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# Contextualizing the *Homo Economicus*: Essays on Non-Instrumental Relationality, Quality of Life, and Civic Engagement

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The undersigned Luis Aranda, in his quality of doctoral candidate for a Ph.D. degree in Economics granted by the Advanced School of Economics of Ca' Foscari University of Venice, attests that the research exposed in this dissertation is original and that it has not been and it will not be used to pursue or attain any other academic degree of any level at any other academic institution, be it foreign or Italian.

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# Abstract

The aim of this dissertation is to highlight the importance of re-contextualizing the individual in economic analysis. In particular, the emphasis is placed on human relationality in its non-instrumental form for the study of life satisfaction and quality of life. Chapter 1 introduces the concept of non-instrumentality in relations and describes the problem posed by its continuous decline in recent years. An alternative categorization of such form of relationality is proposed and equipped with a theoretical model where traditional economic modeling tools are mixed with Hirschman (1970) insights of organizational behavior to endow non-instrumental relationships with a restorative signal mechanism aimed at preserving their stability from within. Moreover, a model of relational capital is constructed around the proposition that non-instrumental relationships are commodities which can be both consumed and produced by individuals through investments in the form of time and market goods. In Chapter 2 the positive link between one form of non-instrumental relationality –namely, family ties– and quality of life is documented. Using a difference-in-differences propensity score matching approach, a thorough empirical analysis of the relationship between the psychological well-being of older generations and their coresidence choices is carried out. The findings seem to highlight the supporting role played by family proximity in old age: respondents from historically Catholic European countries choosing to live under the same roof with an adult child reported significantly lower depression levels than those for whom such a treatment was not present. Chapter 3 uses a stag-hunt game to exemplify the risk- and payoff-dominant equilibria often present in the provision of public goods. An instrumental variables approach is used to document the link between cognitive abilities and pro-social behaviors in old age. The results advocate for the existence of a seemingly strong causal link running from cognition to community engagement. This empirical finding supports theories of collective agency –such as those of we-rationality and team-thinking– and is in line with mainline experimental results showing how participants with higher cognitive abilities tend to be less risk averse and hence more willing to opt for a payoff-dominant action in a stag-hunt game context more often.

To my family.

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# Preface

Conventional economic theory has for long relied on a de-contextualized and atomistic notion of the person, epitomized by the economic individualism of Robinson-Crusoe-type theories and the more general conception of *homo economicus*. However, as noted by the celebrated "Easterlin paradox," staggering economic growth much sought after in the last decades (based on a belief equating economic progress to well-being) has failed to increase the national happiness levels of most economically-advanced societies in a significant way. On the other hand, traditional social support structures have undergone quick-paced revolutionary changes. Direct human contact has become an ever-scarcer good, being replaced by pervading technologies which often replace the real thing with a much lighter, undemanding, and emotionally-emptier virtual version. Genuine relationships seem to be gradually declining in what appears to be a relational crisis casting a shadow over much of the economically-developed world.

The aim of this dissertation is to highlight the importance of re-contextualizing the individual in economic analysis. In particular, the emphasis is placed on human relationality in its non-instrumental form for the study of life satisfaction and quality of life. In so doing, I have taken the opportunity to put in writing some thoughts and premises which I believe could prove themselves useful for the study of human happiness and satisfaction with life, complementing them with concurrent empirical analyses based on the exploitation of microeconometric techniques. As better data on human relationships and networks become available, it is my perception that social

support attained through genuine relationality will emerge as an indisputable engine of wellbeing, of paramount importance for societies and policy-makers alike.

Chapter 1 introduces the concept of non-instrumentality in relations and describes the problem posed by its continuous decline in recent years. An alternative categorization of such form of relationality is proposed and equipped with a theoretical model where traditional economic modeling tools are mixed with Hirschman (1970) insights of organizational behavior to endow non-instrumental relationships with a restorative signal mechanism aimed at preserving their stability from within. Moreover, a model of relational capital is constructed around the proposition that non-instrumental relationships are commodities which can be both consumed and produced by individuals through investments in the form of time and market goods. An initial relational stock which depreciates over time is inherited by individuals, who enlarge it by investing in each or all of its four components.

In Chapter 2 the positive link between one form of non-instrumental relationality – namely, family ties– and quality of life is documented. Using a difference-in-differences propensity score matching approach, a thorough empirical analysis of the relationship between the psychological wellbeing of older generations and their coresidence choices is carried out. The findings seem to highlight the supporting role played by family proximity in old age (50+): respondents living in traditionally Catholic European countries living under the same roof with an adult child reported significantly lower depression levels than those for whom such a treatment was not present. Efforts to justify this outcome by means of sole economic gains arising from the coresidence decision proved systematically insufficient.

Chapter 3 addresses some well-known deficiencies of standard economic theory when accounting for observed human behavior. A stag-hunt game is used to exemplify the risk- and payoff-dominant equilibria often present in the provision of public goods. Although standard theory of individual rationality presumes risk-averse

decision-makers, in reality cooperative behaviors –leading to the pay-off dominant equilibrium– are much too often observed. With this in mind, an instrumental variables approach is used to document the link between cognitive abilities and pro-social behaviors in old age. The results advocate for the existence of a strong causal relationship running from cognition to community engagement. Albeit contradicting standard theoretical predictions, this empirical finding supports theories of collective agency –such as those of we-rationality and team-thinking– and is in line with mainline experimental results showing how participants with higher cognitive abilities tend to be less risk averse and hence more willing to opt for a payoff-dominant action in a stag-hunt game context more often.

In summary, this work touches on diverse topics which seem to pinpoint some of the challenges currently faced by economic scientists. In particular, the rise of individualism in conventional theory has often led economists to neglect the communal aspect of human existence which permeates all forms of behavior. As Nobel laureate Robert Solow notes, "[t]he simple combination of rationality and individual greed that provides the behavioral foundation for most of economics will only go so far. There are important aspects of economic life and economic performance that cannot be analyzed that way. More accurately, it is part of the athleticism of economics to analyze everything this way; but the attempt often fails...[t]he story gets more interesting when it has to allow for the fact that a lot of economically relevant behavior is socially determined" (Solow, 1999, p. 7-8).

In Daniel Defoe's novel, Robinson Crusoe's sociality is casted away by a surging wave of individualism. The striking analogy with conventional economic theory has in the last decades made for a great introduction to undergraduate economics courses. However, life is not a solitary enterprise: the importance of sociality in updating the conventional view of what characterizes appropriate economic behavior must be acknowledged. Just like Robinson Crusoe's twenty-four lonely years on the island,

perhaps the unrealistic solitude of the *homo economicus* has been upheld overlong and starts to take its toll through its effect on well-being.

The isolated utopian experience of standard economic theory is longing for companionship –and some footsteps are starting to appear on the sand. Though transitions may be arduous, if attained it will undoubtedly prove beneficial to the advancement of economic and social sciences. As the previously emotionless Robinson Crusoe documents –with unforeseen relief– after his first encounter with *Man Friday*, the native who will later become his loyal companion: "I took him up, and made much of him, and encourag'd him all I could...he spoke some words to me, and though I could not understand them, yet I thought they were pleasant to hear"[1].

[1]Defoe (1719 (2008, p. 324).

# Chapter 1

# Relational Capital: Thoughts and Premises on Non-Instrumental Relationships

"*Salud, Dinero, y Amor... y tiempo para disfrutarlos*"
(*Health, Wealth, and Love... and time to enjoy them*)
Latin American proverb

## 1.1 Introduction

In recent decades, most of the Western world has seen a spectacular increase in GDP and life expectancy. These aggregate advancements in wealth and health, however, have not been able to promote higher levels of life satisfaction among the population, a phenomenon commonly referred to as the "Easterlin paradox" (Easterlin, 1974). Western societies have become richer and healthier but certainly not happier. In a period marked by economic growth and remarkable improvements in technology, science, and medicine, happiness in the developed world has for the most part stayed constant, and in some cases, it has even slightly declined.[1]

The remarkable improvements in science and technology which have made such economic growth possible have also been accompanied by dramatic cultural mutations and changes in traditional social support structures. Families have become smaller as

[1]Throughout this study the terms *happiness*, *life satisfaction*, and *human flourishing* will be used interchangeably.

fertility rates plunged and single-parenting as well as divorce rates boomed, resulting in the inversion of the population pyramid. In some societies, this has caused the sustainability of welfare systems to be called into question. Independent or "solo" living is commonplace in household arrangements and loneliness is on the rise, especially so in old age.[2]. Depression and other mental disorders abound, and suicide rates are in ascent.[3] Direct human contact has become an ever-scarcer good, being replaced by pervading technologies which often replace the real thing with a much lighter, undemanding, and emotionally-empty "virtual" version. When taken altogether, these happenings point toward the existence of a much neglected crisis pressing most economically developed societies, which appears to be *relational* in nature.[4]

## Happiness' three pillars

As per the opening quotation, in Latin American popular wisdom a happy existence is achieved from the intermixture of three comprehensive macro elements: health, wealth, and love –love being implicitly understood as the relational component of life. The vast majority of human wants and desires can be seen as subsets of these three pillars. Support for the relevance of this partition encompassing the main components of life satisfaction as a measure of well-being can be found in influential works such as Cantril (1965)[5] and Layard (2003) (p. 3). Nevertheless, while from an economic perspective health and wealth have for years been subject to extensive scrutiny and modeling, the literature has failed to acknowledge and give proper weight

[2]In England, for instance, living alone in later life has increased from 10% in 1945 to 37% in the late 1990s (Victor et al., 2002, p. 589). For empirical analyses on this issue using Israeli and Finnish data, see Cohen-Mansfield et al. (2009) and Jylh (2004), respectively.

[3]According to the World Health Organization (WHO), suicide rates increased 45% worldwide from 1950 to 1995, and suicide attempts were from 10 to 20 times more frequent than actual suicides. Moreover, suicide rates have increased particularly among young people (WHO, 2014).

[4]This hypothesis has already been advanced by authors such as Luigino Bruni, Benedetto Gui, Stefano Bartolini, and John Helliwell, among others.

[5]Individuals from 12 different countries were asked to rank items according to their relevance for happiness. The top three selected items across countries were "(Material) Living Level," "Family," and "Health" (See Cantril (1965), appendix E).

to the third element –epitomized by genuine, non-instrumental relationships– as as a fundamental component of a happy society. It has thus been given no structure and its effects on well-being remain vastly obscure. In this respect, the present study proposes an alternative categorization of non-instrumental relationships in the hope of simplifying its microeconometric formulation, providing a basic structure from which the direct impact of human relationality[6] on life satisfaction could be analyzed.

The hypothesis that a certain degree of relationality is necessary for human flourishing is at the backbone of this work.[7] Reasonably, then, health and material wealth are necessary but only up to a certain sufficiency point, above which they become superfluous and, in the case of the latter, may even prove detrimental to a person's happiness.

Following this line of reasoning, the utility function of a representative individual –given by $U(H, X, R)$– is made up of three basic arguments: health ($H$), standard of living ($X$), and genuine relationality ($R$). Arguably, the vast majority of factors commonly deemed important for human flourishing could be subclassified under one of these three categories.

## The third pillar: non-instrumental relationality

Although in some ways similar to the concept of social networks (*e.g.*, Granovetter (1973); Jackson (2008)) and embracing the values commonly referred to as social capital[8] (*e.g.*, trust, social engagement, etc.), the concept of *relational capital* hereby proposed is different in that it considers only non-instrumental relationships which

[6]The word "relatedness" has also been used to define this concept (Ryan and Deci, 2001).

[7]Given, of course, that at least a minimum survival level of health and wealth is met. Consider, for instance, the case of a person with poor physical health due to an accident or illness, but who nevertheless attains happiness by compensating her physical condition with a greater appreciation of the genuine relationships around her.

[8]For an overview of this literature, see Putnam (1995, 2000); Lin et al. (2001); Portes (1998); Bourdieu (1985), among others.

a person values intrinsically.[9] The non-instrumentality condition only admits meaningful, non-calculating, and emotionally-loaded relationships, which are interpersonal and fulfilling. By exclusion, then, instrumental relationships are characterized by being shallow in nature and by displaying a weak or non-existent emotional bond between the participants to the relationship. Frequency of contact cannot be, to this end, a determinant of instrumentality: instrumental relationships can exist even in the presence of a high frequency of contact, just as frequent contact is not necessary to preserve a non-instrumental relationship.[10]

The distinction between instrumental and non-instrumental relationships is relevant in that only the latter are retained crucial components to a person's happiness. In other words, increasing the number of instrumental relationships may not guarantee a reduction in, say, loneliness, and in some cases it may even exacerbate the problem.[11,12] This phenomenon can be illustrated by the striking technological advancements in the last decades: today, geographical distance poses a lesser challenge to communication thanks to the increasing availability of mobile phones and high-speed internet connections, making the world seem a much smaller place (almost like a virtual cafeteria). In spite of providing a framework for increased human interaction, in the long term it can lead to emotionally-empty relationships where only conventional forms of speech –*e.g.*, small talk– are accepted, and where the boundary between public and private life is at times impenetrable. Although people are communicating more, we are actually not "in touch" with one another. We have hundreds of acquaintances but very few friends –resulting at times in feelings of "outsiderness"

[9] As Nobel laureate Kenneth Arrow remarks, "much of the reward from social interaction is intrinsic –that is, the interaction is the reward" (Arrow, 1999, p. 3).

[10] Non-instrumental relationships can (and often do) arise from an instrumental setting (colleagues at work, closest butcher to home, etc.) but develop in time achieving non-instrumentality through concrete acts of kindness, trust, and gratuity between the agents.

[11] Through a review of several studies, (Nezlek, 2000) finds that, in predicting well-being, what matters most is the quality (rather than the quantity) of a person's interactions.

[12] "Nowhere does a man feel himself more solitary than in a crowd" (Goethe, 1992).

inside our own social networks.[13] This, in the course of time, may derive in ensuing loneliness[14] and unhappiness.[15,16,17]

Although appropriate data are very seldom available, the progressive fall in genuine relationships can nevertheless be inferred through various indicators of social isolation and lack of supportive relationships. For instance, the *ad hoc* social networks modules of the GESIS International Social Survey Programme (ISSP) document an increase in the percentage of people who declare not being able to ask any relative, friend, or neighbor for help from 1986 to 2001 (the only two years when this module was implemented). As seen in Figure 1.1, in 2001 the percentage of people who feel isolated in periods of illness as well as in financial terms has grown to almost double its 1986 size.[18] Moreover, Figure 1.2 shows a clear negative correlation between the proportion of people not being able to ask anyone for help (*i.e.*, the socially isolated) and life satisfaction by country.[19]

Costa and Kahn (2003) document a similar decline in the prevalence of close relationships for the case of United States. In their work, the authors claim that social

[13]Using a persuasive experience-sampling method, Kross et al. (2013) show that facebook use predicts declines in both affect and cognitive well-being over time. On the other hand, no such decrements in subjective well-being are observed when interacting with people directly (either face-to-face or by phone).

[14]Understood as the lack of people available or willing to share social and emotional experiences (Rook, 1984) or, equivalently, "a social deficiency –a discrepancy between one's desired and achieved social contact" (Peplau and Perlman, 1979).

[15]According to the Gallup poll, while television and telephones went from infrequent to prevalent among Chinese households in the decade after 1994, satisfaction with life actually declined slightly. Additionally, for a study which identifies loneliness as the cause of compulsive internet behavior and consequent negative life outcomes (such as lower subjective well-being) see Kim et al. (2009).

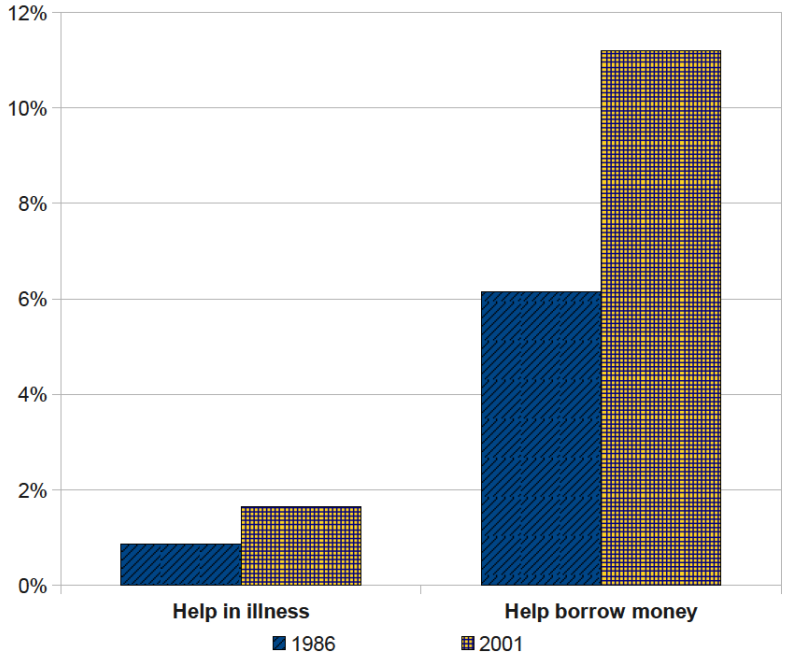
[16]Using a Canadian dataset and the European Values Survey, Helliwell and Huang (2013) document the different effects that real-life and on-line friends have on happiness. They find that, while the number of real-life friends is positively and significantly correlated with subjective well-being, the size of the virtual network remains largely uncorrelated.

[17]Ryan and Deci (2001) review a number of studies showing the positive link between relatedness and subjective well-being, affirming that "loneliness is consistently negatively related to positive affect and life satisfaction" (p. 154).

[18]For consistency, only those countries present in the 1986 study were considered (Australia, Austria, Great Britain, Hungary, Italy, United States, and West Germany). Sample sizes are 10,746 and 7,883 individuals in 1986 and 2001, respectively.

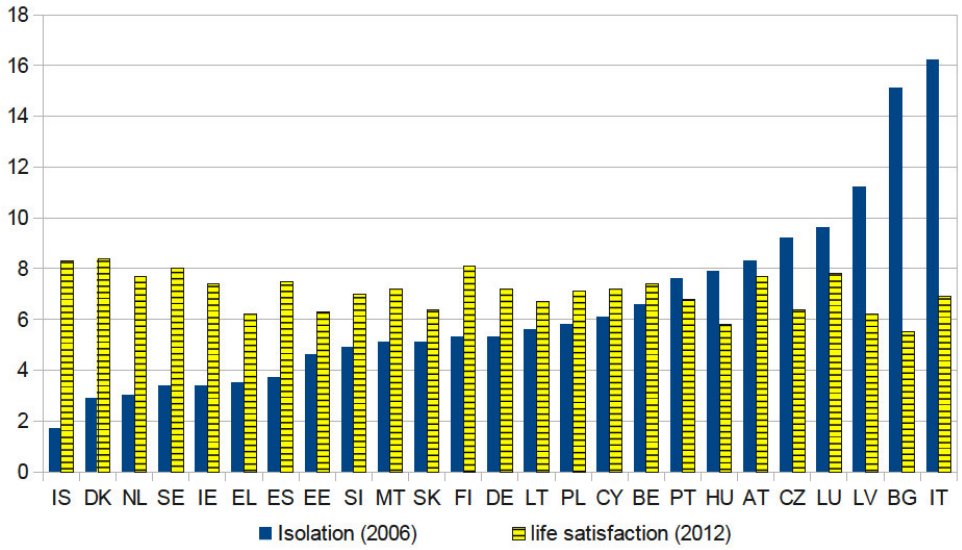
[19]The share of those who declare not having anyone to rely upon for help is approximately 7% in the EU on average.

**Figure 1.1:** Individuals not able to ask any relative, friend, or neighbor for help (%)




*Source:* GESIS ISSP Social Networks modules (1986 and 2001)

**Figure 1.2:** Isolation and life satisfaction by country




*Note:* life satisfaction is measured on a scale from 1 to 10; isolation is given as a percentage.
*Source:* Eurostat *ad hod* module on social participation (2006) for data on social isolation, and Eurostat SILC (2012) for data on life satisfaction

capital can either be produced within the community (*e.g.*, volunteering, membership in organizations, etc.) or at home (*e.g.*, visiting with friends, neighbors, family, etc.). Using data from the DDB Life Style Survey, the Gallup poll, America's Use of Time Survey, the Current Population Survey (CPS), and the General Social Survey (GSS), among others, they find that while only small declines in community-produced social capital are found, a steep negative trend is instead observed for social capital produced at home. The latter is evidenced, for instance, by a drop in the proportion of married individuals reporting entertaining people at home at least 12-24 times in the past year from 41% in 1975 to 20% in 1998, as well as by a sharp decline in the fraction of respondents who declare usually eating dinner together with their family (from 44% in 1977 to 26% in 1998) (see Figure 1.3). In addition, the proportion of people visiting with friends or going to parties in the 24 hour period before the interview dropped from 41% in 1965 to 27% twenty years later, and only 30% reported spending more than one social evening once a month with neighbors in 1998 (compared to 43% in 1974).[20].

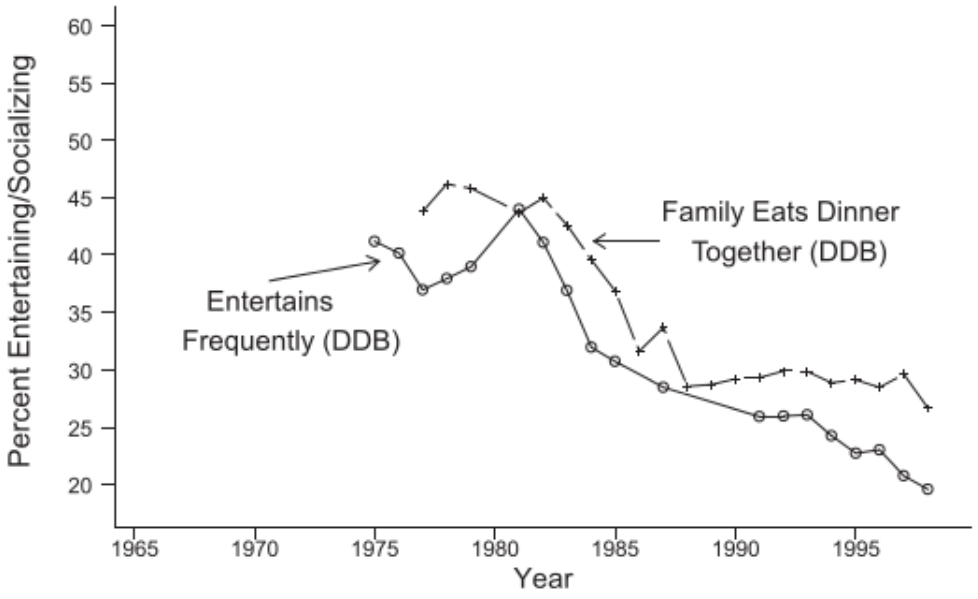
The importance of rebuilding torn social fabric based on genuine, supportive, non-instrumental relationships in order to tackle deficiencies in reported well-being has gained momentum in recent economics and sociology literature (Bruni, 2012; Gui, 2005; Gui and Sugden, 2005; Layard, 2003, among others). This evidences the novel willingness of scientists and researchers to go beyond the idea of a selfish and isolated *homo economicus*, replacing it with a much more realistic, contextual, and interdependent human prototype where others *do* matter.

