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Determinants of Household Saving Using Linear Regression Model. Evidence in Italian Regions

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Abstract: Household saving decisions have always attracted the attention of researchers and policymakers. In fact, an increase in savings increases investments and this is reflected in an improvement in the standard of living of householders. Therefore, the focus of this article is on the determinants of household saving decisions in Italian regions. The savings of Italian families are represented by the volume of bank and postal deposits (set aside income) and the volume of indirect collections (invested income), while the determinants of savings are chosen after having conducted a review of the literature on the socio-economic context, economic aspects and demographic factors that have a greater impact on household savings. From the methodological point of view, the study uses a multiple linear regression model to evaluate the possible functional relationship between saving (dependent variable) and its determinants (independent variables). The regression model was built considering two dependent variables: Volume of bank and postal deposits (model A) and volume of indirect collections (model B). Data refer to the 20 Italian regions and they are extrapolated by the Statistical Data Base (BDS) of the Bank of Italy and the Istat website. From the results of both models, it emerges that economic uncertainty could fuel the savings accumulated for precautionary purposes. This study represents a starting point for investigating the saving phenomenon, increasing the observed variables with other factors that can affect saving, in order to formulate any new hypotheses for further future studies.

Keywords: Saving, Linear Regression Model, Italian Regions, Economic Theories on Saving, Determinants, Household

Introduction

In an economic context, saving is represented by a renunciation of consumption today with the aim of spending more tomorrow, of protecting the household from unforeseen situations that occur during the life cycle (illness, death of a loved one, loss of a source of economic support, released from one's future income, etc.) or to increase the sum set aside for future investments (Browning and Lusardi, 1996). According to this vision, saving represents one of the fundamental items in every economic system: Without saving, in fact, it is not possible to make investments. From this, it follows that saving represents one of the fundamental elements for the balanced development of a country, also making households less exposed to unpleasant and unexpected dynamics that can arise at any time (Schmidt-Hebbel and Servén, 1999).

Households' saving behavior is determined by a complex of economic, demographic, social and cultural factors (Fidrmuc *et al.*, 2013). Furthermore, several empirical studies focus on case studies of specific countries (Munozmoreno *et al.*, 2013), while few empirical studies carry out a comprehensive cross-sectional analysis of the determinants of saving.

The aim of the paper analyzes the behavior of households in the Italian regions with reference to saving and the determinants that affect it. The study takes into consideration two variables to represent the savings of Italian households, namely the volume of bank and postal deposits (set aside income) and the volume of indirect collections (invested income).

Determinants of saving are chosen after conducting a review of the literature on the socio-economic and demographic factors that have the greatest impact on

household saving. In almost all the studies taken into consideration, the main determinants are linked to the degree of uncertainty in the economy (unemployment rate and inflation rate), the composition of the population and wealth Gross Domestic Product (GDP).

For this reason, the paper identified the degree of uncertainty in the economy (unemployment rate and inflation rate), the composition of the population and wealth Gross Domestic Product (GDP) as the main determinants. The paper hypothesizes that there may be a dependent relationship between the savings of Italian households and some of the main determinants.

From a methodological point of view, a multiple linear regression model is applied. The model intends to evaluate the possible functional relationship between a given variable (endogenous or dependent variable) and one or more other variables (explanatory or independent variables). In this case, saving and its determinants. The data collected refers to the 20 Italian regions, relates to the year 2021 and is taken from the Statistical Data Base (BDS) of the Bank of Italy and from the Istat website.

The paper begins with a literature review on the defining elements of the concept of saving and on the main economic theories and then it illustrates an overview of the legal dimension of saving in Italy. Subsequently, the research highlights a review of the literature regarding the studies on the determinants of savings, which constitute the starting point for the definition of the dependent variables to be included in the model of regression. After, it describes the analysis methodology based on the linear regression model and the data set relating to savings and its possible determinants collected by BDS and Istat. Then, the regression model is applied on the data sample. Finally, the study discusses and summarizes the main results and how these can be used to draft policy recommendations.

Literature Review

Saving Definition

In the literature, it is possible to identify two definitions of household savings (Poterba, 2007). In the first definition, saving is considered as the flow of income minus the flow of expenses during a given period, while in the second definition, saving is understood as the change in a household's net wealth during a given period of time. In this last definition, the capital gains and/or losses generated over a period of time by the assets owned are also taken into consideration. In most studies on household savings, the second definition is not taken into consideration due to the difficulty in defining capital gains and mini-gains (Rocher and Stierle, 2015).

Every household has a different approach to saving; this depends on the amount of money the household is

willing to save, the income they have and their propensity for risk. In general, in fact, households with higher incomes will have the possibility and therefore the propensity to save more easily.

Over the years, attitudes towards saving have changed. In the past, it was considered only from a precautionary perspective intended as a reserve for the future, in particular, in retirement age. Today, following the uncertainties involving the precarious working positions of young people, it is considered from a different perspective, representing the reserve of economic resources to be used in case of emergency or in moments when income is no longer sufficient to cover expenses (Gardenal and Rigoni, 2016).

