in the long run, direct and indirect costs are conditioned by the present circumstances, and in particular, by the macroeconomic conditions. The literature investigating the influence of the business cycle on enrolment decisions often suggests a counter-cyclical relationship without considering that economic fluctuations can produce heterogeneous effects among households facing different economic situations. Through a fixed effects regression based on panel data from the Italian component of the EU-SILC survey, I find the existence of a counter-cyclical propensity to enrol that is symmetric to the stages of the economic cycle. However, after disaggregating the analysis by household income quartiles, results show that a 1% increase in GDP reduces the probability of the poorest individuals being enrolled in non-compulsory education by 1.2%, while the wealthier portion of the population shows an a-cyclical relationship. The policy implications of these results are particularly important as they suggest that measures directed towards youths from poorer households to promote their enrolment in non-compulsory education should be strengthened when economic conditions improve.

Keyword: Economic cycle; Educational economics; Human capital; Rate of return.

JEL Classification: A22, E32, I23, I24.

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The time to repair a roof is when the sun is shining.

John F. Kennedy

1. Introduction

In all developed countries, the school career is typically composed of two periods. The duration of the first is compulsory and is regulated by the state, while post-mandatory education is freely chosen by individuals and their families. Since education is among the main factors influencing the individual's quality of life, one of the core principles of a fair society is to remove the obstacles preventing an equal distribution of the opportunities to obtain the desired amounts and quality of schooling (OECD, 2018). Studying the determinants of education investment decisions is therefore an important task for economic researchers in order to provide useful tools to policymakers aiming to increase school enrolment rates.

Focusing on non-compulsory education, the most common approach to studying the determinants of enrolment decisions is Human Capital Theory, which considers non-compulsory education as a period when a young person spends money, time, effort, and forsakes income opportunities in anticipation of monetary and non-monetary benefits in the future (Becker, 1964).

This theory views participation in education and training as an investment that yields not only private but also social benefits (Ashton and Green, 1996). The private returns are reflected in individual earnings over time, better career opportunities, an ability to adapt to changes in the labour market, and possibly, better health outcomes (Alstadsæter, 2010; Jacob et al., 2011). Social benefits are described by the OECD as the advantages that 'include the increased productivity associated with the investment in education and a host of possible non-economic benefits, such as lower crime, better health, more social cohesion and more informed and effective citizens'.[2]

As the human capital model suggests, when a person decides whether to continue in education, he rationally compares the above-mentioned benefits to the direct (for example, tuition fees), indirect (foregone earnings), and psychic costs of doing so.

While the benefits are mainly in the long run, direct and indirect costs are conditioned by the circumstances of the present, namely, the condition of the economic cycle, which affects foregone earnings and the economic status of families in opposite directions. The crisis due to the COVID-19 pandemic, for example, has led some families to suffer a deterioration in their socioeconomic conditions, but some empirical evidence suggests that people seem to be 'staying in or returning

[2] https://stats.oecd.org/glossary/detail.asp?ID=5426

to education rather than trying their luck in the uncertain waters of the COVID-19 labour market'.[3]

There is an extensive literature studying the effect of the economic cycle on enrolment decisions, mostly focused on tertiary education (McFarland, 1995; Dellas and Sakellaris, 2003; Long, 2014). As we will see in the next paragraph, the majority of these studies agree on a counter-cyclical relationship. However, the existing literature considers the aggregate trend of the economic cycle, which has effects that can be heterogeneous across households facing different economic conditions (Gripaios et al., 1999; De Janvry and Sadoulet, 2005; Dynan et al., 2012, Berardi and Marzo, 2015).

Relying on panel data from 2004 to 2014 from the Italian component of the European Union Statistics on Income and Living Conditions (EU-SILC) survey, I aim to understand whether the economic cycle effects on individuals' schooling are homogenous across different economic conditions. Two competing consequences are suggested. During a worsening of the overall economic conditions, low-income individuals may suffer greater-than-average liquidity constraints, which can prevent them from investing in education. If this effect prevails, the inequalities in terms of access to education may increase during an economic downturn. On the other hand, their opportunity costs may be lower because their labour services are likely to be more easily substitutable and their jobs more uncertain. They would therefore be more affected by macroeconomic changes, and a worsening of economic conditions may improve their investment options more than those of the rest of the population. Therefore, the economic ups and downs of the economic cycle may lead to inequalities in access to higher education because it changes the opportunity costs of individuals in different economic conditions.

I focus my study on Italy because in this country, inequalities in the access to non-compulsory education and school attendance rates are urgent matters. Even though the university system is essentially centralized and funds are provided mainly by the central government (Aina, 2012; Abramo et al., 2018), there are significant geographical differences (Cattaneo et al., 2017). Despite the amount of funding being among the lowest in Europe (Janger et al., 2019), tuition fees are low, and in particular in public universities (Checchi, 2000), with limited variation across institutions and fields of study; moreover, students in the lowest 10% of the household income distribution are not required to pay fees.[4] Education is mandatory until 16 years of age, and the high school diploma is usually obtained at 19. The country is characterized by a low levels of educational achievement (Brunello et al., 2000) and higher dropout rates in tertiary education compared

[3] See Financial Times (2020) *Young people in UK staying in education rather than seeking work*, November, 19, https://www.ft.com/content/1654622a-8d7c-46b4-95b4-ff82066fd9fc. For an assessment of students' condition during the Covid-19 pandemic, see Murat and Bonacini (2020).