## Categorization of non-instrumental relationships

An etymological exploitation of the third element in the opening quotation –namely, *love*– provides for a starting point to categorize non-instrumental relationships. Un-

[20]The sample is composed of respondents aged 25 to 54.

**Figure 1.3:** Percent of 25-34 year olds entertaining/socializing (1965-1998)




*Source:* Costa and Kahn (2003)

like English and other languages, ancient Greek used not one but four words to convey the full meaning of the concept of love as humans experience it, which is mainly contingent on the nature of the relationship: *storge* (family relationships); *philia* (friendships); *eros* (intimate relationships); and *agape* (charity and spirituality). Most –if not all– types of non-instrumental relationships could arguably be contained under such four categories. Albeit admittedly being an oversimplification of the richness of human relationships, this categorization constitutes the point of departure of the present research.[21] Its sole aim is that of providing a defined structure for the analysis of genuine relationships, both theoretically and empirically.

The nature of the first two categories –those considering the dynamics and resource transfers among family members and among friends, respectively– is self-explanatory; the latter two, however, deserve additional elucidation. It has been widely held throughout the years –and still is to-day, perhaps even to a greater extent– that

[21] Arguably, more than one form of relationality may be present and intermingled in a given exchange. Think, for instance, of spouses who develop bonds of friendship (or *vice-versa*).

eros is just another word to describe the carnal element of sexual desire present in some relationships of intimacy. Such connotation is quickly perceived in eros' etymological derivatives, epitomized by the word *erotic*. Yet, in Plato's *Symposium* physical attraction was not necessarily a part of eros, since eros seeks a beauty which is eternal and physical appearance does not in any way comply with such requirement.[22] Consequently, to avoid any ambiguity it is imperative to clearly define the meaning given to eros throughout the present work. Our treatment of eros is not be concerned directly with human sexuality simply as such, but rather as an integrating element of a much more complex relationship. The relevance of such clarifying statement lies in the fact that sexuality and eros are seen as complements rather than substitutes: sexual activity can take place instrumentally and outside a relationality framework, while eros as intended here denotes a non-instrumental relationship of which the sexual experience is but one of its possibly many elements.[23] Thus the description of eros as *intimate* relationships: intimate in the sense of being particularly close, personal, and particularly private nature. This includes, but is not limited to, simple dating, engaged and cohabiting couples, civil unions, domestic partnerships, and marriages.

On the other hand, agape has been defined as "an intentional response to promote well-being when responding to that which has generated ill-being" (Oord, 2005, p. 934). Moreover, Montague (2006) elucidates that unlike eros and other forms of relationality, an agape relationship is a purest seeking of the other's good and not a promotion of one's own self-interest. For our purposes, agape is the unconditional regard of one person for another which is not fully contained under the eros, philia, or storge categories and which encompasses charitable actions intentionally and selflessly

[22]For an entertaining mythological story of how eros and sexual orientation came into being, see Aristophanes' speech –also known as "Myth of the Androgyne"– in Plato's *Symposium*: "It is from that time that the innate Love [Eros] of humans for each other came to be, and draws us to that primeval nature, and as a consequence makes one out of two ["hen ek duoin"] and heals humanity's nature." Popular idioms, such as "platonic love" as well as the usage of "my other half" to describe one's partner, spurred from this tale.

[23]This distinction is made with the sole purpose of limiting our analysis to genuine non-instrumental relationships and as such is intended to infer no moral implications of any kind.

directed to *exoteric*[24] individuals. Working as a volunteer, personally helping the poor, assisting the old in a nursing home, participating in church activities as well as frequency of prayer are all indicators of time contributions to agape relationality; in turn, financial contributions are exemplified by charitable donations as well as philanthropic funding, to name a few. For organizational clarity and to differentiate financial contributions emanating from agape relationality alone, donations under this category are those directed exclusively toward exoteric individuals or organizations.

As soon as concrete examples of agape relationality are offered, we start wondering about the intentions driving a person's acts of generosity. These questions are legitimate because, in classifying an action as a charitable one, motives matter. In many cases it could be argued that behind an act of charity there are self-centered motives of prestige and/or reputational gain.[25] However, and in line with the previous paragraphs, by definition an act of agape relationality cannot be classified as such in the absence non-instrumentality. Empirically, charitable inputs are usually taken as given, since most available data do not allow for a breakdown of the true underlying reasons motivating an act of giving (*i.e.*, whether it is altruistic or selfish, generous or meager).[26] Examining the real motives that fuel individual acts of charity and spirituality goes therefore beyond the scope of this work and is left as fertile soil for future research.[27]

[24]Intended as all entities (*e.g.*, people, organizations, charitable foundations, etc.) who do not classify as members of the agent's in-group, which consists of her extended family, group of friends, or sentimental-life circle.

[25]Becker (1974b) observed that "apparent 'charitable' behavior can also be motivated by a desire to avoid scorn of others or to receive social acclaim" (p. 1083).

[26]Becker (1991, p. 279) faced a similar conjecture when defining altruism: "I am giving a definition of altruism that is relevant to behavior –to consumption and production choices– rather than giving a philosophical discussion of what 'really' motivates people."

[27]A theory of *impure altruism* is presented in Andreoni (1989) and Andreoni (1990). The author builds a model where an individual's charitable actions are the by-product of two forces: a *purely egoistic* one motivated by selfish feelings of "warm-glow" and a *purely altruistic* force where the individual cares only about what her gift produces for the community (*i.e.*, a charitable gift is meaningful only if it increases the supply of the public good). Thus, when those two forces are combined to induce an individual to act in a charitable way, the agent is said to be *impurely altruistic*.

In what follows, in Section 1.2 a brief model model which could serve as general prototype portraying non-instrumental relationships in their most basic form is proposed, followed by a model of relational capital in Section 1.3. A short reflection on the challenges posed by the concept of forgone earnings to life satisfaction studies follows in Section 1.4. Finally, the conclusions are presented in Section 1.5.

## 1.2 A Model of Stability of Non-Instrumental Relationships

Several strands of literature have proposed to characterize certain elements of human behavior and relationality into a set of formulas and mathematical equations. Sociologists, psychologists, mathematicians, and economists have all contributed their share in the discussion. Perhaps one of the better-known theorists –at least in the field of economics– to write about the issue is Nobel prize laureate Gary Becker. His economic theory of marriage (Becker, 1973) is grounded on the rationality assumption which is considered to underlie all human choices, including those governing human relationships. Becker's analysis relies upon two main assumptions: first, people choosing to get involved in an intimate relationship can be assumed to do so because they rationally expect to raise their utility to a higher level than what it would otherwise be were they to remain single; second, a *marriage market* is assumed to exist, imposing restrictions through the so-called "search costs" on individuals looking for a mate (p. 814). Therefore, in forming a relationship every single step is rationally taken by individuals, from choosing the optimal partner with the right traits at the optimal time –so that search costs are minimized– to breaking up, switching partners, or getting more than one companion for the sake of maximizing one's own personal utility.

Based on economic tradition and classical preference theory, the model presented hereafter sides with Becker in presuming that rationality plays a fundamental role in human decision-making. As such, the model assumes that, throughout life, people's nurturing of non-instrumental relationships is reflected in higher utility levels. More specifically, an agent $i$ seeks to maximize the following monotonous and strictly quasi-concave utility function, which is an increasing function of her own consumption and the stability level of the relationship:[28]

$$u_i(x_i, S) \tag{1.2.1}$$

subject to[29]

$$px_i + h = y = wt^y \tag{1.2.2}$$

$$t^y + t^S = 1 \tag{1.2.3}$$

where

$$S = S(\varphi_i\, t^S, (1 - \varphi_i)h) \tag{1.2.4}$$

As opposed to Becker's marriage market, this model presumes that agent $i$ has already gone through the search and selection process and thus currently shares a non-instrumental relationship with agent $j$. In other words, $i$ has rationally decided that $j$ represents the best fit of all available options in the relationships market and thus sharing a relationship with $j$ maximizes $i$'s expected utility.[30]

[28]For simplicity the model is reduced to a one-period (thus, no uncertainty) two-agent scheme, where agent $i$ maintains only one non-instrumental relationship (*e.g.*, with agent $j$).

[29]The present study does not consider *leisure* as a component of the time constraint. Our approach takes support in Becker's (1965) "A Theory of the Allocation of Time," which asserts that the concept of forgone earnings is more important than that of leisure for economic analyses since leisure as a concept cannot even be defined properly and reliably (so far it has been commonly defined in the literature as the residual between total time available and time at work, which is ambiguous at best).

[30]For a theory on assortative mating see Chapter 4 of Becker's *Treatise on the Family*. Our model starts being effective only after the relationship has been established.

Without loss of generality, the total time available to agent $i$ for production and consumption activities has been scaled to 1; $p$ is the price of the single commodity $x$; $h$ represents the amount of monetary contributions invested in the relationship; and $y$ stands for $i$'s total income, which is given is by the hours worked $t^y$ times the wage rate $w$. A *value of proximity* factor is included under $\varphi_i$ $(0 < \varphi_i < 1)$ and accounts for the differential weight given by agent $i$ to the time spent with her *mate* or *confidant*[31] as opposed to making monetary contributions. Its inclusion is motivated by the fact that personal interaction arguably implies more proximity with the confidant and may therefore induce higher levels of satisfaction for certain individuals. Moreover, $\varphi_i$ gives room to a personalized relationship: it supplements forgone earnings as the only determinant of choice.

As indicated in equation (1.2.1), agent $i$ does not only care about her own personal consumption $x_i$ but also about the stability $S$ of her relationship with agent $j$. This has led me to define a "stability production function" (1.2.4), whose arguments are the time $i$ spends with $j$ (*i.e.*, $t^S$) and the expenditures and money transfers $h$ that she invests in the relationship. Hence, such equation acts as an investment function similar to the one conceived in Grossman (1972) seminal work on health production, and displays the following properties:

$$\frac{\partial S}{\partial t^S} > 0,\ \frac{\partial^2 S}{\partial (t^S)^2} < 0,\ \frac{\partial S}{\partial h} > 0,\ \frac{\partial^2 S}{\partial h^2} < 0$$

The aim of such a set-up is that of producing a series of resource-allocation trade-offs between time and money transfers, as well as between personal consumption and shared relational stability.

[31] Both adjectives will be used interchangeably and are hereby preferred to other terms since they both accomodate a non-instrumental connotation in their original context, *i.e.*, *mate* = from Old English *gemetta* ("sharer of food, table-guest"); and *confidant* = from Latin *com-* and *fidere* ("trustworthy").

Substituting the time and budget constraint into the objective function (1.2.1) we get:

$$u_i(x_i, S(\varphi_i\ (1-t^y), (1-\varphi_i)(wt^y - px_i)))$$

which, when maximized with respect to $x_i$ and $t^y$, yields the following first order conditions:

$$\frac{\partial u_i/\partial x_i}{\partial u_i/\partial S} = \frac{\partial S}{\partial h} p(1-\varphi_i) \tag{1.2.5}$$

$$\frac{\partial S/\partial t^S}{\partial S/\partial h} = \frac{w(1-\varphi_i)}{\varphi_i} \tag{1.2.6}$$

Equations (1.2.5) and (1.2.6) represent respectively the marginal rates of substitution between consumption and relationship stability (given by the effect of contributions $h$ on stability $S$, normalized by the price of consumption $p$ and the value of proximity $\varphi_i$) and between the allocation of time and money to the rapport (given by agent $i$'s wage weighted by the value assigned to proximity). An intuitive way to interpret equation (1.2.6) is by alluding to the concept of opportunity cost or forgone earnings: the higher $i$'s wage, the more earnings she would have to give up in order to spend more time $t^S$ with her mate. Putting it still differently, the opportunity cost of $i$'s time increases with her wage. Nevertheless, such opportunity cost is offset by $i$'s appraisal of quality time with her mate, given by $\varphi_i$: a higher value attached to physical proximity lightens the weight of wage and price in the resource allocation decision.

Agent $i$'s time and money will then be distributed in such a way as to maximize her own utility, depending on the importance she assigns to personal consumption of any kind and to the state of affairs with her mate. The logic goes as follows: if $i$ cares enough about her relationship with $j$ (as required by the non-instrumentality condition), she will be willing to spend some of her time and money to ensure that the correct maintenance is given to the preservation and prolongation of such a rela-

tionship, which in turn renders her own life, if not more pleasurable, at least not as disagreeable.

The fact that relationship stability is an argument in $i$'s utility function implies that she is content as long as her mate is *at ease* with the relationship. An unsatisfied mate will endanger the stability of such relationship, directly affecting $i$'s utility. Reciprocity issues are thus not considered here since I assume for simplicity that the relationship depends solely on $i$'s efforts –namely, her time inputs and contributions of market goods. This particularity is more easily understood if we follow Becker (1991) treatment by expanding our model so that stability is produced by one mate and consumed by both.[32] Letting $i$ be the deferential[33] producer, both her own consumption $S$ as well as $j$'s gains in utility enter $i$'s preferences in the following form:

$$u_i(x_i, S, u_j(S)) \tag{1.2.7}$$

where both $u_i$ and $u_j$ are monotonous and strictly quasi-concave, and the latter –namely, $u_j$– is perfectly known to confidant $i$. Moreover, the following conditions are met:

$$\frac{\partial u_i}{\partial x_i} > 0;\ \frac{\partial^2 u_i}{\partial x_i^2} < 0;\ \frac{\partial u_i}{\partial S} > 0;\ \frac{\partial^2 u_i}{\partial S^2} < 0;\ 0 < \frac{\partial u_i}{\partial u_j} < 1$$

The last condition, $0 < \partial u_i/\partial u_j < 1$, serves as indicator of how much $i$ cares about her mate. Under this treatment, confidant $j$'s preferences are not deferential, however, as $u_j$ is an increasing function of $S$ alone and does not in any way depend on $u_i$.

[32]For further reference, see Becker's models of altruistic behavior and the resulting "rotten kid theorem."

[33]To take up Pollak (2003) terminology, aimed at highlighting the characteristics of altruism from an economical point of view.

Now, suppose that $j$'s preferences regarding the relationship are known by $i$ and are averaged into a single value of proximity parameter $\varphi$ such that[34]

$$0 < \varphi = \frac{\varphi_i + \varphi_j}{2} < 1 \tag{1.2.8}$$

which enters the stability production function as follows:

$$S(\varphi t^S, (1-\varphi)h)$$

where $t^S$ and $h$ keep their meanings as $i$'s time and monetary contributions to the relationship. Subject to constraints 1.2.2 and 1.2.3, the Lagrangian function for this system can be expressed as follows:

$$\begin{aligned} max \;\; \mathcal{L}(x_i, h, t^S) =& u_i(x_i, S(\varphi t^S, (1-\varphi)h), u_j(S(\varphi t^S, (1-\varphi)h)) \\ &+ \lambda[w(1-t^S) - px_i - h] \end{aligned} \tag{1.2.9}$$

After maximizing (1.2.9) and disentangling the first order conditions algebraically, we obtain:

$$\frac{\left(\frac{\partial u_i}{\partial x_i}\right)}{\left(\frac{\partial u_i}{\partial S}\frac{\partial S}{\partial h} + \frac{\partial u_i}{\partial u_j}\frac{\partial u_j}{\partial S}\frac{\partial S}{\partial h}\right)} = (1-\varphi)p \tag{1.2.10}$$

$$\frac{\left(\frac{\partial u_i}{\partial S}\frac{\partial S}{\partial t^S} + \frac{\partial u_i}{\partial u_j}\frac{\partial u_j}{\partial S}\frac{\partial S}{\partial t^S}\right)}{\left(\frac{\partial u_i}{\partial S}\frac{\partial S}{\partial h} + \frac{\partial u_i}{\partial u_j}\frac{\partial u_j}{\partial S}\frac{\partial S}{\partial h}\right)} = \frac{(1-\varphi)w}{\varphi} \tag{1.2.11}$$

Equations (1.2.10) and (1.2.11) mimic those obtained beforehand, namely and respectively (1.2.5) and (1.2.6). Yet, in the newly-developed equations the impact of

[34]Recall that, according to our own treatment of the term, non-instrumental relationships must be particularly close and personal. Therefore, I do not consider it venturous to assume that agent $i$ is aware of $j$'s perceptions and wants regarding the relationship –given in particular by $\varphi_j$; she will thus distribute her resources sensibly as to ensure $j$'s most urgent needs are met first.

time and money spent by $i$ on the stability of the relationship enjoyed also by $j$ is visible and directly influences the allocation of $i$'s resources. To illustrate, the price of consumption goods $p$ depicts the give-and-take relationship between $i$'s consumption and her allocation of financial resources to the production of relationship stability. It is as if she were to weight her money-spending choices at each moment in time: she will opt for increasing personal consumption whenever her marginal utility from $x_i$ is higher than the marginal utility she would otherwise get from investing one more dollar on the soundness of her relationship. The latter is measured by the effect of such investment on her own utility level $u_i$, through its direct effect on both $i$'s and $j$'s consumption of stability.

With respect to equation (1.2.11), $i$'s wage $w$ gives the trade-off between the amount of time and money alloted to the stability of her union with $j$, only that now $j$'s consumption of each market good is included in the calculations. *Caeteris paribus*, in an allegorical situation where a high $\varphi_j$ is observed, $i$ would increase the time she spends with her confidant ($t^S$) given her confidant's higher regard for companionship over gifts and money. In such a case, for instance, it is in $i$'s best interest plan a vacation together (*e.g.*, to her summer house) instead of buying her mate a new TV set with surround system. The aforementioned behavior would render $j$ much more comfortable with the relationship and its stability, beneficially affecting $i$'s satisfaction.

It is worth mentioning that $i$ is by no means trying to please $j$ blindly and foolishly. Some conditions must be met in order to delimit the situation under which it would indeed be in $i$'s best interest to maintain a stable relationship with $j$. This happens

as long as the following condition holds:[35]

$$\frac{\partial u_i}{\partial S} \geq 0$$

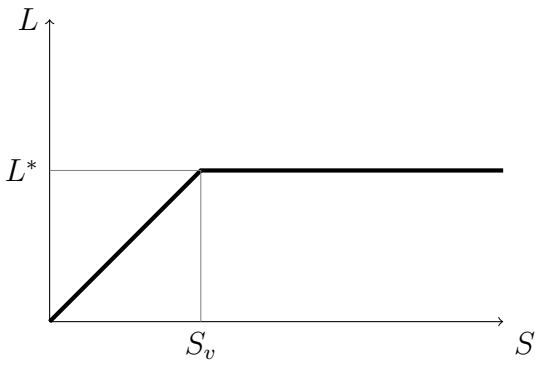
Otherwise, agent $i$ could, under reasonable terms, arrive at the conclusion that her relationship with $j$ is not worth the effort. She would then start decimating the amount of time and money she puts into the relationship, which, after decreasing beyond a minimum level, would render the union unstable (*i.e.*, $S = 0$).

In this regard, however, it is useful to note that termination is an option of last resort in non-instrumental relationships. Non-instrumentality requires loyalty: without loyalty, genuine concern for the other is lost and the concept of non-instrumentality collapses. Moreover, loyalty ensures that the relationship in itself and its stability thereof are of intrinsic value to the participants. In turn, when the stability of a relationship is put to risk by one of the agents, loyalty guarantees the existence of an alert system that aims at re-establishing or recuperating stability.[36] In the spirit of Hirschman (1970), I will refer to this recuperation system as "voice." The logic is as follows: there exits a critical relationship stability level at which a voice of alarm is given by one of the participants to the relationship. This serves as a warning message to signal relationship weakness and endangered stability. If the voice of the consuming mate is *heard* by the other (implying that concrete actions are taken to fix the issues that prompted voice in the first place), then stability is recovered and no termination takes place. Otherwise, if a mate does not *hear* or ignores the voice of the

[35] Even though equality does not provide agent $i$ with any utility whatsoever, I include it here since I assume that no utility is better than negative utility, implying that it would be enough to not have any disutility in order to stay in a relationship; in this manner, the huge costs that come with relationship termination (*e.g.*, legal costs of divorce in the case of spouses, of psychological care for broken parent-child relationships, of social exclusion from a group of friends, of setting out a new search for mate, etc.) would be avoided.

[36] "[T]he barrier to exit constituted by loyalty is of finite height –it can be compared to such barriers as protective tariffs. As infant industry tariffs have been justified by the need to give local industry a chance to become efficient, so a measure of loyalty to a firm or organization has the function of giving that firm or organization a chance to recuperate from a lapse in efficiency" (Hirschman, 1970, p. 79).

**Figure 1.4:** Loyalty as a function of the stability of a non-instrumental relationship



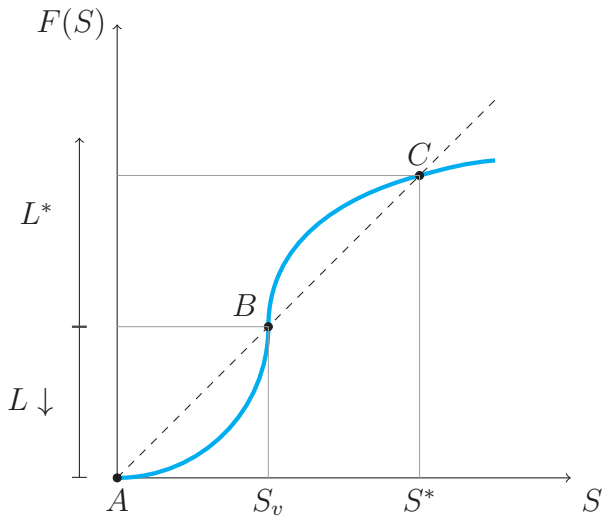

other and continues to behave detrimentally to the stability of the relationship, the loyalty condition is violated and the relationship will come to an end. In other words, termination is the consequence of the instrumentalization of the relationship, which results in $\partial u_i/\partial S < 0$. The voice mechanism is effective insofar as the termination option exists and is credible.[37]

It is as if loyalty $L$ followed the path given in Figure 1.4, where it is mapped on relationship stability $S$. Here, $L^*$ gives the minimum non-instrumentality level of loyalty, above which the relationship is stable. $S_v > 0$ stands for the critical stability threshold where voice occurs. Loyalty drops below $L^*$ when voice is not heard, eventually reaching the break-up level or termination point $S = 0$. Although the distance between $S = 0$ and $S_v$ is individually determined, the loyalty component of a non-instrumental relationship ensures that no termination can take place without a precedent voice signal.