It is important to remember that different strategies for protecting and trying to increase your wealth can be implemented. The first strategy consists of static savings (bank and postal deposits), i.e., maintaining one's monetary wealth, which can be used at any time. However, this strategy means that savings remain the same amount (the interest accrued on bank and postal deposits is, in fact, very low) with the only positive aspect linked to the certainty of being able to count on liquidity at any time. A second strategy consists of dynamic saving (indirect collection) i.e., investment for the purchase of real and/or financial assets. In this last strategy, the aim is to try to increase one's wealth through productive investments. In this case, saving is considered in a broad sense because it takes the form of a real investment, involving the assumption of various risks. The investor who takes on greater risk will be rewarded with a higher interest rate. In reality, the two savings strategies are generally combined, in order to create an investment strategy that is in line with the individual's needs.

Economic Theories on Saving

Since the mid-sixties of the last century, the main economic theories on saving have been implemented. In the study, the life cycle theory, the permanent income theory and the precautionary saving theory are taken into consideration.

Modigliani and Brumberg's (1954) life cycle model of consumption and saving is one of the most used models in economics, particularly in theories that seek to explain consumption and saving. Specifically, the model is based on the life cycle, demonstrating how the volume of consumption and saving changes depending on the age group.

According to life cycle theory, one of the most important reasons for saving is to provide for retirement. The life cycle of a person is divided by Modigliani into 3 phases: Youth, working phase and retirement phase. Depending on the phase, consumption and saving acquire different connotations. At the beginning of the working period, 20 years, individuals are assumed to have negative savings by consuming more than the income they can

spend. There is a trend reversal around the age of 40 when income exceeds consumption. Savings will reach their highest peak around age 55 and then drop to negative again around age 65 which is the retirement age. Indeed, Modigliani (1986) maintains that «one might expect and generally does, find an approximately constant saving rate in the middle age group, but lower or even negative savings among very young or elderly individuals. Therefore [...] the wealth of a given cohort tends to grow until it reaches a maximum between the ages of 60 and 65». Therefore, according to Modigliani's theory, we must expect an initially negative saving rate and a generally constant rate in the central age cohorts (Baranzini, 2005).

All this determines that if the population grows the country will have more young people than old people; therefore, there will be more individuals with positive savings than individuals with negative savings, resulting in a positive net saving. Furthermore, if incomes increase, young people will tend to save more than if older people decrease their savings and this will also generate positive savings, in the same way as population growth.

The life cycle theory replaced Keynes' theory represented by the "fundamental psychological law" of saving. According to the latter theory, savings grow more than proportionally to the increase in current income. This theory was attributed to the flaw of considering only current income as dependent on saving decisions. According to the life cycle theory, the level of savings depends, however, on the demographic structure of the population, rather than on the level of current income (Martini and Spataro, 2023).

In recent years some economists have expressed doubts about the general validity of the life cycle theory (Diamond and Vartiainen, 2012). For example, Bernheim and Rangel (2004) proposed an alternative saving model in which individuals make stochastic errors.

Friedman (1957) theory of permanent income is to be considered a microeconomic theory of individual behavior. Friedman's analysis starts from Fischer's theory of saving. The consumer plans consumption, maximizing the long-term utility function.

The concept of permanent income introduced by Friedman is defined as "the amount of consumption that the individual carries out or thinks he can carry out while maintaining wealth intact". According to this theory, consumption depends mainly on permanent income and consumers resort to saving or borrowing to equalize consumption in the face of changes in transitory income.

Despite this, household consumption appears to be stable over time because a drop in income does not necessarily lead to a reduction in consumption. In light of this data, Friedman tries to explain the phenomenon by stating that consumption is not determined only by the income of the last month, but by the sum of past, present

and future income. Therefore, permanent income is defined as the amount that the consumer is able to allocate to consumption while maintaining the value of his capital constant. The difference between permanent income and current income is called transitory income.

The main characteristic of this theory is that the individual (economic agent) can monitor and balance his consumption throughout his life. According to Friedman, even if one were to come into possession of a large amount of money unexpectedly, one would not be pushed to spend it entirely because they are aware that the episode is singular, rather one would be led to keep the sum of money in the bank. The case is different if a salary increase were to be obtained: In this case, the increase would represent a growth in income production in the long term and this would lead to greater peace of mind and an incentive to be able to spend more.

However, some studies have highlighted different behaviors. Canzoneri *et al.* (2006) verified the mathematical equation of Friedman's theory by comparing it with real financial data. According to this study, when interest rates are high, people save more and consume less.

Finally, precautionary saving theory analyzes saving decisions under conditions of uncertainty. Uncertainty regarding future incomes and needs is the basis of that part of savings which represents a form of insurance against uncertain and unfavorable future events and is greater the more uncertain the event against which one intends to protect oneself (Deaton, 1992).

A rational consumer able to foresee the possibility of a risk in advance is led to increase his savings to cope with the probable loss of well-being caused by the presence of uncertainty.

In a scenario of uncertainty about future incomes in which, however, the hypothesis of complete markets does not apply (i.e., that all the risks to which individuals are subject can be neutralized through insurance contracts or income redistribution rules envisaged by the welfare state or through private agreements) a prudent individual can protect himself imperfectly from risks only through saving. In this context, the incentive to reduce the negative effects of risk through saving is added to the incentive to redistribute resources between periods, as happens in the life cycle model.

To understand what determines the amount of precautionary saving, it is necessary to evaluate household risk aversion. Cagetti (2003) finds that as risk aversion increases, the household accumulates more assets for precautionary purposes and believes that the variation in risk aversion is a determining factor in explaining the differences in behavior between households. While risk aversion determines how large a buffer of precautionary savings households accumulate to protect themselves from unexpected circumstances, the

buffer is determined by households' views on future income and costs. If households aim for stable consumption over the life cycle but lack information on future risks and income, saving will adjust accordingly to today's income and the household's spending expectation (Berg, 1983).