[4] https://eacea.ec.europa.eu/national-policies/eurydice/sites/eurydice/files/fee_support_2018_19_report_en.pdf

to other OECD countries (Cingano and Cipollone, 2007). Moreover, the school and university dropout rates are greater for children with less-educated and blue-collar parents (Triventi and Trivellato, 2008; Ballarino et al., 2011).[5]

My econometric strategy relies on a fixed effects model to remove the unobservable effects of the time-invariant characteristics. Specifically, I perform the analysis on the entire sample to understand the overall role of the economic cycle on human capital investment decisions. After that, I investigate the heterogeneity among families facing different economic conditions, dividing the population into income quartiles and performing the same analysis on each of these. Although the first findings confirm that the economic cycle has a counter-cyclical relationship with non-compulsory schooling decisions, my results show that this is true only for the poorest people, while the relationship for the wealthier portion of the population is a-cyclical.

This study represents an important starting point to improve policy proposals tailored to deal with inequalities in access to non-compulsory education produced by the economic cycle, and even more so in light of the economic shock caused by the COVID-19 pandemic that spread across the entire world in 2020. The rest of this paper is structured as follows. The next section is a review of the literature. Section 3 presents the datasets used and some descriptive results. Section 4 shows the methodology, and Section 5 presents our main results and provides an account of a series of robustness checks. Finally, Section 6 offers some concluding remarks.

2. Literature review

The majority of the literature studying the role of the economic cycle in human capital investments is based on data from the United States and finds a counter-cyclical relationship between economic conditions and investment decisions in education.

[5] Regarding the economic trend, the so-called 'Great Recession' was particularly rough for the Italian population, and especially for the lower-income population. Before this recession, income inequality had already been increasing dramatically throughout the 1990s, and at the beginning of the economic crisis it was already high (Jappelli and Pistaferri, 2009). But during the Great Recession itself, almost all poverty and inequality indicators increased. For example, the percentages of relatively poor households and of absolutely poor households rose, respectively, from 11.1% to 12.7% and from 5.2% to 6.8%, and the ratio between income owned by the top 20% of earners and the lowest 20% rose from 5.1% in 2008 to 5.6% in 2010 (Freguja, 2013).

2.1. On the cyclicality of human capital investment

Dellas and Sakellaris (2003), studying high school graduates between the ages of 18 and 22 years old in the U.S., show that enrolment rates seem to display a counter-cyclical pattern with respect to the unemployment rate. Dellas and Koubi (2003), in their investigation of U.S. persons aged 16 to 35, explain that people are more likely to attend school during bad aggregate times. Long (2014) examines the effects of the Great Recession in the United States, and the results suggest that the net effect of the recession has been positive in terms of college enrolment levels. Betts and McFarland (1995), studying American colleges, find that the link between enrolment and the unemployment rate is significant and positive both for full-time and part-time students. Mendez and Sepuvelda (2012) provide evidence regarding the cyclicality of skill acquisition activities via both formal schooling and on-the-job training in the United States. Their results indicate that both the incidence of schooling and the time devoted to schooling are strongly counter-cyclical. Heylen and Pozzi (2007) consider 86 developed and developing countries in the period of 1970–2000. Their analysis confirms the positive effects of economic crises on human capital investment. Sakellaris and Spilmbergo (2000) analyse foreign students' behaviour in the United States. They conclude that there are two different effects of economic fluctuations on enrolment behaviour: for OECD countries, enrolment decisions are counter-cyclical, whereas for non-OECD countries they are pro-cyclical. Mattila (1982) regresses school enrolment ratios on rate-of-return variables for people in the United States. The most interesting result is the large and positive enrolment response to an increase in the rate of return to college. He also finds that school enrolments increased during recessions for young men but not for older men.

Few studies disagree with the conclusion of a counter-cyclical relationship. Polzin (1984) examines data on students at Montana University. His analysis indicates that the enrolment of first-time freshmen was influenced by hometown unemployment rates. But the effects of changes in unemployment rates were not the same for all units, and the relationship between unemployment rate and the economic cycle is uncertain. Edwards (1976) examines how school enrolment and retention rates in the U.S. respond to changes in overall business conditions. The results of the paper indicate that only one of the four teenage groups studied, non-white males, responds to cyclical upswings in employment opportunities by dropping out of school.

Outside of the United States, and regarding the cyclicality of dropouts, Schady (2004) examines the effect of the macroeconomic crisis in 1988–1992 in Peru. Results seem to suggest that households are reluctant to reduce human capital investments. Therefore, an economic recession would not cause an increase in dropout rates. Adamopoulou and Tanzi (2017) use data on three cohorts of university students in Italy to study how the Great Recession affected their dropout probability. They find that while an increase in the adult unemployment rate reduces the dropout probability of university students, a rise in the youth unemployment rate increases their probability of dropping out.

2.2. Does the economic cycle shape schooling inequalities?

Very few studies focus on the inequalities in human capital accumulation produced by the economic cycle, and their results tend to differ. Rucci (2003) investigates the impact of the Argentine crisis that began in 1998 on children's schooling decisions. The results suggest that the economic recession has negatively affected schooling decisions, and its effect is worse for youths belonging to households with parents with low levels of education. Christian (2007), using data on 18- and 19-year-old U.S. students, studies whether the unemployment rate influences enrolment in college. His results show that college enrolment is a-cyclical or very mildly counter-cyclical. He did not find any evidence that the cyclicality of college enrolment by children from non-home-owning households is different from that of children from home-owning households. Also studying U.S. data, Alessandrini et al. (2015) estimate the probability of being enrolled in college, finding that macroeconomic conditions have a negative marginal effect on education decisions. The sample was also divided into two groups in order to distinguish between high and low parental education. They find that the impact of an increase in GDP is greater for the low parental education category than for people with more highly educated parents. In Europe, Ghignoni (2016) studies the phenomenon of dropouts in Italy. Her paper shows that during the 2008 crisis, the probability of dropping out of university increased significantly for students from families belonging to the lower social classes and for less proficient/less academically oriented students compared to the pre-crisis period. In a working paper, Ayllon and Nollenberger (2016) consider young people aged 16 to 29 in 28 European countries. They find a counter-cyclical relationship between rising unemployment rates and both school enrolment and the return to education. They also conduct an analysis by population subgroups, finding that when there is an increase in unemployment, youths belonging to the most disadvantaged backgrounds are less likely to enrol in tertiary studies.