Similarly, the stability of a non-instrumental relationship could be expressed in terms of inter-temporal equilibria. Figure 1.5 shows the three possible equilibria –$A$, $B$, and $C$– given by the condition $F(S) = S$, where $F(S)$ is a function of relationship stability. A relationship eventually converges to the stable equilibrium $C$ as long as it lays at a point on the $S$-axis above $S_v$. Nevertheless, the relationship is placed at

[37]In some cultures, termination of familial relationships (*i.e.*, those labeled under the *storge* category) may be seen as particularly improbable, often justified by "family is not chosen"-type beliefs.

**Figure 1.5:** Equilibria of a non-instrumental relationship




an unstable equilibrium $B$ when voice is raised by one of the confidants. If voice is heard, the relationship moves toward stability; otherwise, if voice is ignored stability converges to $A$ where $S = 0$ and break-up occurs.[38]

The existence of voice and loyalty in non-instrumental relationships does away with the possibility of "cold-switching" of mates whenever two relationships were mutually exclusive.[39] More specifically, cold-switching will not take place even in the case that a better option $k$ is believed to exist in the relationship market, a situation epitomized by $(\partial u_j/\partial S^i) < \{\partial u_j/\partial S^k\}$, where $S^i$ and $S^k$ represent the stability of $j$'s relationships with agents $i$ and $k$.[40] The argument is based on the fact that, obliged by the loyalty condition, $j$ will voice her preference for $k$, after which two possibilities exist: $a$) voice is heard by $i$ and disputes are solved, equalizing or surpassing theoretical benefits of switching to $k$, *i.e.*, $(\partial u_j/\partial S^i) \geq \{\partial u_j/\partial S^k\}$; or $b$) voice is ignored and $(\partial u_i/\partial S_j) < 0$, after which the relationship is terminated

[38]For simplicity, voice is taken as a discrete signal at a given point in time, although in real life it could be made up of many different signals spanning a much longer time interval.

[39]Moreover, the non-instrumentality condition provides a exclusion mechanism for those behaviors in which loyalty is lost or not present (*e.g.*, cheating on spouse, child abandonment, etc.).

[40]The curly braces are used to highlight the fact that such relationship must be hypothetical in nature, given that, by definition, two mutually exclusive relationships cannot exist simultaneously.

and $i$ goes back to the relationship market. This latter case opens the door for a new search to be started by $i$; agent $k$ will be chosen only if she remains the best option. At this point, however, being concerned with the effects of existing non-instrumental relationships on life satisfaction, the formation process dynamics of genuine relationships lays outside the scope of this work and is left for further research.[41]

As has been shown, the concepts of exit, voice, and loyalty introduced in Hirschman (1970) are palpable in non-instrumental relationships. Combined with traditional economic concepts, they serve as tools to characterize the frailty of human relationships.[42]

Theoretically, the aforementioned model aspires at encompassing all four types of non-instrumental relationships. Its mechanism can readily seem appropriate for family, friendship, and intimate relationships, where the receiver is clearly defined and can tangibly voice concerns. A less intuitive situation is presented for the case of agape relationships where, contrastingly, voice may result from either an external situation (*e.g.*, a charitable fund request, people in need, etc.) or an internal need (*e.g.*, spiritual void, generosity urge, etc.). In any case, voice exists, which justifies the proposed theoretical conception even in such a case.

Given the positive essence that differentiates genuine relationships from other – perhaps more pragmatic– types of relationality, the model presented in this section attempted to provide the agents with a restorative signal mechanism aimed at preserving the stability of such rapports from within. Ultimately, by positively entering the

[41]Bruni (2012) hypothesizes that they are founded on acts of kindness and gratuity.

[42]C.S. Lewis illustrates the frailty of eros relationships in particular by stating that "[w]e have all heard of people who are in love again every few years; each time sincerely convinced that '*this* time it's the real thing,' that their wanderings are over, that they have found their true love and will themselves be true till death...Eros is driven to promise what Eros of himself cannot perform" (Lewis, 1960, p. 158).

utility function, a stable non-instrumental relationship translates into higher levels of well-being. In other words, genuine relationships *matter*.

## 1.3 Relational Capital: The Tie that Binds

A central proposition of this paper is the existence of a *relational* capital, built in the form of a stock, which can indeed be modeled and (possibly) measured empirically. In building the model, I follow the strategies originally set forth by Becker (1965) and Grossman (1972), claiming that non-instrumental relationships are goods which can be both consumed and produced by the people involved.[43] Moreover, a new commodity arises from such an interaction or "encounter," which has often been referred to as a *relational good*[44] (Gui, 1987, 2005; Gui and Sugden, 2005; Uhlaner, 1989).

Much like health in the Grossman model, relationships can be viewed in the aggregate as a durable stock which produces an output of "happy days" characterized by peace of mind[45] and a sense of belonging. In particular, by consuming and producing quality relationships an individual seeks to minimize the amount of "sad days" in her life, which are marked by solitude, depression, and emotional instability.[46] Therefore,

[43] According to the dialogue held between Socrates and Diotima in Plato's *Symposium*, love is the offspring of *Poros* (resource) and *Penia* (poverty). As such, love bears the traits of both her mother (impoverished and needy) and father (resourceful and generous). This provides a philosophical precursor to the proposition of treating relationships as both consumption and investment goods.

[44] "[T]he affective components of interpersonal relations [that] are usually perceived as having value through their sincerity or genuineness" (Gui and Sugden, 2005, p. 3).

[45] To take up Grossman's (1972) own terminology in his illustrative definition of derived demand: "...consumers produce commodities with inputs of market goods and their own time. For example, they use traveling time and transportation services to produce visits; part of their Sundays and church services to produce 'peace of mind'; and their own time, books, and teachers' services to produce additions to knowledge. Since goods and services are inputs into the production of commodities, the demand for these goods and services is a derived demand" (p. 224).

[46] On loneliness not being a desirable human state: "Men think that the happy man ought to live pleasantly. Now if he were a solitary, life would be hard for him; for by oneself it is not easy to be continuously active; but with others and towards others it is easier" and "[s]urely it is strange, too, to make the supremely happy man a solitary; for no one would choose the whole world on condition of being alone, since man is a political creature and one whose nature is to live with others. Therefore even the happy man lives with others" (Aristotle, 1999, p. 158). Moreover, "loneliness is increasingly recognized as a cross-cultural affliction, one that can be hazardous to health and hostile to happiness. Indeed, rampant loneliness signals serious social breakdown. Although loneliness is a

relationships are the goods to be produced, for which other goods and services (*market goods*) as well as *time* can be used. The demand for such goods and services is consequently a derived demand.

It is assumed that individuals inherit an initial relational stock which depreciates over time, but which can be increased by investing in each or all of its four components. As in the Grossman model, the gross investments in relational capital for each of its components include the consumer's own time and investments in the type of market goods. For a particular individual, each component has a specific weight which determines its importance in the production of relational capital.

An important point to make is that, in contrast with health capital in the Grossman model, here relational capital is split up into different components, each acting as an autonomous member which not only depreciates over time but could also be augmented through localized investments. Nevertheless, in order to get a measure of relational capital as such, *storge*, *agape*, *eros*, and *philia* must be examined altogether and in consonance; in this way not only their individual significance but also their interactive potential can be captured. To illustrate, a married person will display high levels of eros relationality, while single individuals will arguably tend to be more active in their relationships with family and friends.[47] Similarly, a monk would make up for the lack of intimate relationships with more acts of charity, spirituality, and community involvement. Consequently, the level of relational capital is not exogenous but rather influenced by the individual through the allocation of her own personal resources in each of the four components, which together determine her relational stock.

perennial, indeed, an immemorial human nemesis, it is thought to have reached epidemic proportions in the present era... loneliness must be considered an evil insofar as it can be an excruciating physical pain, as well as a searing mental and spiritual suffering. Gabriel Marcel insists that *loneliness is the only suffering*" (McGraw, 2000, p. 145).

[47]Helliwell and Huang (2013) find that the positive effect of having real-life friends on life satisfaction is larger for non-married people, providing evidence for a sort of substitution effect between spouses and friends.

In our model, relational capital is inherently related to health capital: shocks to one's relational stock could possibly affect one's health as well. For instance, the loss of a loved one would lead to periods of stress and depression, which have consistently been shown to produce a strong negative effect on health (*e.g.*, Moussavi et al. (2007); Kennedy et al. (1991); Rumsfeld et al. (2003)).[48] In the most extreme of all cases, large negative shocks to relational capital could even lead an individual to death through, for instance, the heavy burden of depression and a consequent suicide (*e.g* Sable (1992); Davila and Daley (2000); Ledgerwood (1999); Thomas et al. (2002); Sheftall et al. (2013); Grunebaum et al. (2010)). Though clearly in the majority of cases a decrease in relational stock does not directly cause an individual to die (fortunately so), it nevertheless poses a strong indirect force on both life satisfaction and health, which can prove determinant to her life expectancy.[49] Thus, without loss of generality, we can assume that for each individual there exists a minimum level of relational stock below which "life is not worth living"[50], or in other words, death occurs. This is not to say, however, that in all cases death is the result of an insufficient level of relational capital (in most cases it is not).[51] Indeed, arriving at such minimal level of relational capital seems to be the exception and not the rule in human interactions.

Consequently, my interest is not on the direct effects of relational capital on health but rather on an individual's life satisfaction and well-being. My hypothesis is that

[48]Using data from the World Values Survey, Moussavi et al. (2007) find that, after adjusting for other socioeconomic factors and health conditions, depression produces the most detrimental effect on mean health scores compared with other chronic conditions, such as asthma and diabetes.

[49]Recent studies have consistently documented a positive link between relationships and good health. For instance, social support increases breast cancer survival (Kroenke, 2013); relationality in old age protects against cognitive decline (James et al., 2011); marriage helps improve cancer survival rates (Aizer et al., 2013) as well as survival rates after cardiovascular interventions (King and Reis, 2012); and having strong social connections can improve a person's odds of survival by 50% (Holt-Lunstad et al., 2010).

[50]Phrase immortalized by Socrates' famous quote in Plato's *Apology*: "the unexamined life is not worth living" (38a)

[51]The partial inter-factor substitutability in our model makes it more difficult for this minimum level of relational capital to be reached than it is, for instance, to arrive at the "unavoidable death" level of health in Grossman's work.

there exists a threshold level of life satisfaction or a given amount of "happy days" which is unachievable unless serious deficiencies in relational capital are addressed, reduced and/or eliminated.

As usual in this type of capital models, the production of relational stock depends on "environmental variables" which determine the efficiency of the production process. Although the literature has for long considered the level of education as the most important environmental variable (*e.g.*, Grossman (1972); Becker (2009)), in our model a much broader interpretation of environmental factors is taken up. Accordingly, the efficiency of investments in the production of relational capital depends on those environmental factors which shape up an individual's social attitudes, capabilities, and personality. Take, for instance, the educational choices and other lifetime opportunities that influence human behavior through their effects on cognitive abilities;[52] or the differential weighting of life values that result from diverse circumstances and upbringings. Comparatively, an individual who places a higher importance on values of generosity, service to others, positive reciprocity,[53] trust, and sincerity will arguably be more efficient in producing genuine relationships than someone who favors selfishness, antagonism, material possessions, and prestige. Therefore, environmental forces –which include, but are not limited to, educational achievements– are hence determinant to human relationality through their tailoring of a person's mental abilities and life values.[54]

Finally, similar to health in the Grossman model, non-instrumental relationships are demanded by consumers for two reasons: *a*) as a consumption good directly

[52]In psychological studies, cognitive abilities are prominent among the five major domains commonly used to categorize individual differences in behavior (the other four being personality, social attitudes, psychological interests, and psychopathology) (Lubinski, 2000). Although admittedly to a large extent genetically determined, the operation of environmental effects on cognitive abilities is widely acknowledged in psychological literature (Bouchard and McGue, 2003).

[53]As opposed to reciprocity in general, which accepts negative retaliation.

[54]Using longitudinal data, Judge et al. (1999) highlight the importance of accounting for both mental abilities and personality traits –as proxied by the Five-Factor Model (FFM) of personality– in predictive analyses of life outcomes such as career success.

entering their utility function, reducing the amount of "sad days" which produce disutility; and $b$) as an investment good, determining the amount of time available for market and non-market activities. The dual nature of a commodity introduced by Becker (1965) is thus re-adopted in our model.

Admittedly, the bases have been set for the construction of a theoretical framework in which philia, agape, eros, and storge are combined into a single model of relationality. We propose the following model as the tie that binds all four categories of relationality together and incorporates them to form an individual's composite relational stock.

A two-period modeling set-up is adopted to explore the dynamics of the relational stock (see Zweifel et al. (2009) for a similar exercise on the Grossman model). We consider an individual whose life extends for two periods, and in each period she experiences a non-negative amount of "downtime" $\underline{t}$. Such downtime is characterized, among other things, by depression, sadness, and/or loneliness. Her utility function is time independent; that is, the marginal rate of substitution between downtime and consumption does not change with age. A discount factor $\beta \leq 1$ is applied to all future utility. Consequently, the agent maximizes:

$$u_i = u(\underline{t}(RC_0), x_0) + \beta u(\underline{t}(RC_1), x_1) \tag{1.3.1}$$

with

$$\frac{\partial u}{\partial \underline{t}} < 0, \frac{\partial^2 u}{\partial \underline{t}^2} > 0, \frac{\partial u}{\partial x} > 0, \frac{\partial^2 u}{\partial x^2} < 0, \frac{\partial \underline{t}}{\partial RC} < 0$$

Relational capital $RC$ depreciates at rate $\delta$, causing downtime to increase over time; such decrease is counterbalanced by the investments made to augment such stock (in the form of time investments $t^{RC}$ and market goods $M$, which includes financial transfers). As a result, the change in relational stock over time is characterized

by the following equation:

$$RC_1 = RC_0(1-\delta) + I(M, t^{RC}; V) \tag{1.3.2}$$

Some important housekeeping remarks about the investment function –namely $I(M, t^{RC}; V)$– are in order. Firstly, and as mentioned earlier, $V$ is an aggregate of environmental variables encompassing an agent's mental capabilities and life values (*e.g.*, education, trust, altruism, honesty, loyalty, etc.) and determining the efficiency of her investments in the production of relational capital. Arguably, the display of certain values in an individual's preferences as well as her acquired abilities would increase the efficiency of her investments. Secondly, investments in genuine relationality are made by investing directly in any of its four components. This means that investments have an impact on an individual's relational stock insofar as they are done through one of its proposed elements. One could think of philia ($P$), agape ($A$), eros ($E$), and storge ($S$) each as individual stocks following similar dynamics as the relational stock itself, *i.e.*,

$$P_t = P_{t-1}(1-\delta^P) + I^P(M^P, t^P; V)$$

$$A_t = A_{t-1}(1-\delta^A) + I^A(M^A, t^A; V)$$

$$E_t = E_{t-1}(1-\delta^E) + I^E(M^E, t^E; V)$$

$$S_t = S_{t-1}(1-\delta^S) + I^S(M^S, t^S; V)$$

while their respective evolution in time determines the rate at which the relational stock evolves in time. Without loss of generality, it can be assumed that total investments in relationality are given by the sum of all the individual investments made in each of its four components, a set-up which will in turn preserve the complementarity

nature of the elements:

$$I(M, t^{RC}; V) = I^P(M^P, t^P; V) + I^A(M^A, t^A; V) + I^E(M^E, t^E; V) + I^S(M^S, t^S; V) \tag{1.3.3}$$

where

$$t^{RC} = \sum_i t^j \text{ and } M = \sum_i M^j, \quad j = \{P, A, E, S\}$$

Finally, time and market goods have positive but diminishing effects on the investment function (1.3.3):

$$\frac{\partial I}{\partial M} \geq 0, \frac{\partial^2 I}{\partial M^2} \leq 0, \frac{\partial I}{\partial t^{RC}} \geq 0, \frac{\partial^2 I}{\partial (t^{RC})^2} \leq 0$$

By equation (1.3.2), investment in $RC$ occurs during the initial period only, although wage is earned in both periods.[55] This does not imply, however, that the last period relational stock $RC_T$ will be equal to zero. A positive level of relational stock at the time of death ($RC_T > 0$) is certainly plausible unless an individual's end of life is directly caused by a decrease in such stock beyond a minimum level $RC_{min}$. As this scenario seems unlikely in most cases (although possible), the majority of deceases are commonly attributable to negative shocks to an individual's health, which are external to her social sphere and which drive the health stock below its critical level.

Under this two-period set-up, an individual will face the following budget and time constraints:

$$A_0 + w_0(t^Y) + \frac{w_1(t^Y)}{R} = pM + cX_0 + \frac{cX_1}{R} \tag{1.3.4}$$

$$t^Y + t^{RC} + \underline{t}(RC_0) = T = 1 \quad \text{for period 0}$$

$$t^Y + \underline{t}(RC_1) = T = 1 \quad \text{for period 1} \tag{1.3.5}$$

[55] In a formulation with more than two periods, it would be possible to have periods where net investment in relationships equals zero (*i.e.*, $M_t = 0$, $t^{RC} = 0$, but $\delta_t > 0$).

where $A_0$ is the initial wealth; $R = 1 + r$ ($r$ being the interest rate); $p$ is the price of market goods invested in the relational stock (normalized to one when such market goods take the form of financial transfers); and $c$ is the price of all other consumption goods. In all, and treating $RC_0$ as predetermined, the following Lagrangian is maximized:

$$\begin{aligned}\mathcal{L}(RC_1, t^{RC}, M, x_0, x_1) = {} & u(\underline{t}(RC_0), x_0) + \beta u(\underline{t}(RC_1), x_1) \\ & + \mu[RC_0(1-\delta) + I(M, t^{RC}) - RC_1] \\ & + \lambda[A_0 + w_0(1 - \underline{t}(RC_0) - t^{RC}) + \frac{w_1(1-\underline{t}(RC_1))}{R} \\ & - pM - cX_0 - \frac{cX_1}{R}]\end{aligned} \tag{1.3.6}$$

The Lagrangian multipliers $\mu \geq 0$ and $\lambda \geq 0$ serve as indicators of the amount of system improvement obtained by relaxing one of its constraints. In formulations with more than two periods, the Lagrangian multipliers change over time, *e.g.*, if no investment in relational stock is made in a given period $t$, the value of $\mu_{t+1}$ increases since the relational capital constraint becomes more binding. By setting the derivatives with respect to all decision variables equal to zero, one obtains the first-order conditions for an interior optimum:[56]

$$\frac{\partial \mathcal{L}}{\partial RC_1} = \beta \frac{\partial u}{\partial \underline{t}} \frac{\partial \underline{t}}{\partial RC_1} - \frac{\partial \lambda}{\partial R} w_1 \frac{\partial \underline{t}}{\partial RC_1} - \mu = 0 \tag{1.3.7}$$

$$\frac{\partial \mathcal{L}}{\partial t^{RC}} = \mu \frac{\partial I}{\partial t^{RC}} - \lambda w_0 = 0 \tag{1.3.8}$$

$$\frac{\partial \mathcal{L}}{\partial M} = \mu \frac{\partial I}{\partial M} - \lambda p = 0 \tag{1.3.9}$$

$$\frac{\partial \mathcal{L}}{\partial x_0} = \frac{\partial u}{\partial x_0} - \lambda c = 0 \tag{1.3.10}$$

$$\frac{\partial \mathcal{L}}{\partial x_1} = \beta \frac{\partial u}{\partial x_1} - \frac{\lambda}{R} c = 0 \tag{1.3.11}$$

[56]Moreover, the derivatives with respect to the Lagrangian multipliers are not displayed, since their sole function is to ensure that the constraints (1.3.2), (1.3.4), and (1.3.5) are satisfied.

A re-arrangement of the first-order conditions leads to an inter-temporal equation aimed at facilitating understanding and interpretation of the results. Let us start by dividing (1.3.8) by (1.3.9), to obtain:

$$\frac{\partial I/\partial t^{RC}}{\partial I/\partial M} = \frac{w_0}{p} \tag{1.3.12}$$

Next, the ratio between equations (1.3.10) and (1.3.11) is calculated:

$$\frac{\partial u/\partial x_0}{\partial u/\partial x_1} = \beta R \tag{1.3.13}$$

Equation (1.3.11) can be solved for $\frac{\lambda}{R}$ and the result plugged into (1.3.7):

$$-\beta \frac{\partial \underline{t}}{\partial RC_1}\left[\frac{w}{c}\frac{\partial u}{\partial x_1} - \frac{\partial u}{\partial \underline{t}}\right] = \mu \tag{1.3.14}$$

Lastly, an expression for $\mu$ can be found from equations (1.3.9) and (1.3.10); the result is then substituted in (1.3.14) to obtain:

$$-\beta \frac{\partial \underline{t}}{\partial RC_1}\left[\frac{w}{c}\frac{\partial u}{\partial x_1} - \frac{\partial u}{\partial \underline{t}}\right] = \frac{p}{c}\left[\frac{\partial u/\partial x_0}{\partial I/\partial M}\right] \tag{1.3.15}$$

A thorough diagnosis of the main implications of the relational stock model can be attained by analyzing equation (1.3.15) in greater detail. Before all else, (1.3.15) is a condition which requires that the marginal utility of an investment in relationality (*i.e.*, the left-hand side) be equal to its marginal cost (*i.e.*, the right-hand side).

In the left-hand side, both the *consumption* and the *investment* nature of the relational good are observed. The earlier comes into existence under the term $\beta\left(\partial \underline{t}/\partial RC_1\right)\left(\partial u/\partial \underline{t}\right)$, which represents the (discounted) gain in utility obtained from a reduction in an individual's downtime $\underline{t}$.[57] Relationality is thus a consumption

[57] Recall $\frac{\partial u}{\partial \underline{t}} < 0$.

good: it increases an agent's utility by reducing her downtime. The latter nature of the relational good, namely its investment character, is encompassed under the term $-\beta\left(\partial \underline{t}/\partial RC_1\right)(w/c)\left(\partial u/\partial x_1\right)$, which implies that investments in relationships pose a return in terms of increased wage and wealth –even if downtime were not considered unpleasant *per se*. Although in such cases relationality itself may not be a valuable consumption good, its effects on wealth make it important enough as to make it a deserving recipient of an individual's investments. The value of investments in relationships may then be assessed according to the marginal utility produced by the extra consumption goods that can be purchased, $\partial u/\partial x_1$.