Legal Dimension of Saving in Italy

A discussion, albeit brief, of the main legal discipline of savings in Italy cannot be limited to the examination of the provisions envisaged by the legislative and regulatory discipline of the sector but necessarily finds its roots in the provisions of the Italian constitution.

The constitutional principles represent, in terms of the hierarchy of sources, the apex of the value pyramid of the Italian legal system, thus outlining the legislative and regulatory production that has resulted from it.

The starting point is the concept of "savings", subject to constitutional recognition through articles 47 and 117 of the constitution (Catalano and D'Amico, 2008).

In particular, the art. 47 of the constitution establishes: "The republic encourages and protects saving in all its forms; regulates, coordinates and controls the exercise of credit. It promotes the access of popular savings to home ownership, to direct agricultural ownership and to direct and indirect equity investment in the large production complexes of the country".

The expression "protection of savings" originates from this article for the purpose of both savings understood as a collective good, in more "static" terms and the individual interests of savers, who invest them in the markets, in more "dynamic" terms.

Furthermore, the art. 117 of the constitution, reformed in 2001 following the entry into force of the constitutional law of 18 October 2001 n. 3 "amendments to title V of the second part of the constitution", in the first paragraph, letter e) provides that "[...] The State has exclusive legislation in the following matters: [...] e) money, protection of savings and financial markets; [...]".

This article, together with the previous one, presupposes, firstly, that the protection of savings and financial markets, concerning a new global economy, is a matter of exclusive competence of the state and secondly, that the State encourages the various forms of savings, including that of investing in the stock market.

Indeed, the state promotes and defends every form of saving, both the "static" one, to safeguard accumulated wealth and the "dynamic" one, to invest and develop it.

The instruments for the protection of savings provided for by articles 47 and 117 of the constitution are based on the two consolidated laws on banking and finance (consolidated law on banking and credit laws-TUB, Legislative Decree of 1 September 1993, no. 385 and text of Finance-TUF Legislative decree of 24 February 1998, no. 58).

With the entry into force of the European Union treaties and the related implementing legislation, the Italian savings legislation was nourished by the sources of community law. The promulgation of the law for the protection of savings and the regulation of financial markets of 28 December 2005 n. 262 were achieved (Capriglione, 2006).

Law 262/2005 increases the rules on corporate governance, company transparency and auditing and completes the rules for intermediaries in order to be in line with community legislation.

The main objective concerns the modernization of European company law and the improvement of company administrations, especially those listed on the financial markets.

In particular, the following directives are cited:

- Directive 2003/71/EC disclosed the need to improve information on financial instruments offered to the public and their comparability with the new directive on prospectuses
- Markets in Financial Instruments Directive (MIFID) i directive 2004/39/EC has promoted and at times imposed, effective prevention and management of conflicts of interest of intermediaries, adequate rules of conduct towards customers, new articulations of distribution channels
- Directive 2004/109/EC introduced new and more extensive market information obligations on the part of listed companies
- MIFID II directive 2014/65/EU has placed emphasis on: The provision of investment services, the protection of retail investors (those "retail"), independent consultancy services and finally, the established methods of communication to customers and the supervisory authorities

Furthermore, with EU Regulation no. 600/2014 Markets in Financial Instruments Regulation (MIFIR) on the markets of financial instruments, the attention is on:

- Communication of trading data to the public
- Reporting operations to the relevant authorities
- Trading of derivative instruments in organized venues
- Non-discriminatory access to compensation and negotiation of reference values
- The powers of the national authorities, the European Securities and Markets Authority (ESMA) and the European Banking Authority (EBA)
- Investment services and activities by companies from third countries
- Authorization and supervision of data communication service providers

Savings, in light of the value that they gradually take on in the global financial market, require not only mediated or systemic protection, but also direct and immediate protection, which the varied and heterogeneous regulatory production cited irrefutably expresses.

Not only: Negotiations are currently underway between the Council of the European Union and the EU parliament for the review of EU Regulation no. 600/2014 and the MIFID II directive 2014/65/EU in order to review the existing regulatory system and issue a MIFID III to improve:

- Transparency and availability of market data
- Equal conditions between execution venues
- EU market infrastructures and ensuring their competitiveness at the international level

The continuous solicitations and revisions of the most suitable forms of community regulation for the protection of savings do not only aim to safeguard the (static) allocation of resources but have the aim of guaranteeing, through the (dynamic) investment of the same resources in the markets financial, the resumption of economic processes. This is a central purpose of European and also Italian legislation.

Determinants of Household Savings: Theoretical Review

A study on savings can consider two different aspects: The identification of personal motivations and the selection of explanatory variables.

As regards the personal reasons capable of justifying a single act of saving, these can be multiple. In particular, it is possible to identify four main reasons (Keynes, 1936), namely:

- Provide resources for retirement and bequests
- Finance large lifetime expenses, including purchasing a home and education
- Finance unexpected income losses, precautionary savings situation
- Make the availability of financial resources more fluid over time and maintain a more stable consumption profile

The literature mainly focuses on the motivations that underlie saving, while there are still few studies that investigate the coexistence of different motivations for saving (Schunk, 2009).