3. Data and descriptive evidence

In this work, I use data from 2004 to 2014 from the Italian component of the European Union Statistics on Income and Living Conditions (EU-SILC) survey in its longitudinal form. Panel data are very valuable for my goal because they allow reducing the volatility and random fluctuations over time with respect to cross-sectional data. The panel component of EU-SILC is therefore more precise than cross-sectional data to estimate changes over time, despite a smaller sample. For my purposes, there are three main limitations to the use of this database: its reduced number of waves (four) during which individuals are traced, the wide territorial level (NUTS-1 level), and the lack of a variable specifying the exact grade of study that the person is enrolled in. The dataset contains information on 73,184 individuals each traced for four consecutive waves. Since I am interested in analysing the enrolment rate, I reduce the sample to consider only people in the typical age of non-mandatory education attendance. Italy is characterized by an average time to effective degree

attainment much longer than the institutional one[6] (Contini et al., 2017). I therefore consider individuals up to the age of 29 years included. I exclude all the people declaring to be already graduated because for this category I am not able to discern between a bachelor's degree and a master's degree. Finally, I drop individuals who did not obtain a high school diploma during the four waves considered. The final sample includes 4,878 persons (19,512 observations), of which 3,180 remained in the same student status in each tracked year. The main variable used as a proxy of the economic cycle is GDP at the NUTS-1 level (expressed as a logarithm). I extracted the data on GDP from the Eurostat database and merged these with EU-SILC data.

I consider as enrolled in post-secondary education all students who already have a high school diploma and say they are currently studying (ENROL).[7] To analyse the role of the economic cycle in this decision, I consider as the main variable the natural logarithm of the GDP (LN_GDP). Additional time-varying variables at the individual level are also included: the age that the person turns in the year of the interview (AGE), the logarithm of the household equivalent income (LN_YEQ), and the percentage of government expenditure in education on the GDP (GOV_EXP). Descriptive statistics are presented in Table 1.

The EU-SILC dataset makes available detailed information on individual/household socioeconomic and demographic characteristics. The longitudinal component allows for analysing changes at the individual level over time and covers a long period starting with a positive economic cycle that was interrupted by the Great Recession, which affected Italy in 2008 through the global financial crisis and in 2011 with the consequent economic crisis, and concludes with a positive economic trend. As Figure 1 shows, while the financial crisis seems to be homogeneous among the macro-areas, the economic crisis seems to produce heterogeneous effects, as in the South and Islands area the GDP decreases less than in the central and northern areas. Enrolment in post-secondary education increases in each area until 2008. After this year, the overall trend is stable in the North and in the Centre, while it seems to decrease in the other areas.

[6] XVII indagine Profilo dei Laureati 2014. Bologna: Consorzio AlmaLaurea http://www. almalaurea.it/universita/profilo.

[7] Individuals enrolled in post-secondary non-tertiary education are considered free to decide whether to continue their studies upon graduation.

