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ISTRUZIONE E MOBILITÀ INTERGENERAZIONALE: UN'ANALISI DEI DATI ITALIANI

INTERGENERATIONAL EDUCATION MOBILITY: EVIDENCE FROM ITALY

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ABSTRACT

Il presente lavoro illustra recenti analisi sulla mobilità intergenerazionale d'istruzione in Italia.

A causa delle disuguaglianze educative all'interno del Paese e rispetto ad altri Paesi dell'Unione Europea, risulta rilevante verificare la possibile esistenza di una relazione diretta tra il titolo di studio ottenuto dai genitori e quello ottenuto dai figli in Italia.

L'obiettivo è di descrivere la relazione tra il titolo di studio dei figli, indicati come capifamiglia, e quello dei genitori.

Il lavoro si propone di misurare come avviene la trasmissione del titolo di studio tra generazioni analizzando al contempo i cambiamenti principali che hanno caratterizzato il contesto italiano a partire dagli anni Cinquanta del secolo scorso.

La tesi si sviluppa tramite un'introduzione generale al tema della mobilità intergenerazionale di istruzione in Italia dove viene presentato il problema dell'immobilità e delle disuguaglianze tra figli di genitori laureati e di genitori non istruiti. Nell'introduzione viene presentato l'obiettivo dello studio, la metodologia e i risultati sperati dall'analisi. La tesi prosegue poi con lo sviluppo di quattro capitoli. Il primo capitolo si focalizza sul concetto di mobilità sociale, le determinanti del fenomeno e gli approcci che possono essere utilizzati per lo studio della materia. Il capitolo due affronta la metodologia utilizzata per l'analisi della

mobilità intergenerazionale di istruzione. L'analisi si svolge attraverso l'utilizzo di matrici di transizione basate sul concetto di catena Markoviana e l'uso di indici di mobilità, quali l'indice di Shorrocks e l'indice di Sommers e Conlisk. Il capitolo tre riguarda l'elaborazione dei dati e la scelta delle variabili analizzate. In ultimo, il capitolo quattro analizza i risultati ottenuti. A finire, nelle conclusioni vengono presentati e analizzati i risultati dello studio e si propongono future possibili estensioni del lavoro al fine di continuare l'analisi.

Analizzando i risultati ottenuti dalle quattro matrici di transizione si evidenzia che durante gli anni è avvenuta una riduzione del coefficiente di correlazione tra i livelli di studio dei genitori e dei figli.

Nonostante ciò, c'è ancora un alto livello di diversità persistente tra i figli di genitori laureati e i figli di genitori non istruiti. In aggiunta, si evidenzia l'alta persistenza nelle classi sociali di origine dei figli rispetto alle posizioni dei genitori.

Gli indici di mobilità presentano una situazione sociale delicata dove anche per le coorti dei più giovani si nota una diminuzione nella lunghezza degli spostamenti tra classi non adiacenti.

This work presents recent analyses of intergenerational education mobility in Italy. Due to educational inequalities within the country and with respect to other countries of the European Union, it is important to verify the possible existence of a direct relationship between the educational qualifications obtained by parents and that obtained by their children.

The aim of the work is to describe the relationship between the educational qualifications of children, presented as person of reference of the household, and those of their parents.

The analysis focuses on measuring how the transmission of the educational qualification takes place between generations while analyzing the main changes that have characterized the Italian context since the 1950s of the last century.

The work consists of a general introduction to the subject of intergenerational educational mobility in Italy, where the problem of immobility and inequalities between children of graduated and uneducated parents is presented. The objective, the methodology and the expected results of the analysis are introduced too.

The thesis is articulated in four chapters. The first chapter presents the concept of social mobility, the determinants of the phenomenon and the approaches that can be used to study the subject. Chapter two discusses the methodology used to analyze intergenerational mobility in education. The analysis is carried out using transition matrices based on the Markovian chain concept and using mobility indices, such as the Shorrocks index and the Sommers and Conlisk index. Chapter three deals with

data elaboration and the choice of the variables analyzed while chapter four analyses the results obtained. Finally, the results of the study are briefly highlighted again in the conclusions and two possible future extensions of the work are recommended to continue the analysis.

The analysis of the results of the four transition matrices shows that over the years there has been a reduction in the correlation coefficient between the educational attainments of parents and those of their children.

Nevertheless, there is still a high level of persistent diversity between children of graduate parents and children of uneducated parents. In addition, there is a high persistence in the social classes of origin of the children compared to the social status of their parents.

Mobility indices present a delicate social circumstance where even for the younger cohorts there is a decrease in the length of the movements between non-adjacent classes.

INTRODUCTION

The existence of a positive correlation between parental and child incomes repeatedly emerges in the numerous empirical studies which, in recent times, have been devoted to intergenerational inequalities.

This correlation appears, however, a significant influence of specific elements, especially institutional ones, on processes for the transmission of inequalities between generations.

In fact, the knowledge of these processes is still very incomplete, and this is due, above all, to the great complexity of the issues to be addressed to arrive at a solidly founded explanation.

In the economic literature the influence of parental income is explained by reference to liquidity constraints due to imperfections in the capital which makes investment choices in human capital dependent on parental income (Franzini and Raitano, 2010).

The latter, in fact, could make it possible to escape those constraints and to ensure that children accumulate human capital which labor market strongly reward. Therefore, the belief is that education is the main, if not the only, element to consider in the explanation of the influence of parental income on children educational level.

Investment in human capital is usually considered the main tool for access to wages and higher social positions and, therefore, to increase intergenerational

mobilization. The transmission of intergenerational inequalities can be assessed by multiple dimensions including the level of education, wages, and employment classes.

In modern societies, education is a very important feature for individuals as it affects different aspects of their life such as the employment level, career opportunities, income perceived, well-being and prestige (Ballarino and Schizzerotto, 2011). The investment in human capital is also considered one of the main instruments in favor of social mobility (Checchi and Zollino, 2001). Nevertheless, besides being one of the channels through which individuals can enhance their social position, education is also recognized as the channel of transmissions for social inheritance and, therefore, as one of the contributing factors of the maintenance of inequalities in the points of departure (Checchi, 2003).

Commonly, in low- and middle-income families, parents wish for their children a higher standard of living compared to the one they are living, in addition, most people aspire to have the opportunity to reach higher social positions compared to the ones they come from. Conversely, the higher the wellbeing of the family and consequently the income, the lower the desire or the need to wish and pursue a higher social status. The government should therefore adopt appropriate public policies to make a fairer access to certain social positions also for those individuals who start from disadvantaged situations.

On the other hand, less educated families may be driven to reduce investment in the human capital of their children not only for economic reasons, but also for cultural reasons. As a result, the expectations that the parents have on the abilities of their children may influence the amount of investment in human capital also being conditioned by their own experience.

A poorly educated family will therefore be less inclined to invest in the education of their children based on their experience. All this reduce the probability that children can reach a social position higher than their parents one.

The study of the social and educational mobility is fundamental to understand if the society has an open or rigid stratification system. A rigid stratification system makes the society be inefficient and unfair. On the other hand, a society which presents high social mobility is characterized by an open stratification system.

A society with an open stratification system is based on perfect mobility when all individuals, regardless of their original position, can achieve a specific socio-economic status. This highlights that the socio-economic position is reached through effort and capabilities. People succeed by virtue of their abilities rather than their privileged origins (Azzarà, 2015).

Conversely, if the society has a rigid stratification system, it is inefficient because the most talented individuals do not necessarily succeed to achieve the highest levels of education while, it is unfair because the educational deprivation of children

coming from less educated families may increases the risk of social marginalization.

In addition, the lack of education for a considerable part of the population damages the whole growth of the country as there is no increase in human capital which, in general, is considered one of the channels for the economic development of a country. Moretti (2013) explains that the differences in mobility, combined with the effects of the changes in the economy on the labor market, have significant economic costs as they tend to increase inequalities between people with different educational levels.

Italy has often been depicted as a country with low intergenerational mobility, given the strong association existing between the socio-economic outcomes of parents and their children as adults (Checchi et al, 1999).

In Italy, the issue of social and educational mobility is particularly relevant since the Country, as well as showing a significant delay in the expansion of school participation compared to other advanced countries, it has also been characterized by strong social inequalities for many years (Schizzerotto and Baron, 2006).

Moreover, Italy seems to have made relatively little progress in terms of quality of education and its distribution in the society.

In fact, despite the numerous school reforms that have taken place over the years to favor the spread of education mainly from the Second postwar, Italy seems to have

made relatively little progress in terms of quality of education and its distribution and presence in the whole society.

Recent OECD studies, by sampling individuals aged between 25 and 64 years old, show that only 30% of individuals completed the level of secondary studies, 8% university studies and 62% the elementary and lower middle studies. (Brunetti, 2020). According to OECD data (2018), the share of the population aged 25-64 years old with at least a higher secondary education qualification is the main indicator of a country's level of education. The diploma is considered, indeed, the level of education necessary to participate in the labor market with potential for individual growth.

On the other hand, the proportion of people with tertiary qualifications continues to be very low with 19.6% in Italy against 33.2% in the EU which is explained by a slower graduate population growth than in other EU countries.

Nevertheless, young people are more educated than the rest of the population.

In 2019, more than three-quarters (76.2%) of 25-34-year-olds individuals have obtained at least the upper secondary school diploma, compared to just half (50.3%) of 55–64-year-old population, 57.7% of 45-54-year-old populations and 68.3% of 35-44-year-old individuals.

From this point of view, and compared to other European countries, Italy therefore appears as one of the least educated countries, ranking second to last for share of graduates, ahead only of Romania (EUROSTAT, 2021).

Finally, the investment in education is one of the lowest. Therefore, individuals with a university degree earn on average only 40% more than those with upper secondary education, compared to a 60% more than the OECD average.

The employment rate of the graduate population resident in Italy is only higher than the Greek one and is 5 points lower than the average European one (81.4% to 86.3%). This difference is reduced as the age increases but is cancelled out only in the most mature age groups, from 50 years old and up. In our country, therefore, the employment opportunities are smaller even for those who reach the highest level of education.

Consequently, despite education is public in Italy and it plays an important role, intergenerational immobility levels in education are still very high nowadays (Cannari and D'Alessio, 2018).

According to Corte dei Conti (2021) the brain drain phenomenon is in a worrying rise. Many young people prefer not to complete university studies for the persistent difficulties of entry into the labor market, but also because the degree does not offer, as in the rest of the OECD area, greater employment opportunities than those of individuals with a lower level of education.

Based on these arguments, the present study aims at describing the relationship between the educational qualifications of children and those of their parents. In particular, the analysis aims at measuring the level of intergenerational education transmission according to the main changes that have been observed in Italy from the second half of the last century on education and society.

The study focuses on recent evidence of intergenerational education mobility in Italy. The goal is to observe whether there is a direct link between the educational qualifications attained by parents and that of the children in correspondence with educational inequalities which characterize Italy.

Hence, this work presents an estimate of the degree of persistence in levels of education between parents and children using the data Survey on Household Income and Wealth (SHIW) provided by Banca d' Italia between 1995 and 2016.

To simplify the study of the temporal evolution of intergenerational mobility of education, the sample has been divided into four cohorts built according to the year of birth of the person of reference of the household and defined in ten-year classes as it follows: 1947-1956, 1957-1966, 1967-1976, 1977-1986.

From the methodological point of view, the sociological approach has been adopted combined with the use of mobility matrices at finite states for each cohort of birth. A mobility matrix, also known as transition matrix, provide a general view of the movements that individuals make between classes of education or employment.

At the base of the transition matrix there is the Markovian chain concept also known as a dynamic system where the transition from one state to another takes place on a probabilistic rather than a deterministic base. Mobility matrices allow the development and the calculation of synthetic mobility measures known as mobility indices used to quantify the level of mobility expressed through the transition matrix.

Additionally, through mobility matrices it is possible to make a detailed analysis of the transitions that take place between classes of education by describing on the one hand the process that governs the changes and on the other identifying the type of mobility observed: upwards or downward.

The results that will be obtained from the transition matrices should highlights that in Italy still exists a remarkable difference in the destination social status between children coming from high-educated and low-educated families. This also implies that the relationship between the origin class and the destination class is strongly associated.

The reasons for this evidence are manifold and can be ascribed to structural changes that have characterized the Italian economic system and which have influenced the choices of education made from parents and children leading to low educational returns, low demand for tertiary education and qualified employment.

The dissertation is structured as follows:

The first chapter deals with the concept of social mobility explained through theoretical definitions of reference. A first analysis focuses on the determinants of social mobility such as the family context, the school system and the concept of equity and freedom underlying social mobility.

A further step consists in the analysis of the different approaches by which social mobility can be analyzed, that is from a sociological point of view and from an economic point of view.

Chapter two focuses on the methodology used to manipulate the data and the results obtained. The study is based on the use of transition matrices and mobility indices. The chapter analyses the concept of the Markovian chain underlying the use of transition matrices and the mobility indices. In the work two mobility indices are employed, the Shorrocks index and the Sommers and Conlisk one.

chapter three deals with data manipulation. The chapter describe the data repository from which the reference datasets have been extrapolated. Moreover, the variables and the datasets used to obtain the final number of observations employed to obtain the results will be presented too.

The last chapter, chapter four, deals with the analysis of the results obtained.

The results highlight the educational qualifications obtained by fathers and children over the years, differentiating according to gender, age, and geographical area. Transition matrices for each cohort of birth will be analyzed to understand the level

of mobility or social immobility of the society at that age. The results will then be proofed by the values expressed through the mobility indices.

Finally, in the conclusion section there will be a short summary of the work done throughout the thesis and two future extensions of the work will be suggested.