In its right-hand side, equation (1.3.15) stands for the costs incurred by the agent for holding an additional unit of relational stock. These costs are reflected by the forgone marginal utility of consumption, $\partial u/\partial x_0$, materializing when an agent decides to invest in her relationships. Nevertheless, the efficiency of such investments –in the form of market goods and financial transfers, expressly given by $\partial I/\partial M$– will be critical in alleviating the losses inflicted by forgone consumption.[58] The price $p$ of investments $M$ mitigates their efficiency, for as $p$ goes up, less units of investments will be made. The same deflating effect is observed in the case of the price $c$ of consumption goods: the higher their price, the less consumption units forgone when investing in genuine relationships.

## 1.4 A Note on *Chronos*, *Kairos*, and the Opportunity Cost of Time

Two words described the concept of time in ancient Greek culture: *chronos* and *kairos*. The earlier is much like the notion of chronological or sequential time as commonly understood today, while the latter refers to the right or opportune moment,

[58] The larger $\partial I/\partial M$, the more efficiency in investments.

a time when the conditions are adequate for the accomplishment of an action. *Chronos* is quantitative and ephemeral, whereas *kairos* remains qualitative and permanent in nature.

So far economic tradition has emphasized the *chronos* aspect of time, as it simplifies analyses by allowing for the concept of forgone earnings and opportunity costs. However, not all aspects of life can be assigned a monetary value as functions of forgone earnings; this is particularly so for those aspects of life which are most influential to a person's life satisfaction. Take, for instance, meaningful relationships or rewarding experiences.[59] How much would a mother pay to see her son before he gets deployed to a war zone, even if just for one hour? Would it be an equal measure of her hourly wage rate? Can a friendship be entirely monetized? How does the effect of an hour at work on life satisfaction differ from that of a stunning hour-long sunset during a vacation? And would the effect of a given job on life satisfaction be proportional to its wage?

If self-fulfillment and happiness are to be regarded as the highest human goods (what Aristotle called *eudaimonia*) then the need arises to individuate those things that count the most toward their attainment. In the achievement of such a task, an indicator of the quality of time –encompassed by the concept of *kairos*– could indeed be regarded as a valuable complement to the traditional *chronos* measures. It would thus make sense to advocate for the development and utilization of a composite measure of time in economic analyses of life satisfaction where the time spent in each of the activities composing the time constraint is weighted by a measure of quality or gratification found in such activity.[60] A scale or index –perhaps similar to that commonly used to assess satisfaction with life– in which people subjectively appraise

[59]Recent studies suggest that resources spent on experiences (*e.g.*, traveling) and other people –rather than on material possessions– are more efficient in producing positive long-lasting effects to life satisfaction (Dunn and Norton, 2013).

[60]Recent data collection methods, such as "experience sampling," attempt to do just that. Moreover, a cheaper and less intrusive technique known as the "day reconstruction method" has been proposed by Kahneman et al. (2004).

their preferences regarding certain activities could be devised to account for such a measure.[61]

The insufficiency of the forgone earnings concept as a measure of the opportunity cost of time in a wide range of human activities is clear and its deficiencies must be addressed.[62] Reliable alternative ways of assigning value to such activities are needed in economics –and in other fields as well– in order to come closer to tackling the important issue of life satisfaction and human fulfillment.

## 1.5 Discussion and Conclusions

Throughout this essay I have tried to highlight –in a much too casual manner– the importance of human relationality in its non-instrumental form for the analysis of life satisfaction. In so doing, I have taken the opportunity to put in writing some thoughts and premises which I believe to be vital for the advancement of the study of human happiness and satisfaction with life. As better data on relationships and human networks become available, it is my perception that social support attained through genuine relationships will emerge and be acknowledged by societies and policy-makers alike as an indisputable engine of well-being.

Firstly, I have defined the concept of non-instrumentality and described the problem posed by its continuous decline as an element of relationships in recent years. This led me to propose an alternative categorization of such form of relationality composed of four subdivisions: family relationships, friendships, intimate relationships, and relationships of charity and spirituality. Albeit admittedly committing an oversimplification of relationship schemes, such grouping aims at providing a defined structure for the analysis of genuine relationships, both theoretically and empirically.

[61] An illustrative survey question for this purpose would be: "On a scale from 0 to 10 where 0 means not gratifying at all and 10 means very gratifying, how gratifying are the following activities to you?"

[62] In Section 1.2, I attempted to provide an indirect compensation mechanism to forgone earnings by allowing for a value-of-proximity variable, $\varphi$, where subjective weights are employed to influence the allocation resources.

Secondly, a generic model of non-instrumental relationships is proposed, where traditional economic tools and Beckerian-type modeling techniques are mixed with Hirschman (1970) insights of organizational behavior to endow non-instrumental relationships with a restorative signal mechanism aimed at preserving their stability from within.

Thirdly, a model of relational capital is constructed around the proposition that non-instrumental relationships are goods which can be both consumed and produced by individuals through investments in the form of time and market goods. An initial relational stock which depreciates over time is inherited by each agent, who may then enlarge it by investing in each or all of its four components.

Finally, a note on the insufficiency of the forgone earnings concept as a measure of the opportunity cost of time –in particular for those activities most relevant to a person's satisfaction with life– is offered. Ancient Greek conceptions of time, portrayed by the words *chronos* and *kairos*, are borrowed to better illustrate the concepts and fix ideas.

In what follows, two supporting empirical exercises are presented. In Chapter 2 the positive link between one form of non-instrumental relationality –namely, family ties– and quality of life is documented, exploiting the SHARE panel dataset through a difference-in-difference propensity score matching approach. Chapter 3, in turn, uses instrumental variable methods to look at the other side of the relational coin, giving support to the hypothesis by which individual cognitive abilities enhance the efficiency of production of relational capital.

# Chapter 2

# Doubling Up: A Gift or a Shame? Multigenerational Households and Parental Depression of Older Europeans

**Abstract:** The Great Recession has brought along a rearrangement of living patterns both in the U.S. and in Europe. This study seeks to identify the consequences of the "doubling up" of two or more generations of adults into the same household. In particular, a difference-in-difference (DID) propensity score matching approach is employed to target the causal effect of a change in geographical closeness of respondents and their children —either moving together (doubling up) or apart (splitting up)— on the well-being of the older generation, proxied by their depression score. We find that, although heterogeneous across European regions, in no case does doubling up pose a negative effect to the quality of life of older Europeans. On the contrary: for "Catholic" Europe, a double up seems to be followed by a significant reduction in the depression level of the older generation. Our results highlight that, although a negative connotation has usually been attached to multigenerational living arrangements in the post-WWII era, its benefits are evident and, in a time marked by increasing demographic aging, can lead to significant improvements in the quality of life of older Europeans.

*Keywords:* Doubling up; Depression; Aging; Difference-in-differences; Matching estimator

*JEL classification:* J140; I310; E32

## 2.1 Introduction

Multigenerational homes, which gather together adults from three or more generations, have been on the rise for the last few decades. The post-WWII trend of independent living seems to have been stopped and even slightly reverted, giving way to an increased number of multigenerational households. In recent years, more and more families are deciding to live together under one roof. There has been a sharp increase in the number of households where more than one generation of adults live together, a phenomenon of increasing social and economic importance known as "doubling up." In particular, an increasing number of young adults (aged 25-34) are moving back into their parents' home –arguably a strategic and protective response to the economic hardships and high unemployment rates brought about by the Great Recession (Mykyta, 2012; Kaplan, 2012).[1]

In this respect, a paradox has been brought to light by ongoing research showing an association between economic downturns, health improvements, and reduced death rates among the elderly (Ruhm, 2000, 2003, 2005). In particular, Miller et al. (2009) show that this countercyclical association is strongest for women aged 65 and over, casting doubts on the argument that links such health outcomes with individual employment status. While the question is left for the most part unanswered, the authors make an appeal for further research suggesting the varying living situations and care-giving arrangements arising from economic fluctuations as possible platforms from which to bridge unemployment and health.

In searching for explanations to this puzzle, we turn to coresidence trends –and doubling up in particular– in the hope of making useful contributions to the discussion. Such hypothesis is based upon the following logic: recessions and economic difficulties may increase the chances that the elderly share a household with their children, who in turn provide support, social interaction and companionship to their parents. By decreasing loneliness and solo-living, this fulfillment of family roles potentially results in an increase in life-satisfaction and emotional well-being of the older generation.[2]

The causes of multigenerational household arrangements are without a doubt of great interest and importance. However, in this paper we shift our attention to the analysis and measurement of its effects (if any) which have been greatly disregarded in the literature, especially so for individuals belonging to the 50+ age group. So far,

[1] The increasing demographic importance of the group of young adults moving back to their parents' home has led sociologists to describe them by coining the term "boomerang" generation.

[2] A positive association between loneliness and depression in old age is consistent in the literature (Green et al., 1992; Singh and Misra, 2009).

much has been said and done about the effects of leaving or returning to the parents' household on the younger generation (Taylor et al., 2012; Parker, 2012; Mykyta, 2012; Wiemers, 2012; Kaplan, 2012), but how do older adults fare when such changes take place? This paper therefore takes a closer look at the effects of doubling up on the quality of life of older Europeans, seeking in particular to untangle its effects on their psychological health as proxied by a self-reported depression index. The findings point to a significant drop in the number of depressive symptoms of respondents following a double up in those European countries historically marked by a Catholic tradition.

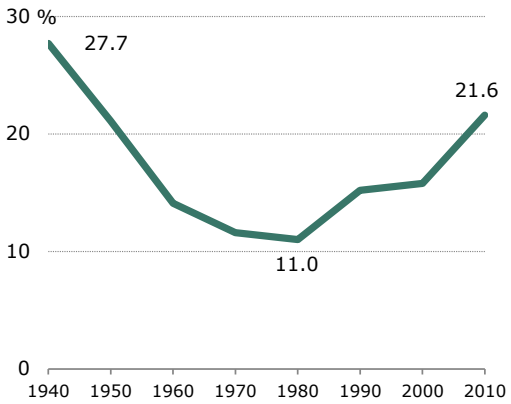
In what follows, the transnational nature of the double up phenomenon is documented by exploring its presence and development in the United States and as well as in Europe and providing evidence of its increasing importance as a relevant social occurrence in the last decades. Subsequently, in Section 2.2 the theoretical foundations of the analysis are laid, spanning from the presentation of the common problem of properly evaluating a given intervention, to the introduction of the difference-in-differences estimator and the subsequent exposition of matching methods, which culminates in the DID matching estimator. Section 2.3 constructs the empirical methodology from which the results are obtained. In it, the data are described, the variables explained and the problem at hand modeled. In Section 2.3 the results are presented and justified through a series of balancing tests. The analysis is conducted sequentially, starting with the pooled sample but proceeding steadily into a macro-regional dissection where Protestant and Catholic Europe are compared in an attempt to capture any possible latent cultural factors. Section 2.5 further controls for potential economic confounders. Finally, the sensitivity and robustness of our results are tested in Sections 2.6 and 2.7, followed by a brief discussion and concluding remarks in Section 2.8.

### 2.1.1 The American case

In the twentieth century, a revolutionary change in living arrangements occurred in the United States, characterized by an astronomical increase in solo-living by the elderly.[3] This cultural trend toward more autonomy might have been the result of increasing affluence and choice in American society, giving rise to the (increasingly contested) popular belief that privacy is a normal good. However, according to a 2010 Pew Research Center report based on U.S. Census Bureau data, in the United States

[3]In the beginning of the century, 75% of adults aged 45-64 lived with their children, other relatives, or both, and only one in seven lived alone or in a childless couple. In the end of the century, however, half of the individuals in this age category lived alone (Fischer and Hout, 2006).

**Figure 2.1:** Rising share (%) of young adults (25-34) living in multigenerational households in the U.S.

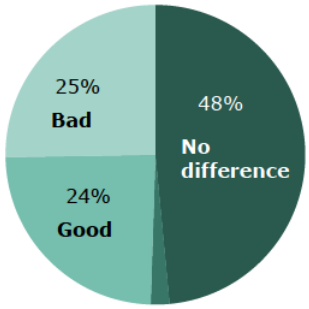



*Source:* Pew Research Center analysis of U.S. Decennial Census data, 1940-2000 and 2010 American Community Survey (IPMUS)

a growing percentage of adult children living with their parents has been observed in recent decades. As shown in Figure 2.1, such trend admits a higher proportion of multigenerational households now than at any time since the 1950s, having increased significantly in the last decade (*e.g.*, 13% of parents in 2009 reported adult children moving back home in the last 12 months, while 24% of 18 to 34 year-olds say they have moved back in with parents in recent years because of economic conditions (Kochhar and Cohn, 2011; Taylor et al., 2012)). Although the trend grew solidly starting in the 1970s, it has recently received more attention as a result of the economic hardships imposed on families by the Great Recession.

More than a new phenomenon, it looks as though multigenerational households were in the process of making a staggering comeback. The economic safety net that such living arrangements represent goes without saying and is backed up by evidence: sharing cost-of-living expenses and other household needs, savings in rent, childcare and old-age care giving (*e.g.*, for grandchildren by grandparents and for grandparents by the rest of the family, respectively), among others. In many cases doubling up shields younger adults from going into poverty: in 2010, 9.8% of Americans aged 25-34 living in a multigenerational household lived below the poverty line, as opposed to 17.4% of those who lived in another type of household (Kochhar and Cohn, 2011). Additionally, according to Figure 2.2 the relational effect of these arrangements is not

**Figure 2.2:** Percentage of "boomerang children" in the U.S. saying that living with their parents at this stage of life has been "good," "bad," or "has made no difference" for relationship




*Note*: based on 25-34-year-olds, $n$=121. "Don't know/Refused" responses shown but not labeled. *Source*: Parker (2012)

all that bad either: only one out of four young adults reports a deterioration in her relationship with her parents resulting from doubling up.[4]

### 2.1.2 The European case

Recent increases in doubling up trends have not only been documented in the United States but also in Europe, where the multigenerational household phenomenon is more pronounced. As reported in 2010 by the statistical office of the European Union (Eurostat), 19.6% of European women and 32% of European men aged 25-34 lived with their parents in 2008, as opposed to 18% and 22% of their American counterparts in the same year. In Europe, moreover, the proportion of multigenerational living arrangements encounters great cross-country variation, being lower in Nordic countries and higher in southern and eastern Europe (Table 2.1).

Parallel to what documented in Section 2.1.1 for the United States and even though only data from the last decade are available, Figure 2.3 corroborates the positive trend in the share of young European adults living with their parents. Overall, from 2004 to 2011 this type of household saw an average increase of 3.5% in the EU-19 area countries.

Such demographic shift has been underscored by varied cultural, social, and economic factors, among which the financial crisis and the following Great Recession

[4]This is accompanied by a paradoxical shift in attitudes against independent living. After being asked "As you know, many older people share a home with their grown children. Do you think this is generally a good idea or a bad idea?" two-thirds of Americans in 1957 considered it a "bad idea," in a time where only half of the elderly lived independently. However, support for independent living fell all the way down to one-third of Americans in 2000, even though solo-living among the elderly had increased to 70% (Fischer and Hout, 2006).

**Table 2.1:** Share of young adults living with their parents by age group and country, averaged over the period 2005-2011

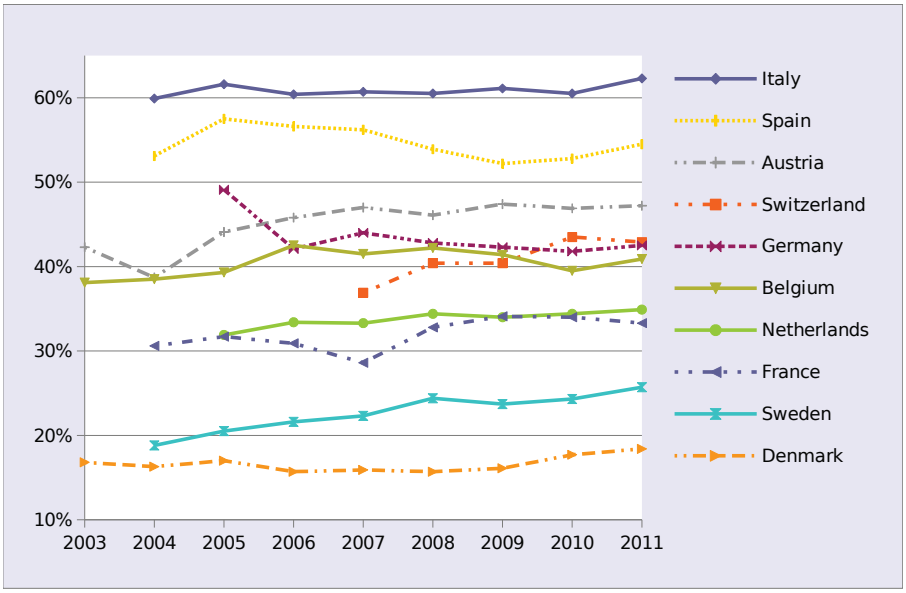
| | **Aged 18-34** | **Aged 25-34** |
|---|---|---|
| Denmark | 16.6 | 2.1 |
| Sweden | 23.2 | 3.7 |
| Norway | 18.5 | 3.8 |
| Finland | 21.0 | 5.1 |
| Netherlands | 33.8 | 9.0 |
| France | 32.2 | 10.1 |
| Iceland | 32.3 | 11.1 |
| Switzerland[a] | 40.8 | 12.1 |
| United Kingdom | 36.4 | 15.0 |
| Belgium | 41.0 | 15.7 |
| Germany | 43.5 | 16.5 |
| Luxembourg | 46.2 | 22.6 |
| Estonia | 45.4 | 22.8 |
| Austria | 46.4 | 23.8 |
| Ireland | 48.7 | 23.6 |
| Cyprus | 54.3 | 28.8 |
| Lithuania | 53.6 | 30.0 |
| Czech Republic | 51.4 | 31.3 |
| Latvia | 55.6 | 36.4 |
| Hungary | 55.2 | 36.5 |
| Spain | 54.8 | 38.3 |
| Romania[a] | 58.3 | 39.7 |
| Poland | 58.7 | 39.7 |
| Portugal | 59.5 | 43.4 |
| Italy | 61.0 | 44.6 |
| Malta | 66.6 | 46.0 |
| Greece | 59.4 | 49.2 |
| Slovenia | 66.8 | 48.7 |
| Bulgaria | 62.0 | 48.7 |
| Slovakia | 70.3 | 50.5 |

Notes:

[a]Data for these countries are for the period 2007-2011.

*Source*: Eurostat online database (EU-SILC) (ilc_lvps08).

**Figure 2.3:** Percentage of young adults aged 18-34 living with their parents in ten European countries




*Source*: Eurostat EU-SILC. Last updated on July 7, 2013; extracted on September 6, 2013

are of prominent importance. Arguably, and similarly to what has been observed in the United States, the European recession has driven families to double up in multigenerational homes.

## 2.2 Theoretical Methodology

We use a non-parametric difference-in-difference (DID) propensity score matching approach to assess the causal effect of a child moving in or outside the household (*treatment*) on the depression level of elder Europeans. In other words, we would like to appraise whether a change in proximity[5] between the *closer* child and the respondent/parent has any impact on the psychological health of the respondent/parent.

### 2.2.1 The Evaluation Problem

Measuring the effect of a given intervention is usually straight forward. However, for a credible evaluation of the effect of an intervention, one must also be able to make an inference about the outcomes that would have been observed had the treated individ-

[5] Although this study aims at assessing the effects of coresidence transitions in particular, the more general term "proximity" will be alternatively used throughout due to its flexibility in encompassing both coresidence and dissolution decisions.

uals not undergone treatment, that is, had the participants not participated.[6] This information is commonly referred to as the *missing counterfactual*. More specifically, the impact of participating in a program is given by:

$$\Delta = Y_1 - Y_0$$

where $Y_1$ and $Y_0$ are the outcomes conditional on participation and non-participation in the program, respectively. The evaluation problem is basically a missing data problem: it emerges with the fact that either $Y_1$ or $Y_0$ are observed for each participant, but not both (and thus $\Delta$ is never observed). This makes it impossible to compute individual treatment effects; consequently, the main parameter of interest in the program evaluation literature is the *mean impact of treatment on the treated* (see *e.g.*, LaLonde, 1986; Heckman, 1990), which is given by:

$$\begin{aligned} ATT &= E(\Delta|X, D = 1) = E(Y_1 - Y_0|X, D = 1) \\ &= E(Y_1|X, D = 1) - E(Y_0|X, D = 1) \end{aligned}$$

where $D = 1$ ($D = 0$) denotes an individual's (non-)participation in the program, for whom outcome $Y_1$ ($Y_0$) is observed, and $X$ is a vector of observable individual characteristics used as control variables. Under this notation, the last term, $E(Y_0|X, D = 1)$, is the missing counterfactual.

Under randomized experiments, the missing counterfactual mean can be directly estimated through the use of a control group. Such direct estimates are not available, however, for non-experimental or observational studies, for which the alternative is to adjust the outcomes of the untreated individuals econometrically and use them as proxies for what would have been the counterfactual (Smith and Todd, 2005a). Consequently, selection (or evaluation) bias emerges as the difference between such adjusted outcomes and the true (but unobserved) counterfactual mean. Failure to properly take into account such bias will ultimately lead the program evaluator into making distorted conclusions.

In the present study, we employ a non-parametric difference-in-differences (DID) propensity score matching approach to estimate the missing counterfactual. It does so by combining two popular econometric techniques, namely difference-in-differences and matching, to achieve in certain situations a contestably more appropriate esti-

[6] "Treatment," "intervention" and "participation" are used interchangeably throughout this paper.

mation method than a simple instrumental variable approach, particularly because strong exclusion restrictions are not required (*e.g.,* Blundell and Dias, 2000; Girma and Goerg, 2007). This offers a clear advantage for our purposes, given the dense endogeneity cloud blurring the already intricate relationship between family issues and psychological health (*e.g.*, depression), and the consequent difficulty in finding valid instruments directly correlated to the earlier but not the latter.

### 2.2.2 Difference-In-Difference Estimator

The standard DID estimator can be described as follows: outcomes are observed for two groups for two time periods, $t = 0$ and $t = 1$. In the second period, one of the groups is exposed to a treatment, while the other group is not. No units are exposed to the treatment in the first period. Denote $D_{it} = 1$ if individual $i$ has been exposed to the treatment, and $D_{it} = 0$ otherwise. We refer to individuals with $D_{it} = 1$ as treated, and those with $D_{it} = 0$ as controls or untreated.

In panel data settings where the same units within a group are observed in each time period, the average gain over time in the control group is subtracted from the average gain over time in the treatment group. The purpose of this double differencing is to smooth between-group comparisons by *a*) removing biases resulting from permanent differences between the control and the treatment groups, and *b*) removing time trends unrelated to the treatment in the treatment group, which could otherwise result in biases over time (Imbens and Wooldridge, 2009).