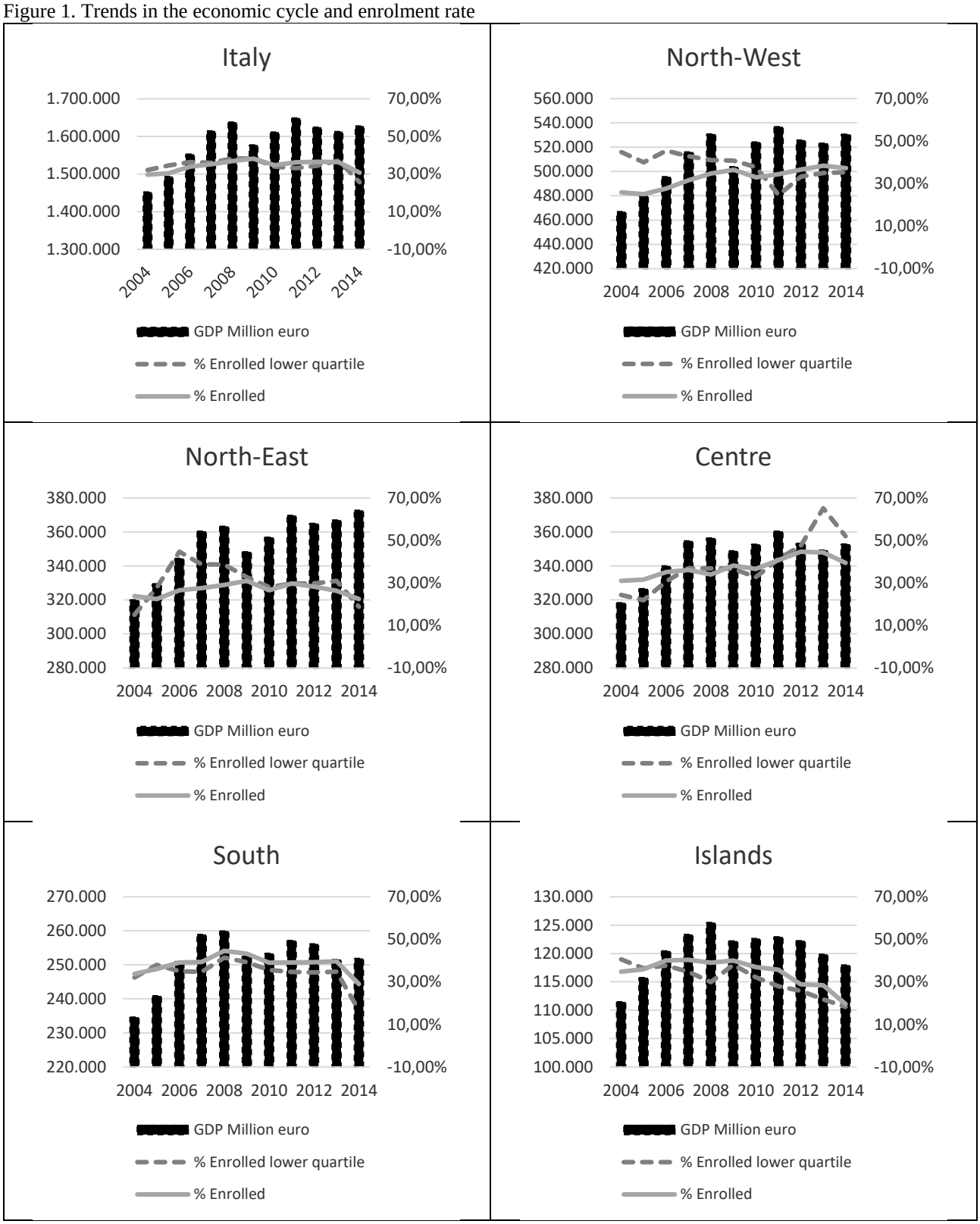
Table 1. Descriptive statistics

Variable			Mean	Std. Dev.	Obs.
Dependent variable	ENROL	overall	0.35	0.48	N = 19,512
		between		0.39	n = 4,878
		within		0.27	
Economic condition (variable of interest)	LN_GDP	overall	26.44	0.39	N = 19,512
		between		0.39	n = 4,878
		within		0.03	
Other socioeconomic covariates	AGE	overall	22.44	3.07	N = 19,512
		between		2.86	n = 4,878
		within		1.12	
	LN_YEQ	overall	9.54	0.93	N = 19,512
		between		0.74	n = 4,878
		within		0.55	
	GOV_EXP	overall	4.30	0.14	N = 19,512
		between		0.11	n = 4,878
		within		0.09	

Notes: All descriptive statistics are computed with individual sample weights. The overall and within summaries are calculated over 19,512 person-years of data. The between statistics are calculated over 4, 878 persons.

Until 2008, there is near-homogeneity between the trends of GDP and enrolment rate in each area. After this year, the differences between the two trends are significant in each macro-region. Figure 1 also highlights that the enrolment rate for the lower quartile of the population seems to be similar to the trend of the entire population in the sample. Nevertheless, the disaggregation by area shows that only in the southern areas (South and Islands) are the trends quite similar along the entire period studied. In the northern areas there are strong differences, in particular at the beginning of the period considered; in the central area the difference is seen only in the last three years.

Figure 1. Trends in the economic cycle and enrolment rate



Notes: Elaborations of % enrolled lower quartile and % enrolled are based on EU-SILC panel data. Data on GDP are extracted from Eurostat.

4. Empirical strategy

To investigate the hypothesis that the economic cycle affects human capital investment decisions, I rely on an econometric model that allows me to analyse the impact of a variable that varies over time (the economic conditions). To this end, the fixed effects analysis fits better conceptually as it removes the unobservable effects of time-invariant characteristics (Kohler and Kreuter, 2005). Using fixed effects, we assume that something within the individual may impact or bias the predictor or outcome variables and control for this. The formal specification of the baseline model is as follows:

$$1) \qquad Y_{ijt}=\beta_1 \, LN_GDP_{jt}+ \beta_2 \, X_{ijt}+ \beta_3 GOV_EXP_{t}+\beta_4 \, T_t+\varepsilon_{ij}$$

where subscript i denotes the individual, j is the macro-region of residence, and t is time. Y is the dependent dummy variable analysed (ENROL); LN_GDP is the variable of interest proxying the macroeconomic conditions. X is the vector of covariates at the individual level (which in the main analysis are LN_YEQ, LN_YEQ squared, and AGE fixed effects), GOV_EXP is the percentage of government expenditure in education on the GDP, and T controls for the time fixed effects.

The literature presented in Chapter 2 usually underestimates the possible asymmetry between positive and negative economic cycles. Nevertheless, the effect of an improvement in macroeconomic conditions may produce non-opposite effects with respect to a worsening. For this reason, in Model 2 I conduct the following analysis:

$$2) \qquad Y_{ijt}=\beta_1 \, LN_GDP_{jt}+ \beta_2 \, IMPROVING_{jt}+ \beta_3 X_{ijt}+ \beta_4 GOV_EXP_{t}+\beta_5 \, T_t+\varepsilon_{ij}$$

Model 2 considers all the variables of Model 1 but also includes a dummy variable (IMPROVING) that is equal to 1 if the GDP in area j is greater than the previous year and 0 otherwise. If this variable is significant, this would indicate asymmetry of the economic cycle.