CHAPETER 1

SOCIAL MOBILITY

1.1 The concept of social mobility

The concept of social mobility is very broad. It involves several aspects and dimensions, such that social mobility can not be seen as a single and homogeneous phenomenon, but as a set of social interdependent processes (Colonna, 2010).

Social mobility can not be defined through a single definition, and it can be analyzed both from an economic as well as a sociological side.

Social climbing is about individual movements and changes in social positions in a stratified society. In analyzing the history of mobility, however, it is possible to speak of social mobility as the passage of an individual, or group of individuals, from one position in the social hierarchy to another through time, also considering the flexibility of the stratification of a social system in favor of such mobility.

The concept of mobility is closely intertwined with two distinct phenomena: on the one hand the temporal phenomenon, since the social position is recorded at two different times, and on the other hand, the distribution of a resource, typically socio-economic status, within a population.

The study of social mobility can therefore consist in analyzing the changes over time in the distribution of a resource within a population.

The typical elements considered to evaluate the socio-economic status of individuals are income, consumption, education, and occupational prestige (Checci and Dardanoni, 2003).

The focus is on investigating the relationship between people's current circumstances and those in which they were originated (Breen, 2004).

Therefore, an essential element which can not be ignored when it comes to social mobility is the complex phenomenon for which, within the same society, different social positions are offered which, in turn, are translated into different opportunities for life. This phenomenon is called social inequality (Pisati, 2002).

There are many factors that determine the social mobility of an individual: culture and values of a society, its level of economic development, the school system, individual characteristics, and social origin. They represent just a few of the related elements which determine the level of social dynamism through time.

The assumption, then, is that there is a social stratification determined, according to the German economist and sociologist Weber (1922), by economic, cultural, and political factors. Max Weber's theory has points of contact with the Marxist theory, but it is not based exclusively on economic factors. Weber distinguishes three aspects of social stratification: class, status, and political party.

Class is the position of an individual within society, consisting of his skills, knowledge, specializations and ultimately his position within the labor market.

Status means the way of life that a certain individual shows within society, based on honor, prestige, and religion. For Weber social status is defined as a group of individuals who have similar amounts of resources, wealth, prestige or who occupy similar positions in power relations.

Ultimately, political affiliation means to achieve common goals even with other individuals, as well as an individual's connections to political power. The sum of these of these three aspects generates for Weber the consequences on the opportunities of life of an individual within society.

According to Cobalti (1995) it is appropriate to distinguish between horizontal mobility, vertical mobility, intergenerational mobility, intragenerational mobility, relative mobility, and absolute mobility.

Horizontal mobility is the transition between two social positions on the same hierarchical level, while, vertical mobility indicates the movement to a higher position, upward mobility, or lower, downward mobility, in the social hierarchy.

On the other hand, intergenerational mobility compares the social position of an individual with respect to that of his family of origin, while intragenerational mobility compares the social position of an individual during its existence.

Finally, absolute mobility is the number of individuals moving from one position to another of the social hierarchy whereas relative mobility, or social fluidity, is the degree of social mobility in the different categories of a stratified society.

Hence, to fully understand what social mobility is, it is important to make distinctions of its aspects. As stated, this study mainly focuses on intergenerational mobility. Thus, the first distinction to be analyzed is the difference between intergenerational and intragenerational mobility. At the same time also the differences between relative and absolute mobility are fundamental.

Usually, social mobility refers to movements and changes of children status through time regardless of their parents' social origins. What is relevant is to understand the origin of these changes.

The aspect to be considered to distinguish intragenerational and intergenerational mobility is the timeframe. The former refers to changes in socio-economic positions over a person's lifetime, the latter refers to changes that occur across generations (Azzarà, 2015).

Intragenerational mobility focus on the individual movements, up or down, from one social status to another over a unique lifetime.

Conversely, intergenerational mobility is about comparing the children social status movement from one socio-economic level to another, with respect to their parents. Basically, this type of mobility shows an overview across generations.

Intergenerational mobility is defined as the extent to which the key characteristics and outcomes of individuals differ from those of their parents (D'Addio, 2007).

On the other hand, there is also a further important distinction to analyze. The one between absolute and relative mobility.

Absolute mobility involves observed flows of individuals from each class of origin to different classes of destination meanwhile, relative mobility involves the disparities in the chances of arriving at certain destination between people from different social origins (Schizzerotto and Marzado, 2008).

Absolute mobility simply represents the total movements achieved by individuals to go from origin to destination classes. It reflects the size of mobile individuals which characterizes the trend to be analyzed and the consequent changes in the class structure through time.

From the relative mobility point of view, this mobility tries to analyze if the chances of being found in one destination class rather than another are the same for everybody regardless of social origins, meaning that family background does not intervene and so there is perfect mobility (Breen, 2004). Therefore, it is also known as social fluidity.

A society can be defined as mobile if it is possible for children to reach a determined social position without being influenced by the family background. Conversely, a society is defined as immobile if characterized by rigidness and social stratification.

Namely, individuals tend to follow their parents path remaining in the specific or similar position in which they were born.

In case a society is characterized by high immobility, it is relevant to understand the reason why the latter shows such rigidity considering rigidity or immobility may be the cause of inequalities and disparities of opportunities.

Thus, mobility and equality are two concepts firmly related to equality of opportunity.

As stated by Azzarà (2015), a society that guarantees equality of opportunity is a society in which socio-economic positions are reached regardless of social origins.

Additionally, when considering social mobility, it is highly recommended to acknowledge the difference between ascribed and achieved status.

This distinction shows the degree to which a certain socio-economic position is inherited being an individual born with it or if it is achieved through personal capabilities, skills, ambitions, and talents.

Else ways, in a society marked by social immobility, the association in socio economic position among parents and children is common.

That is why, this study aims at analyzing the influence of the parent's occupational class of origin on the socio-economic status attained by their children, so the occupational class of destination.

To conclude, in more recent years, some economists have also proposed the analysis of mobility in terms of well-being starting from the study of inequality (Dardanoni, 2004).

Indeed, the study of social mobility can be thought of as a dynamic analysis of inequality. However, some recent empirical studies do not find unequivocal confirmation of this fact. In a comparison between Italy and the United States, Checchi et al (1999) state that Italy is characterized by greater equality in income distribution, but also by less intergenerational mobility, not only in income but also in educational attainment levels. This result seems counterintuitive, since the Italian school system is basically free, and therefore characterized by low barriers to entry. However, the lack of adequate incentives due to the low level of meritocratic competition in the labor market would more than compensate for this, leading to less mobility. In comparison with the United States, other studies have shown that the latter would be less socially mobile than Germany and Sweden, due to a lower quality of the education system and a lack of effective protection systems.

1.2 The determinants of social mobility

1.2.1 The Italian school system

One of the most important dimensions of social mobility is education.

It plays an essential role in the placement of individuals in the social hierarchy because since the childhood period education influences not only peoples' capabilities but also their personality through which they define their social position in adulthood.

The factors that appear to be contributing to low intergenerational mobility in the education are three: the structure of secondary school, in terms of a huge variety of fields of study, the socio-cultural environment in which education takes place and the tertiary level education.

The structure of the secondary school system leaves a lot of room for the intervention of families in the choice of children field of study. Indeed, secondary school in Italy is characterized by many fields of studies without a clear meritocratic mechanism for the students' allocation.

Thus, the family intervention weighs on the impact of the educational resources available at family level (Checchi and Flabbi, 2006).

On the other hand, the socio-cultural environment in which education takes place seems to have a deep influence on the growth of students' competences, which then it is reflected in their future income capacity (Bratti, Checchi and Filippin, 2007).

Finally, at first the tertiary level education was selective from the socio-economic point of view since the probability of not drop-out rates, i.e. university graduates, were disproportionately in favor of children from educated parents, which were on average richer and less risk adverse (Checchi, Fiorio and Leonardi, 2006).

The logic of modern societies expects individuals to make a quantum leap into a better social position due to higher level of education.

Beyond these considerations, it is universally shared the thesis that education is a significant social lifter.

Recently, emphasis has been placed not only on higher education but also on early education, since it has been found that the basis for a proper development of individual human capital is already formed in the first three years of life (D'addio, 2008). That is why educational poverty too is very discussed.

According to the definition originally developed by Save the Children (2014), educational poverty can be defined as a situation in which children's right to learn, to train, to develop skills and competences, to cultivate their aspirations and talents is compromised. Although capturing this phenomenon in quantitative terms is a methodological challenge, several indices of educational poverty have been developed in recent years to capture different aspects and to highlight the correlations, including those regarding the geographical dimension (Openpolis, 2020, Save the Children, 2020).

Education is fundamental since it is not only given the task of delivering tangible career benefits, but it is required to value the talents of the students and accompany them in their studies, avoiding the dispersion of talents thus, contributing to the formation of the new ruling classes.

Study opportunities are supposed to be available as freely as possible, without any privilege for those who come from special family backgrounds.

A modern society based on results must make full use of all the talent at disposal and should not tolerate artificial restrictions linked to family membership, and, in part, drawn from democratic principles according to which all children in a society must have access to the opportunity of entering national educational institutions (Crouch, 2002).

It is therefore clear that a merit-based education system accessible to all individuals, especially universities, guarantees high mobility and it would allow the whole economy to benefit from the skills of those talents who otherwise would have been excluded only because they were disadvantaged by the origin starting point (Tinagli, 2009)

For what concerns Italy, the history of the Italian education system has always been depicted as an endless reform. As if the whole school system was radically changed every time. In fact, in most cases it consists of simple adjustments.

The period immediately following the Second World War represents a period of

institutional, political, and social reconstruction. The education system, however, seemed to be suffering an impasse. In fact, education gained more interest among the late 1940s and the early 1950s.

Those years were characterized by a need for a profound change in the school. An education system similar to the structures of society was needed. The abolition of privileges and the spread of awareness and the cultural development of the citizens were necessary too.

There was emphasis on the establishment of a single secondary school designed as a useful tool for overcoming the gap between social classes.

The early 60s are the years which decreed the end of the Gentile reform[1] which considered education as a means for social control. School becomes mandatory up to the age of fourteen years old.

The access to university was liberalized in 1969 when all graduates could enroll in any faculty. Hence, the demand for university education raised sharply in the second half of the 1980s leading to a growing demand from companies for people with higher educational qualifications than the diploma.

[1] Riforma Gentile (1922)
https://www.treccani.it/enciclopedia/la-riforma-gentile_%28Croce-e-Gentile%29/

In 2003 the Moratti reform[2] was instituted. The main objectives of the assistance were four: increase in the duration of compulsory education to be extended to 18 years old, the development of professional skills and the integration of education and training systems to bridge the gap between the education system and the labor market.

The reform provided several changes in the Italian school system, including the abolition of the elementary license examination, the reduction of school hours, the increase of compulsory schooling, and the duality between the secondary school system and vocational training.

Since 2006 many reforms have been carried out which have led to compulsory schooling up to the age of 16, and it was introduced the reorganization of high schools and the reform of primary and secondary schools following a purely economic criterion aimed at cutting expenditure on education (Gelmini reform[3]).

Finally, in 2010 the university was reformed. The territorial expansion of university provision, the increase in the variety of courses offered and the different articulation of the same courses introduced by the Bologna Process[4], more commonly known

[2] Riforma Moratti (2003)
http://nuovadidattica.lascuolaconvoi.it/riferimenti-normativi/2003-riforma-moratti/
[3] Riforma Gelmini (2008)
http://nuovadidattica.lascuolaconvoi.it/riferimenti-normativi/2008-riforma-gelmini/
[4] Bologna Process (1999)
https://www.miur.gov.it/processo-di-bologna

as the reform of the "3+2" years of study, seem to have favored the expansion of university enrolment, a reduction in drop-out rates (Di Pietro and Cutillo, 2008) and an increase in the graduation rate of first level (Lucifora and Cappellari, 2008).

Nevertheless, Checchi et al. (1999) point out that, despite in our Country there is a mainly public school system, the Italian society appears much less mobile compared to the United States.

In 2015 the so-called "Buona Scuola[5]" was approved, which has the aim to propose a significant reform in the school system, focusing on students and teachers, considered the main protagonists of the teaching-learning process.

It revolves around twelve key points, including: school autonomy and internships, considered a valuable tool for tackling early school leaving.

[5] Riforma Renzi (2015)
https://www.istruzione.it/allegati/2017/La_Buona_Scuola_Approfondimenti.pdf

1.2.2 The social origin: family influences

If, on the one hand, the educational qualification is a determining variable for the acquisition of social origin, on the other hand it is in many countries a discriminating factor affecting not only the level of education attained and attainable from individuals but also the social position of destination. Parents provide children with different kinds of endowments from birth as genetic factors, on which the individual's attitudes and characteristics depend, wealth, education or training, and social relations, which depend partly on the social context in which children are born and raised (Meade, 1973).

Direct and indirect effects of social origin are almost impossible not to be influential and although a society, through its education system and the implementation of social policies ensures equal access to opportunities and attempts to encourage social mobility, it will not be never completely independent of social background.

Regarding education, it is enough to think that poor families often reduce investment in education of their children not only for economic reasons, but rather for cultural reasons.

The weight of social origin and family also depends on the cultural context and on the values of the society. There are societies where the value of family is deeply rooted than in others and, in which the behavior of the family members and the influence they can have on the individual's social mobility varies.

An example which contrasts strongly with the logic of the modern societies, which sees the dual separation of the employment system from the family, with education as the protagonist of both critical junctions, is given by those society in which there is a widespread custom of sending children into the same occupation as their parents.