Following Smith and Todd (2005a) framework, we start by defining the possible outcomes for individual $i$ as

$$\begin{aligned} Y_{1it} &= f_1(X_{it}) + U_{1it} \text{ if treated, and} \\ Y_{0it} &= f_0(X_{it}) + U_{0it} \text{ otherwise.} \end{aligned} \tag{2.2.1}$$

Here, $Y_{it}$ is the outcome for individual $i$ at time $t$; $f(X_{it})$ is a function of the vector of observed individual characteristics $X_{it}$; and the residuals $U_{it}$ (or unobservable characteristics) are *a*) normalized to have mean zero; *b*) assumed to be independent of the group indicator; and *c*) have the same distribution over time (Smith and Todd, 2005a).

The observed outcome for $i$ is then given by

$$Y_{it} = D_i Y_{1it} + (1 - D_i) Y_{0it} \tag{2.2.2}$$

By plugging 2.2.1 into 2.2.2 and rearranging terms, we have

$$Y_{it} = f_0(X_{it}) + D_i\delta^*(X_{it}) + U_{0it} \tag{2.2.3}$$

where treatment impact is given by $\delta^*(X_{it}) = f_1(X_{it}) - f_0(X_{it}) + U_{1it} - U_{0it}$. To ease up on notation, assume $\delta^*$ is constant across individuals. Now, denoting $t$ and $t'$ respectively the time periods before and after the intervention and recalling that $D_i\delta^* = 0$ at $t$ for all $i$, we make use of pre- and post-treatment data to construct the standard DID estimating equation[7]

$$Y_{it'} - Y_{it} = f(X_{it'}) - f(X_{it}) + D_i\delta^* + U_{it'} - U_{it} \tag{2.2.4}$$

Simple least-square (OLS) methods can be used to estimate the treatment impact $\delta^*$, which corresponds to the sample counterpart of the DID population estimand $\hat{\delta}_{DID}$, given by:[8]

$$\begin{aligned}\hat{\delta}_{DID} &= E[Y_{i1}|X_{i1}, D_{i1} = 1] - E[Y_{i1}|X_{i1}, D_{i1} = 0] \\ &= (E[Y_{i1}|X_{i1}, D_{i1} = 1] - E[Y_{i0}|X_{i0}, D_{i0} = 1]) \\ &\quad - (E[Y_{i1}|X_{i1}, D_{i1} = 0] - E[Y_{i0}|X_{i0}, D_{i0} = 0])\end{aligned} \tag{2.2.5}$$

In this equation, we assume that $X_i$, the vector of individual characteristics, is predetermined at t (or t=0).[9] This calls for a short note on the treatment of the covariates in DID models. In an ideal DID model, covariates should be treated in a non-parametric way, as in equation (2.2.5), in order to avoid any potential inconsistency arising from a functional form misspecification (Abadie, 2005). To illustrate, introducing the covariates linearly into the parametric model given in (2.2.4) will help account for heterogeneity in outcome dynamics, but may not be appropriate in

[7] An implicit restriction in standard DID models is assuming a coefficient equal to one for the lagged outcome $Y_{it}$ (Smith and Todd, 2005a, p. 312).

[8] Allowing for time-specific intercepts that are common across groups, the DID estimator appropriately prevents confounding problems between, for instance, $\delta^*$ and a given time-specific intercept (Smith and Todd, 2005a, p. 312).

[9] Abadie et al. (2010, p. 494) make a claim against conditioning on after-treatment characteristics: "...researchers [should] decide on study design without knowing how those decisions will affect the conclusions of their studies. (Rubin, 2001) and others have advocated that the ability to make decisions on research design while remaining blind to how each particular decision affects the conclusions of the study is an important device for promoting research honesty in observational studies." The same argument can and should be extended to non-experimental studies.

the presence of heterogeneity in treatment effects, *i.e.*, if treatment exerts different influences on different groups (Meyer, 1995; Abadie, 2005).

Nevertheless, even a non-parametric treatment of covariates may be jeopardized when the number of covariates required to attain identification is large. To obtain interpretable results in such cases, researchers are forced to make use of other available econometric tools that allow for some sort of integration procedure over $X_i$. Propensity score matching techniques (Rosenbaum and Rubin, 1983) allow us to do just that, and are hereafter introduced following a brief review of matching methods.

### 2.2.3 Matching Methods

In measuring the counterfactual, one of the crucial steps is to construct an appropriate control group. We do this through the use of matching techniques. Matching estimators assess the effect of a program by pairing participants with observably similar non-participants and comparing their outcomes (Rosenbaum and Rubin, 1983; Smith and Todd, 2005a). Two assumptions justify the use of matching estimators: the unconfoundedness and the overlap assumptions.[10] The earlier assumes that outcomes are independent of treatment conditional on a set of observable individual characteristics $X_i$, *i.e.*, there are no unobserved characteristics (beyond the observed covariates) associated both with the potential outcome and the treatment:

$$[Yi(0), Yi(1)] \perp D|X \tag{2.2.6}$$

Although controversial, this sort of assumption is neither new nor unique to matching methods, for it is also commonly made when conducting multiple regression analyses.[11]

On the other hand, the overlap assumption states that for all $X_i$ there is a positive probability of either receiving treatment ($D = 1$) or not ($D = 0$):

$$0 < Pr(D = 1|X) < 1 \tag{2.2.7}$$

which implies that the support of the conditional distribution of $X_i$ overlaps for the $D = 0$ and $D = 1$ groups or, put in a more intuitive way, that a match can be found

[10] Using Rosenbaum and Rubin (1983) terminology, the combination of unconfoundedness and overlap ensure identification by inferring "strong ignorability:" when both assumptions are satisfied, treatment assignment is "strongly ignorable" given $X_i$.

[11] Given a multiple regression, $Y_i = \alpha + \gamma W_i + \beta' X_i + \varepsilon_i$, the unconfoundedness assumption is equivalent to assuming that $\varepsilon_i$ and $W_i$ are independent conditional on $X_i$ (Imbens and Wooldridge, 2009).

for all treated individuals. However, if there are regions where both distributions do not overlap, then matching makes sense only if done over the *region of common support* (Smith and Todd, 2005a; Imbens and Wooldridge, 2009) .

Since matching involves comparing treatment and control units across a number of observable pre-treatment characteristics, it may be hard to implement when the number of such characteristics is large. In that case, the so-called "curse of dimensionality" in econometrics may considerably slow down the convergence of the matching estimator, as the number of observations required increases very rapidly with the dimension of $X$. This problem can be solved by reducing the dimensionality of the conditioning problem in order to match solely on the basis of a single index which collects the information from all control variables: the univariate propensity score constitutes such an index (Rosenbaum and Rubin, 1983).

### Propensity Scores

Simply stated, the propensity score is the probability that a given individual gets exposed to treatment conditional on her characteristics. As shown by Rosenbaum and Rubin (1983), when outcomes are independent of treatment given covariates $X$, they are also independent of treatment given the propensity score $Pr(D = 1|X)$.[12] In their own words, given strong ignorability of treatment assignment, "adjustment for a balancing [*i.e.*, propensity] score is sufficient to produce unbiased estimates of the average treatment effect" (p. 45) and, moreover, "units with the same value of the balancing [*i.e.*, propensity] score but different treatments can act as controls for each other, in the sense that the expected difference in their responses equals the average treatment effect" (p. 46). Therefore, matching individuals on the single propensity score effectively reduces the dimensionality of the problem and breaks the dimensionality curse. The propensity score can be estimated using parametric methods, such as a logic or a probit model.

### Matching Estimators (Part I: Kernel Matching)

Although different estimators can be used to perform matching methods, most of them are variations of the more general form given by[13]

[12] In equation form, Rosenbaum and Rubin (1983) show that $E(D|Y, Pr(D = 1|X)) = E(E(D|Y, X)|Y, X)|Y, Pr(D = 1|X))$, so that if $E(D|Y, X) = E(D|X) = Pr(D = 1|X)$, then $E(D|Y, Pr(D = 1|X)) = E(D|Pr(D = 1|X))$, which is the desired result.

[13] Our notation follows that of Smith and Todd (2005a). As commonly done in the literature, for ease of notation let $P = Pr(D = 1|X)$.

$$\hat{\delta}_M = \frac{1}{n_{1P}} \sum_{i \in I_1 \cap S_P} [Y_{1i} - \hat{E}(Y_{0i}|D_i = 1, P_i)] \tag{2.2.8}$$

where

$$\hat{E}(Y_{0i}|D_i = 1, P_i) = \sum_{j \in I_0} W(i,j) Y_{0j}$$

Under this notation, $I_1$ and $I_0$ are the sets of the treated and untreated individuals, respectively; $S_P$ is the common support region; and $n_{1P}$ is the number of treated individuals whose propensity score lies under the region of common support, *i.e.*, those belonging to the set $I_1 \cap S_P$. Weighted averages of the outcomes of the untreated individuals are constructed in order to match the treated as closely as possible; the weights $W(i,j)$ depend on the distance between the propensity scores $P_i$ and $P_j$ (Smith and Todd, 2005a). Additionally, a neighborhood region $R(P_i)$ for each treated individual $i$ can be fabricated with a number of untreated individuals $j$ whose propensity score falls inside $i$'s neighborhood. Stated differently, nonparticipants for whom $P_j \in R(P_i)$ are matched to participant $i$ and serve as its counterfactual reference for comparison.

Different matching estimators can be constructed depending on how neighborhood regions are defined and how weights $W(i,j)$ are established. Among the most widely used are *nearest-neighbor* matching which uses the $m$ closest comparison units; *caliper* matching which builds a radius around a point to create the control group; *stratification* matching which breaks the sample into several intervals and estimates the effect of treatment separately in each region; and *kernel* and *local linear* matching which put some sort of distribution around each treated individual so that closer control units receive a higher weight than those which are farther away in the distribution. In small samples, different matching methods may give diverging results, since there exists a trade-off between variance and bias depending on the choice of the algorithm (Heckman et al., 1997).[14] In our specific case, the limited sample size plays a crucial role in choosing the matching algorithm. Consequently, the likely unsatisfactory number of control units at our disposal limits our choice to only those algorithms where matching with replacement is allowed. To make the most of the control units that we do have, however, using information from more than one nearest neighbor will likely increase the precision of the estimates by achieving a lower variance (Caliendo and Kopeinig, 2008). Moreover, arbitrary choices that have to be made when using caliper and stratification matching (*e.g* the tolerance level and the number of strata,

[14]No such problem exists asymptotically for large samples, since all matching estimators become closer to finding perfectly equal matches as the sample size grows (Smith, 2000; Caliendo and Kopeinig, 2008).

respectively) are not required when using kernel matching.[15] Hence, due to its advantages in smaller samples and the lower variance achieved by using more information from a broader control base, the kernel matching estimator with replacement proves itself the better option for the present study.

Kernel estimators use a kernel-weighted average over multiple individuals in the comparison group to construct a match for each treated person. Following Heckman et al. (1997); Heckman, Ichimura and Todd (1998); Heckman, Ichimura, Smith and Todd (1998), the kernel matching estimator is

$$\hat{\delta}_{KM} = \frac{1}{n_{1P}} \sum_{i \in I_1} \left( Y_{1i} - \frac{\sum_{j \in I_0} Y_{0j} \; G(\frac{P_j - P_i}{b_n})}{\sum_{k \in I_0} G(\frac{P_k - P_i}{b_n})} \right) \tag{2.2.9}$$

where the kernel function is given by $G(.)$ and $b_n$ is its bandwidth parameter. The weights $W(i,j)$ are given by the term

$$\frac{G(\frac{P_j - P_i}{b_n})}{\sum_{k \in I_0} G(\frac{P_k - P_i}{b_n})}$$

and depend on the distance between each untreated unit in the comparison group and the treated individual for whom the counterfactual is being built up. Additionally, different kernel functions require different specifications of the neighborhood region $R(P_i)$. In estimation, I use the Epanechnikov kernel function, given by $G(s) = (3/4)(1 - s^2)$ for $|s| \leq 1$, else $G(s) = 0$. Under standard conditions (see Smith and Todd, 2005a, footnote 16), the second term in brackets in (2.2.9), namely $\sum_{j \in I_0} Y_{0j} \; W(i,j)$, consistently estimates the counterfactual term in equation (2.2.8), $E(Y_{0i}|D = 1, P_i)$.

**Matching Estimators (Part II: DID Matching)**

Conditioning on observable characteristics may not, however, be enough to completely identify our matching estimators. The assumption that mean outcomes are conditionally mean independent of treatment may be violated and systematic differences between the treated and the untreated may persist even after conditioning on observ-

[15] As per DiNardo and Tobias (2001) and Caliendo and Kopeinig (2008), although different kernel functions can be chosen when performing kernel matching, in practice the choice of these functions appears to be relatively unimportant.

ables. For instance, selection into treatment may be influenced by unobservable or unmeasured characteristics; outcomes may be measured in different ways for treated and untreated individuals, as when different survey tools are used to collect the data; or there may exist fixed differences in outcome levels over time between the treatment and control groups. In the presence of any of the aforementioned factors, the identification conditions required for matching are violated.

If longitudinal data are available, some of the deficiencies observed in matching methods can be ameliorated by incorporating them into a difference-in-differences framework. This results in what Heckman et al. (1997) and Heckman, Ichimura, Smith and Todd (1998) defined as a difference-in-differences matching strategy, which has the additional advantage of removing unobserved time-invariant differences in outcomes between treated and untreated individuals that standard matching estimators fail to eradicate. According to Blundell and Dias (2000, p. 438), the combination of matching estimators and DID methodology has the potential to "improve the quality of non-experimental evaluation results significantly."

Although analogous to the standard DID regressor estimator defined in (2.2.4), the DID matching estimator is convenient in that it does not impose a linear functional form restriction to estimate the outcome's conditional expectation, and uses the weighting function defined by the matching estimator to re-weight the observations (Smith and Todd, 2005a). The general DID propensity score matching estimator for panel data[16] is given by

$$\hat{\delta}_{DIDM} = \frac{1}{n_{1P}} \sum_{i \in I_1 \cap S_P} \left[ (Y_{1it'} - Y_{0it}) - \sum_{j \in I_0 \cap S_P} W(i,j)(Y_{0jt'} - Y_{0jt}) \right] \tag{2.2.10}$$

where the weights depend on the type of matching estimator adopted. Beside the overlap or support condition (2.2.7), the following equality must also be satisfied for the DID matching estimator to work:

$$E(Y_{0t'} - Y_{0t}|D = 1, P) = E(Y_{0t'} - Y_{0t}|D = 0, P) \tag{2.2.11}$$

Equation 2.2.11 is commonly referred to as the parallel-trends assumption. It requires the average effect of treatment on the treated if left untreated to be equal to the observed change in outcome of comparable controls.

[16]The specification varies if cross-sectional instead of longitudinal data is used. However, as reported in Smith and Todd (2005a), the panel data DID matching estimator is more robust than its cross-sectional counterpart.

In what follows, the empirical part of this study is materialized, starting with the description of the data and evolving through the methodology until the estimators are computed, presented, and appraised. The aforementioned DID matching estimator for panel data is implemented throughout as the empirical backbone of this work.

## 2.3 Empirical Methodology

### 2.3.1 Description of the Data

We use data from the first (2004), second (2006) and fourth (2010) waves of the Survey on Health, Aging and Retirement in Europe (SHARE)[17], which surveys people aged 50 and over in 19 European countries (and Israel). Since we exploit the longitudinal nature of the data, only respondents present in all three waves mentioned above will be considered, limiting our study to the ten countries present in those waves, which are: Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, and Switzerland. SHARE is a multidisciplinary and cross-national database which provides detailed information on physical and mental health, socio-economic status, and social and family networks of respondents and their households. International comparisons are allowed by the inter-country standardization of all questions.

The current sample is made up of 10,107 individuals participating in wave 1, 2 and 4 (57% females) who make for 30,321 observations, of which 12,463 contain complete information on depression levels, geographical proximity with children, and the usual controls (*e.g.*, socioeconomic and health indicators).

#### Independent Variable

The purpose of this paper is to analyze how levels of depression of older Europeans are affected by changes in the geographical closeness with their children. Children proximity in SHARE is measured by asking respondents about their children's living

[17]This article uses data from SHARE 2004, 2006 and 2008, Wave 1, 2 and 4, release 2.5.0 for wave 1 and 2 and release 1.1.1 for wave 4. The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5- CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, N 211909, SHARE-LEAP, N 227822 and SHARE M4, N 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see `www.share-project.org` for a full list of funding institutions).

arrangements, *i.e.*, "Where does child [*child name*] live?" with nine possible answers: 1) in the same household; 2) in the same building; 3) less than 1 kilometer away; 4) between 1 and 5 kilometers away; 5) between 5 and 25 kilometers away; 6) between 25 and 100 kilometers away; 7) between 100 and 500 kilometers away; 8) more than 500 kilometers away; and 9) more than 500 kilometers away in another country. Since 97.2% of respondents in our dataset mention having at most five children, our analysis is limited to the geographical proximity of the first five children of each respondent.

Given the longitudinal nature of the dataset, we are able to identify changes in proximity between the respondent and her children from one wave to the next, as well as to observe the respondent's depression level before and after the move. The analysis is split up into two periods, depending on when the move took place: short term (between wave 1 in 2004 and wave 2 in 2006) and medium term (between wave 2 in 2006 and wave 4 in 2010).[18] These short and medium term schemes seem adequate in capturing the real and lasting effects of a shock in family proximity, since depression is known to be a recurrent condition with symptoms and effects that can take some time to develop and even longer to dissipate, continuing for months and even years.[19]

One of the drawbacks of the data is that following children in time is troubling at best, which, among other things, hinders our ability to make conclusions regarding the gender and the age of the specific children involved in the treatment. Moreover, although after a coresidence change we are unable to identify who the actual mover is, for our purposes the factor of interest remains family closeness *per se* irrespective of which family member is the protagonist of such move (be it child $A$, child $B$, *etc.* or the respondent herself). Thus, given such data limitations, family closeness in our analysis is a measure of proximity between the respondent and her *closest* child. Family proximity is hence the independent or explanatory variable of this study, constructed as a binary "in household" indicator equal to one if the respondent and *at least* one of her children live in the same household and zero otherwise.

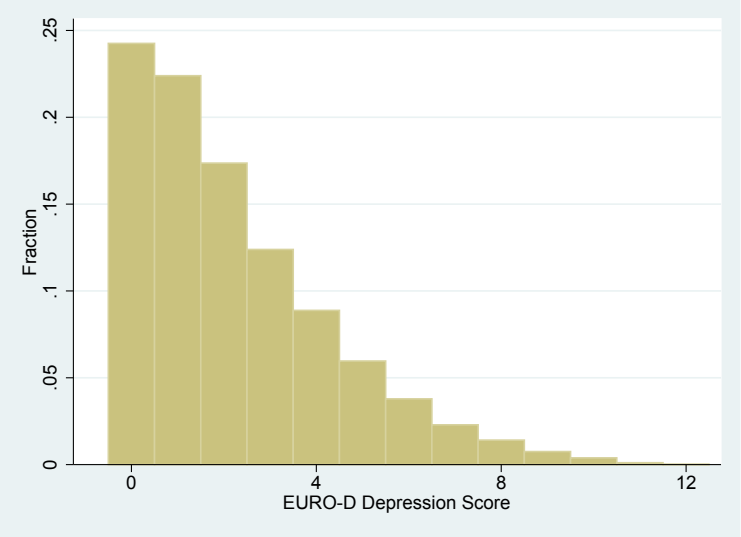
### Dependent Variable

The dependent variable of interest is depression, defined on the basis of a symptom-oriented measure known as the EURO-D scale. The EURO-D is made up of 5 de-

[18] A long-term period (from 2004 to 2010) is not considered since a given respondent may have actually experienced multiple coresidence changes in either direction during this time, hindering the indentifiability of results.

[19] See the description of "depression" provided by the American Psychiatric Association in their website `http://www.psychiatry.org/depression` (accessed on July 23, 2013).

**Figure 2.4:** Distribution of the EURO-D depression score variable in our sample




pression measures[20] which are harmonized to produce a 12-item scale comprising the following symptoms: pessimism, depressed mood, suicidal thoughts, guilt, trouble sleeping, loss of interest, irritability, fatigue, inability to concentrate, lack of appetite, incapacity of enjoyment, and tearfulness (Prince et al., 1999). The index was developed in an effort to compare depression symptoms in fourteen European centers and is constructed by summing the binary items, ranging from a score of 0 (no symptoms) to 12 (all symptoms). According to Prince *et al.*, the EURO-D is a valid and internally consistent scale which correlates well with other well-known mental health measures, providing for a valid comparison of risk factor associations in mental health between units. The EURO-D variable in our sample is distributed as shown in Figure 2.6.

### Matching Covariates

The propensity score is built upon a number of observables which may prove themselves important factors influencing the outcome of interest, which in this case is the depression level of the respondent. Such observables include: *a*) sociodemographic characteristics of the respondent, such as age, gender, marital status, years of education, area of residence (either urban or rural), and health (the number of chronic conditions as well as the difficulties in performing activities of daily living); and *b*) her economic situation, measured by her household income (split into quintiles by country), her ability to "make ends meet" financially (*i.e.*, financial distress), and

[20] Geriatric Mental State-AGECAT (GMS-AGECAT), SHORT-CARE, Centre for Epidemiological Studies Depression scale (CES-D), Zung Self-Rating Depression Scale (ZSDS), and Comprehensive Psychopathological Rating Scale (CPRS).

her employment status (employed, unemployed, or retired). We also use the available information on the respondent's offspring to match on the number of children who are still alive per respondent and their average age.[21]

Table 2.2 presents summary statistics of the main variables in our sample. The mean age at survey entry (*i.e.*, in the year 2004) is 63.5 and 64.1 years for men and women, respectively. 70% of respondents are married and living together with their spouse, while about a fifth of them are either widowed or divorced. In 2004, respondents' children were, on average, 34.9 years old. Approximately one third of respondents report being financially constrained. When it comes to health, almost half suffer from two or more chronic conditions (a list of 17 items going from asthma, high cholesterol, and blood pressure to cancer and Alzheimer's disease), while 10% of them report at least one limitation in performing activities of daily living (ADLs). More than half of the respondents are retired, and only about 3% of them report being unemployed. One in three live in a rural area. The average respondent declares having either 2 or 3 children.

### 2.3.2 Modeling the Problem

Following the theoretical representation in Chapter 1, the utility function of a representative individual is

$$u_{it} = u(\underline{t}(C_{it}), x_{it}) \tag{2.3.1}$$

where $\underline{t}$ represents a non-negative amount of "downtime" experienced by agent $i$, characterized by symptoms of depression such as sadness and/or loneliness; $C$ is a binary variable equal to one if the respondent coresides with (at least) one of her children in period $t$ and zero otherwise; and $x$ is an aggregate variable encompassing all forms of consumption.