As regards the explanatory variables that can influence households' saving decisions, the discussion mainly concerns the following key variables: Current income, expected future income flows, the interest rate and the stock of wealth. In reality, a complex of objective factors that interact, with results that are not easily predictable and measurable, must be added to

them (McFarlane *et al.*, 2020). These include demographic factors (age, life expectancy, household unit), income-related factors (type, relative levels and predictability), social conditions, liquidity constraints and institutional guarantees (retirement age, social security, political stability) are considered. Indeed, in several empirical studies, the most used explanatory variables were public savings, demographic growth, GDP, the unemployment rate, the real interest rate, the inflation rate and the presence of a developed financial system (Le Blanc *et al.*, 2015).

The impact of some of these variables on household savings is well-defined and consistent from both a theoretical and empirical point of view. Furthermore, starting from the hypothesis formulated in the life cycle theory, the higher the old age dependency ratio, defined as the proportion of the population aged over 65 compared to the working age population, the lower the savings will be aggregate of households because the elderly dissipate savings during retirement. The unemployment rate and the inflation rate, commonly used as proxies for the degree of uncertainty in the economy, also have a positive impact on saving. Indeed, several studies highlight that households increase their savings in the event of greater uncertainty (Kessler *et al.*, 1993; Rocher and Stierle, 2015).

For other variables, however, a good deal of uncertainty remains regarding the direction of the impact. For example, the impact on saving of a change in the real interest rate is theoretically ambiguous, while empirically it is positive, although very often not significant. GDP per capita growth also has a generally ambiguous effect. In fact, GDP per capita measures the average standard of living recorded in a country. Consequently, an increase in GDP per capita can generate an increase in savings. In reality, households could also choose to increase their consumption and consequently, reduce their saving (Carlin and Soskice, 2005).

Even a developed financial system has an important influence on household savings, with an ambiguous direction of impact. Indeed, the development of the financial system can increase the opportunities and returns of financial savings, but, at the same time, it can improve access to credit and ease the liquidity constraints of households. As a result, the development of the financial system could lead to a reduction in household savings (Bayoumi, 1993).

In addition to these factors, the structure of the tax, social security and welfare systems could also have an impact on each of savings' motivations highlighted above. The structure of the tax system can influence savings both by changing wealth and by influencing the rate of return on savings (Disney *et al.*, 2010).

Methods and Materials

The methodology is a regression that is used to study the relationship between two or more variables (Olive, 2017).

Regression is a method of estimating the conditional expected value of a dependent variable, Y , given the values of an independent variable, X , or other independent variables $x_1, x_2, x_3, \dots, x_k$:

$$E[Y|X_1, X_2, X_3, \dots, X_k]$$

In the case in which only one independent variable, X , is present and we want to observe how the dependent variable is influenced by it, we must know that Y is a function of X if each of its values corresponds to only one value of Y . The functional relationship is simple and linear and it is written as follows:

$$Y = \beta_0 + \beta_1 X + \varepsilon_i$$

where, Y is the dependent variable, X is the independent variable, β_0 is the intercept of the regression line, β_1 is the slope of the regression line, ε_i is the statistical error and finally, $Y = \beta_0 + \beta_1 X$ represents the regression line.

Regression can be extended to the case in which several variables contribute to explaining the dependent variable, Y , in this case, the regression model is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \varepsilon_i$$

where, $i = 1, 2, 3, \dots, n$ varies among observations, Y_i is the i -th value of the dependent variable, X_{ki} is the i -th observations of each of the k regressors, $\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$ is the regression line, β_0 is the intercept of the regression line as well as the expected value of Y when all the X_i are equal to zero, β_i is the slope of X_i , ε_i is the statistical error and finally $\beta_0, \beta_1, \beta_2, \dots, \beta_i$ are the regression coefficients.

The general model takes the following form:

$$Y = \beta X + \varepsilon$$

where, the variables used to explain the model are called explanatory or regressors, while the variable being analyzed is called regressand.

The objective of the analysis is precisely to predict the values assumed by a dependent variable, starting from the knowledge of those observed on multiple independent variables.

Subsequently, it is necessary to understand how much the (independent) predictive variables combined are significantly correlated with the dependent variable as well as how much of the result is explained by the combination of the predictive variables used in the model. Furthermore, it is assessed how much each independent variable is related to the dependent one and which of the predictors is the best one to estimate the regressand.

In multiple regression r^2 (che si può anche indicare con R^2) has the same meaning as in simple regression but does not correspond to the square of the correlation between X and Y but to the square of the multiple correlation between Y and all the X or to the square of the correlation between Y and \hat{Y} that is the estimate of the dependent variable.

Since r^2 tends to increase with the number of independent variables, an adjusted value can be introduced and used which will be equal to the:

$$1 - (1 - r^2)^2 \frac{N - 1}{N - K - 1}$$

with N which is the sample size and K which indicates the number of independent variables. It is important to remember that r^2 provides information on the percentage of explained variance of the entire equation, i.e. the combined effect of the independent variables present in the equation, but unfortunately, it does not provide information on the contribution of each individual independent variable.

Because of this, a significance test should be carried out, which allows us to establish whether the contribution of the independent variables in explaining the dependent variable is statistically significant.

The level of significance of a test is usually given by a verification of the hypothesis test, in most of the simplest cases it involves accepting or rejecting the null hypothesis. The significance levels are represented with the letter alpha, α , it is usually assumed that $\alpha = 0,05$ if the hypothesis testing test yields a value p minor of α , the null hypothesis is rejected.