Crouch's study (1999) in this type of society denotes a moral duty by parents to take advantage of any means available to secure a place to their own children, with the consequence that in this kind of society people are not perceived as individuals with a destiny separated from the lives of other family members.

To underline once again the dependence of the determinants of social mobility, it is found that the influence, direct and indirect, exerted by the family through the whole range of endowments mentioned above, can vary to a greater or lesser extent depending on the territorial context in which individuals are located which, in turn, is influenced by all the historical, cultural, and economic variables that have characterized it in that era.

1.2.3 Equal opportunities: freedom and democracy

Equality of opportunity is perhaps the first factor to generate social mobility within a given context.

It is within the democratic principle itself the concept of equality and freedom not only in the political sphere but also in the social sphere.

A democratic society is based on two fundamental principles: Equal rights and Freedom, where freedom is at the service of equality as it constitutes the element which must be fairly distributed among individuals.

An egalitarian society governed by laws through its representatives chosen by the population implies equality in individual freedoms.

Thus, an equality of conditions which extends its influence even outside the political and legal system and it dominates not only the government but also civil society (Tocqueville, 1835-1840). This equalization of conditions leads to the end of pre-modern societies where the achievement of high social positions happened by ascription and inheritance, in favor of a society in which the career is open to the talent, where everyone can have the same possibilities. Therefore, it is essential that the access to any economic activity is open to everybody under the same conditions. Equal opportunity means an open opportunity for everybody to gain access to the highest positions in terms of wealth, status, and power. Therefore, from a formal point of view, it is possible to assert that a society can feel more fluid and open the

greater the opportunities which it offers indistinctively to its members to move in the social hierarchy.

It is only in a context where Equality and Freedom are the foundations of a society that the full implementation of a mechanism such as social mobility is possible. Only an egalitarian society can consider itself meritocratic where equality means equal treatment guaranteed to all individuals.

The real problem arises when the hypothesis of a static and theorist world disappears, and aspects of the real world emerges forcing the consideration of the existence of an intergenerational mobility approach.

Considering a realistic world, the idea of equality at origin position is questioned by the advantages and disadvantages that derive from the wealth or poverty of the family of origin.

That is why the concept of equal opportunities, regardless of all its complications, is one of the main tools able to ensure social mobility.

1.3 Economic or sociology approach? Two sides of the same coin

Many social science research has tried to investigate whether all individuals have the same opportunity to achieve social and economic success regardless of their parents' status.

International literature has been analyzing the degree to which socio-economic status is passed on from generation to generation.

The topic of social mobility has been deepened both in sociology and economics using different methods and analysis techniques.

Social mobility is defined as a shift of social class carried out by an individual, or by a household, in the hierarchy of a given society through time. There exist two different types of generational mobility. The intrageneration mobility investigates the transition from one social class to another, while the intergeneration mobility analyzes social class change among generations. (Checchi and Dardanoni, 2002).

Recently, both economists and sociologists have found remarkable differences in the level of inequality resolution across different countries.

According to economists, an individual status or position is characterized by income or earnings.

Nevertheless, the increasing literature has pointed out a series of problems when defining and measuring intergenerational mobility only focusing on this individual dimension representing social status.

In fact, another criterion has been the connection between the social and economic status of an individual compared to the one of its family.

This can be analyzed by studying the interconnection between the social and economic outcomes of individuals belonging to the same family across different generations.

According to the economists Becker and Tomes (1979,1986) parents decide whether and how much to invest in the future of their children in response to credit constraints, capabilities of the child and other endowments.

Conversely, in the sociological literature, the education system is regarded as an institutional element through which intergenerational persistence of economic advantages can be favored by reproducing the status quo.

The inequality of education, however, seems to be positively associated with institutional structure of education systems. The more the system and the paths are rigid, the less equality of opportunities exists.

Differences in education can be analyzed as follows: based on the distribution of study titles in each country or examining differences in educational opportunities arising from social origin. With respect to social origin, the theme of education mobility has important ethical implications. Examining the inequalities of opportunities in terms of education determines whether societies are stratified based on credit and, consequently, whether they are more or less equal than in the past (Goldthorpe and Jackson, 2008).

Pfeffer (2008) identifies three complementary mechanisms that can explain the choices related to the level of education, the educational outcomes of children and the possible persistence of education. The mechanisms are the following: the educational path, the knowledge learned inside and outside the educational context and the parents' expectations about children's abilities.

Most of the literature focuses on the United States but part of the analysis has been dedicated also to the transmission of economic status in other countries.

Italy certainly represents an interesting case for comparison. Its labor market is heavily regulated, with centralized wage-setting institutions and a high proportion of its workforce covered by collective bargaining. The school system is extremely centralized and egalitarian, the level of cross-sectional income inequality is lower than in the United States but higher than most Western European countries (Brandolini and Smeeding, 2005).

As a result of lack of data, the economic literature has given little importance to Italy. That is why most of the studies on intergenerational mobility focus on socio-economic measures and conditions. Consequently, occupational class and educational achievements are analyzed.

As for Italy, Checchi et al. (1999) point out that, despite in our Country there is a mainly public school system, the Italian society appears much less mobile compared to the United States. International comparisons by sociologists indicate

that Italy displays low levels of intergenerational mobility in terms of social fluidity (Breen, 2004).

Cannari and D'Alessio (2018) state that after a long period during which the weight of the social origin of the family on the social class of the children was weakened, today it is increased again, thus suggesting an inversion of trend.

What seems to have a greater impact are the initial choices since children tend to choose the same path of their parents in terms of years of study and subjects presenting education as an ineffective tool of mobility (Piraino, 2006).

This study does not consider the cross effect that instruction and occupation of parents have on the social status of the children, but it focuses on the direct relationship between the two.

The aim of the thesis is to highlight the existence of a positive correlation between the education of parents and that of children and the worsening of educational opportunities for children. Therefore, the existence of intergenerational mobility is confirmed mainly for the younger cohorts.

CHAPTER 2

EMPIRICAL ANALYSIS

2.1 Methodology

It is known that there exist two different approaches to the study of social mobility. The economic approach and the sociological approach. Moreover, also two different types of social mobility can be analyzed: intergenerational and intragenerational social mobility.

As already said, the topic of social mobility has been deepened both in sociology and economics using different methods and analysis techniques.

From an economic point of view the economic literature has given little importance to Italy to study social mobility due to a lack of data. That is why most of the studies on intergenerational mobility focus on socio-economic measures and conditions.

Nevertheless, many economic studies have been carried out. The difference in approach is also highlighted by the different methodology used to measure the phenomenon of social mobility.

Economists use the intergenerational elasticity of income indicator (IGE), defined as the most common indicator used in the literature to measure intergenerational mobility (Acciari et al., 2019).

This indicator is too much concise since it only reports the average level of intergenerational transmission without providing information about the processes in place in the various points of the income and wealth distribution placing possible problems with policy implications (Franzini and Raitano, 2010).

Thus, economists focus on indicators which show the grade of persistence in income and wealth among future generations.

On the other hand, this study focuses on intergenerational social mobility from a sociological point of view. Characteristic of the sociological approach is the use of transition matrices also known as Markovian matrices. At the base of the matrix there is the status classification measured in terms of children and parents' level of employment or education.

According to sociologists the use of transition matrices is highly recommended to overcome the obstacles deriving from the conciseness of the IGE and to better understand the processes which govern the changes in status from one generation to another.

This work estimates the transition matrices, and it calculates three different composite mobility indices to learn more about the transformations in the process of intergenerational mobility of education.

At the base of the model used to analyze the intergenerational mobility there is a Markovian chain also known as a dynamic system where the transition from one state to another takes place on a probabilistic rather than a deterministic base.

The composite mobility indices used in the study are three: Shorrocks index, hence Trace index and Determinant index, and Sommers and Conlisk's one.

In the following paragraphs the model used to analyze intergenerational mobility and the three indices will be further explained.

2.2 The Markovian model

At the base of the transition matrix there is the Markov chain concept, a dynamic system in which the transition from one state or class to another takes place on a probabilistic rather than a deterministic base. It is a mathematical model able to describe random state changes which temporal evolution depends only on the current state and not on the past one.

Precisely, in probability theory, Markov's property for a stochastic process consists of exclusive dependence of the present state of the random variable for future states, not from past states, as the history or path of the process, but only from the last observation. A process with Markov's property is called Markovian process.

The use of the Markovian model in the context of social mobility is justified by the fact that it is possible to clearly identify the different state of the system such as the

education level in this study. Additionally, there exists the possibility to make a series of observations on the movements leading to a change of state by individuals and finally, it is possible to analyze the dynamics which bring out the process of transition.

A Markov chain is defined as a process with discrete time and discrete state space (Rocca, 2019). Following the Markov property, the Markov chain is a set of states, taken from a state space which may be finite or infinite.

The Markov chain can be mathematically denoted as it follows:

$X = (X_n)_{n \in \mathbb{N}} = (X_0, X_1, X_2, \dots).$

In this chain the process takes the values in a finite set E at each time so that

$X_n \in E \qquad \forall_n \in \mathbb{N}.$

The Markov property infers that

$\mathbb{P}(X_{n+1} = s_{n+1} | X_n = s_n, X_{n-1} = s_{n-1}, X_{n-2} = s_{n-2}, \dots) =$

$\mathbb{P}(X_{n+1} = s_{n+1} | X_n = s_n)$

where for a given previous set of status, the likely distribution for the next status only depends on the current status and not on the past ones.

2.3 Transition matrix

As stated in chapter 1 the concept of social mobility is very broad. Hence, there exists many different approaches to the study of social mobility. The biggest and most different approaches are the intergenerational and the intragenerational ones. The main aspect which distinguishes the above approaches is the timeframe. Basically, intragenerational mobility focus on the individual movements, up or down, from one social status to another over a unique lifetime.

Conversely, intergenerational mobility is about comparing the children social status movement from one socio-economic level to another, with respect to their parents. The study focuses on the intergenerational social mobility approach. In order to study the intergenerational mobility, it is common to use transition matrices which, in line with what stated in the previous paragraph depend on the Markovian process. They provide a general view of the movements that individuals make between classes of education or employment, and, in addition, they allow the development and the calculation of composite mobility measures known as mobility indices that are easily interpreted.

The aim of the transition matrix is to determine how many individuals belong to the groups made up from the matrix combinations, and what are the frequencies of possible transactions (Breuker, 2018).

The properties of transition probability matrices derive directly from the nature of the elements that characterize them.

A transition matrix P_t for a Markov chain $\{X\}$ at time t is a matrix containing information on the likelihood of transitioning between states. Particularly, the $(i,j)^{th}$ element of the matrix Pt is given by $(P_t)_{ij}=\mathbb{P}(X_{t+1} = j|X_t = i)$.

That is to say, each row of the matrix represents a probability vector which sum is equal to one. (Maltby et al.).

In fact, observing that the elements of the matrix are probabilities, they must have a value between 0 and 1. Moreover, thinking about the meaning of each element and the fact that a Markov chain must always be in one of the eligible states, the sum of the probabilities of transition from a state i, in any number of k steps, on the states of arrival, must be unitary.

One property of the transition matrix states that:

$P_0 \cdot P_1$ has in its $(i,j)^{th}$ position the probability that $X_2=j$ given that $X_0=i$.

Generally, the $(i,j)^{th}$ position of $P_t \bullet P_t +1 \ldots P_{t+k}$ is the probability $\mathbb{P}(X_{t+k+1} = j|X_t = i)$.

Thus, a transition matrix P with p_{ij} correspond to the probability of getting to state j from the starting point i (Shorrocks, 1978).

As explained by Brunetti (2020), in the model, k are the possible values that the social class x can assume and n_{ij} with i, j = 1...k is the number of individuals in the sample who belong to the class i at time t and to class j at time t+1.

The total sample is equal to $n = \sum_{i=1}^{k} n_i$. The probability an individual in class i at time t transits in class j at time t+1 is defined as $p_{ij} \equiv p(x_{t+1} = j)|(x_t = i)$.

The random variable x takes values in space (k x k). Thus, the example analyzed by Brunetti highlights that a transition matrix with k = 3 is defined as the matrix where the single element p_{ij} is non-negative and equal to $\left[\frac{n_{ij}}{n_i}\right] \in [0,1]^{kxk}$ with $i, j \in k$.

That is a double-entry square matrices, in which the origin social classes are placed on the rows, while the target classes are located on the columns. In each cell are found the frequencies of individuals, belonging to a specific class of origin, present in a certain class of destination (Cobalti and Schizzerotto, 1994).

In this specific case, the rows indicate the origin state and if added, the elements count for 1, conversely, the columns are the destination state. The probability p_{ij} derives from empirically observed frequencies, that is, the proportion of individuals transiting from i in j. Along the main diagonal of the matrix it is possible to find the observations defined as immobile since they do not move from one status to another. While the other elements of the matrix are identified as observations that have changed social category, that is to say mobile observations.

It can happen that as for education, observation can be sorted. In this specific case they are sorted in ascending order, in the upper triangle of the matrix we will have the ascending mobile observations while in the triangle lower the diagonal there are the descending mobile observations.

In the case of intergenerational mobility, p_{ij} indicates the probability of observing a family in which the child is in class j and the father in class i.

It is necessary to distinguish between the concept of immobility, that is, individuals who are on the diagonal of the matrix, therefore, the social class of origin remains the same as the class of destination, and the concept of mobility or individuals who are placed in the remaining cells, moving from one social class to another during a given period. Indices are used for this purpose. Many of the proposed indices are directed at these matrices and they completely determine the dynamic structure if the process governing transitions follows a Markov chain (Shorrock, 1978). There exists two limit cases of transition matrices: the one of perfect immobility that can be indicated with PI, and the one of perfect mobility that it is indicated with PM.