Under a difference-in-differences approach, the following expression would be required:

$$\Delta u_i = u(\underline{t}(C_{it+1}), x_{it+1}) - u(\underline{t}(C_{it}), x_{it})$$

Treated individuals are those for whom $C_{it} \neq C_{it+1}$, or, in other words, those respondents for whom a change in coresidence status is observed between waves (be it a double up or a split up). It is further assumed that the utility function displays the

[21] Additional variables, such as the number of grandchildren, were included to assess the robustness of the model at hand, but were then dropped for lack of explanatory power. As per Bryson et al. (2002) and Caliendo and Kopeinig (2008), including extraneous variables in the model may aggravate the common support problem, and hence researchers should refrain from over-parameterizing their models.

**Table 2.2:** Summary statistics of the main variables in the sample

| Variable | Mean | Median | S.D. | Min | Max | N |
|---|---|---|---|---|---|---|
| *EURO-D* | 2.27 | 2 | 2.14 | 0 | 11 | 12463 |
| *Age* | 63.82 | 63 | 9.16 | 50 | 94 | 12463 |
| *Female* | 0.57 | 1 | 0.49 | 0 | 1 | 12463 |
| *Married*[a] | 0.58 | 1 | 0.49 | 0 | 1 | 12463 |
| *Single*[b] | 0.42 | 0 | 0.49 | 0 | 1 | 12463 |
| *Education (years)* | 10.75 | 11 | 4.42 | 0 | 25 | 12463 |
| *Financial distress* | 0.31 | 0 | 0.46 | 0 | 1 | 12463 |
| *Income quintile* | 2.90 | 3 | 1.40 | 1 | 5 | 12463 |
| *Employed* | 0.09 | 0 | 0.29 | 0 | 1 | 12463 |
| *Unemployed* | 0.03 | 0 | 0.16 | 0 | 1 | 12463 |
| *Retired* | 0.57 | 1 | 0.49 | 0 | 1 | 12463 |
| *Chronic conditions* ($> 1$) | 0.45 | 0 | 0.50 | 0 | 1 | 12463 |
| *ADLs* ($\geq 1$) | 0.09 | 0 | 0.29 | 0 | 1 | 12463 |
| *Urban arean* | 0.45 | 0 | 0.50 | 0 | 1 | 12463 |
| *Rural area* | 0.55 | 1 | 0.50 | 0 | 1 | 12463 |
| *Number of children* | 2.46 | 2 | 1.32 | 0 | 12 | 12463 |
| *Age of children* | 34.93 | 34 | 10.06 | 2 | 70 | 12463 |

Notes:

[a] Married and living together or in a registered partnership.

[b] Separated, never married, divorced, or widowed.

following properties:

$$\frac{\partial u}{\partial \underline{t}} < 0, \frac{\partial^2 u}{\partial \underline{t}^2} > 0, \frac{\partial u}{\partial x} > 0, \frac{\partial^2 u}{\partial x^2} < 0$$

No assumptions are made, however, with regard to the effect of coresidence with children $C$ on the amount of downtime $\underline{t}$, given by $\partial \underline{t}/\partial C$. Indeed, this remains the effect of interest of the present study, to which the present empirical section is dedicated.

Empirically, respondents are classified depending on whether a change in coresidence status with respect to their closest child was registered in-between two waves, independent of the direction of the change (*e.g.*, coresidence or dissolution). Mirroring the theory developed in Section 2.2, let $D_{it} \in [0, 1]$ indicate such a change in coresidence status from one wave to the next. If a change is registered, respondents are classified as treated and are assigned a value of $D_{it} = 1$.[22] Otherwise, respondents are left untreated ($D_{it} = 0$) if parental coresidence status with the closest child remains unchanged between waves. Moreover, let $Y_{1i(t+s)}$ be the respondent's depression score

[22] Or, equivalently, $D_{it} = 1$ whenever $C_{it} \neq C_{it+1}$.

at time $t+s$, $s \geq 0$, following a change in proximity, while $Y_{0i(t+s)}$ represents the depression score had there not been such a change. The causal effect of a change in family proximity for respondent $i$ at time $t+s$ is then given by $Y_{1i(t+s)} - Y_{0i(t+s)}$, which leads to the estimation of the average treatment effect on the treated:

$$E[Y_{1i(t+s)} - Y_{0i(t+s)}|D_{it}=1] = E[Y_{1i(t+s)}|D_{it}=1] - \underbrace{E[Y_{0i(t+s)}|D_{it}=1]}_{\theta} \quad (2.3.2)$$

The last term in (2.3.2), labeled $\theta$ for short, represents the expected outcome that treated respondents would have experienced had there not been a change in proximity, *i.e.*, the counterfactual. Given that the counterfactual is unobserved for respondents undergoing a change in proximity, causal inference relies on its proper approximation through a suitable empirical construction of $Y_{0i(t+s)}$.

Provided the absence of confounding factors which might influence treatment assignment (and thus permeate our results with biases and endogeneity), a valid approximation to $E[Y_{0i(t+s)}|D_{it}=1]$ would be given by the average depression level of respondents not experiencing a change in family proximity, namely $E[Y_{0i(t+s)}|D_{it}=0]$. This is not always the case, however, and so the need arises to resort to matching techniques in order to minimize estimation bias by constructing an appropriate control group. By building up the probability of receiving treatment (*i.e.*, the propensity score) for each respondent on the basis of observable characteristics, we are able to pair each individual undergoing an inter-wave change in children proximity with a comparable respondent for whom such move is nonexistent. In this manner, individual differences in observable attributes are minimized and depression score dynamics for the untreated group can be used to construct the counterfactual for the treated individuals. A probit model is used to calculate the propensity score $P(D_{it}=1) = f(X_{i(t-1)})$, where, as mentioned in Section 2.2, $X_{i(t-1)}$ constitutes a vector of observed pre-treatment individual characteristics.

The average treatment effect on the treated is then estimated by inserting the propensity score into the DID-matching estimator, as defined in equation (2.2.10). Although this estimator still requires the selection on observables assumption inherent to matching, performing DID effectively eliminates all unobserved time invariant characteristics of respondents which would otherwise bias the results (Girma and Goerg, 2007).

Finally, the assumption of independence conditional on observables given by equation (2.2.6) implies that the treatment and control groups should be balanced –made

similar– in terms of pre-treatment characteristics. To ensure that no significant differences exist between treatment and control groups, such balance must be achieved. By guaranteeing comparability, a set of properly balanced covariates will make a case for the validity of our results. Another way to diagnose the quality of the propensity score matching estimates is to perform sensitivity and robustness checks by exposing the model to minor changes and testing its main assumptions, which is done in Sections 2.6 and 2.7. The findings presented in the following section are chaperoned by several balancing tests displayed in both numerical and graphical format.

## 2.4 Results

The analysis is split into two subsections: the first one pools all ten countries together to perform the DID matching estimates, while the second splits the sample up into two European macro blocks (Protestant and Catholic Europe) in an attempt to individuate any potential large scale cultural effects.

### 2.4.1 Pooled Sample

Table 2.3 displays the DID matching estimates[23] of the doubling up effect when the ten European countries in our sample are pooled together.[24] As described in Section 2.2.3, such estimates differ from traditional cross-sectional matching in that they remove the time-invariant factors in both the treatment and comparison groups conditional on the propensity score $P(X)$. Surprisingly, the estimates indicate that neither the doubling up nor the dissolution of a child-parent household between the waves has a significant effect on the levels of depression of the parents. This is true both in the short and the medium term when the ten countries are pooled together into a single European sample.

[23]The *diff* and *psmatch2* user-written Stata commands and their subcommands were employed for estimation (Villa (2011) and Leuven and Sianesi (2003), respectively). In particular and as mentioned in Section 2.2.3, matching results throughout this study are based on the Epanechnikov kernel distribution.

[24]Bootstrapping methods with 200 repetitions are used to estimate the standard errors (variance) of the DID matching estimates throughout this study. In spite of being extremely time-consuming and computationally demanding, bootstrapping aims at obtaining a distribution of average treatment effects that approximates the sampling distribution of the population mean (Caliendo and Kopeinig, 2008). Bootstrapping in a matching context has been commonly done in the literature (Lechner, 2002; Heckman et al., 1997; Black and Smith, 2004) although some controversy exists (Imbens, 2004; Abadie and Imbens, 2008).

**Table 2.3:** "Double up" and "split up" DID matching estimates for the pooled sample

| | **Double up** | | **Split up** | |
|---|---|---|---|---|
| | **S.T.** | **M.T.** | **S.T.** | **M.T.** |
| $\Delta Depression$ | 0.191 | -0.300 | -0.051 | -0.225 |
| *p-value* | 0.615 | 0.161 | 0.825 | 0.315 |
| *Std. Error* | 0.380 | 0.214 | 0.232 | 0.224 |
| *Number treated* | 69 | 215 | 282 | 281 |
| *Number control* | 3017 | 2946 | 791 | 573 |

Notes:
**S.T.**=Short term (2 years); **M.T.**=Medium term (4 years).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The validity of our estimates is justified by providing graphical and numerical evidence on the successful balancing of the treatment and control groups, which satisfies the crucial assumption that, conditional on the propensity score, the treatment and comparison groups are in fact comparable. Table 2.4 shows that matching is effective in removing differences in observable characteristics between individuals undergoing treatment (either doubling up with parents or splitting up into different households) and their control counterparts. It presents the standardized difference[25] (or bias) for all the covariates used in the propensity score estimation (Rosenbaum and Rubin, 1983). For instance, the standardized bias for a given covariate is defined as the difference in means between the treated sample and the matched control group used as comparison, divided by the square root of the average of the variances of such covariate in the original pre-matching samples (Smith and Todd, 2005b).[26]

Intuitively, the standardized difference can be described as the difference in means of a covariate divided by the pooled standard deviation. The lower the standardized bias, the higher the balance (or comparability) between the treatment and control

[25]Standardized differences of means are commonly preferred to $t$-tests as measures of balance quality. Given the assumptions required for $t$-tests to work (*e.g.*, normal distribution of variables) and its high sensitivity to sample size, post-matching comparisons based on $t$-tests are greatly disputable.

[26]Formally, the standardized bias for a given covariate $X_k$ is calculated as follows (*e.g.*, Rosenbaum and Rubin, 1985; Smith and Todd, 2005b):

$$SDIFF(X_k) = \frac{100 \, \frac{1}{n_{1P}} \sum_{i \in I_1} \left( X_{ik} - \sum_{j \in I_0} W(i,j) \, X_{jk} \right)}{\sqrt{\frac{var_{i \in I_1}(X_{ik}) + var_{j \in I_0}(X_{jk})}{2}}}$$

groups in terms of the covariate under scrutiny. Given the lack of formal criteria for evaluating the size of the bias, we follow Rosenbaum and Rubin (1983) in assuming that a value of 20 is "large." Additionally, we abide by the common practice in the literature of estimating the standardized bias for all the covariates included in the matching, since bias reduction for individual covariates might be misleading (*e.g.*, if the means are already so close together in the unmatched sample that matching methods have basically no room for improvement, it would seem as if matching was indeed not able to reduce the bias). Notably, adopting the propensity score matching approach reduces the median absolute bias of the models substantially by a factor ranging from 65% to 87%. The standardized differences between the treatment and control samples are all less than 3%. Matching also effectively removes any explanatory power of the covariates in the model, as indicated by a pseudo R-squared close to zero.

The second balancing assessment is given in Figure 2.5, where the standardized percentage bias across individual covariates before and after matching is made graphically comparable. The reduction in standardized percentage bias for each of the models is evident, indicating that the chosen matching technique is effective in removing a substantial part of the standardized percentage biases present in the covariates before the treated and control units were matched.

Histograms of the propensity scores of the treatment and control groups are plotted in Figure 2.6 in order to assess if enough overlap exists to make reasonable comparisons between them. The treated and control cases are shown in green and violet in the top and the bottom of the $x$-axis, respectively. The charts are satisfactory in that they show similar propensity score distributions for both groups; put differently, there are enough control cases to serve as analogue counterparts for the treated.[27] In Figure 2.7, a more detailed picture of the propensity score distribution is given by increasing the number of bins from 20 to 100.

The balancing tests presented above indicate that the balancing conditions are satisfied and suggest that the chosen matching specification effectively accounts for factors that determine selection into treatment.

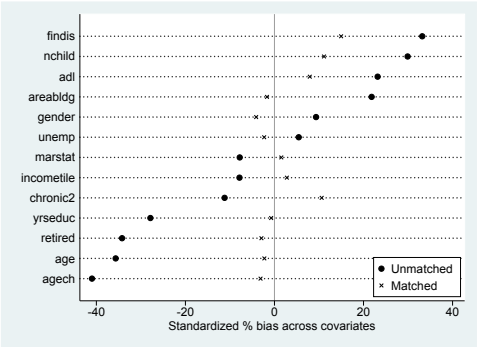
Being aware of the enormous heterogeneity present across Europe, the foreseeable question given the lack of significance in our estimates is whether there exists a cultural factor which may determine the impact of household arrangements on parental

[27]Nevertheless, the fact that matching with replacement is being used implies that comparisons would still be possible even if only few control cases existed for a given propensity score, since such cases would be used over and over again as matches for the treated.

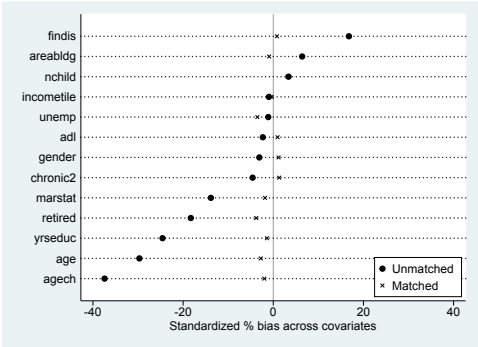
**Table 2.4:** Balancing statistics for the pooled sample

| | Pseudo $R^2$ | | LR *chi*2 | | $p > chi2$ | | Median bias | | % reduction in bias |
|---|---|---|---|---|---|---|---|---|---|
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched | |
| **Double up** | | | | | | | | | |
| *Short term* | 0.067 | 0.010 | 89.57 | 4.09 | 0.000 | 0.990 | 23.2 | 2.9 | 87.5 |
| *Medium term* | 0.037 | 0.001 | 115.08 | 1.67 | 0.000 | 0.999 | 6.4 | 1.4 | 78.1 |
| **Split up** | | | | | | | | | |
| *Short term* | 0.045 | 0.003 | 112.12 | 3.86 | 0.000 | 0.993 | 7.6 | 2.6 | 65.8 |
| *Medium term* | 0.028 | 0.003 | 60.92 | 4.65 | 0.000 | 0.982 | 5.9 | 2.0 | 66.1 |

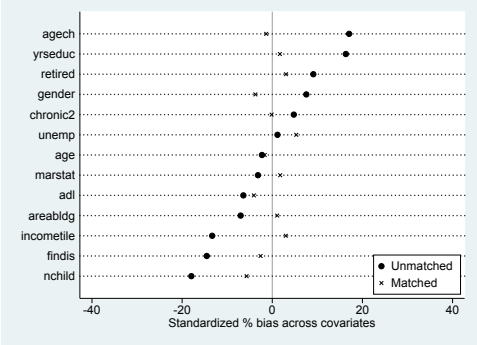
**Figure 2.5:** Standardized percentage bias across covariates before and after matching for the pooled sample



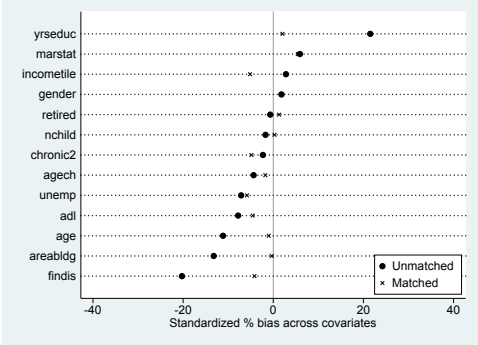

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

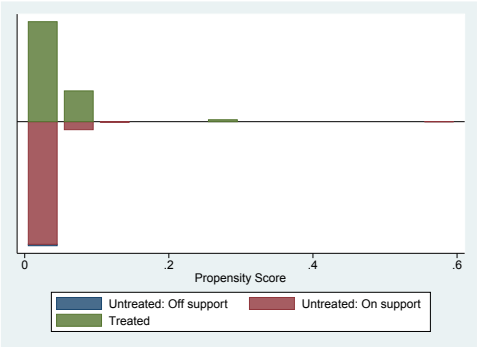
*Note:* the variables in alphabetical order are limitations in activities of daily living (*adl*); age of respondent (*age*); age of children (*agech*); area of residence (*areabldg*); two or more chronic conditions (*chronic2*); financial distress (*findis*); gender (*gender*); income quintile (*incometile*); marital status (*marstat*); number of children (*nchild*); retired (*retired*); unemployed (*unemp*); and years of education (*yrseduc*)

depression levels and which would be eclipsed by the pooling of all ten European countries in our data. For instance, it is well known that in Mediterranean countries such as Italy or Spain adult children leave the household at a much older age than they would do, say, in Sweden or the Netherlands. Such cultural differences are explored in more detail in the following subsection.

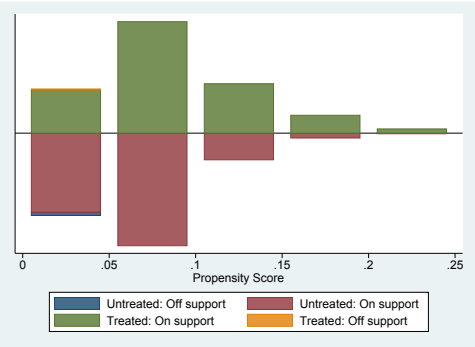
### 2.4.2 Protestant *vs.* Catholic Europe

It is possible that the impact of treatment differs across the treated depending, for instance, on environmental factors, making the estimation of the average treatment effect on the treated ambiguous and inconclusive. Thus, in an attempt to account for such environmental differences, the analysis is split into two geographical macro

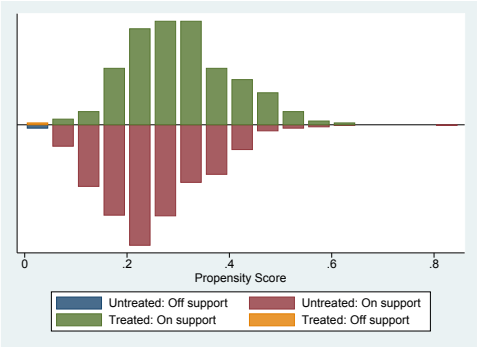
**Figure 2.6:** Propensity score histogram for the treatment and control groups for the pooled sample (20 bins)



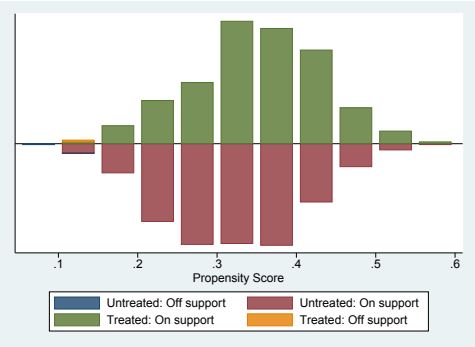

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

regions: Protestant Europe (Sweden, Denmark, Germany, the Netherlands, and Switzerland) and Catholic Europe (France, Belgium, Austria, Italy, and Spain).[28,29] DID matching estimates are then calculated for each of these regions separately and then compared among them to assess the extent to which regional differences play a determinant role in the doubling up phenomenon.

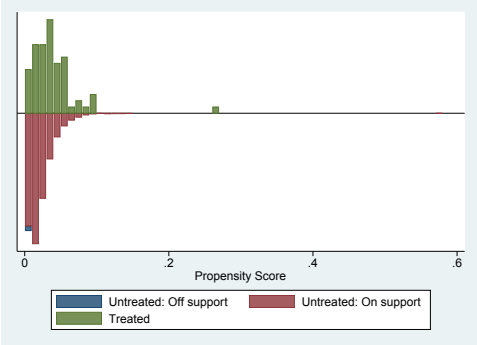
Table 2.5 shows the DID matching estimates after the sample has been split up by region.[30] One remarkable effect emerges: in Catholic Europe, doubling up signifi-

[28]This arrangement follows Inglehart and Welzel (2005) "cultural map of the world," a chart that positions countries according to their people's values as opposed to their geographical location. Using data from the World Values Survey (WVS), they find that two major dimensions of cross-cultural variations –namely, (1) traditional *vs.* secular-rational and (2) survival *vs.* self-expression values– are enough to explain more than 70% of the cross-national variance in a factor analysis of ten indicators. In this way, the authors split western Europe into two culturally and historically-diverse groups, which are generalized under the labels "Protestant" and "Catholic" Europe.

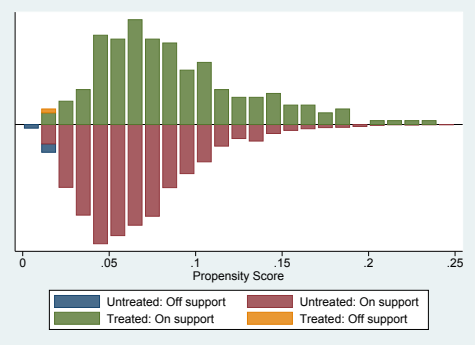
[29]In a further re-categorization, the sample is split up into three regions, namely northern, central, and southern Europe. This is presented in Section 2.6 and aims at assessing the robustness of our results. Although it is clear that the analysis would be best at a country or even city level, small sample sizes make this option statistically unviable.

[30]42.6% of respondents live in Protestant Europe, 57.4% in its Catholic counterpart.

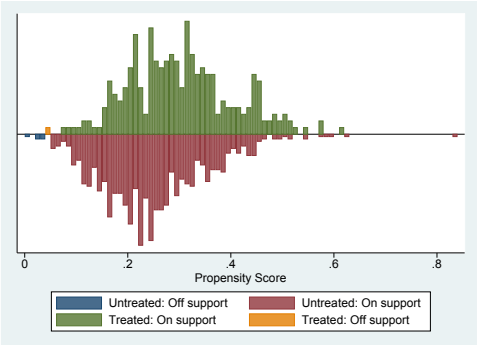
**Figure 2.7:** Propensity score histogram for the treatment and control groups for the pooled sample (100 bins)



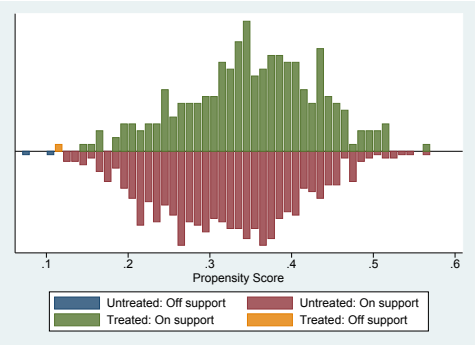

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

cantly reduces parental depression in the medium term, making it approximately 19% lower than what it would have otherwise been had the double up not taken place.[31] On the other hand, no significant effect of doubling up on parental depression levels is observed in Protestant Europe.