In the regression model, the choice of regressors is very important. As part of this choice, we must try to mediate between two needs, namely the greater number of variables to improve the fit or parsimony to make the model more robust and interpretable.

It is possible to use automatic calculation procedures to select the optimal subset of regressors among the possible ones.

In this study, the procedure used to study the determinants of savings occurs using the statistical software SPSS version 28 and in particular, the backward elimination model is followed (backward elimination).

This is a variable selection procedure in which all the regressors are initially present. Subsequently, one variable at a time is removed from the model, choosing at each step the regressor that involves the least loss of explanatory capacity of the variability of Y , without the possibility of reinserting them after their cancellation. The variable with the smallest partial correlation with the dependent variable is considered first in removal. After the first variable, the removal of other variables that have a small partial correlation is carried out. The procedure stops when there are no variables in the equation that meet the removal criteria (Miller, 2002).

Model selection started from the hypotheses formulated in the study by Le Blanc *et al.* (2015) which investigates the factors that determine the saving behavior of households in fifteen-euro area countries over the years 2008-11. Le Blanc *et al.* (2015) have identified several factors that could influence the saving behavior of households, including the unemployment rate, the inflation rate, income, wealth and demographic data. The study took into consideration some of the variables indicated in Le Blanc *et al.* (2015) model to carry out an analysis of the determinants of saving in the various Italian regions. In particular, the variables used concerned the degree of uncertainty in the economy (unemployment and inflation) and the composition of the population and wealth (GDP).

The analysis is based on the 20 Italian regions: Abruzzo, Apulia, Basilicata, Calabria, Campania, Emilia-Romagna, Friuli-Venezia Giulia, Lazio, Liguria, Lombardy, Marche, Molise, Piedmont, Sardinia, Sicily, Tuscany, Trentino-Alto Adige, Umbria, Aosta Valley and Veneto. The data set relating to the year 2021 was collected from the Statistical Database (BDS) of the Bank of Italy and from the Istat website. The choice of Italian regions, determinants of saving and time period were based on the availability of the data on the Bank of Italy and from the Istat website.

As regards, however, saving, it was considered unconsumed wealth and as such usable for new investments or further consumption.

According to this meaning, savings are made up of liquid financial resources kept in a financial institution and the result of consumption that is lower than the income received.

Consequently, the concept of savings was taken into consideration both as the set of household wealth held in bank and postal deposits and as the set of household wealth invested in financial instruments (indirect collection) (Onado, 2021).

This dual taxonomy arises from the observation that while once households directed their savings only towards deposits, considered safer than investing in the capital market, for decades now Italian households have also been able to opt, thanks to the spread of various instruments of managed savings, towards the investment of one's savings in the purchase of financial instruments (shares, bonds, government bonds) which are traded in the financial markets (Banfi *et al.*, 2016; Saunders *et al.*, 2022).

It is for these reasons that in the paper two linear regression models were built and evaluated: One in which bank deposits and postal savings will be used as the dependent variable, the other in which Y will instead be indirect collections.

Table 1 presents a brief description of the two dependent variables taken into consideration to express household savings and the explanatory variables.

Table 1: Description of dependent and independent variables

Dependent variables	Description	Source
Bank deposits and postal savings	Amounts in euros of bank and postal deposits of consumer households in 2021 The data for each region was compared to the national average value in 2021	Statistical Database (BDS) of Bank of Italy
Indirect collection	Amount in euros of the savings of consumer households that are invested in financial instruments in 2021. The data for each region was compared to the national average value in 2021	Statistical Database (BDS) of Bank of Italy
Independent variables	Description	Source
Gross Domestic Product (GDP)	GDP at market prices per capita	Istat dataset: Main territorial aggregates of national accounts
Population over 65 years	The population over 65 years old as a percentage of the total national population over 6 years' old	Istat dataset: Resident population on 1 st
Unemployment rate	The share of the workforce that is out of work but is available and looking for work. Data is measured as a percentage of the total workforce	Istat dataset: Unemployment rate-previous for regulation (until 2021)
Inflation rate	Inflation is defined as the consumer price index i.e., the average of the elements of the basket weighted according to the importance that each has on the total expenditure. (base 2015 = 100) (average annual percentage changes)	Istat dataset: Nic-annual averages since 2016 (base 2015)

Source: Own processing

Table 2: Descriptive statistics of the dependent variables with values expressed on a percentage basis

Variable	Arithmetic average	Standard deviation	Median	Minimum value	Maximum value
Bank deposits and postal savings	5.24	4.86	2.78	0.24	20.81
Indirect collection	5.26	7.19	2.06	0.13	30.85

Source: Own processing on Statistical Database (BDS) of the Bank of Italy

Table 3: Descriptive statistics of independent variables with values expressed on a percentage basis

Variable	Average	Standard deviation	Median	Minimum value	Maximum value
GDP at market prices per capita	96.48	26.33	99.96	58.89	146.18
Population over 65 years	5.00	4.06	3.10	0.22	16.57
Average unemployment rate	9.51	4.65	8.23	4.50	20.10
Average inflation	-0.09	0.39	-0.10	-0.70	0.70

Source: Own processing on Istat data

Table 2 the main descriptive statistics of the dependent variables are highlighted which allows the validation of the results (Weaver *et al.*, 2017).

It is possible to highlight that the variable “bank deposits and postal savings” and the variable “indirect collection” have an average equal to 5% with a standard deviation of 4.86 and 7.19 respectively, which denotes greater variability of the data of the Italian regions of indirect collection compared to the average value.