Several further analyses and robustness check are implemented. First, the possibility that the variable of interest could have lasting effects is among the major issues of this type of model since this would influence the causal relationship (Woolridge, 2010). To deal with this risk, I substitute the variable LN_GDP with the natural logarithm of the GDP lagged by one year (LN_GDP_LAG). The specification of this analysis is the same as Model 1 except for the variable of interest:

3) $$Y_{ijt}=\beta_1 \text{ LN_GDP_LAG}_{jt}+ \beta_2 X_{ijt}+ \beta_3 \text{GOV_EXP}_t+\beta_4 T_t+\varepsilon_{ij}$$

Second, I focus on the relevance of the length of the period, or in other words, whether schooling decisions are influenced only by the current macroeconomic situation or also by that in the period just elapsed. To explore this option, I rely on the following model:

4) $$Y_{ijt}=\beta_1 \text{ LN_GDP}_{jt}+\beta_2 \text{ LN_GDP_LAG}_{jt}+ \beta_3 X_{ijt}+ \beta_4 \text{GOV_EXP}_t+\beta_5 T_t+\varepsilon_{ij}$$

In the regression in (4), I simultaneously consider both the logarithm of GDP and the logarithm of GDP lagged by one year. If the coefficients β_1 and β_2 are both significant, it means that not only the current macroeconomic condition but also its duration is relevant for human capital investment. Third, I conduct a sort of placebo test in which I repeat the analysis using a model specification where no relationship between the dependent and independent variables occurred based on a priori knowledge (Athey and Imbens, 2017). Assuming that individuals are not more influenced by the macroeconomic condition of the next year than the current one, I substitute the variable of interest in Model 1 with the same variable but referring to the following year (LN_GDP_n + 1). The model is presented here:

5) $$Y_{ijt} = \beta_1 \text{ LN_GDP_n} + 1_{jt} + \beta_2 X_{ijt} + \beta_3 \text{GOV_EXP}_t + \beta_4 T_t + \varepsilon_{ij}$$

In other words, in the placebo test the outcome is replaced by a pseudo-outcome that is known to not be affected by the treatment. A positive result of the placebo test means that the coefficient $\beta_1$is not significant because a relationship between the two variables does not exist.

Other analyses conducted regarding the inclusion of different or additional variables in Model 1 include the substitution of the variable of interest with the natural logarithm of GDP pro capita (LN_GDP_CAP; Model 6), the exclusion of LN_YEQ squared from the covariates (Model 7), the substitution of the variables LN_YEQ and LN_YEQ squared with

the dummy ‘Capacity to face unexpected financial expenses’ (UN_FIN_EX), which is a proxy of household economic security (Model 8), and the inclusion of time-invariant covariates (i.e. female and macro-region fixed effects, Model 9).

In the second part of this paper, I analyse the effect of the economic cycle distinguishing by household economic condition. As mentioned above, persons who decide to continue their studies after compulsory education are not randomly assigned with respect to economic status and their parents’ social conditions (Checchi et al., 2013). For this reason, I prefer not to compute the quartiles of population on the basis of the restricted subsample but consider the entire initial sample. Since I build a fixed effects model, I adopt two different methods, (A) and (B), to disaggregate the sample into population quartiles.

Through method (A), the quartiles into which the population is divided are calculated on the basis of income in each year. Adopting this method, quartiles are made up by the same number of persons each year and the distinction of a persons’ economic condition is in-depth (for instance, the fourth quartile is composed of the poorest people in that year). Another characteristic of this method is that a person may switch between different quartiles during the period of observation if they improve or worsen their economic condition compared to the rest of the population. Since the fixed effects model does not consider the observations that remain in a quartile for just one year, through this method I only count observations that have remained in the same quartile for 2 years or more.

Adopting method (B), I assign to each person the quartile most prevalent during the four years of observation. If a person is in two or more different quartiles for the same number of years, I consider the lowest quartile. This method is almost specular with respect to the first: a person is tracked during all four years and he/she is considered in the same quartile also if a change at the tail-end of the years observed represents a structural change. Let me take the example of a person who improves his wage at the fourth year of the tracked period, thanks to a promotion. His household income belongs to the second quartile during the first three years, and it climbs to the third quartile in the last year of observation. Through this method, this person is considered as being in the second quartile in each period.

Table 2 presents descriptive data on the logarithm of income comparing the two methods. The subsamples of the first and second quartiles are larger and the mean is higher in method (B) than in method (A) because it includes observations that are in the upper quartiles for one or two years.

Table 2. Disaggregation of income in quartiles

(A) LN_YEQ		Mean	Std. Dev.	(B) LN_YEQ	Mean	Std. Dev.
Fourth quartile	Overall	8.66	1.35	Fourth quartile	9.07	1.12
N = 5,131	Between		1.03	N = 8,956		0.81
n = 2,007	Within		0.85	n = 2,239		0.77
Third quartile	Overall	9.49	0.12	Third quartile	9.71	0.36
N = 5,042	Between		0.11	N = 5,172		0.21
n = 2,522	Within		0.07	n = 1,293		0.29
Second quartile	Overall	9.82	0.11	Second quartile	9.98	0.28
N = 5,017	Between		0.10	N = 3,168		0.17
n = 2,459	Within		0.06	n = 792		0.21
First quartile	Overall	10.30	0.30	First quartile	10.39	0.34
N = 4,322	Between		0.24	N = 2,216		0.29
n = 1,794	Within		0.14	n = 554		0.17