Following Brunetti's example two transition matrices are derived.

$$PI \equiv \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad PM \equiv \begin{bmatrix} 0.20 & 0.50 & 0.30 \\ 0.20 & 0.50 & 0.30 \\ 0.20 & 0.50 & 0.30 \end{bmatrix}$$

The elements along the main diagonal of the PI matrix are all equal to 1 while, those outside are equal to 0. Hence, it is suggested that there were no movements between generations. A society described through this transition matrix is a completely immobile society where the social position of the father totally influences and

characterizes the social position of the children. If the matrix is interpreted, 1 stand for the likelihood of the child to get to the same position as the parent.

On the other hand, there is the PM matrix where there is perfect independence between the origin and the destination classes. All the rows are identical showing a society which is characterized by perfect mobility meaning perfect equality of opportunities regardless the origin state. Every child has the same probability of getting to a higher social position.

2.4 Mobility measures: index of mobility

As stated in the above paragraph, the transition matrix is useful to analyze the movements individuals make between classes of education or employment. Through transition matrices it is also possible to develop and compute composite mobility measures known as mobility indices that are easy to be interpreted. As Shorrocks affirmed, many of the proposed indices are directed at these matrices and they completely determine the dynamic structure if the process governing transitions follows a Markov chain.

2.4.1 Properties of mobility measures

1. *Normalization* (N): $0 \leq M(P) \leq 1$ for all $P \in$ P
2. *Monotonicity* (M): $P>P'$ implies that $M(P) > M(P')$
3. *Immobility* (I): $M(I)=0$
4. *Perfect Mobility* (PM): $M(P)=1$ if $P=ux'$ where $u= (1,1\ldots\ldots1)'$ and $x'u=1$

A mobility index is defined as a continuous real function M(•) over a set of transition matrices defined as P (Shorrocks, 1978).

Property n.1 implies that the range of the index can be restricted to the interval which goes from 0 to 1 implying that zero mobility corresponds to the value of the index equal to 0 and perfect mobility equal to one.

The index must reflect the change to a higher level of mobility or to a lower level of mobility according to the elements inside the transition matrix. The probability of movement of the elements inside the matrix is given by the off-diagonal observations. If those components increase at the expense of the components on the diagonal, the structure may indicate a higher mobility level. Thus, property n.2 must be respected. This condition shows that any transition matrix will be ranked higher than an identity matrix which takes place when no movement between status happens at all. Hence, the identity matrix is associated with the lowest value of the index which indicate a state of immobility as expressed in property n.3.

On the other hand, it can be assigned also a maximum value of the index linked to a matrix which shows maximum mobility. This matrix is known as connection matrix where all rows are identical meaning that the probabilities of getting to a higher state are independent from the original state. The maximum value the index can assume is defined as Perfect Mobility represented by property n.4.

The above properties can not be considered universally accepted apart from the Immobility one which associate zero as the minimum value represented by the index with immobility.

Shorrocks (1978) and Sommers and Conlisk (1979) indices represent composite indices which allow to identify the level of mobility according to different criteria. Those two indices are used in the present study as mobility measures.

2.4.2 Shorrocks Mobility Index

Shorrocks introduces two mobility indices, the Trace index, and the Determinant measure. The Trace index is defined as it follows:

$$I_T = \frac{k - trace(P)}{k - 1}$$

Basically, the Trace index I_T is based on the sum of the elements of the diagonal, also known as trace(P) while K indicates the number of states that the component can achieve. I_T can be defined as a concentration measure around the matrix diagonal (Ciommi et al., 2018).

On the other hand, the Determinant measure is defined as

$$I_D = 1 - \frac{det(P)}{k - 1}$$

Shorrocks index varies in the range $\left[\frac{0,k}{k-1}\right]$where if it equals zero it is called perfect immobility. While increasing the values in the matrix, it also increases the movements of individuals from the origin state to the destination state therefore arising the level of mobility. The I_T considers only the main diagonal of the matrix completely ignoring the distances individuals travel to transit from one state to another.

2.4.3 Sommers and Conlisk Index

Sommers and Conlisk mobility index is similar to Shorrocks one. The index proposed is a function of the eigenvalues of the transition matrix *P*. It is mathematically expressed as:

$$I_{SC} = 1 - |\lambda|$$

where **λ** represent the second largest eigenvalues while the first eigenvalue is always set as 1 by virtue of the transition matrix properties.

CHAPTER 3

DATA ANALYSIS: SURVEY ON HOUSEHOLD INCOME AND WEALTH

3.1 Data source

The data source used in the analysis is the data repository from Bank of Italy on Survey on Household Income and Wealth (SHIW), a national representative household survey which collects data from a random sample of 8,000 Italian families per year where surveys are one for each family. Data is collected annually from 1977 and every two years from 1987.

According to Brandolini (1999), the SHIW is considered the best representation of income distribution in the Country.

The data collected through this survey constitute a very important information base, as it allows to carry out important analyses on the social and economic condition of Italian families in the last fifty years.

The survey collects information on the characteristics of households and their components, the characteristics of the properties owned, income, employment

status, consumption and savings, household wealth and education qualification of all the family members.

Moreover, in the recent waves of the survey from 1996 to 2016, heads of the household have been asked the education qualification, year of birth and the employment status of their parents when they were at the same age of the interviewees. According to the survey questionnaire the person of reference of the household is defined as the person in charge of the economic decisions of the whole family.

The analysis focuses only on three main datasets of the whole data repository. Specifically, the datasets from the SHIW called “COMPONENTI”, “FAMILIARI” and “PESO”, defined as “COMP”, “FAMI” and “PESO”. For each of the three datasets only few variables are analyzed in this work.

The variables analyzed from the dataset COMP are the following: *NQUEST, SESSO, CFDIC, STUDIO, ANNO, ANASC, AREA5, PAR, NINTPRE, NORD, ETÀ*. On the other hand, from the dataset FAMI only the variables *NQUEST, stupcf, stumcf* have been analyzed. Last but not list from the dataset PESO only *NQUEST*, *ANNO* and *PESOPOP* are selected.

3.2 Variable's definition

3.2.1 The COMP dataset

The dataset "COMP" mainly focuses on the characteristics of the members of the family. It shows a general picture of the families highlighting mainly sex, age, geographical position, employment status, educational attainment, type of job and the relationship network inside the family.

The variables presented in the previous paragraph are explained as it follows:

LABEL	DESCRIPTION
NQUEST	It is the key variables. Survey number-family ID.
SESSO	Gender. 1= Male, 2= Female
CFDIC	Declared reference person of the household. 1= reference person of the household, 0= other family member
STUDIO	Educational qualification. 1= none, 2 = primary school, 3=lower secondary school 4=upper secondary school, 5 = degree, 6 = postgraduate qualification.
ANNO	Year in which the interview takes place.
ANASC	Interviewee's year of birth.

AREA5	Division of the Italian territory in five geographical areas. 1= North-West, 2 = North-East, 3 = Center, 4 = South, 5 = Islands.
PAR	Status in household. 1= reference person of the household, 2= spouse/partner, 3 =child, 4 = other.
NINTPRE	Number of interviews already had in previous years.
ETA	Age of the interviewee.
NORD	Serial number of the family members within the household - component identifier. 1= Reference person of the household.

3.2.2 The FAMI dataset

The dataset "FAMI" highlights the characteristics of the family from an economic point of view. Mainly it focuses on the number of credit cards, the existence of bank deposits, debts and shares owned, type of family, the monthly average expense, and the educational qualification of the person of reference of the household's parents. The variables analyzed are the following:

LABEL	DESCRIPTION
NQUEST	It is the key variables. Survey number-family ID.
STUPCF	Educational qualification of the person of reference of the household's fathers when they had their age. (NORD =1). 1= none, 2= primary school, 3=lower secondary school, 4=upper secondary school, 5 = degree, 6 = postgraduate qualification, 7=no answer.
STUMCF	Educational qualification of the person of reference of the household's mothers when they had their age. (NORD =1). 1= none, 2= primary school, 3=lower secondary school, 4=upper secondary school, 5 = degree, 6 = postgraduate qualification, 7= no answer.

3.2.3 The PESO dataset

In the dataset "PESO" the sampling plan foresees non-constant probed fractions. The use of weighting coefficients is necessary to obtain undistorted estimates. The coefficients shall also consider the response process and limit its possible distortive effects on estimates.

Through years, the survey's sampling procedures have undergone several modifications which make the weighting coefficients in the annual surveys not fully homogeneous. Since 1987 the sampling strategy has been broadly stabilized. To limit the variability due to the different treatments of weights over the years, new rebalancing coefficients have been calculated using ranking techniques. Unlike the weights available in the individual annual surveys, the coefficients contained in this archive have been obtained using the most recent socio-demographic information released by ISTAT.

The variables analyzed are three:

LABEL	DESCRIPTION
NQUEST	It is the key variables. Survey number-family ID
ANNO	Year in which the interview takes place
PESOPOP	It is obtained by multiplying the variable PESO by a constant different for each year of survey. It allows the estimation of totals related to the universe of the Italian population or resident population.

3.3 Data selection

To get to the final number of observations many filters have been implemented to sort out data. Firstly, all the surveys analyzed have been made to people of reference of the household. To get this information the filters "PAR=1", "CFDIC=1" and "NORD=1" have been selected to be sure about the role of the interviewee in the family.

A second filter imposed is about the variable called "ANNO" which must be ANNO ≥1995 since the analysis is focused on eleven waves which cover the years 1995-2016. The study considers the surveys answered only in that period. The analysis is limited to those years because only for waves from 1993 to 2016 all people of reference of the household have been asked to specify the educational level of their own parents when these had the same age as the interviewees. This detail is particularly important to study the intergenerational mobility and see the change in status from parents to children.

The people of reference of the household considered are both men and women, they are born between 1947 and 1986, thus ANASC≥1947 and ANASC≤1986, and aged between 30 and 65 years old with ETA≥30 and ETA≤65.

This age period has been selected to make a valuable comparison among people belonging to different generations. In fact, at 30 years old, in most cases, the educational path is over, even for the youngest generations, and people have entered the labor market (ISTAT, 2020).

Observations from head of the family who did not give information about their parent's educational level were deleted through "stupcf≠7" and "stumcf≠7", as well as that information repeated due to several interview by the same NQUEST through the years, as a result of the longitudinal component also defined as panel established in SHIW since 1998 to avoid counting more than once the same heads of household. The longitudinal component has been filtered through the variable "NINTPRE=0". Hence, the three former datasets have been merged through and a final dataset of 19,874 observations with 14 variables has been created.

The aim of the analysis is to interpret the temporal development of educational mobility hence, after having sorted out data, four cohorts according to the year of birth of the person of reference of the household have been created through the new variable called "COORTE". The length of each cohort is of 10 years: 1947-1956, 1957-1966, 1967-1976, 1977-1986.

The choice is derived from the idea that the four periods are characterized by a different level of social openness and by the evolution of inequality of wealth over time (D'Alessio, 2012).

The final target social position is identified by the educational level obtained by the person of reference of the household, while the social position of origin is identified by the highest educational level between that of the father and that of the mother of the interviewee (Fiorio and Leonardi, 2010). In order to find the highest educational level between the two parents a new variable has been created.

The variable is defined as "STUGEN[6]" where the maximum value of the education qualification between the father and the mother is taken to be analyzed as a reference in the study.

The variable which stands for educational level can be explained in different categories if related to the parents or to the children known as person of reference of the household, since many different educational reforms of the school system have occurred in Italy through the years. With the purpose of avoiding a possible distortion in data due to different categories of the same variable, a new variable called "STUDIO_NEW" which comprehend four classes that have been defined as it follows: None (NT), Mandatory school (SO= primary school certificate and lower secondary school certificate), High school diploma (SS=upper secondary school diploma), University degree (TU=university degree and postgraduate qualification).

The classification into classes for both parents and children were obtained from the information contained in the questionnaire of the SHIW[7].

In particular, the application referring to the education qualification of the person of reference of the household shows six possible modalities: none (1), primary

[6] STUGEN= Studio Genitori

[7]Survey on Italian household income and wealth: https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/bilanci-famiglie/documentazione/documenti/2016/Quest_eng2016.pdf?language_id=1

school (2), lower secondary school (3), high school (4), degree (5), postgraduate specialization (6). The question related to the parent's degree contains seven modalities: none (1), primary school (2), lower secondary school (3), high school (4), degree (5), postgraduate specialization (6), no answer (7). To obtain the three classes the various modes have been merged as follows: for heads of the household, the class NT=1, SO=2+3, SS=4 and TU=5+6.

According to this agglomeration, another variable called "STUDIOGEN_NEW" has been created to obtain classes also for heads of the household parents where again the class is NT=1, SO=2+3, SS=4 and TU=5+6.

Basically, in the end the final dataset has 19874 observations with 18 variables where 14 were originated in the initial single datasets while the last four, "STUDIOGEN", "STUDIO_NEW", "STUDIOGEN_NEW" and, "COORTE" have been created to help the data elaboration.

3.5 Expected results

According to data the aim of the study is to find three main results.

The first step is to analyze the percentage distribution of three socio-demographic variables belonging to the person of reference of the household for each cohort. The variables are gender, educational qualification, and the geographical area. The aim is to see how the trend of intergenerational mobility has changed through years according to different areas and gender.

The second objective is about analyzing the descriptive statistic of the four transition matrices for each cohort. The aim is to see the mobility of children according to the original status of parents. It helps to position the Country in a context of perfect mobility or immobility.