The minimum percentage value of bank deposits and postal savings is 0.24 in the Aosta Valley, while that of indirect collection is 0.13 in Molise.

While for the maximum values, a substantial difference is observed respectively 20.81% (bank and postal deposits) and 30.85% (indirect collection) both recorded in Lombardy, this explains why such high standard deviations are recorded.

From the descriptive statistics of the independent variables, it is observed that the data vary greatly between the Italian regions (Table 3).

With reference to the data relating to the Italian regions, a significant data is the inflation rate which in some Italian regions is negative (Abruzzo, Basilicata, Emilia Romagna, Friuli Venezia Giulia, Lazio, Liguria, Lombardy, Marche, Sardinia, Tuscany, Umbria, Aosta Valley and Veneto) and it highlights in these regions a phenomenon of deflation, i.e., a decrease in the general level of prices which generates an increase in the purchasing power of the currency.

This derives from the weakness of the demand for goods and services, consumers are incentivized to postpone purchases of non-essential goods and services.

The highest inflation rate in 2021 is recorded by Trentino-Alto Adige, with 0.7%, followed by other regions of southern Italy such as Campania (0.4%), Calabria (0.3%), Apulia (0.2%) and Sicily (0.1%), while the smallest one is recorded in Aosta Valley (-0.70%). Another relevant data concerns the unemployment rate which is not particularly encouraging for the regions of Southern Italy. In particular, the highest unemployment rate is recorded in Calabria (20.1%), while the lowest value is recorded in Trentino-alto Adige (4.5%). In terms

of the number of people over 65 years of age compared to the national population, the most relevant data is registered in Lombardy with a value of 16.57%; this value is significantly higher than the average data of the Italian regions (5.00%). The lowest value, however, is recorded in Aosta Valley and is equal to 0.22%.

As regards the GDP at market prices per inhabitant, an average value of the Italian regions equal to 96.48% is recorded, with a high standard deviation of 26.33. The maximum value, equal to 146.18%, is registered in Trentino-Alto Adige, while the minimum value, equal to 58.89%, is registered in Calabria.

Results

In the regression model, the following notations are given to the set of independent variables:

- “GDP” refers to GDP at market prices per inhabitant on the national total
- “POL65” refers to the population over 65 years of age out of the total national population
- “DIS” refers to the unemployment rate
- “INF” refers to the average inflation rate in 2021

The dependent variable Y was calculated taking into consideration:

- Y_1 = Percentage ratio between bank and postal deposits of households in the Italian regions and the corresponding national average value
- Y_2 = Percentage ratio between the amount in euros of direct collection by households in the Italian regions and the corresponding national average value

The regression model was therefore built considering two dependent variables: Y_1 (model A) e Y_2 (model B).

Model A

The first model assumes as dependent variable Y_1 . Initially, all the regressors, i.e., all the independent variables, were entered. The missing data, compared to the 20 Italian regions, relates to the INF of Molise.

Table 4: Correlation matrix and level of significance of the variables

		Y ₁	GDP	POL65	DIS	INF
Pearson correlation	Y ₁	1				
	GDP	.328	1			
	POL65	.973	.165	1		
	DIS	-.175	-.866	-.008	1	
	INF	-.209	-.346	-.134	.477	01
Significance (one-tailed)	Y ₁					
	GDP	.085				
	POL65	.000	.250			
	DIS	.236	.000	.487		
	INF	.196	.073	.292	.20	
N	Y ₁	19	19	19	19	19
	GDP	19	19	19	19	19
	POL65	19	19	19	19	19
	DIS	19	19	19	19	19
	INF	19	19	19	19	19

Source: Own elaboration using SPSS 28

The analysis of the model involves checking the correlation matrix (Leti and Cerbara, 2009).

The theory suggests that if the independent variables were to be correlated with each other, a choice would need to be made among them; if they were used equally, the disadvantage would be in terms of no additional information and furthermore, the model used would be more complex, with the risk of decreasing its predictive capacity. Through statistical analysis, it is not always possible to demonstrate cause-effect relationships between variables but rather to quantify the link between them. The ideal situation is one in which the dependent variable is strongly correlated with the independent variables and the latter are strongly uncorrelated with each other. Table 4 shows the values of the correlation matrix.

Table 4 shows a strong positive correlation between the variable Y₁ and the variable POL65 (0.973). Furthermore, the correlation table also shows a fair correlation, always positive, between Y₂ and GDP (0.328). On the contrary, there is a negative correlation between the variable Y₁ and respectively, the variable DIS (-0.175) and the variable INF (-0.209).

These results are partly justifiable. First of all, the analysis shows that as the population over 65 grows, so saving grows. This result, although in contrast with life cycle theory, could depend on the fact that demography is a slow determinant. Indeed, if the study had been conducted over a longer period of time it would certainly have been able to capture changes in demographic data and indicate the real effect of population aging on saving. Furthermore, the following concerns may also be encountered:

- GDP growth generally has an ambiguous effect (for example, households who expect a higher income in the future choose to increase current consumption and reduce saving) (Carlin and Soskice, 2005)

- The uncertainty estimated by the increase in the unemployment rate (DIS) and Inflation (INF) should negatively impact household savings in consideration of precautionary reasons (households tend to increase savings when they expect difficult times) (Rocher and Stierle, 2015)

It is important to remember that the best independent variable is the one that has the highest correlation value with the dependent one, since the higher it is, the greater the strength of the link between the variables and consequently, the accuracy of the prediction.