Several reasons make this a noteworthy finding:

- Doubling up never increases depression significantly, neither in Catholic nor in Protestant countries, neither in the short nor in the medium term. Nor does a split up –or dissolution– of intergenerational households.

- An apparent cultural divide emerges in the case of intergenerational coresidence, as the effects of a double up in Protestant and Catholic Europe seem to move in opposite directions. In the short term, for instance, coresidence decreases

[31] The initial average number of depression symptoms in Catholic Europe were 2.57. Following the trend in the control group, had the treatment not taken place the number of symptoms would have increased by 0.25, to reach a level of 2.83. According to our results, however, after a double up the depression score of Europeans living in Catholic countries drops to 2.29.

**Table 2.5:** "Double up" and "split up" DID matching estimates by regions (Protestant *vs.* Catholic Europe.

| | **Protestant Europe** | | | | **Catholic Europe** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Double up** | | **Split up** | | **Double up** | | **Split up** | |
| | **S.T.** | **M.T.** | **S.T.** | **M.T.** | **S.T.** | **M.T.** | **S.T.** | **M.T.** |
| $\Delta$*Depression* | -0.543 | 0.108 | -0.078 | -0.226 | 0.559 | **-0.540**** | -0.077 | -0.220 |
| *p-value* | 0.434 | 0.731 | 0.802 | 0.478 | 0.243 | **0.049** | 0.804 | 0.406 |
| *Std. Error* | 0.694 | 0.313 | 0.311 | 0.318 | 0.478 | **0.275** | 0.311 | 0.264 |
| *Number treated* | 24 | 82 | 114 | 100 | 43 | **133** | 168 | 182 |
| *Number control* | 1273 | 1456 | 187 | 133 | 1481 | **1492** | 577 | 432 |

Notes:

**Protestant Europe**=Sweden, Denmark, the Netherlands, Germany, and Switzerland.

**Catholic Europe**=Belgium, France, Austria, Italy, and Spain.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

parental depression in Protestant countries but leads to an increase in depression in Catholic ones (although in neither case significantly so).

- In the medium term, however, more intergenerational proximity increases parental depression in Protestant Europe but proves itself significantly beneficial for its Catholic counterpart. This finding could be attributed to a more family-oriented environment in the latter where the so-called welfare State may be lacking in comparison to the earlier and where intergenerational households are much more prevalent. A weaker welfare State combined with a stronger family tradition in Catholic Europe may result in a scenario where elderly parents rely mainly on the help, assistance, and companionship of their children. Contrastingly, while family unity and intergenerational support might be the rule in such a region, Protestant values might instead encourage professional success, personal independence, and mobility.[32]

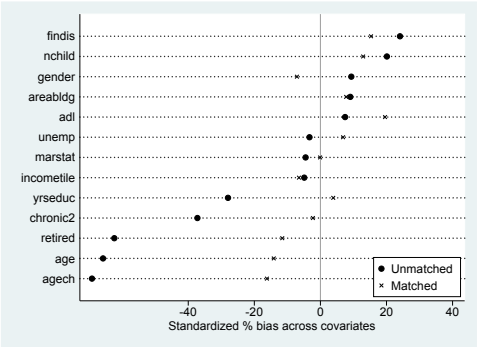
- The fact that doubling up increases depression in the short term but drastically decreases it in the medium term[33] in Catholic European countries may be an indicator of the existence of a parental adaptability period, characterized by an initial negative connotation attached to a double up (*e.g.*, signaling a problematic situation, such as a lack of independence, unemployment, etc.) but which either turns out beneficial or is just accepted as a fact in the long term. Blatantly put, when it comes to doubling up Europeans in Catholic countries learn to literally "live with it" –and they seem to capitalize on it.

- Throughout Europe, the dissolution of intergenerational households might be regarded as "nature's course" or the "appropriate" life-cycle path, as it reduces depression levels in both short and medium terms for both Protestant and Catholic countries, although never significantly so.

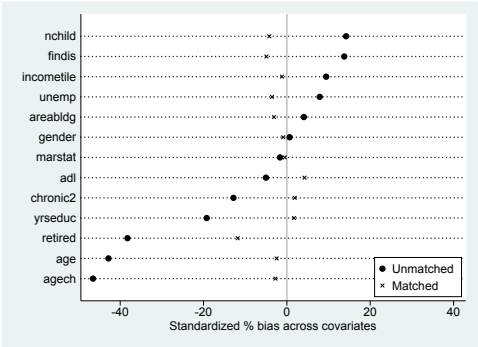
The balancing tests that follow (Table 2.6 and Figures 2.8, 2.9, 2.10, 2.11, 2.12, and 2.13) assert the overall validity of our findings. All eight regional DID matching models presented pass the balancing tests by which the effective comparability of treatment and control units is ascertained. However (and although the estimates are not statistically significant), caution is advised when interpreting the effect of a split up in Protestant Europe in the medium term, given the relatively small (18.8%) post-matching bias reduction and the fact that some of the matched covariates come

[32] See Isengard and Szydlik (2012) for supportive evidence of this intra-European cultural divide.
[33] Not significantly and significantly so, respectively.

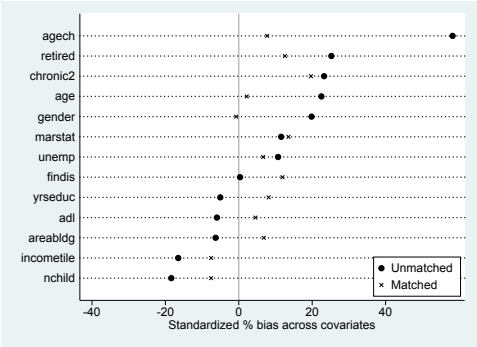
**Figure 2.8:** Standardized percentage bias across covariates before and after matching for Protestant Europe



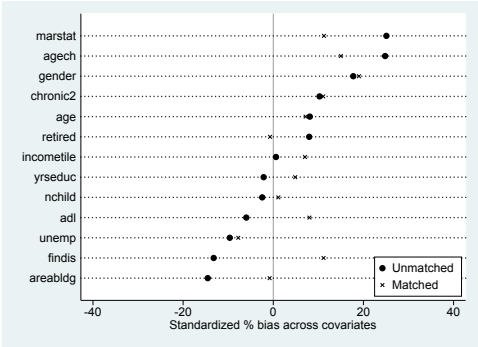

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

*Note:* the variables in alphabetical order are limitations in activities of daily living (*adl*); age of respondent (*age*); age of children (*agech*); area of residence (*areabldg*); two or more chronic conditions (*chronic2*); financial distress (*findis*); gender (*gender*); income quintile (*incometile*); marital status (*marstat*); number of children (*nchild*); retired (*retired*); unemployed (*unemp*); and years of education (*yrseduc*)

close to the 20% standardized bias threshold (Figure 2.8d).[34] Comparability among the treatment and comparison groups may be challenged when such a threshold is surpassed.

## 2.5 The Role of Economic Factors

Admittedly, doubling up brings with itself a trade-off between beneficial aspects (*e.g.*, intergenerational monitoring) as well as adverse effects (*e.g.*, increased expenses and intergenerational conflict) for the older generation. Some of these shocks are most probably economical in nature and their possible influence cannot be left unexplored.

[34]This might be due to the comparatively smaller control group for such case (see Table 2.5).

**Table 2.6:** Balancing statistics by region (Protestant *vs.* Catholic Europe)

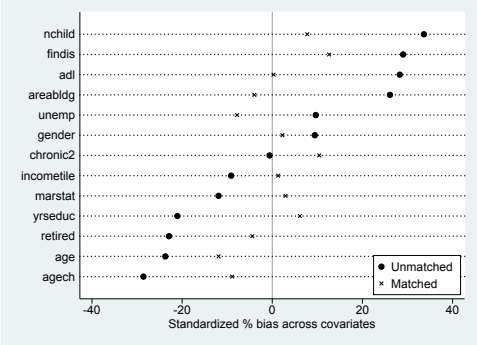
| | Pseudo $R^2$ | | LR *chi*2 | | $p > chi2$ | | Median bias | | % reduction in bias |
|---|---|---|---|---|---|---|---|---|---|
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched | |
| **a) Protestant Europe** | | | | | | | | | |
| **Double up** | | | | | | | | | |
| *Short term* | 0.095 | 0.024 | 49.47 | 3.00 | 0.000 | 0.998 | 20.1 | 7.8 | 61.2 |
| *Medium term* | 0.039 | 0.007 | 49.64 | 3.02 | 0.000 | 0.998 | 12.8 | 2.7 | 78.9 |
| **Split up** | | | | | | | | | |
| *Short term* | 0.107 | 0.031 | 90.00 | 16.66 | 0.000 | 0.215 | 16.5 | 7.6 | 53.9 |
| *Medium term* | 0.029 | 0.025 | 18.64 | 12.28 | 0.135 | 0.505 | 9.6 | 7.8 | 18.8 |
| **b) Catholic Europe** | | | | | | | | | |
| **Double up** | | | | | | | | | |
| *Short term* | 0.071 | 0.013 | 56.80 | 3.00 | 0.000 | 0.998 | 22.9 | 6.1 | 73.4 |
| *Medium term* | 0.037 | 0.002 | 68.25 | 1.56 | 0.000 | 0.999 | 7.7 | 1.9 | 75.3 |
| **Split up** | | | | | | | | | |
| *Short term* | 0.034 | 0.004 | 55.85 | 3.81 | 0.000 | 0.993 | 8.0 | 2.7 | 66.3 |
| *Medium term* | 0.029 | 0.007 | 44.75 | 6.40 | 0.000 | 0.930 | 5.5 | 3.1 | 43.6 |

Notes:

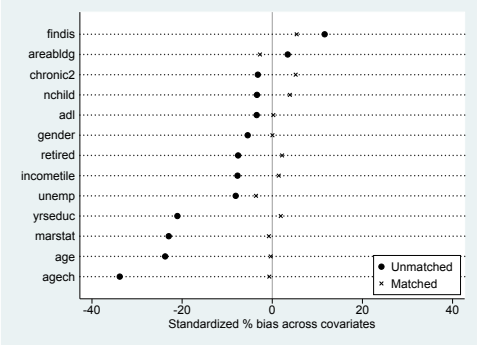
**Protestant Europe**=Sweden, Denmark, the Netherlands, Germany, and Switzerland.

**Catholic Europe**=Belgium, France, Austria, Italy, and Spain.

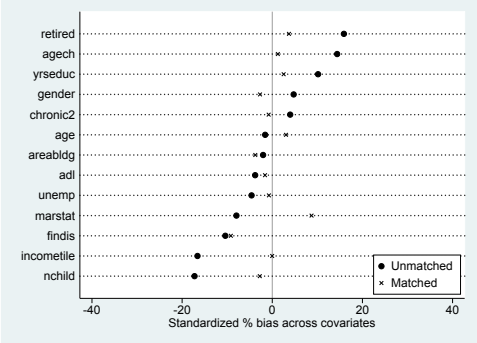
**Figure 2.9:** Standardized percentage bias across covariates before and after matching for Catholic Europe



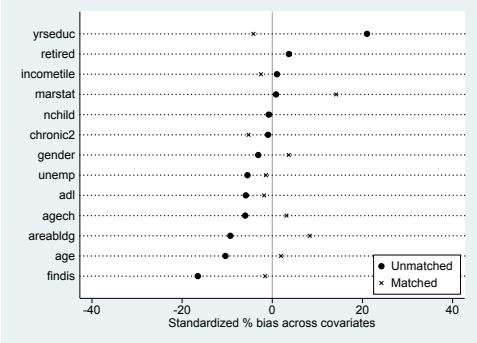

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

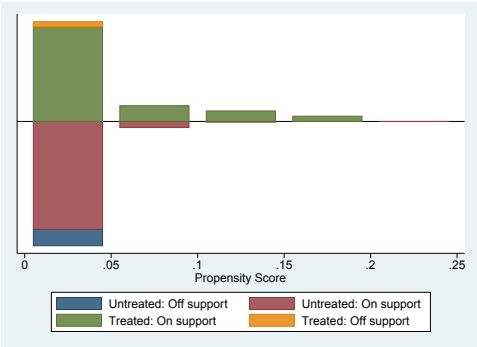
*Note:* the variables in alphabetical order are limitations in activities of daily living (*adl*); age of respondent (*age*); age of children (*agech*); area of residence (*areabldg*); two or more chronic conditions (*chronic2*); financial distress (*findis*); gender (*gender*); income quintile (*incometile*); marital status (*marstat*); number of children (*nchild*); retired (*retired*); unemployed (*unemp*); and years of education (*yrseduc*)

Our aim in this section is that of assessing whether such economic factors exert any notable effects in the present analysis.

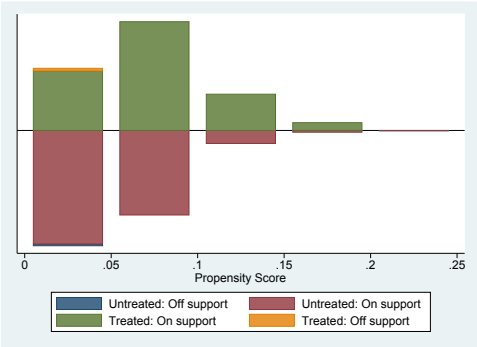
Five steps were taken to investigate possible economic confounding factors in our results. Our efforts in this respect are centered around the case where a significant effect of doubling up on depression is found.

Firstly, a bivariate probit model was devised to address the claim that economic conditions and doubling up are dependent on each other and should thus be modeled simultaneously. Specifically, the binary variable measuring financial distress is used as an indicator of economic hardship. Subsequently, a bivariate probit regression of financial distress and doubling up was estimated with all the covariates previously used to construct the propensity score, and the standard errors were clustered by respondent. As a result, the Wald test comparing both equations fails to reject the

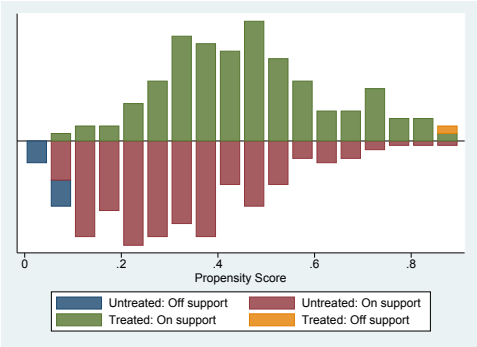
**Figure 2.10:** Propensity score histogram for the treatment and control groups for Protestant Europe (20 bins)



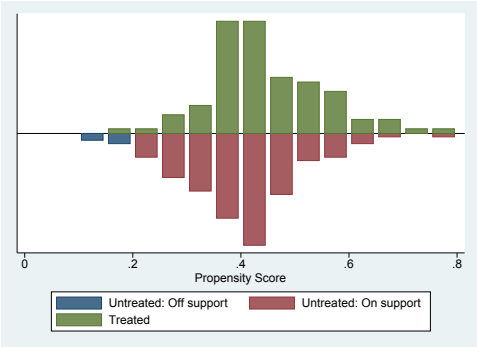

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)

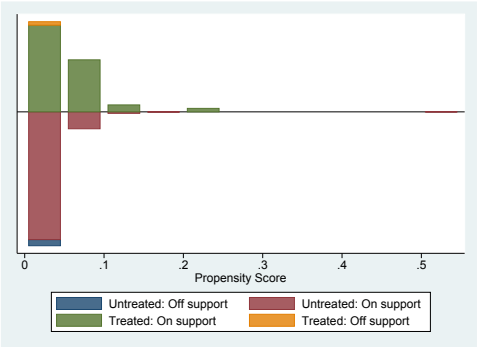



**(d)** Split up (medium term)

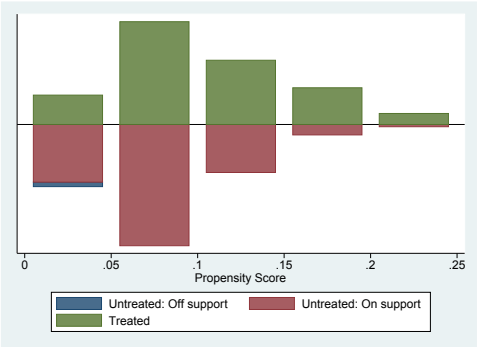
hypothesis that the two specifications (*i.e.*, the standard errors of the two models) are independent from each other ($p$-value= 0.19). Intuitively, this means that the probabilities of being financially distressed and experiencing a double up cannot be regarded as joint probabilities in our specific sample, and therefore that separate models fit the data better.

Secondly, an analysis of the provision of public benefits in the ten countries in our sample was performed and the differences appraised. This is founded on the view that some countries may provide for informal long-term care –in the form of cash benefits either to the care-giver or the beneficiary– which may in turn have an influence on the mental wellbeing of respondents through a betterment in financial conditions. In particular, were those benefits to exist predominantly and disproportionately in the Catholic European macro region, then this could in fact be regarded as a plausible explanation for the observed depression drop following a double up in that region. Indeed, the difference-in-differences approach would fail to remove such an effect, as it benefits exclusively those respondents receiving treatment and disregards all others.

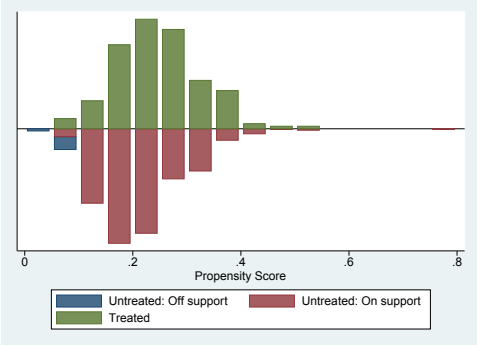
**Figure 2.11:** Propensity score histogram for the treatment and control groups for Catholic Europe (20 bins)



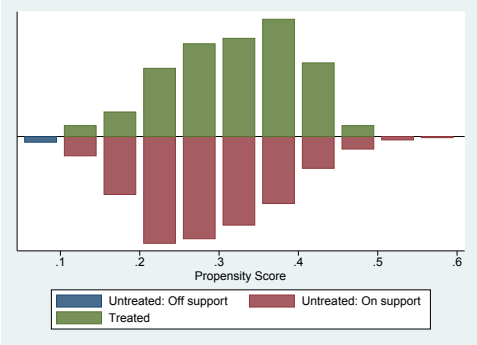

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)

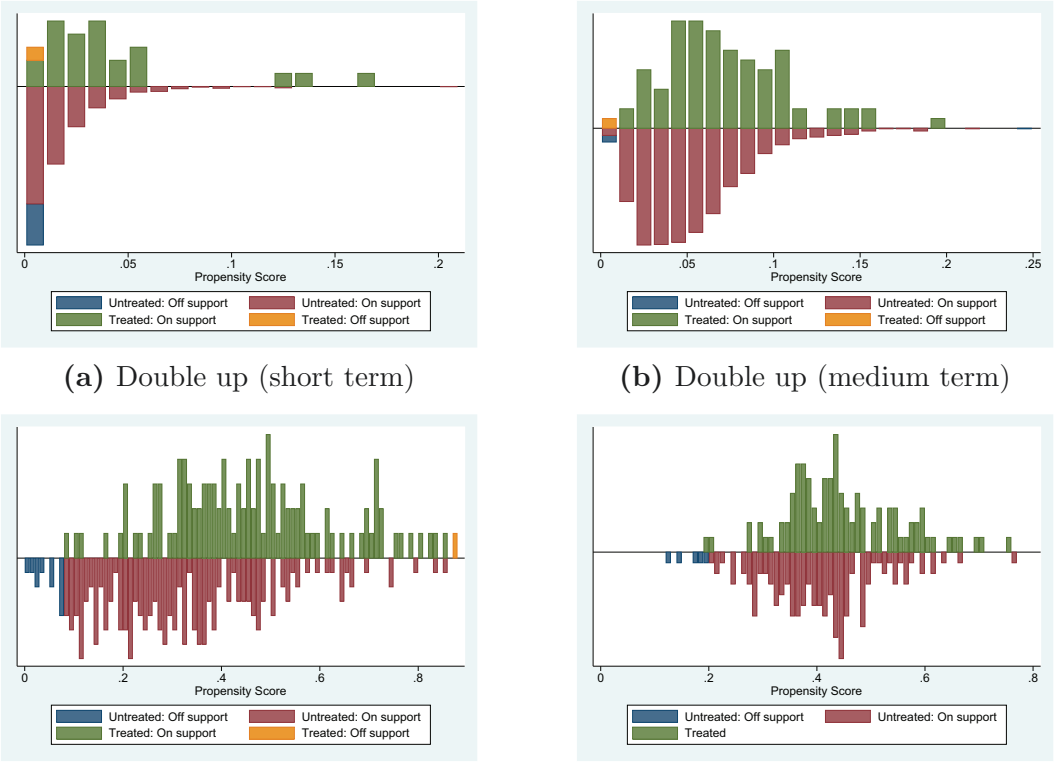



**(d)** Split up (medium term)

The findings suggest that three our of five countries give benefits to care recipients in Protestant Europe, as opposed to four out of five in its Catholic counterpart. This ratio stays unchanged when it comes to welfare benefits to informal care givers (Table 2.7). Although this illustrates the stronger preference for formal care in northern countries with a Protestant tradition, it fails to provide solid enough evidence to justify the difference in depression scores observed after a double up in both regions.