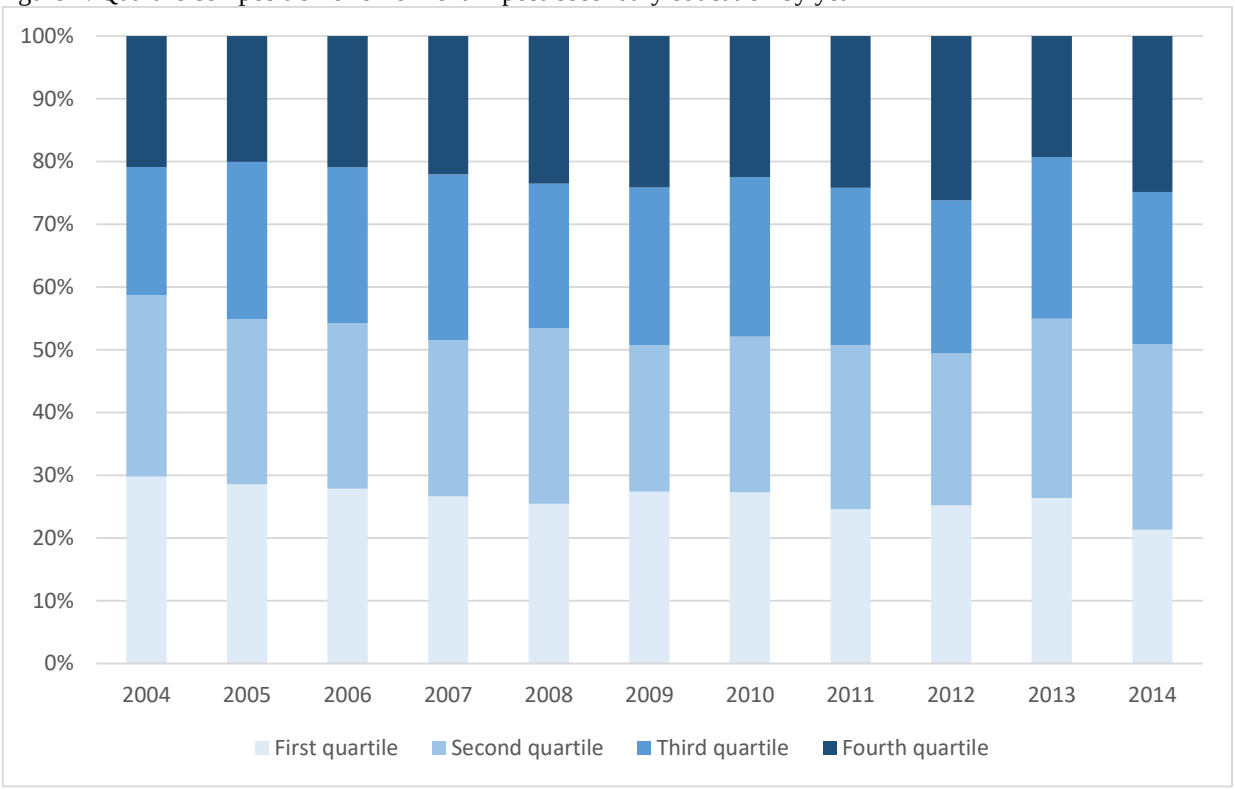
Notes: All descriptive statistics are computed with individual sample weights. The overall and within summaries are calculated over N person-years of data. The between statistics are calculated over n persons.

Figure 2 displays the trend in the economic composition of university enrolment disaggregating the entire population by income quartiles. It underlines that during the first five years of observation, more than half of those enrolled in post-secondary education are in the poorer part of the population. From 2009, the percentage is stable at 50%. It is also possible to notice a general decrease in the share of the lowest quartile over time (30% in 2004, 21% in 2014) and a concurrent increase, especially until 2009, of the wealthier half of the population (enrolment of students in the fourth and the third quartiles comprised, respectively, 21% and 20% of total enrolments in 2004 and 25% and 24% in 2014).

5. Results

The main assumption of the fixed effects model is that time-invariant individual characteristics should not be correlated with other characteristics. For a correct analysis, it is therefore important to test whether error terms are correlated. I conducted a Hausman test that allows examining whether the unique errors are correlated with the regressors (Green, 2008). The results are reassuring and indicate that the fixed effects model performs well, since the overall statistic has p-value equal to zero and I can eject the null hypothesis that individual effects are random.

Figure 2. Quartile composition of enrolment in post-secondary education by year



Notes: The computation of the quartiles in each year is based on the entire population sample.

Table 3 provides the marginal effects of the estimated variables of interest in all models. The complete results are presented in Table A1 of the Appendix. Specifically, row 'Model 1' reports the marginal effect calculated from the main analysis. The coefficient is negative and strongly significant, meaning that the relationship between the economic cycle and the enrolment decisions is counter-cyclical. A 1% increase in GDP reduces the probability of enrolling or remaining in non-compulsory education by 1.2%. In analysis (2), I consider the case in which there is a difference between a positive and negative change in economic conditions on the dependent variable. Adding this variable (IMPROVING) to regression (1), I am able to explore the asymmetry of the economic cycle. As shown in the Model 2 row of Table 3, while the variable GDP remains significant and negative, the variable IMPROVING is not significant. This finding suggests that the marginal effect of GDP has the same effect in both sides of the economic cycle. These results are consistent with those of Dellas and Sakellaris (2003), who examine whether there are differences between expansions and contractions and conclude that the response of enrolment seems to be symmetric in the two stages of the business cycle.