Table 5, which shows the test on the model and Table 6, which shows the significance of the regressors, confirm that the model is significant exclusively for the POL65 variable.

Considering this evidence, the study proceeds with the backward elimination method. The adopted criterion eliminates one variable at a time and sets up the analysis again until a model is reached in which all the variables are significant.

A new analysis is set up without the GDP variable. From the regression analysis without the GDP variable, it emerges that the POL65 and DIS variables are significant, in fact, only these two regression coefficients are statistically significant with a $\alpha = 0.05$. We therefore try to propose the analysis again by eliminating, in addition to GDP, also the INF variable. Consequently, eliminating the INF variable, the sample size returns to 20. A multiple regression model is achieved which presents the characteristics reported in Table 7.

From the information in Table 7, it emerges that the significance of the regressors is lower than the threshold of $\alpha = 0,05$ respectively 0.001 for POL65 and DIS, therefore, a good model that explains the dependent variable Y₁ is identified. There is a low probability that the observed difference can be attributed to chance and therefore statistical significance can be considered.

Table 5: ANOVA

Model	Sum of Squares	Gl	Quadratic Mean	F	Significance
Regression	418.321	04	104.580	144.253	.000
Residue	10.150	14	.725		
Total	428.471	18			

Source: Own elaboration using SPSS 28

Table 6: Coefficients

Model	Unstandardized coefficients		Standardized coefficients		Significance
	B	Standard error	Beta	t	
(Constant)	-1.958	2.378		-.823	.424
GDP	.019	.016	.103	1.162	.265
POL65	1.154	.054	.954	21.512	.000
DIS	-.076	.096	-.074	-.788	.444
INF	-.145	.723	-.010	-.201	.844

Source: Own elaboration using SPSS 28

Table 7: Regression analysis without GDP and INF ANOVA

Model	Sum of squares	Gl	Quadratic mean	F	Significance
Regression	437.891	2	218.945.318.350	000	
Residue	11.692	17	.688		
Total	449.582	19			

Model	Unstandardized coefficients		Standardized coefficients		Significance
	B	Standard error	Beta	t	
(Constant)	.809	.492		1.645	.118
POL65	1.164	.047	.972	24.850	000
DIS	-.172	.041	-.164	-4.191	000

Source: Own elaboration using SPSS 28

The final multiple regression model is made up of two significant variables:

- The population over 65 years old as a percentage of the total national population over 6 years old
- The share of the workforce that is unemployed but available and looking for work out of the total workforce

Taking into account the variables within the multiple regression model, how they affect the savings rate is described by the regression coefficient.

Model B

Model B assumes as dependent variable Y_2 , that is, indirect collection. Also for this model, all the regressors, i.e., all the independent variables, were initially included.

Table 8 shows the values of the correlation matrix which shows a strong positive correlation between the variable Y_2 and POL65 (0.876) and a fair correlation, always positive, between Y_2 and GDP (0.448), on the contrary, there is a negative correlation between the

variable Y_2 and respectively DIS (-0.341) and INF (-0.3). Data reflect what has already emerged in model A.

Subsequently, the content of the ANOVA table (Table 9) is reported, in which the test on the model is significant (Table 10).

As happened for Model A, since only the POP65 variable is significant, we proceed with the backward elimination method. A new analysis is set up without the GDP variable which shows that POL65 and DIS are significant in this model. We therefore try to propose the analysis again by eliminating, in addition to GDP, also the INF variable. By eliminating the INF variable, the sample size returns to 20. A multiple regression model is achieved which presents the characteristics reported in Table 11.

The information also proposes for the dependent variable Y_2 a final multiple regression model made up of two significant variables, namely the population over 65 years old as a percentage of the total national population over 6 years old and the share of the workforce that is without a job but is available and looking for employment out of the total workforce.

Table 8: Correlation matrix and level of significance of the variables

		Y ₂	GDP	POL65	DIS	INF
Pearson correlation	Y ₂	1				
	GDP	.448	1			
	POL65	.876	.165	1		
	DIS	-.341	-.866	-.008	1	
	INF	-.300	-.346	-.134	.477	.01
Significance (one-tailed)	Y ₁	.000				
	GDP	.027				
	POL65	.000	.250	.		
	DIS	.076	.000	.487	.	
	INF	.106	.073	.292	.20	.
N	Y ₁	19	19	19	19	19
	GDP	19	19	19	19	19
	POL65	19	19	19	19	19
	DIS	19	19	19	19	19
	INF	19	19	19	19	19

Source: Own elaboration using SPSS 28

Table 9: ANOVA

Model	Sum of squares	Gl	Quadratic mean	F	Significance
Regression	844.045	4	211.011	26.006	.000
Residue	113.597	14	8.114		
Total	957.642	18			

Source: Own elaboration using SPSS 28

Table 10: Coefficients

Model	Unstandardized coefficients		Standardized coefficients		Significance
	B	Standard error	Beta	t	
(Constant)	-1.489	7.956		-.187	.854
GDP	.022	.055	.079	.854	.696
POL65	1.548	.180	.856	.696	.000
DIS	-.376	.321	-.247	.000	.261
INF	-.910	2.420	-.041	.261	.712

Source: Own elaboration using SPSS 28

Table 11: Regression analysis without GDP and INF

ANOVA

Model	Sum of squares	Gl	Quadratic mean	F	Significance
Regression	862.339	2	431.169	60.956	.000
Residue	120.249	17	7.073		
Total	982.588	19			

Coefficients

Model	Unstandardized coefficients		Standardized coefficients		Significance
	B	Standard error	Beta	t	
(Constant)	2.117	1.578		1.342	.197
POL65	1.548	.150	.874	10.303	.000
DIS	-.511	.131	-.330	-3.893	.001

Source: Own elaboration using SPSS 28

Discussion

Through regression Models A and B, it can be concluded that what affects the savings of consumer households in the Italian regions (expressed both as bank and postal deposits and as indirect collections) is the

incidence of the population over 65 years of age on the total population and the unemployment rate.