Finally, Shorrocks and Sommers and Conlisk indices will be analyzed to further interpret the phenomenon of intergenerational mobility.

To conclude, the analysis is limited to consider the vertical dimension of intergenerational mobility in view of absence of information about where individuals were born, where they studied or what school they have attended, nor information about the income of the parents during school. Nevertheless, even without having the information on the type of diploma or the type of degree attended, it is believed that there is an informative value in the analysis of educational levels in intergenerational mobility that somehow leads back to the aspects just mentioned.

CHAPTER 4

INTERGENERATIONAL MOBILITY IN ITALY: MAIN RESULTS

4.1 Descriptive statistics of the Sample

The descriptive statistics of the sample are analyzed in this section. The aim of the analysis is to interpret the temporal development of educational mobility hence, after having filtered data as occurred in chapter three, to simplify the analysis, four cohorts according to the year of birth of the person of reference of the household have been created. The length of each cohort is of 10 years: Cohort I =1947-1956, Cohort II=1957-1966, Cohort III=1967-1976 and, Cohort IV=1977-1986.

The choice is derived from the idea that the four periods are characterized by a different level of social openness and by the evolution of inequality of wealth over time as previously stated by D'Alessio (2002).

Table 1 shows the percentage distribution of three sociodemographic variables used to describe the characteristics of the person of reference of the household in the surveys. To understand the trend of these sociodemographic variables through time, they have been analyzed for each cohort of birth. The variables are gender, educational qualification, and the geographical area of reference.

Table 1: Descriptive statistics of the sample

	TOTAL	1947-1956	1957-1966	1967-1976	1977-1986
Male	63.35	68.56	66.15	57.23	52.5
Female	36.65	31.44	33.85	42.77	47.5
None	0.58	1.13	0.43	0.27	0.24
Primary school	8.98	19.71	5.96	3.35	2.01
Lower secondary school	44.24	42.25	46.93	44.12	40.03
Upper secondary school	31.84	26.01	34.11	35.19	31.75
Degree	13.24	10.44	11.68	15.39	23.27
Postgraduate specialization	1.12	0.47	0.89	1.68	2.7
North-West	29.55	29.8	29.63	28.57	31.7
North-East	21.52	20.63	20.43	24.51	19.34
Center	20.53	20.5	20.31	21.11	19.68
South	20.6	20.63	21.42	18.83	22.97
Islands	7.79	8.44	8.21	6.97	6.31
TOTAL	**19,874**	**7,258**	**7,588**	**4,165**	**863**

Source: data elaboration by the author from SHIW 2015-1996

All observations are weighted

4.1.1 The gender variable

With respect to the gender variable, the study shows that 63.35% of the total head of the household analyzed in the sample is male while 36.65% is female. In the first two cohorts, female heads of household are a smaller share than the counterparty male heads of the household, but the gap tends to narrow in the last two cohorts. This result suggests that a growing proportion of women are in a condition to self-identifying as responsible for economic decisions of the family.

Such evidence highlights and confirms that, since the beginning of the eighties of the last century, the participation of women on the labor market has had a constant growth (Carta, 2019). In addition, not only the higher participation in the labor market can be considered an explanation of the obtained results, but there are also deep changes in the concept of the family institution underwent in the second half of the twentieth century (Saraceno, 2003).

4.1.1.1 Women rights and the labor market

The Second World War is a destabilizing factor, men are forced to leave their families and women replace them in the labor market. In the post-war period, there is a glimpse of the possibility of effective emancipation of women in public life, as evidenced the debate on women's capacity for self-determination and full legal capacity, which abolishes marital authorization once and for all and establishes that women are admitted to all occupations and professions on an equal footing with men (Vellati, 2017).

After the mid-50s, social customs changed rapidly, increasingly marked by the escape from the countryside and rural realities to cities which guarantee jobs, well-being, and consumption.

Craninz (1966) affirms that the year of the economic miracle, the 1958, also defined some progress in relation to the status of women with the Merlin Law[8] abolishing prostitution (20th February 1958 n. 759) and the law regulating domestic work[9] (2nd April 1958 n. 339). Since the 1960s a historic process of growth has begun throughout Europe. Women's participation in the labor market increases without being interrupted since then.

[8] Legge Merlin
https://www.altalex.com/documents/leggi/2013/10/24/legge-merlin

[9] Legge sulla regolazione del lavoro domestico
https://www.cliclavoro.gov.it/normative/legge_2_aprile_1958_n.339.pdf.

This is partly true because women are mainly employed in the tertiary sector which have been least affected by the economic crisis. The growth of the labor force between the 1960s and the 1980s (+2. 4 million) was due to the positive contribution of women who, in 1981, accounted for 34% of the labor force compared to 25% in 1961 (Righi, 2003).

Since 1971, there have been several proposals for reform of family law, which revolves around the concept of equality between husband and wife, with a view to a clear historical transition at the end of a long legislative process. The family was reformed by Law No. 151 of 19th May 1975[10]. It is a family that is completely equal, both in terms of rights and duties, in terms of freedom dictated by the non-existence of a head of family. It introduces the communion of goods, attributing to the woman the recognition of her contribution to the possession, maintenance, and growth of the family goods. In the new family, therefore, women find their place, manifesting their subjectivity through work, which, however, needed a new legislative action in 1977 with Law No. 903[11] on equal treatment of men and women at work.

[10] https://www.gazzettaufficiale.it/eli/id/1975/05/23/075U0151/sg

[11] https://www.gazzettaufficiale.it/eli/id/1977/12/17/077U0903/sg

4.1.2 The educational qualification variable

For what concerns the educational qualification, Table 1 shows that on the total number of the person of reference of the household, a very low share doesn't have an educational qualification where none = 0.58% while the highest value is for lower secondary school qualification = 42.25% followed by upper secondary school = 31.84% meaning that the average educational attainment is the secondary school.

Analyzing the four cohorts it is observable that the trend related to none is rapidly shrinking over the years, indeed the percentage of person of reference of the household without an educational qualification decreases, over 40% had the lower secondary qualification and, on average, only 10% the degree.

The proportion of those who obtained the lower secondary education title, then compulsory since the 1962[12] reform, has been increasing up to the cohort of born in between 1957-1966, and then started its decreasing phase.

In fact, the minimum education attainment seemed to be moving towards higher education qualifications being school mandatory up to the age of 14 years old.

Since everyone was obliged to achieve a lower secondary school certificate, the focus changed in favor of a higher educational attainment to position differently in the labor market.

[12] End of the Gentile Reform and the beginning of the education of the masses which made school compulsory up to the age of 14 years old.

Meanwhile, the younger cohorts show a further move towards university degrees or post-graduates indeed although the results show low percentages with respect to lower educational titles, the highest share of educational attainments are reflected in the third and fourth cohorts.

According to the reform of the school system, the liberalization of the university access in 1969 made the 80s have a sharp increase in the number of students enrolling and graduating at university leading to a growing demand from companies for people with higher educational qualifications than the diploma. That is explained why the percentage of head of the household having a diploma decreases for the younger cohorts meanwhile that of the degree increases.

4.1.3 The geographical area variable

With respect to the distribution for geographical area, no peculiar differences emerge except for the Islands which have the smallest share of heads of the family. On average most of the people of reference of the household come from the Northern areas. The percentages remain almost constant over time.

It is reasonable to expect that future data will show a decreasing trend of the lower or upper secondary school diploma qualification in favor of higher education and more frequently graduation degrees.

4.2 Years of education and reduction in inequalities: How do they work?

What is important to highlight is to understand the real effectiveness of the increase in years of education on intergenerational inequalities.

It is interesting to understand if the increase in the number of years of education has been followed by a reduction in inequalities in terms of education. Fiorio and Leonardi (2010) show that unfortunately there is still a significant difference between children of uneducated parents and children of educated parents even among the younger cohorts.

Equity brought to an increase of opportunities, but this increase underlies still big differences.

There is still a disadvantage for low-middle income children in the probability of obtaining a university degree compared to high income children.

Two possible explanations could be the presence of liquidity constraints and risk aversion.

Families with low educational attainment have higher risk aversion and lower probability of enrolling children at university.

Sciclone (2002) has shown some possible policy indications linked to these two explanatory factors.

Scholarships in Italy are very ineffective, and therefore a first policy could aim to facilitate access to credit for families with school-age children.

Another set of policies should provide insurance against the risk of bankruptcy while studying at university.

Other policies have to do with the institutional designation of the education system. The introduction of the three-year of study formula should reduce dropouts and thus benefit the children of disadvantaged families.

In addition, the Italian system is organized according to different fields of study that children at 14 years old are called to choose often still under parental influence rather than by true individual choice. These decisions are very binding for future university choices.

To help explain why even the youngest cohorts born in mid-70s maintain a gap getting a degree depending on the family background to which they belong is not at all obvious in a country like Italy where university education has characteristics which should theoretically make and easier access for all social classes (Bratti, Checchi and De Blasio, 2008).

Inequality in educational attainment has decreased both within homogeneous groups and between groups, although, analyses show that it is still far from complete convergence in the levels of education. This result suggests the presence of a significant relationship and persistence between the educational qualifications of parents and that of children.

4.3 The role of women in social mobility

Before moving on with the analysis it is important to highlight and remember that in this work the basic unit of stratification is the family whose position is determined only from the person of reference of the household.

The individual definition of the social position of destination in the matrix has a negative aspect. It doesn't consider the role of the marital family and thus of all the resources, material, and symbolic elements of which the family unit itself can dispose of.

According to De Lillo (1996) this limit can make an incomplete representation of the social mobility process. Nevertheless, according to Pisati (2009) the individual approach can grasp with sufficient accuracy the essential aspects of the phenomenon.

Furthermore, an innovative aspect to be considered is the inclusion of women as person of reference of the household. Many of the analyses carried out on social mobility are based on data representing only male people of reference of the household.

This concept was however strongly criticized (Giddens, 2001) because it does not keep account of the role played by woman in the family. The growing participation of women on the labor market and the changes which the family institution has suffered in the past decades have ensured that the gender issue became relevant also in the studies on social mobility (Meraviglia, 2013).

Very frequent are the cases where women are the people who make economic decisions in the family.

Economic theory has long shown that there are two possible and opposite effects of recessions on the labor supply of the so-called secondary components of the labor force, such as young people and women.

The first is the added worker effect. When, during a recession, the breadwinner head loses his job, or sees his salary cut, the wife, if housewife, could start looking for work to cope with the worsening economic conditions of the family. This thesis highlights the potential role of female labor force participation as insurance against poverty, especially in time of economic downturn (Ghignoni and Verashchagina, 2013).

Another key point is that many unskilled jobs have been lost during the crisis, but this has occurred more frequently in sectors where men are the most employed, namely construction and industry. On the contrary, low-skilled women working in personal services have managed to keep their jobs. So, it is true that women are working more, and less skilled women are finding a job more easily than their corresponding less skilled men or husbands (Stoppini, 2015).

Since as discussed by Eurofound (2017) and ILO (2018), women on average show mobility rates higher than men, their inclusion in the analyses can lead to an overall increase in education mobility.

4.4 Transition matrices for cohort of birth

Transition matrices provide a general view of the movements that individuals make between classes of education.

Table 2 shows the transition matrices for each cohort of birth one below the other with their respective marginal distributions. The parents' distribution is represented in the last column while the children distribution, also referred to as person of reference of the household, is represented in the last row of each matrix.

These are double-entry square matrices, in which the origin social classes are placed on the rows, while the target classes are located on the columns. In each cell are found the frequencies of individuals, belonging to a specific class of origin, present in a certain class of destination.

To understand the phenomenon of intergenerational mobility between parents and children, it is important to compare the 4 different matrices, more specifically, each row of the matrices.

Table 2: Transition matrices for cohort of birth

Cohort I	**NT**	**SO**	**SS**	**TU**	**Obs**
NT	0.05	0.82	0.11	0.02	1,266
SO	0	0.63	0.29	0.08	5,153
SS	0	0.16	0.45	0.39	625
TU	0	0.04	0.3	0.65	214
Obs	**86**	**4,385**	**1,959**	**828**	**7,258**
Cohort II	**NT**	**SO**	**SS**	**TU**	**Obs**
NT	0.04	0.79	0.15	0.02	797
SO	0	0.57	0.34	0.08	5,554
SS	0	0.14	0.56	0.31	895
TU	0	0.04	0.35	0.61	342
Obs	**46**	**3,942**	**2,642**	**958**	**7,588**
Cohort III	**NT**	**SO**	**SS**	**TU**	**Obs**
NT	0.03	0.77	0.17	0.03	265
SO	0	0.57	0.34	0.09	2,905
SS	0	0.14	0.51	0.35	765
TU	0	0.07	0.27	0.66	230
Obs	**13**	**1,976**	**1,495**	**681**	**4,165**
Cohort IV	**NT**	**SO**	**SS**	**TU**	**Obs**
NT	0.06	0.84	0.08	0.02	49
SO	0	0.53	0.37	0.1	545
SS	0	0.13	0.42	0.45	182
TU	0	0.09	0.23	0.68	87
Obs	**4**	**363**	**302**	**194**	**863**

Source: data elaboration by the author from SHIW 1995-2016

It is observable that for all the four cohorts, the increase in years of education has not been followed by a decrease in educational inequalities. That is why the results obtained are far from the situation of perfect equality of opportunity described in chapter 2 through the perfect mobility matrix (PM). Consequently, inequalities between children from families with different levels of education are still evident. Also, in the case of the younger cohort which should have benefit the most from the educational reform in the school system and from the reforms in terms of family value and welfare. A child of parents who obtained a university degree has 68% of probability to graduate, a child from a family where both parents have a diploma has a maximum probability of 45% to get a degree while if parents have a primary or lower secondary school diploma, the probability for the children to get a degree steadily decrease to 10% up to 2% probability if parents have no educational attainment at all.