Analysis (3) is conducted considering the lagged variable of interest. The marginal effect is smaller than the previous one (–0.3%) but remains negative and significant ('Model 3' row). In analysis (4), I consider both current GDP and GDP lagged. This analysis is important in order to understand whether the duration of the economic cycle can also affect

enrolment decisions. As we can see in the row 'Model 4', the GDP variable remains negative and significant while the lagged variable is positive and not significant. This finding suggests that investment in education is influenced only by the current economic condition, not by the length of the period. Following this, the placebo test is conducted to demonstrate that the effect of the economic cycle does not exist when it 'should not' exist. I regress the status of student on the GDP not of the same year but of the following year (for example, the variable ENROL in 2004 is regressed on the GDP in 2005). A positive result of the placebo test may indicate a non-significant correlation between the two variables. The results are in the 'Model 5' row and show that the marginal effect is not significant when we test for a relation that should not exist.

As explained above, several further analyses are conducted to check the robustness of the coefficient and the cause–effect relationship between the two variables: considering the natural logarithm of the GDP pro capita as the variable of interest ('Model 6' row), supposing a linear effect of household income on the probability of being enrolled and thus excluding LN_YEQ squared from covariates ('Model 7' row), substituting the income variable with the dummy 'Capacity to face unexpected financial expenses', which is a proxy of the household's economic security ('Model 8' row), and adding the time-invariant covariates (i.e. female and macro-region fixed effects, 'Model 9' row). All results strongly confirm the counter-cyclical relationship between the economic cycle and human capital investment.

Table 3. Overall role of the economic cycle on human capital investment decisions - Marginal effects

	VARIABLES OF INTEREST					
ANALYSIS	LN_GDP	LN_GDP_LAG	LN_GDP n+1	LN_GDP_CAP	IMPROVING	N. of Observations
(Model 1)	-0.012***					6,760
(Model 2)	-0.011***				-0.001	6,760
(Model 3)		-0.003*				6,760
(Model 4)	-0.022***	0.009				6,760
(Model 5)			0.000			6,760
(Model 6)				-0.012***		6,760
(Model 7)	-0.012***					6,760
(Model 8)	-0.012***					6,760
(Model 9)	-0.012***					6,760

Notes. *** p<0.01, ** p<0.05, * p<0.1

5.1. Is it an overall effect?

I now disaggregate the impact that the economic cycle produces on enrolment by considering different economic characteristics. The economic conditions may lead to different responses to a change in circumstances as poorer households are more affected by a worsening of the economy. I conducted the analysis for each quartile of income defined through the two different methods, (A) and (B), explained in Section 4.

Following method (A), the population is divided into quartiles calculated for each year. Through this scheme, the analysis is conducted on a smaller number of persons because the units that do not remain in the same quartile for two or more consecutive years are not included. The advantage of this method is that the analysis considers the real relative economic situation of individuals.

Results of both models are reported in Table 4 and in Table A2 in Appendix. Using method (A), the marginal effect of GDP is negative and significant for the subgroup in the first quartile and has the same coefficient as the overall analysis (–1.2%). The second and third quartiles are negative but not statistically significant different from zero. The wealthier quartile is positive and statistically non-significant. This first analysis seems to suggest that only the lower part of the income distribution is affected by the economic cycle.

A further analysis is conducted to control this result. Since the second and the third quartiles are negative, I check that the non-significance is not due to the size of the sub-samples (respectively, 1,084 and 990 observations). I therefore consider the two subgroups together in a further analysis (Table 4 and Table A2). Through this robustness check, I consider not just the 2,074 observations in the previous analysis but also the individuals switching from the second to the third quartile after one year (and vice versa). The new coefficient is negative and non-significant, confirming the previous result.

Using method (B), I divide the population in quartiles of income, assigning to each person the quartile prevalent during the four years of observation. As explained above, this method has different advantages and disadvantages with respect to method (A).

As shown in Table 4, the lower quartile of the population is affected negatively by an increase in the economic cycle and presents the same marginal effect as in the previous analysis (–1.2%). The second income quartile of population turns out to be negatively influenced, and the marginal effect is almost the same as for the first quartile (–1.4%). Finally, this method of disaggregation confirms that persons in the wealthier half of the population are not affected by the economic cycle as the coefficients are not significant and nearly zero.

Both approaches to disaggregation present potential endogeneity between household economic condition and enrolment decisions, i.e. when an individual starts working, there is an increase in the income of the household, which can therefore

move to a higher quartile. On the other hand, a young person deciding to enrol in non-mandatory education can increase family costs, moving it to a lower quartile. My disaggregation methods may therefore present bias. Unfortunately, the survey used does not allow for controlling this issue through ad-hoc questions. Thus, I control for this potential reverse causality by computing the quartiles of population on the basis of the householders' available income only.

The coefficients, reported in Table A3 in the Appendix, strongly corroborate my main results since they are all non-significant, except for the lower quartile (–1.2%) and the higher quartile, whose coefficient is equal to zero.

These findings have positive and negative implications: on a positive note, a worsening of economic conditions allows low-income individuals to acquire more education and reduce their gap with respect to the rest of the population. On the other hand, during a positive economic cycle low-income young people are less inclined to invest in non-compulsory education, while their peers remain indifferent.

Table 4. Marginal effects of the logarithm of GDP in each income quartile

Method	QUARTILE N°	LN_GDP	N. of Observations
(A)	1	-0.012***	1,523
	2	-0.026	1,084
	3	-0.000	990
	4	0.003	1,021
(A2)	1	-0.012***	1,523
	2–3	-0.014	2,720
	4	0.003	1,021
(B)	1	-0.012***	3,384
	2	-0.014***	1,660
	3	-0.000	1,000
	4	-0.000	716

Notes. *** p<0.01, ** p<0.05, * p<0.1

6. Discussion and policy implications

In line with the literature, the present analysis finds a counter-cyclical relationship between the economic cycle and human capital accumulation. The improvement of macroeconomic conditions, therefore, reduces the probability of an individual

being enrolled in non-compulsory education. However, previous contributions overlook the heterogeneity of this phenomena among families facing different economic conditions. My results show that this is an important factor to consider: while a 1% increase GDP reduces the probability of the poorest individuals being enrolled in non-compulsory education by 1.2%, the population in the wealthier part of the income distribution is not influenced. This finding is in line with Alessandrini et al. (2015), who show that an increase in GDP has a greater effect on enrolment for students with low levels of parental education than those whose parents have a high level of education.