With regard to the incidence of the population over 65 years of age, income and savings should increase with advancing working age, leading to a constant accumulation of wealth over the years; the elderly

population, on the other hand, should have a lower income than in previous years, therefore savings should also reduce because they are used with advancing age to meet different spending needs. The result that emerged from both regression models is therefore not in line with the life cycle theory developed by Modigliani and Brumberg (1954) which demonstrates how the volume of savings changes depending on the age group as the level of savings an individual, in a specific period, does not depend exclusively on the present income, but also on the expected future income. Recent studies have also reiterated these considerations. Sambt *et al.* (2021) have shown, for example, that on average saving is zero until adulthood, is negative from 20 years up to around 45 years of age (due to the individual's indebtedness), is positive from 50 up to retirement age, also in the form of investments in financial assets and is negative in retirement age as the elderly spend more than they receive. The income deriving from the pension, which is lower than the earnings previously received, is added to the savings capitalized over time; in this phase, it is used to cope with the increase in expenditure that characterizes advanced age. The result that emerged from the regression models, although in contrast with the life cycle theory, could be justified by the fact that demography is a slow determinant. Indeed, if the study had been conducted over a longer period of time it would certainly have been able to capture changes in demographics and indicate the real effect of population aging on saving.

With reference to the unemployment rate, several studies show how the unemployment rate is a key factor in saving, especially in savings called precautionary, both on a theoretical and empirical level (Carroll *et al.*, 2019). For example, Mody *et al.* (2012) have shown for a set of advanced countries (including the United States) that a 1 percentage point increase in the unemployment rate increases the savings rate by approximately 0.3% points. The literature has therefore shown that the increase in unemployment can fuel savings accumulated for precautionary purposes. Furthermore, it is necessary to take into consideration the fact that the data taken into consideration in the regression models concern the year 2021 i.e., the year following the outbreak of the pandemic crisis from which the economic crisis arose. Indeed, in this period most of savings were limited because of the social distancing and lockdown measures imposed by the government during the emergency undoubtedly significantly limited household spending capacity.

Conclusion

The study investigated some factors considered crucial for household savings in the Italian regions, verifying the existence of a possible relationship between these factors

and the savings itself. Results confirmed what has already emerged in other studies (Le Blanc *et al.*, 2015; McFarlane *et al.*, 2020), namely that attention is focused on socio-economic and demographic variables. It was therefore hypothesized, taking into account the references in the literature, that the forms of savings could be represented both by bank and postal deposits and by indirect collection. It was therefore possible to build two multiple linear regression models, A and B, with two possible methods of estimating savings and relative significance. Furthermore, the backward elimination method was used in order to identify the "suitable" model.

From model A it is clear that two independent variables affect savings, understood as bank and postal deposits: The population over 65 years of age and the unemployment rate, both statistically significant.

The regression model highlighted that bank deposits and postal savings increase for people over 65 years of age, a figure which is also confirmed by a positive correlation equal to 0.97. Regarding the unemployment rate, the regression model shows that the degree of unemployment has a significant negative effect on household savings.

Even in model B, in which the dependent variable is represented by indirect collection, the population over 65 years of age and the unemployment rate are significant variables.

From the results of both models, it emerges that the hypothesis of the life cycle theory is not confirmed, i.e., the saving rate would decrease as people enter retirement, on the contrary, the hypothesis of the precautionary savings theory is observed, i.e., that the increase in economic uncertainty can fuel the savings accumulated for precautionary purposes. Nothing, however, emerges from the models with reference to Friedman's permanent income theory.

This study presented practical implications for policymakers, in fact, it is important to study household saving decisions, considering that an increase in saving generates an increase in investment and a higher capital stock improves living standards. It also represents a starting point for investigating the saving phenomenon, integrating the observed variables with other factors that can influence saving, in order to formulate any new hypotheses for further future studies.

Finally, some limitations of the study must also be considered. First, the paper did not examine the situation in other countries with different financial and economic systems. Secondly, the study only considered the role of some socio-economic and demographic determinants, neglecting other factors (e.g., psychological factors). According to the literature analyzed, in fact, there are various theories and empirical studies that examine the explanatory variables that can influence families' saving decisions.

Therefore, there remain many possibilities for further research, for example, the use of an alternative research approach. Furthermore, future studies can expand research to other financial and economic contexts and systems. These attempts will help enrich the literature and provide greater implications for future savings studies.

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Author's Contributions

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Maria Anastasia Arcuri: Mainly contributed to section “legal dimension of saving in Italy”;

Angela Coscarelli: To section “methods and materials” and “conclusions”.

Domenica Federico: To sections “introduction”, “literature review” and “empirical results: model b”.

Antonella Notte: To sections “determinants of household savings: theoretical review”, results: model a” and “discussion”.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and that no ethical issues involved.

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