Analyzing in detail the values of the transition matrices and comparing the marginal distributions of the four cohorts in the case of the first two classes of educational qualification, namely NT and SO, for each cohort of birth, the number of observations of children is always lower than the number of observations of parents (86 vs 1,266 and 4,385 vs 5,153 for the first cohort and 4 vs 49 and 363 vs 545 for the last cohort).

On the other hand, in the case of the SS and TU classes, it is possible to witness the opposite phenomenon (1,959 vs 625 and 828 vs 214 for the first cohort and, 302 vs

182 and 194 vs 87 for the fourth cohort). Hence, children have progressively moved forward towards upper destination classes.

This result is also confirmed by the time dynamics of the main diagonals of each transition matrix. The main diagonals measure the level of persistence of the children in the class of origin.

Actually, NT trend remains stable on average through time with 5% probability for children not to get an educational qualification if their parents do not have one. Meanwhile, the SO trends are progressively decreasing (SO: 63% in the first cohort vs. 53% in the fourth cohort).

These results can be observed as a valid proof of the increase in schooling in the long term (Fiorio and Leonardi, 2010) occurred thanks to the 1962 reform which introduced compulsory schooling up to 14 years old and the education of the masses started.

Conversely, the probability of obtaining an upper secondary school diploma for children whose parents have the same degree of education (SS) has had a fluctuating trend. Indeed, from the first to the second cohort the probability tends to increase going from a 45% to 56%, while from the second cohort to the last there is a reduction reaching 42%.

This reduction partly benefits the probability of getting a university degree which through the years increases from 65% up to 68% with a downward peak in the

second cohort of 61%, but in some cases, it also favors the probability of the lower classes.

For children from high educated families the probability of obtaining the same educational title of their parents, as fort the TU, is gradually increasing as stated before from 66% of the first cohort to 68% of the last one.

Undoubtedly, in Italy, school system reforms have increased access to all levels of education, but socioeconomic differences and their effects have not changed accordingly leading to a mismatch of opportunities which have been benefited from all classes without distinction but mainly from the upper classes (Pisati, 2000).

It follows that the liberalization of university access in 1969, as pointed out by Blanden and Machin (2004), seems to have favored the children of the most educated families only.

In 1969 the access to university was completely liberalized and any student with a diploma could enroll in any faculty. This triggered a chain process, which was disastrous both quantitatively and qualitatively speaking. Universities, with the structures and resources at their disposal, were totally unable to accommodate such a mass of students. The quality of the lectures had to be reduced considerably, many students didn't know ancient languages such as Latin or Greek since they came from schools where ancient languages were not taught. Most of the new students went to the humanities faculties, which were considered easier with the result of obtaining degrees that were not suitable for the labor market of the time.

This led to a sharp rise in intellectual unemployment, a growing unease and frustration among young people and their families (Ghignoni, 2015).

Hence, this apparent equality of educational opportunities, although considered likely, it was a failure since the number of people from disadvantaged social classes enrolled in university was very low, it is therefore reasonable to assume that those who enrolled were particularly motivated and talented individuals.

After the Second World War, university enrolment rates rose rapidly among the higher social classes and much less among the lower social classes. The increase in enrolment has brought into the university students that on average were less capable and motivated and, therefore, more at risk of dropping out. The drop-out rate has increased over the years, but while the incidence of drop-out among students from higher social classes has remained almost constant, the risk of drop-out among university students from disadvantaged families has increased rapidly (Bedeschi, 2017).

A further step of the analysis consists in the study of the dynamics of the transition probabilities above and below the main diagonal of the transition matrix. This analysis is useful to give an indication of the type of mobility faced by children. The mobility can be upward or downward.

Analyzing the triangle above the main diagonal overtime, thus considering upward displacements, it is possible to witness an increase in the opportunities to move to a higher education class than the original one.

However, children of parents with an upper school diploma represent an exception. Actually, the probability of obtaining a university degree for children whose parents have a diploma decreases of 8 percentage points from the first to the third cohort (39% for the first and 31% for the third) and then increases steadily again for those individuals born between 1977 and 1986 (45%). The probability of children to get the same educational level of their parents (SS) decreases in favor of the increase in the probability of getting a degree.

Otherwise, shifting the focus on the triangle below the main diagonal, thus analyzing downward shifts, there is a tendency to reduce the probability of positioning in a lower class with respect to the previous generation.

Here also the children of parents having an upper secondary school diploma follow the trend, in the last cohort the probability for children to get the same educational level of their parents (SS) decrease with respect to the third cohort but in favor of an higher educational attainment and at the same time there is a reduction in the probability for children to get to a lower class compared to their parents position.

4.5 Mobility indices analysis

Mobility matrices are relevant not only for the study of the movements between classes of education, but they also allow the development and the calculation of synthetic mobility measures known as mobility indices used to quantify the level of mobility expressed through the transition matrix.

In this section three mobility indices are analyzed. Table 3 shows the estimation of the three synthetic mobility indices presented in chapter 2 and computed for the four cohorts. The mobility indices are the Trace index and the Determinant Index estimated by Shorrocks and the Sommers and Conlisk Index.

The Trace index I_T is based on the sum of the elements of the diagonal and, K indicates the number of states that the component can achieve. In this case the states are four: NT, SO, SS, TU. Then, the Sommers and Conlisk index I_{SC} is defined through eigenvalues where λ represent the second largest eigenvalues while the first eigenvalues is always set as 1 by virtue of the transition matrix properties. Namely, the Indices are mathematically defined as it follows:

$$I_T = \frac{k - trace(P)}{k - 1}$$

$$I_D = 1 - \frac{det(P)}{k - 1}$$

$$I_{SC} = 1 - |\lambda|$$

Table 3: Mobility indices

Index/Cohort	1947-1956	1957-1966	1967-1976	1977-1986
I_T	0.74	0.74	0.7433	0.77
I_D	0.9985	0.9985	0.9988	0.9984
I_{SC}	0.4157	0.4699	0.4824	0.5393

Source: data elaboration by the author on SHIW 1995-2016

From Table 3 it is possible to observe that the three indices follow the same increasing trend. Both the Trace and the Determinant index remain stable and identical for the first two cohorts. The Trace index gradually increases through time and the same does the Sommers and Conlisk index highlighting and proofing the same evidence.

The decrease of the Determinant Index in the fourth cohort could be due to the low number of observations at disposal for the years 1976-1987. It could be that for the computation of this specific index, there is the need of a bigger number of observations to truly represent the trend of mobility.

It is important to keep in mind that the Shorrocks Index completely ignores the distances traveled by individuals among states, it only focuses on the level of mobility. The I_S remain constant and varies very little through the different cohorts above all for the first three cohorts, suggesting a stable mobility through time, while between the third and fourth cohorts the I_S increases again due to a lower persistence

that has been observed in Table 2 above all in SS class in favor of the TU class. The same evidence is observable in the I_{SC} index.

Only observing the Shorrocks indices, there would be a partial view of the phenomenon.

A stable or even worse decreasing mobility can indicate not only that the society is immobile but also that the movements between classes are always of lesser magnitude meaning that children will increase and diversify their position of destination towards adjacent positions rather than higher positions.

Of course, this result can be read in a positive key when it comes to downward mobility or when children already find themselves in the maximum position of origin, but also, and above all, negative when it comes to upward mobility.

The above results can be proved with evidence.

First, as mentioned in the previous paragraph 4.1.1.1, the progressive increase in the number of women self-identifying as person of reference of the household, the higher educational qualification attained and the higher mobility rates possible to obtain, can explain, at least in part, the increase in both the probability of moving towards TU and the persistence in TU class for the two most recent cohorts (68% and 45%).

Parents' experience and liquidity constraints also play an important role in the choices made by families for their children during their adolescence.

Poorer and less educated families could decide not to send their children to university because they believe that their children do not have the characteristics necessary for that type of education or because they fail to have sufficient liquidity to support both taxes and other expenses related to enrollment in the university (Fiorio and Leonardi, 2010).

An additional explanation for the low probabilities of children of less educated families obtaining a university degree is given by the low aversion to risk shown by the families, then handed down to their children (Belzil and Leonardi, 2007).

In fact, less educated families consider enrollment in university a risky investment since children could leave before the end of their studies nullifying the risk and the money investment.

The factors who negatively influence the choice of getting a degree are manyfold. It is showed that obtaining a degree does not assure a high income and the entrance in the labor market at the end of the studies, or, even worse, the probabilities of getting a job are equal or, not so higher than the probabilities for those individuals who got a diploma.

According to the OECD report, in 2016 80% of 25–64-year-old with tertiary education are employed, but the employment rate drops to 64% for the younger age group (25–34-year-old), the lowest level in industrialized countries, where the average is 83%. In Italy, job opportunities for graduates are lower than those for individuals with a diploma. On the territorial side, there are still too many gaps

between the North, the Centre, and the South of Italy in terms of employment levels, graduates and young people who do not study or work.

Moreover, graduates earn on average only 40% more than high school students compared to 60% of the OECD average.

Thus, insufficient job expectations and low financial returns following graduation are two of the main causes of low rates of graduates in Italy. Moreover, qualifications in Italy are concentrated on fields that the labor market fails to exploit such as Literature, Political Science, Sociology, Communication Sciences, Art (OECD, 2017).

Technological change too represents a threat. The speed of technological changes could make obsolete the degree obtained and the job position unnecessary. It would therefore be useful to know whether, among the many degree courses offered by the university system, there exist some in which would be particularly beneficial to invest in, perhaps by granting facilities to students from disadvantaged backgrounds who intend to study in those fields.

A further and most alarming factor is the low demand of skilled labor and consequently tertiary education. The phenomenon is called overeducation. Mandrone et al. (2015) affirm that the low share of graduates that the Italian system produces is already more than enough to meet the low demand for skilled work that the economic system requires.

In other words, the economic system need of graduates is so modest that it is not possible to absorb the offer, thus the low number of graduates compared to other countries all over the world.

This is a very controversial aspect, from one side Italy is seen as a country with one of the lowest rates of graduates but on the other hand, the rate, although being low, is much higher than the need of the country. Individuals are required to get a degree but then there is no job opportunity for high skilled labor, or at least not in all sectors.

Young Italian graduates find it difficult to find a job and pay is low on average. The reason is that Italian companies are too small and do not hire high skill graduates. Medium-sized and large companies need young people coming from universities but differently from small companies, medium and large companies or MNEs are very rare in Italy. In addition, the cuts in public spending have reduced recruitment opportunities in the public service (Abravanei, 2018).

It is also possible to highlight a gender gap among European graduates. The percentage of women with a degree is 46%, while that of men remains at 35%. Moreover, the gender gap has widened over time, from 9.4% in 2011 to 10.8% in 2020. This has revealed a much slower rate of growth in the male graduate population.

Despite this, women in Italy do not exploit the full advantage of having a degree, and thus presumably reach higher paid jobs. Data reported by the Job Pricing

Observatory (2020) show that there is a higher wage gap between men and women with university degrees than non-graduates. The gender pay gap thus increases with the level of education, with a pay gap between graduate men and graduate women of 32. 8%, and even of 47. 3% after a master's degree.

All this translates into a reduction in upward mobility since parents with a low or medium level of education might not consider the investment in tertiary education as a valuable tool for obtaining a skilled and more remunerative job for their children.

Decades of poorly innovation-oriented business strategies, inadequate public and private R & D studies have resulted in low educational attainments, low productive innovation, and they have nullified part of the public and the private resources invested (ISTAT, 2018).

It is therefore clear that reassessing both the training system and the production system so that even the least educated families find it advantageous to invest in the human capital of their children would be the best choice.

The use of these mobility indices would be very useful for Policy makers to better study and improve the phenomenon of intergenerational education mobility. To do so it is advisable to continue using and analyzing the Sommers and Conlisk Index. The I_{SC} index is easier to compute than Shorrocks index.

In fact, the Shorrocks index gives a partial view of the phenomenon since it doesn't consider the distances of the movements from one educational class to the following or previous one as stated at the top of the paragraph.

Another index which could be useful to adopt to deepen the analysis of intergenerational education mobility is Bartholomew index which although being complicated in terms of computation, it does consider the distances of the movements between classes. It is also possible to compare the entity of the movements through time. This means that the society could show sign of mobility but, at the same time, very short movements imply a difficulty for heads of the household to separate from their class of origin. I.e., if the value of the Bartholomew index is low there is a low chance for children from SO origin class to get to TU class. The computation of this index and the analysis of the results obtained can be seen as a future extension of this work to completely analyze the phenomenon.

CONCLUSIONS

This work provides new evidence on the level of intergenerational education mobility in Italy. The goal pursued is to observe whether there is a direct link between the educational qualifications attained by parents and that of the children in correspondence with educational inequalities which characterize Italy.

The new aspect is the analysis of direct relationship between the educational qualifications of parents and that of their children identified as person of reference of the household.

In fact, often the focus is on education as a means to analyze the job position and employment of both parents and children.

However, Crompton (2006) and Pfeffer (2008) show that focusing on a two-generation approach allows to better understand the mechanisms governing the choices made by parents and children meanwhile it also has important policy implications.