This result also confirms that the low-income population is more affected by variations in the economic cycle than the rest of the population. In other words, when a worsening of economic conditions occurs, the reduction of opportunity costs cuts deeper for poorer populations than for the wealthy. This is due to the fact that they are more often employed in unskilled jobs and are more easily replaceable. Moreover, we could expect that the burden of direct costs for education to be greater the lower the individual's income. In Italy, this effect may be mitigated by the system of student fees, which, as explained in the introduction, are among the lowest in Europe and are not paid by one student in ten (Checchi, 2000). As Contini et al. (2018) explain, direct costs in Italy are not a reason why low-income students decide to not study. It will be important to develop further analyses focusing on the role of fees and grants in preventing the rise of inequalities in the access to higher education during economic cycles.

The most important political implication suggested by this analysis involves the strengthening of measures promoting enrolment in non-compulsory education, in an economic and especially in a cultural way, when economic conditions improve. In particular, this should be applied to youths from poorer households. As Checchi (2006) points out, higher average educational attainment is correlated with smaller differences in educational achievement among the population, leading to reduced income inequality as a results of better employment opportunities and greater social mobility. In this respect, the present paper may represent a starting point to study another serious problem in Italy: the dropout phenomenon from secondary education and post-secondary education. It is not possible to analyse how changing macroeconomic conditions my lead to upper-secondary dropout using EU-SILC data. This will be the focus of the next analysis conducted with a different dataset. Furthermore, limitations of the data do not allow the study of the determinants of university dropout. In particular, it may be of interest for economists to explore the effects of changes in household economic conditions on educational achievement.

The OECD (2018) describes education as the cornerstone of individual's progression through life, and it must be based on the principle of equity: every person should have the same opportunities to gain skills and to be fulfilled, regardless of their economic and social condition. For this reason, it is crucially important that research into the economics of education provides policymakers with the necessary tools to build a fairer society.

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Appendix

Table A1. Overall role of the economic cycle in human capital investment decisions—Marginal effects

	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)	(Model 7)	(Model 8)	(Model 9)
LN_GDP	-0.012***	-0.011***		-0.022*			-0.012***	-0.012***	-0.012***
IMPROVING		-0.001							
LN_GDP_LAG			-0.003*	0.009					
LN_GDP_n+1					0.000				
LN_GDP_CAP						-0.012***			
GOV_EXP	-0.003***	-0.007*	-0.001**	-0.005*	-0.007	-0.004***	-0.003***	-0.003***	-0.003***
LN_YEQ	0.000	0.001	0.000	0.001	0.004	0.000	0.000		0.000
LN_YEQ squared	0.000	0.000	0.000*	0.000	0.000	0.000			0.000
UN_FIN_EX								0.000	
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant covariates	No	No	No	No	No	No	No	No	Yes
Observations	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760

Notes. *** p<0.01, ** p<0.05, * p<0.1

Table A2. Marginal effects of covariates in each income quartile

Model:			(A)	
Quartile:	1	2	3	4
LN_GDP	-0.012***	-0.026	0.000	0.003
GOV_EXP	-0.001	-0.006	0.000	-0.002
LN_YEQ	0.000	0.061	0.000	-0.027
LN_YEQ squared	0.000	-0.003	0.000	0.001
Time fixed effects	Yes	Yes	Yes	Yes
Age fixed effects	Yes	Yes	Yes	Yes
Observations	1,523	1,084	990	1,021
Model:			(A2)	
Quartile:	1		2–3	4
LN_GDP	-0.012***		-0.014	0.003
GOV_EXP	-0.001		-0.004	-0.002
LN_YEQ	0.000		0.063	-0.027
LN_YEQ squared	0.000		-0.003	0.001
Time Fixed Effects	Yes		Yes	Yes
Age Fixed Effects	Yes		Yes	Yes
Observations	1,523		2,720	1,021
Model:			(B)	
Quartile:	1	2	3	4
LN_GDP	-0.012***	-0.014***	0.000	0.000
GOV_EXP	-0.002***	-0.005	0.000	0.000
LN_YEQ	0.000	0.008	0.000	0.000
LN_YEQ squared	0.000	0.000	0.000	0.000
Time fixed effects	Yes	Yes	Yes	Yes
Age fixed effects	Yes	Yes	Yes	Yes
Observations	3,384	1,660	1,000	716

Notes. *** p<0.01, ** p<0.05, * p<0.1

Table A3. Quartiles of population on the basis of the householders' available income—Marginal effects

Quartile:	1	2	3	4
LN_GDP	-0.012***	-0.014	-0.013	0.000**
GOV_EXP	0.000	-0.004	-0.014	0.000
LN_YEQ	0.000	-0.008	-0.008	0.000
LN_YEQ squared	0.000	0.000	0.000	0.000
Time fixed effects	Yes	Yes	Yes	Yes
Age fixed effects	Yes	Yes	Yes	Yes
Observations	949	823	1,372	1,949

Notes. *** p<0.01, ** p<0.05, * p<0.1