The thesis consists of an introduction followed by four chapters and a conclusion section. In the introduction the subject of intergenerational education mobility and the main objective of the work were introduced. The first chapter dealt with the concept of social mobility explained through theoretical definitions of reference and its determinant. The determinants analyzed are the family context, the school system and the concept of equity and freedom at the base of social mobility. Moreover, the chapter focused on the different approaches used to explain social

mobility, namely the sociological point of view and the economic point of view. Chapter two was about the methodology used to elaborate data and the results obtained, thus the use of transition matrices and mobility indices. The concepts of the Markovian chain underlying the use of transition matrices and the mobility indices were analyzed. Moreover, two mobility indices, the Shorrocks index and the Sommers and Conlisk one, were employed. Chapter three dealt with data elaboration. In this chapter the data repository from which the reference datasets have been extrapolated was described.

The last chapter, chapter four, presented the analysis of the results obtained and expected.

In general, the results obtained from the transition matrices highlights that in Italy still exists a remarkable difference in the destination social status between children coming from high-educated and low-educated families.

The results show, firstly, that there is a strong relationship between the educational qualifications of the parent and that of the child, secondly that transitions from one education class to another are confined to classes close to each other. In the younger cohorts, there is a clear increase of the persistence in the highest educational qualification.

Moreover, within the same birth cohort, there are still differences in the chances of achieving a degree other than that of the parents.

As pointed out by Fiorio and Leonardi (2010) there are still strong differences between children from families with different levels of education.

This last result therefore suggests a worsening of the levels of openness and mobility of the Italian society. For children from low-educated and with liquidity constraints families it is complicated to gain access to higher education qualifications. It emerges the need for truly incisive measures to address economic disparities, providing capable and deserving individuals without economic possibilities with the resources they need to achieve at least an adequate level of education.

There is therefore a need for policies to guarantee access to university for all students by reducing enrolment fees or by calibrating them based on family income. The government should therefore adopt appropriate public policies to make a fairer access to certain social positions also for those individuals who start from disadvantaged situations.

Consequently, despite education is public in Italy and it plays an important role, intergenerational immobility levels in education are still very high nowadays.

Valid instruments to support greater equity in educational opportunities are policies which involve a fairer allocation of funds to schools even in more disadvantaged contexts and a greater focus on extracurricular activities.

Referring to secondary school, the political and academic debate is focusing on changing the way students must choose too early for their future giving special attention to students at risk of dropping out (OECD, 2018).

Future extensions to this work are related to the analysis of the relationship between intergenerational education mobility and the gender of both parents and heads of the household. The correlation between parents and children gender could ease the understanding of the families influences on their children. The influence could vary according to the gender of the child. Male children could be pushed to follow their parents' path or mainly their fathers' paths, while female children could be deprived of education to stay home and take care of their children.

Furthermore, as discussed by Eurofound (2017) and ILO (2018), women on average show mobility rates higher than men, a deeper analysis could set the basis for the elimination of the gender gap equality leading to an overall increase in education mobility.

A second deepening will focus on the relationship between mobility and the territorial dimension. Indeed, most of the opportunities are often determined by the place where the individual was born and raised and, as a result, situations of margination due to the place of birth may occur. This phenomenon is particularly characteristic of large metropolitan areas.

APPENDIX

R code

```
#NOME: R code Simpatici
#DESCRIZIONE: Intergenerational mobility analysis

rm(list=ls(all=TRUE)) #Cancellazione degli oggetti dell'ambiente
cat("\014") #Pulizia Console
```

```
gc()
```

```
##          used (Mb) gc trigger (Mb) max used (Mb)
## Ncells 403543 21.6     833508 44.6   638942 34.2
## Vcells 743057  5.7    8388608 64.0  1804292 13.8

require(dplyr)

## Loading required package: dplyr

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

require(tidyr)

## Loading required package: tidyr

require(readr)

## Loading required package: readr

## Warning: package 'readr' was built under R version 4.0.5

require(openxlsx)

## Loading required package: openxlsx

require(Hmisc)

## Loading required package: Hmisc
```

```
## Warning: package 'Hmisc' was built under R version 4.0.5

## Loading required package: lattice

## Loading required package: survival

## Loading required package: Formula

## Loading required package: ggplot2

##
## Attaching package: 'Hmisc'

## The following objects are masked from 'package:dplyr':
##
##     src, summarize

## The following objects are masked from 'package:base':
##
##     format.pval, units

require(weights)

## Loading required package: weights

## Warning: package 'weights' was built under R version 4.0.5

require(labstatR)

## Loading required package: labstatR

## labstatR 1.0.11

## Insieme di funzioni di supporto al volume

## 'Laboratorio di Statistica con R'

## Iacus-Masarotto, MacGraw-Hill Italia, 2006.

## Si veda 'library(help="labstatR")' per i comandi disponibili.

## Nota: 'mean.a', 'mean.g' e 'hist.pf' sono state sostituite rispettiva
mente da 'meana', 'meang' e 'histpf'

require(dineq)

## Loading required package: dineq

## Warning: package 'dineq' was built under R version 4.0.5

require(mobilityIndexR)
```

```
## Loading required package: mobilityIndexR

## Warning: package 'mobilityIndexR' was built under R version 4.0.5

require(plotrix)

## Loading required package: plotrix

options(dplyr.summarise.inform = FALSE)

#Definizione percorso

setwd("C:/Users/ACER/Desktop/Tesi")
input <- "C:\\Users\\ACER\\Desktop\\Tesi\\Input\\"
output <- "C:\\Users\\ACER\\Desktop\\Tesi\\Output\\"

#Definizione funzione peso

wpct <- function(x, weight=NULL, na.rm=TRUE, ...){
  if(is.null(weight)){
    weight <- rep(1, length(x))
  }
  y <- wtd.table(x, weight, na.rm=na.rm, ...)$sum.of.weights/sum(wtd.tab
le(x, weight, na.rm=na.rm, ...)$sum.of.weights)
  names(y) <- wtd.table(x, weight, na.rm=na.rm, ...)$x
  z <- as.vector(y)
  names(z) <- names(y)
  if(is.logical(x))
    z <- rev(z)
  z
}

#Definizione funzione matrice di transizione

trans.matrix <- function(X, prob=T)
{
  tt <- table( c(X[,-ncol(X)]), c(X[,-1]) )
  if(prob) tt <- tt / rowSums(tt)
  tt
}

#Caricamento dati

#Componenti
dati <- read.csv("Input\\comp.csv",as.is = TRUE)

dati <- dati %>%
  mutate_if(is.character,.funs=trimws) %>%
  mutate(NQUEST = as.character(NQUEST)) %>%
  select(NQUEST,SESSO,CFDIC,STUDIO,ANNO,ANASC,AREA5,PAR,NINTPRE,NORD,ETA
```

```
)


#Familiari
fami <- read.csv("Input\\fami.csv",as.is = TRUE)

fami <- fami %>%
  mutate_if(is.character,.funs=trimws) %>%
  mutate(NQUEST = as.character(NQUEST),
         stupcf = ifelse(is.na(stupcf),-90001,stupcf),
         stumcf = ifelse(is.na(stumcf),-90001,stumcf)) %>%
  select(NQUEST,stupcf,stumcf)

#Peso
peso <- read.csv("Input\\peso.csv",as.is = TRUE)

peso <- peso %>%
  mutate_if(is.character,.funs=trimws) %>%
  mutate(NQUEST = as.character(NQUEST)) %>%
  select(NQUEST,ANNO,PESOPOP)


#Filtri su ETA, ANNO, PAR, NINTPRE, NORD, ANASC e CFDIC
dati <- dati %>%
  filter(ANNO >= 1995 &
         PAR == 1 &
         ANASC >= 1947 &
         ANASC <= 1986 &
         NINTPRE == 0 &
         NORD == 1 &
         ETA >= 30 &
         ETA <= 65 &
         CFDIC == 1)

#Aggancio tra Componenti e Familiari
db <- dati %>%
  inner_join(fami,by="NQUEST")

db <- db %>%
  distinct(.keep_all = TRUE)


#Aggancio file peso
db <- db %>%
  inner_join(peso,by=c("NQUEST","ANNO"))

db <- db %>%
```

```
  distinct(.keep_all = TRUE)


#Filtro su stupcf e stumcf
db <- db %>%
  filter(stupcf != 7 & stumcf != 7)


#Massimo di stupcf e stumcf
db <- db %>%
  group_by(NQUEST,SESSO,CFDIC,STUDIO,ANNO,ANASC,AREA5,PAR,NINTPRE,NORD,E
TA,PESOPOP) %>%
  summarise(MAX_PADRE = max(stupcf),
            MAX_MADRE = max(stumcf)) %>%
  ungroup()

db <- as.data.frame(db)

#Rinomino i titoli di studio di padre e madre come in origine
db <- db %>%
  rename(STUPCF = MAX_PADRE,
         STUMCF = MAX_MADRE)

#Creazione campo COORTE e STUDIO_NEW (per quest'ultimo trattasi di
aggregazione di gradi di studio)
db <- db %>%
  mutate(COORTE = case_when(
    ANASC>=1947 & ANASC<=1956 ~ 'COORTE_I',
    ANASC>=1957 & ANASC<=1966 ~ 'COORTE_II',
    ANASC>=1967 & ANASC<=1976 ~ 'COORTE_III',
    ANASC>=1977 & ANASC<=1986 ~ 'COORTE_IV',
    TRUE ~ 'ERRORE'),
    STUDIO_NEW = case_when(
      STUDIO %in% c(1) ~ 'NT',
      STUDIO %in% c(2,3) ~ 'SO',
      STUDIO %in% c(4) ~ 'SS',
      STUDIO %in% c(5,6) ~ 'TU',
      TRUE ~ 'ERRORE'))

#Creazioni statistiche descrittive
genere <- round(wpct(db$SESSO, db$PESOPOP)*100, digits = 2)
studio <- round(wpct(db$STUDIO, db$PESOPOP)*100, digits = 2)
studio.new <- round(wpct(db$STUDIO_NEW, db$PESOPOP)*100, digits = 2)
area <- round(wpct(db$AREA5, db$PESOPOP)*100, digits = 2)
```

```
#Carico tabella di gestione
tgc <- read.csv("Input\\TGC.txt",as.is = TRUE,sep=";",header = TRUE)

tgc <- tgc %>%
  mutate_if(is.character,.funs=trimws)

#Creazione Tabella 1

#Tabella Output
temp <- data.frame(matrix(NA, ncol=7, nrow=0))
colnames(temp) <- c("NIND","CODICE","TOTALE","COORTE_I","COORTE_II","COO
RTE_III","COORTE_IV")

#Genere
for(i in 1:length(genere)){

  temp[i,"NIND"] <- ifelse(i == 1,'MASCHIO','FEMMINA')
  temp[i,"CODICE"] <- i
  temp[i,"TOTALE"] <- genere[[i]]

}#Chiusura for genere

rtemp <- nrow(temp)


#Studio
for(i in 1:length(studio)){

  i.riga <- i + rtemp

  tgc.studio <- tgc %>%
    filter(NIND == 'STUDIO')

  i.descrizione <- which(tgc.studio[,"CODICE"] == i)
  descrizione <- tgc.studio[i.descrizione,"DESCRIZIONE"]

  temp[i.riga,"NIND"] <- descrizione
  temp[i.riga,"CODICE"] <- names(studio)[i]
  temp[i.riga,"TOTALE"] <- studio[[i]]

}#Chiusura for studio

rtemp <- nrow(temp)
```

```r
#Area
for(i in 1:length(area)){

  i.riga <- i + rtemp

  tgc.area <- tgc %>%
    filter(NIND == 'AREA')

  i.descrizione <- which(tgc.area[,"CODICE"] == i)
  descrizione <- tgc.area[i.descrizione,"DESCRIZIONE"]

  temp[i.riga,"NIND"] <- descrizione
  temp[i.riga,"CODICE"] <- names(area)[i]
  temp[i.riga,"TOTALE"] <- area[[i]]

}#Chiusura for area


for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

  #Creazioni statistiche descrittive per coorte
  genere <- round(wpct(db[which(db[,"COORTE"] == coorte),]$SESSO, db[whi
ch(db[,"COORTE"] == coorte),]$PESOPOP)*100, digits = 2)
  studio <- round(wpct(db[which(db[,"COORTE"] == coorte),]$STUDIO, db[wh
ich(db[,"COORTE"] == coorte),]$PESOPOP)*100, digits = 2)
  area <- round(wpct(db[which(db[,"COORTE"] == coorte),]$AREA5, db[which
(db[,"COORTE"] == coorte),]$PESOPOP)*100, digits = 2)


  #Genere
  for(i in 1:length(genere)){

    temp[i,coorte] <- genere[[i]]

  }#Chiusura for genere

  rtemp <- nrow(temp[which(!is.na(temp[,coorte])),])


  #Studio
  for(i in 1:length(studio)){

    i.riga <- i + rtemp

    temp[i.riga,coorte] <- studio[[i]]
```

```
  }#Chiusura for studio

  rtemp <- nrow(temp[which(!is.na(temp[,coorte])),])


  #Area
  for(i in 1:length(area)){

    i.riga <- i + rtemp

    temp[i.riga,coorte] <- area[[i]]

  }#Chiusura for area

}#Chiusura for coorte


#Aggiunta riga totale
ntemp <- nrow(temp)+1

for(coorte in c('TOTALE','COORTE_I','COORTE_II','COORTE_III','COORTE_IV'
)){

  if(coorte != 'TOTALE'){

    totale <- nrow(db[which(db[,"COORTE"] == coorte),])

  } else {

    totale <- nrow(db)

  }#Chiusura if coorte


  temp[ntemp,coorte] <- totale

}#Chiusura for coorte

temp[ntemp,"NIND"] <- 'TOTALE'

#Esportazione e formattazione Tabella 1

wb <- createWorkbook()
modifyBaseFont(wb, fontSize = 10, fontColour = "black", fontName = "Aria
l")
```

```
#Esportazione Matrici Tabella 2 su stesso file excel
righe.excel <- nrow(temp)+1
titolo <- 'Statistiche Descrittive'

addWorksheet(wb, titolo)
writeData(wb,titolo,temp)

setRowHeights(wb,titolo,rows = 1:nrow(temp),heights = 15) #imposto l'alt
ezza delle righe
addStyle(wb,titolo,createStyle(halign = "center",valign = "center",fgFil
l = "gray",textDecoration = "bold"),rows=1, cols=1:length(colnames(temp)
)) #allineamento orizzontale al centro + colorazione grigio per la riga
di intestazione
addStyle(wb,titolo,createStyle(valign = "center"),rows = 2:righe.excel,
cols = 1:length(colnames(temp)), gridExpand = TRUE) #allineamento vertic
ale al centro per tutte le righe e tutte le colonne
addStyle(wb,titolo,createStyle(numFmt = "#,##0"),rows=righe.excel, cols
= 3:length(colnames(temp))) #metto % oppure tolgo decimali
setColWidths(wb,titolo,cols=1:length(colnames(temp)),widths=15)
addStyle(wb,titolo,createStyle(border = c("TopBottomLeftRight")),rows=1:
righe.excel,cols=1:length(colnames(temp)),gridExpand = TRUE,stack = TRUE
)

saveWorkbook(wb, paste(output,"TABELLA 1.xlsx",sep=""),overwrite = TRUE)


#Ridecodifica dello studio dei padri (STUPCF) e delle madri (STUMCF) e
prendere il massimo
#creazione variabile STUDIOGEN_NEW
db <- db %>%
  mutate(STUDIOGEN = ifelse(STUPCF > STUMCF,STUPCF,STUMCF),
         STUDIOGEN_NEW = case_when(
           STUDIOGEN %in% c(1) ~ 'NT',
           STUDIOGEN %in% c(2,3) ~ 'SO',
           STUDIOGEN %in% c(4) ~ 'SS',
           STUDIOGEN %in% c(5,6) ~ 'TU',
           TRUE ~ 'ERRORE'))


#Riordine campi
db <- db %>%
  select(COORTE,NQUEST,ANNO,SESSO,CFDIC,ANASC,AREA5,PAR,NINTPRE,NORD,ETA
,PESOPOP,STUDIO,STUPCF,STUMCF,STUDIOGEN,STUDIO_NEW,STUDIOGEN_NEW)
```

```
#Creazione Tabella 2

wb <- createWorkbook()
modifyBaseFont(wb, fontSize = 10, fontColour = "black", fontName = "Aria
l")

for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

  db.coorte <- db %>%
    filter(COORTE == coorte)

  matrice <- trans.matrix(as.matrix(db.coorte[,c("STUDIOGEN_NEW","STUDIO
_NEW")]))

  #Esporto la matrice provvisoriamente in quanto poi devo ricaricarla
per aggiungere i totali per riga e colonna

  #Esportazione Tabella 1
  write.csv2(matrice,paste(output,"MATRICE_",coorte,".csv",sep=""),row.n
ames=FALSE)

  #Carico Tabella 1
  temp <- read.csv(paste0(output,"MATRICE_",coorte,".csv"),as.is = TRUE,
sep=";",header = TRUE)

  temp <- temp %>%
    mutate_if(is.character,.funs=trimws) %>%
    mutate(OBS = NA)

  #Cancello Tabella 1
  unlink(paste0(output,"MATRICE_",coorte,".csv"))

  rtemp <- nrow(temp) + 1

  for(i in 1:length(unique(db.coorte[,"STUDIO_NEW"]))){

    studio <- colnames(temp)[i]

    tot.colonna <- nrow(db.coorte[which(db.coorte[,"STUDIO_NEW"] == stud
io),])
    tot.riga <- nrow(db.coorte[which(db.coorte[,"STUDIOGEN_NEW"] == stud
io),])

    temp[rtemp,studio] <- tot.colonna
    temp[i,"OBS"] <- tot.riga

  }#Chiusura for studio
```

```
  if(sum(temp[1:4,"OBS"]) != sum(as.numeric(temp[5,1])+as.numeric(temp[5
,2])+as.numeric(temp[5,3])+as.numeric(temp[5,4]))){stop("Errore di calco
lo delle numeriche riga/colonna")}

  temp[rtemp,"OBS"] <- sum(temp[1:4,"OBS"])

  temp <- temp %>%
    mutate_if(is.character,.funs=trimws) %>%
    mutate(NT = round(as.numeric(gsub(',','.',NT)),2),
           SO = round(as.numeric(gsub(',','.',SO)),2),
           SS = round(as.numeric(gsub(',','.',SS)),2),
           TU = round(as.numeric(gsub(',','.',TU)),2))

  #Esportazione Matrici Tabella 2 su stesso file excel
  righe.excel <- nrow(temp)+1

  addWorksheet(wb, coorte)
  writeData(wb,coorte,temp)

  setRowHeights(wb,coorte,rows = 1:nrow(temp),heights = 15) #imposto
l'altezza delle righe
  addStyle(wb,coorte,createStyle(halign = "center",valign = "center",fgF
ill = "gray",textDecoration = "bold"),rows=1, cols=1:length(colnames(tem
p))) #allineamento orizzontale al centro + colorazione grigio per la
riga di intestazione
  addStyle(wb,coorte,createStyle(valign = "center"),rows = 2:righe.excel
, cols = 1:length(colnames(temp)), gridExpand = TRUE) #allineamento
verticale al centro per tutte le righe e tutte le colonne
  setColWidths(wb,coorte,cols=1:length(colnames(temp)),widths=15)
  addStyle(wb,coorte,createStyle(border = c("TopBottomLeftRight")),rows=
1:righe.excel,cols=1:length(colnames(temp)),gridExpand = TRUE,stack = TR
UE)

  saveWorkbook(wb, paste(output,"MATRICI TABELLA 2.xlsx",sep=""),overwri
te = TRUE)


  #Esportazione Matrici per Tabella 2
  write.csv2(temp,paste(output,"MATRICE_",coorte,".csv",sep=""),row.name
s=FALSE)

}#Chiusura for coorte

#Creazione tabella 3
```

```
#Tabella Output
temp <- data.frame(matrix(NA, ncol=5, nrow=0))
colnames(temp) <- c("INDICE","COORTE_I","COORTE_II","COORTE_III","COORTE
_IV")

for(indice in c('TI','DI','SCI')){

  if(indice == 'TI'){

    i.riga <- 1

    for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

      #Carico Tabella 1
      tabella <- read.csv(paste0(output,"MATRICE_",coorte,".csv"),as.is
= TRUE,sep=";",header = TRUE)

      tabella <- tabella %>%
        mutate_if(is.character,.funs=trimws) %>%
        mutate(NT = as.numeric(gsub(',','.',NT)),
               SO = as.numeric(gsub(',','.',SO)),
               SS = as.numeric(gsub(',','.',SS)),
               TU = as.numeric(gsub(',','.',TU)))

      tabella <- tabella[1:4,1:4]#Tolgo ultima colonna ed ultima riga

      diagonale <- diag(as.matrix(tabella))
      sum.diagonale <- sum(diagonale)

      temp[i.riga,"INDICE"] <- indice

      #Calcolo Trace Index
      numeratore <- length(tabella) - sum.diagonale
      denominatore <- length(tabella) - 1

      calcolo.ind <- numeratore / denominatore

      temp[i.riga,coorte] <- round(calcolo.ind,4)

    }#Chiusura for coorte

  }#Chiusura if TI

  if(indice == 'DI'){

    i.riga <- 2
```

```
    for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

      #Carico Tabella 1
      tabella <- read.csv(paste0(output,"MATRICE_",coorte,".csv"),as.is
= TRUE,sep=";",header = TRUE)

      tabella <- tabella %>%
        mutate_if(is.character,.funs=trimws) %>%
        mutate(NT = as.numeric(gsub(',','.',NT)),
               SO = as.numeric(gsub(',','.',SO)),
               SS = as.numeric(gsub(',','.',SS)),
               TU = as.numeric(gsub(',','.',TU)))

      tabella <- tabella[1:4,1:4]

      determinante <- det(as.matrix(tabella))

      temp[i.riga,"INDICE"] <- indice

      #Calcolo Determinant Index
      calcolo.ind <- 1 - (determinante / (length(tabella) - 1))

      temp[i.riga,coorte] <- round(calcolo.ind,4)

    }#Chiusura for coorte

  }#Chiusura if DI

  if(indice == 'SCI'){

    i.riga <- 3

    for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

      #Carico Tabella 1
      tabella <- read.csv(paste0(output,"MATRICE_",coorte,".csv"),as.is
= TRUE,sep=";",header = TRUE)

      tabella <- tabella %>%
        mutate_if(is.character,.funs=trimws) %>%
        mutate(NT = as.numeric(gsub(',','.',NT)),
               SO = as.numeric(gsub(',','.',SO)),
               SS = as.numeric(gsub(',','.',SS)),
               TU = as.numeric(gsub(',','.',TU)))

      tabella <- tabella[1:4,1:4]
```

```
      autovalore <- eigen(as.matrix(tabella))

      temp[i.riga,"INDICE"] <- indice

      lambda <- max(autovalore$values[2:length(autovalore$values)])

      #Calcolo Sommers and Conlisk Index
      calcolo.ind <- 1 - lambda

      temp[i.riga,coorte] <- round(calcolo.ind,4)

    }#Chiusura for coorte

  }#Chiusura if SCI

}#Chiusura for indice


#Esportazione Tabella 3 formattata
righe.excel <- nrow(temp)+1

titolo <- 'Indici di Mobilita'

wb <- createWorkbook()
modifyBaseFont(wb, fontSize = 10, fontColour = "black", fontName = "Aria
l")

addWorksheet(wb,titolo)
writeData(wb,titolo,temp)

setRowHeights(wb,titolo,rows = 1:nrow(temp),heights = 15) #imposto
l'altezza delle righe
addStyle(wb,titolo,createStyle(halign = "center",valign = "center",fgFil
l = "gray",textDecoration = "bold"),rows=1, cols=1:length(colnames(temp)
)) #allineamento orizzontale al centro + colorazione grigio per la riga
di intestazione
addStyle(wb,titolo,createStyle(valign = "center"),rows = 2:righe.excel,
cols = 1:length(colnames(temp)), gridExpand = TRUE) #allineamento
verticale al centro per tutte le righe e tutte le colonne
setColWidths(wb,titolo,cols=1:length(colnames(temp)),widths=15)
addStyle(wb,titolo,createStyle(border = c("TopBottomLeftRight")),rows=1:
righe.excel,cols=1:length(colnames(temp)),gridExpand = TRUE,stack = TRUE
)

saveWorkbook(wb, paste(output,"TABELLA 3.xlsx",sep=""),overwrite = TRUE)
```

```r
#Calcolo Standard Error

#Tabella Output
temp <- data.frame(matrix(NA, ncol=5, nrow=0))
colnames(temp) <- c("STATISTICA","COORTE_I","COORTE_II","COORTE_III","CO
ORTE_IV")

temp[1,"STATISTICA"] <- 'StandardError'

for(coorte in c('COORTE_I','COORTE_II','COORTE_III','COORTE_IV')){

  db.coorte <- db %>%
    filter(COORTE == coorte)

  ris.se <- std.error(db.coorte[,"STUDIO"])

  temp[1,coorte] <- round(ris.se,4)

}#Chiusura for coorte


#Esportazione Tabella 3 formattata
righe.excel <- nrow(temp)+1

titolo <- 'Standard Error'

wb <- createWorkbook()
modifyBaseFont(wb, fontSize = 10, fontColour = "black", fontName = "Aria
l")

addWorksheet(wb,titolo)
writeData(wb,titolo,temp)

setRowHeights(wb,titolo,rows = 1:nrow(temp),heights = 15) #imposto
l'altezza delle righe
addStyle(wb,titolo,createStyle(halign = "center",valign = "center",fgFil
l = "gray",textDecoration = "bold"),rows=1, cols=1:length(colnames(temp)
)) #allineamento orizzontale al centro + colorazione grigio per la riga
di intestazione
addStyle(wb,titolo,createStyle(valign = "center"),rows = 2:righe.excel,
cols = 1:length(colnames(temp)), gridExpand = TRUE) #allineamento
verticale al centro per tutte le righe e tutte le colonne
setColWidths(wb,titolo,cols=1:length(colnames(temp)),widths=15)
addStyle(wb,titolo,createStyle(border = c("TopBottomLeftRight")),rows=1:
righe.excel,cols=1:length(colnames(temp)),gridExpand = TRUE,stack = TRUE
)
```

```
saveWorkbook(wb, paste("Output\\Standard Error.xlsx",sep=""),overwrite =
TRUE)

#Messaggio di conclusione elaborazione

#Caricamento Tabella 1, 2, 3 e Standard Error
tabella1 <- read.xlsx(paste0(output,"TABELLA 1.xlsx"))
tabella2 <- read.xlsx(paste0(output,"MATRICI TABELLA 2.xlsx"))
tabella3 <- read.xlsx(paste0(output,"TABELLA 3.xlsx"))
tabellasd <- read.xlsx(paste0(output,"Standard Error.xlsx"))


if(nrow(tabella1) > 0 & nrow(tabella2) > 0 & nrow(tabella3) > 0 &
nrow(tabellasd) > 0){

  print('Tabelle elaborate e codice finito!!')

} else {

  print('ERORRE: File vuoti o assenti! Controllare e rigirare codice')

  }#Chiusura if

## [1] "Tabelle elaborate e codice finito!!"
```

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