The third approach to assess the influence of economic variables is to look at the reported public benefits received by individual respondents in the dataset. This shifts the focus on public benefits effectively from the aggregate analysis done in the previous paragraphs to the individual level specific to our sample. In waves two and four, respondents are asked to declare whether they have received any public benefits since the last interview. Although six possible answers are offered to respondents, for our purposes only disability insurance benefits and social assistance are consid-

**Figure 2.12:** Propensity score histogram for the treatment and control groups for Protestant Europe (100 bins)




**(a)** Double up (short term)

**(b)** Double up (medium term)

**(c)** Split up (short term)

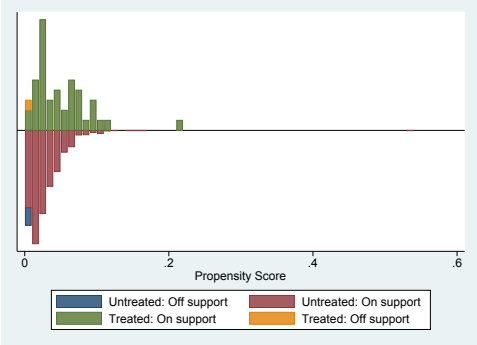
**(d)** Split up (medium term)

**Table 2.7:** Monthly public benefits by country given separately for care recipients and care providers

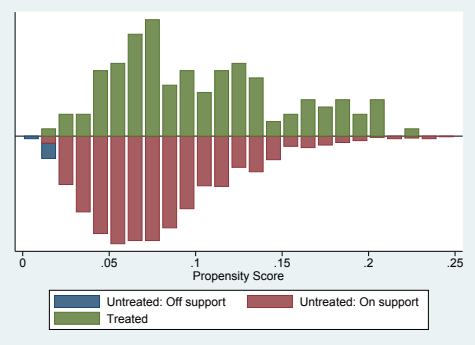
| | Care Recipient | | Care Provider | |
|---|---|---|---|---|
| **Country** | **Y/N** | **Amount** | **Y/N** | **Amount** |
| *Denmark* | N | 0 | Y | 2,220€ |
| *Sweden* | N | 0 | Y | varies |
| *Netherlands* | Y | varies | N | 0 |
| *Switzerland** | Y | 998-16,140€ | N | 0 |
| *Germany* | Y | 225-685€ | Y | varies |
| *France* | Y | 490€ | N | 0 |
| *Belgium* | Y | 274€ | Y | varies |
| *Austria* | Y | 154-1,656€ | Y | varies |
| *Spain* | N | 0 | Y | 727€ |
| *Italy* | Y | 472€ | Y | varies |

*Source*: Riedel and Kraus (2011). *For Switzerland, *Switzerland: Long-term Care* (2011).

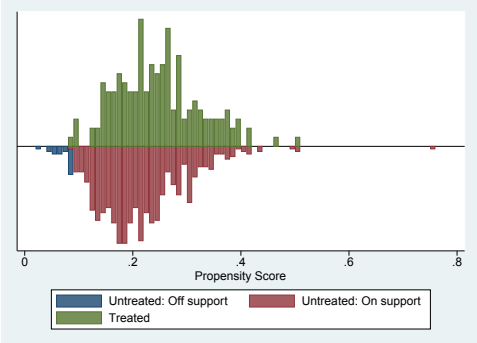
**Figure 2.13:** Propensity score histogram for the treatment and control groups for Catholic Europe (100 bins)



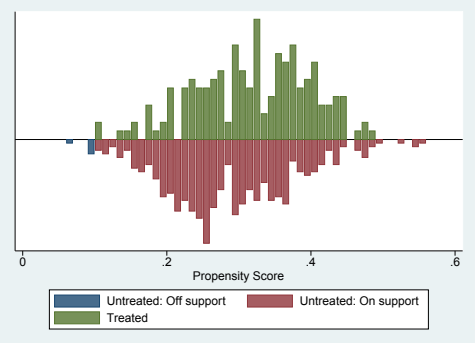

**(a)** Double up (short term)




**(b)** Double up (medium term)




**(c)** Split up (short term)




**(d)** Split up (medium term)

ered.[35] After creating a variable *benefits*$\in [0, 2]$, a test for unconfoundedness between this variable and doubling up is performed by estimating the effects of the latter on the earlier using the difference-in-difference propensity score matching estimator. In agreement with the aggregate benefits analysis, the model does not support the claim that in-household moves are incentivized by foreseen transfers of disability and/or social assistance benefits ($p$-value$= 0.73$).

Moreover, the *benefits* variable was included as a matching variable in our model in order to assess its potential protagonistic role in the construction of the propensity score of respondents. However, even after the inclusion of received benefits as a matching covariate, doubling up remains significant in reducing parental depression in the Catholic region and insignificant in its Protestant counterpart ($p$-values of 0.06 and 0.90, respectively).

[35]While most of the answers suffer from cross-country and inter-wave comparability issues (*e.g.*, the sickness benefits option is dropped in Switzerland), the two answers selected are consistent across countries and waves.

Subsequently, information on home ownership and household net worth was examined under the logic that both may decrease substantially in old age, given the eventual need for additional liquidity in order to cover increasing health expenditures. This mechanism could provide for an underlying motive behind a decision to double up. Nevertheless, the DID matching estimates provide no evidence in support of significant decreases in either home ownership or household net worth following a double up ($p$-values of 0.88 and 0.89, respectively).

Lastly, a ratio of the amount of household food expenditure to the total household income is constructed. The logic goes as follows: in a situation where the child returning to the parental home does so in response to a negative economic shock, an increase in the proportion of food consumption relative to total earnings might be expected in such household. In other words, treated households experiencing a double up might experience a significant increase in their food-to-income ratio. On the other hand, a decrease in such ratio may be the case whenever the home-returner equips the household with additional income. Nevertheless, the DID matching estimate provides no evidence to support either claim ($p$-value= 0.78).[36]

Throughout this section, various attempts to provide an economic explanation to the drop in depression of respondents in Catholic Europe after a double up were carried out. For this purpose, complementary economic indicators from different waves in SHARE were brought into the analysis and exploited. Yet, such efforts proved systematically insufficient in finding an economic rationale behind to the observed positive effects of doubling up on the mental wellbeing of older individuals living in certain environments.

## 2.6 Sensitivity Analysis

In this section, the model is subjected to minor changes in order to assess the reliability of our results. The model could indeed be deemed more solid if the estimates are not sensitive to such changes. In particular, further regional re-categorizations are proposed to test the sensitivity of our estimates to the geographical specification at hand.

Eurostat data[37] were used to rank the countries according to the average percentage of young adults (aged 24-35) living in cohabitation with their parents from 2005

[36]Repeating this analysis using household income alone as the dependent variable produces similar results ($p$-value= 0.73).

[37]All data can be publicly accessed under the link: `http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/data/database`.

to 2011 (see Table 2.1). This information was used to split our sample into three groupings according to the average coresidence rate: low (less than 10%), medium (more than 10% but less than 20%), and high (more than 20%). A geographical pattern emerges: low coresidence in northern Europe (Denmark, Sweden, and the Netherlands), medium in central (France, Switzerland, Belgium, and Germany), and high in southern Europe (Austria, Spain, Italy).

DID matching estimates for this re-categorization exercise are given in Table 2.8 and confirm the robustness of our results. Contrary to what would be otherwise expected, the effect of doubling up in countries with the highest percentage of coresidence (Austria, Italy, and Spain) loses conventional significance levels. In this respect, doubling up seems to be more beneficial in countries with medium rates of coresidence (France, Switzerland, Belgium, Germany) than in their (usually referred to as) more family-oriented southern counterparts. This is evidenced by a $p$-value of 3.6% and a negative matching estimate of -0.700 in the former as opposed to 23.9% and -0.302 in the latter. However, when both groups are combined the effect of doubling up is magnified to a statistical significance level of 1.4%.[38] The fact that the effect of a double up in northern Europe runs in the opposite direction in both short and medium terms to that in southern Europe is worthy of note.[39]

A second test for the sensitivity of the results relied on the inclusion of $a$) regional dummies (based on Inglehart and Welzel (2005) categorization) as matching covariates in the pooled sample regressions and $b$) country dummies as controls in both the pooled and the split sample regressions. Despite admittedly producing slight additional losses in the efficiency of the matching procedure, all estimates –together with their levels of statistical significance– remain largely unchanged.

Although sample sizes suffer tremendously with the choice to split the sample into more than two macro regions, our findings seem robust in that they advocate for a strong cultural difference present across Europe, hence confirming our cross-regional approach as appropriate in correctly assessing the effect of the phenomenon at hand and enhancing the interpretability of results.

[38]This might be a reflection of the increasing number of treatment and control individuals in the subsample analyzed.

[39]Results from the corresponding balancing tests are available from the author upon request.

**Table 2.8:** "Double up" and "split up" DID matching estimates by region (northern, central, and southern Europe)

| | | | **N** | **C** | **S** | **N+C** | **S+C** |
|---|---|---|---|---|---|---|---|
| **Double up** | S.T. | $\Delta$*Depression* | -0.221 | -0.153 | 0.776 | -0.171 | 0.313 |
| | | *p-value* | 0.810 | 0.733 | 0.269 | 0.707 | 0.435 |
| | | *Std. Error* | 0.920 | 0.449 | 0.701 | 0.454 | 0.401 |
| | | *Treated* | 13 | 32 | 22 | 46 | 55 |
| | | *Control* | 397 | 1369 | 587 | 2184 | 1845 |
| | M.T. | $\Delta$*Depression* | 0.428 | **-0.700**** | -0.302 | -0.257 | **-0.574**** |
| | | *p-value* | 0.342 | **0.036** | 0.239 | 0.364 | **0.014** |
| | | *Std. Error* | 0.451 | **0.334** | 0.256 | 0.283 | **0.235** |
| | | *Treated* | 55 | **82** | 77 | 137 | **159** |
| | | *Control* | 1002 | **1400** | 543 | 2380 | **1916** |
| **Split up** | S.T. | $\Delta$*Depression* | -0.352 | -0.072 | -0.008 | -0.156 | 0.016 |
| | | *p-value* | 0.345 | 0.817 | 0.985 | 0.519 | 0.950 |
| | | *Std. Error* | 0.373 | 0.313 | 0.426 | 0.242 | 0.249 |
| | | *Treated* | 69 | 113 | 94 | 186 | 210 |
| | | *Control* | 111 | 291 | 359 | 404 | 663 |
| | M.T. | $\Delta$*Depression* | -0.185 | -0.472 | 0.205 | -0.384 | -0.215 |
| | | *p-value* | 0.656 | 0.114 | 0.652 | 0.169 | 0.411 |
| | | *Std. Error* | 0.414 | 0.298 | 0.454 | 0.279 | 0.261 |
| | | *Treated* | 65 | 138 | 74 | 201 | 214 |
| | | *Control* | 65 | 199 | 289 | 276 | 496 |

Notes:

**North (N)**=Denmark, Sweden, and the Netherlands.

**Center (C)**=France, Switzerland, Belgium, and Germany.

**South (S)**=Austria, Spain, and Italy.

**S.T.**=Short term (2 years); **M.T.**=Medium term.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## 2.7 Robustness Checks

As discussed in Section 2.2, in order for the econometric methods employed throughout this paper to hold, three assumptions were made: the overlap condition and the unconfoundedness assumption (both indispensable to the matching estimator) as well as the parallel trends assumption (crucial to the DID estimator). This section aims at assessing the plausibility of these assumptions under our current framework and data limitations.

First, the robustness of the results with respect to deviations from the common support condition is discussed. The common support condition was imposed in all the aforementioned results: no comparable control units exist for treated individuals that fall outside the common support region, which are then disregarded and hence their treatment effects not calculated. However, if the number of individuals dropped out of the sample is large, the estimates obtained for the remaining units may neither be representative nor consistent for the pooled sample (Bryson et al., 2002; Caliendo and Kopeinig, 2008). Therefore, although the common support condition ensures comparability, in some cases its application may be misleading. In response, all the DID matching estimates aforementioned were re-calculated without imposing the overlap assumption this time around. While preserving a larger sample size, no change in results is observed when the common support condition is not imposed (Table 2.9). This is an indication that, for the most part, treatment effects are not heterogeneous across individuals inside and outside the common support region.

Second, the unconfoundedness assumption critical to our identification strategy is discussed and examined. Although this assumption is not directly testable, a number of indirect ways of assessing its validity exist and are often used in practice. For the most part, they consist on estimating a causal effect that is known to be zero. An estimated effect different from zero is an indication that the treated and control units are different in terms of this particular covariate conditional on the others, rendering the unconfoundedness assumption less plausible. Otherwise, unconfoundedness would be supported by an estimated effect close to zero. Moreover, the power of this proxy test is higher when the variables used are closely related to the outcome of interest and, in consequence, to the unobservable factors likely affecting it.[40]

To illustrate, consider the number of chronic illnesses diagnosed a priori to a given individual. It is well known that health and depression are closely correlated,

[40]See Lee (2008) and Battistin et al. (2009) for an application of these methods to a regression discontinuity design.

**Table 2.9:** "Double up" and "split up" DID matching estimates without imposing the common support condition

| | | | **Pooled** | **Protestant** | **Catholic** |
|---|---|---|---|---|---|
| **Double up** | S.T. | $\Delta Depression$ | 0.235 | -0.191 | 0.549 |
| | | *p-value* | 0.469 | 0.676 | 0.165 |
| | | *Std. Error* | 0.324 | 0.456 | 0.395 |
| | | *Treated* | 115 | 52 | 73 |
| | | *Control* | 4089 | 2505 | 2098 |
| | M.T. | $\Delta Depression$ | -0.309 | -0.095 | **-0.495**** |
| | | *p-value* | 0.101 | 0.751 | **0.035** |
| | | *Std. Error* | 0.188 | 0.297 | **0.235** |
| | | *Treated* | 301 | 134 | **188** |
| | | *Control* | 4178 | 2591 | **2148** |
| **Split up** | S.T. | $\Delta Depression$ | 0.034 | -0.077 | 0.050 |
| | | *p-value* | 0.859 | 0.758 | 0.831 |
| | | *Std. Error* | 0.193 | 0.252 | 0.236 |
| | | *Treated* | 413 | 208 | 246 |
| | | *Control* | 1115 | 377 | 840 |
| | M.T. | $\Delta Depression$ | -0.144 | -0.317 | -0.085 |
| | | *p-value* | 0.451 | 0.256 | 0.731 |
| | | *Std. Error* | 0.191 | 0.279 | 0.246 |
| | | *Treated* | 385 | 183 | 252 |
| | | *Control* | 869 | 275 | 665 |

Notes:

**Protestant**=Sweden, Denmark, the Netherlands, Germany, and Switzerland.

**Catholic**=France, Belgium, Austria, Italy, and Spain.

**S.T.**=Short term (2 years); **M.T.**=Medium term.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

while it is at the same time unlikely that the number of long-term illnesses (such as asthma, arthritis, cancer, and Parkinson's disease) will be affected by a double up. Hence, the causal effect of a double up on the number of long-term illnesses must be zero; otherwise, if significant differences in chronic conditions are found before and after treatment, we would have evidence against the validity of the unconfoundedness assumption. The same case could be made for other variables, such as education and marital status.[41]

In Table 2.10 we present the estimates of the effect of a double up in Catholic Europe in the medium term on several outcomes likely to be determined prior to

[41]Higher educational levels as well as marriage have been shown to have a protective effect against depression (Bjelland et al. (2008) and Ross and Mirowsky (2006); and Simon (2002) and Kim and McKenry (2002), respectively).

the treatment itself. They include dummies for educational level, marital status, unemployment, and financial distress, as well as the number of children, ADLs, and chronic conditions. As the results indicate, all the considered cases are consistent with our identification restriction of unconfoundedness.

**Table 2.10:** Overidentification tests (using variables likely determined before a double up)

| Variable | Estimate | Std. Error | $z$ | $p$-value |
|---|---|---|---|---|
| Primary school | 0.007 | 0.056 | 0.120 | 0.905 |
| High school diploma | -0.005 | 0.062 | -0.080 | 0.939 |
| College degree | -0.002 | 0.048 | -0.040 | 0.968 |
| Graduate degree | -0.001 | 0.031 | -0.020 | 0.983 |
| Number of chronic illnesses | 0.015 | 0.063 | 0.240 | 0.812 |
| Number of ADLs | -0.049 | 0.094 | -0.520 | 0.601 |
| Married | -0.008 | 0.066 | -0.120 | 0.906 |
| Single | 0.008 | 0.065 | 0.120 | 0.905 |
| Unemployed | 0.011 | 0.011 | 0.930 | 0.355 |
| Financially distressed | -0.028 | 0.066 | -0.043 | 0.669 |
| Number of children | 0.072 | 0.156 | 0.460 | 0.645 |

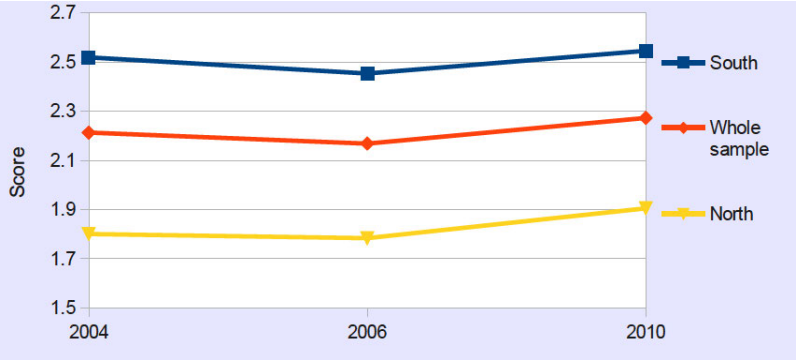
An alternative way of assessing the validity of the unconfoundedness assumption is by the use of lagged outcome variables. In this regard, results remain unchanged and significance is unaffected when the lagged depression variable from the first wave was included as a matching covariate ($p$-value= 0.046).

Finally, two remarks are at hand when it comes to the parallel trends assumption. The first is the finding that the rate of older adults with depressive symptoms tends to increase with advancing age (U.S. Department of Health and Human Services, 1999). This is attributed not only to negative late-life events (such as the loss of friends, widowhood, chronic disorders, declining health, etc.) but also to a natural process of physiological change that comes with age.[42] If such an increasing trend of depressive symptoms with age is accurate and holds true in developed countries and given that our sample is, in fact, representative of the population, there would be no reason to expect the treated and control units in our sample to follow different trends in the absence of treatment.

In a second exercise to test the parallel trends assumption, we conduct a placebo test by exploiting the panel nature of the SHARE dataset. The test consists in moving

[42]According to the American Psychiatric Association, the risk of experiencing depression is augmented by natural physiological changes associated with aging. In particular, there is evidence that lower concentrations of folate in the blood and nervous system may contribute to depression, mental impairment, and dementia (`http://www.apa.org/helpcenter/aging-depression.aspx`).

**Figure 2.14:** Progression in time of the mean EURO-D score for the complete sample by region




the treatment back one period (before it actually happened) to assess whether the difference in trends between the treated and control individuals had been, in fact, historically persistent and thus unrelated to the treatment. Focusing in particular on the case for which the effects of a double up were significantly different between Protestant and Catholic Europe, the placebo test delivers no significant difference in pre-treatment depression trends between the treated and control individuals ($p$= 0.50, see Figure 2.14). Although a more sequential and chronological analysis of trends is not possible with the current data, the results of the placebo test based on the three waves of available data are unable to contest the parallel trends assumption.

## 2.8 Discussion and Final Remarks

In the last decade or so, multigenerational households in the developed world have been on the rise, reverting a post-WWII trend of independent living. As a consequence, an increasing number of parents and their adult children are doubling up into the same household: more young adults are returning to and remaining in the parental household, analogously to the growing number of older individuals who are moving in with their adult children. Among the main causes behind this social occurrence arguably stands the harsh economic situation brought about in the last decade by the "Great Recession."

Regardless of whether they arise out of economic necessity, environmental differences, cultural preferences, health conditions, or stronger family ties, this study is concerned not with the causes themselves (for they have already received considerable attention) but rather with the effects of the doubling up phenomenon, particularly its effects on the psychological health of older Europeans.

Although strongly culturally dependent, not once in our study do the levels of depression of older Europeans increase after a double up. On the contrary: after a appears a short adaptation period, in European countries marked by a Catholic tradition a double up seems to be accompanied by a greater peace of mind of the older generation. Obtained by means of a painstaking analysis of the SHARE longitudinal data through a difference-in-difference propensity score matching approach, these findings provide an alternative explanation to the paradox posed by the increased health observed in older adults during economic downturns. In particular, by producing shocks to coresidence trends, negative economic situations may result in increasingly supportive household conditions for the older generation. Moreover, these findings go in defiance of the much negative stigma that has been attached to multigenerational households in recent decades (which is based on the popular view that privacy is a normal good).

Several data limitations leave room for improvement. For instance, more waves would allow for a stronger support to the parallel trends assumption, as well as an analysis of the phenomenon in the long term. Additionally, it is not yet possible to identify who the closest child is in a given wave nor to discern whether it was the child to move back to the parents' home or vice-versa. The motives behind the coresidence decision are unknown as well. Data improvements in all these areas would permit a better identification of important dynamics in intergenerational living.

In an increasingly aging European society where the mental health of older individuals is of growing concern,[43] this finding is not to be taken lightly –especially so in the current climate of slow economic recovery where long-term shocks to living arrangements are expected to continue. Important policy implications in sectors such as health, housing, and pension schemes are evident. Since in OECD countries family and friends are the backbone of long-term care provision, "paying more attention to family carers is a potentially win-win-win solution," beneficial to the care recipient, who prefers staying home and being looked after by family or friends; to the carers, for they "provide care out of love or duty;" and for the public finances, since supporting family care "can help maintain [formal care] affordable" (OECD, 2011, p. 20).

In this regard, balancing home and institutional care remains a pressing issue in long-term care policy-making in almost all European countries. In particular, relevant policies should give multigenerational living its proper weight as a social force able

[43] According to the World Health Report 2001, by the year 2020 depression is expected to become the second largest cause of burden of disease, as measured by the number of disability-adjusted life years (DALYs) (WHO, 2001).

to bring about not only economic advantages but also gains in terms of psychological well-being of the older generations.

# Chapter 3

# Are Smarter People Better Samaritans? Effect of Cognitive Abilities on Pro-Social Behaviors

**Abstract:** This study investigates the link between cognitive abilities and civic engagement of older Europeans (aged 50+), using waves two and three of the SHARE dataset. An instrumental variable approach is employed in an attempt to disentangle possible endogeneity issues arising between cognition and pro-social behaviors. In so doing, cognitive abilities are instrumented with the number of books in the respondent's place of residence during childhood. The results advocate for the existence of a causal relationship running from cognition in old age to community engagement. Though contradicting standard theoretical predictions, this empirical finding is in line with mainline experimental results showing how participants with higher cognitive abilities tend to be less risk averse, and thus more willing to opt for a payoff-dominant action in a stag hunt game context more often.

**Keywords:** Cognitive ability; civic engagement; instrumental variables; risk aversion; we-rationality.

**JEL:** D03, D64, D71

## 3.1 Introduction

Why are people willing to engage in pro-social activities? Much of today's economic analysis is based on the assumptions that people are both rational (in the Nash equilibrium notion) and selfish. For example, in the context of the prisoner's dilemma, stag hunt games, or in the private provision of public goods, people are assumed to be clever enough to figure out that defection and free riding are the risk-dominant strategies. However, empirical and experimental evidence seems to reject the traditional conjecture of defective behavior under the social dilemma condition.[1]

In general, two arguments have been used to justify people's preferences toward pro-social activities. The first argument conforms to the standard theory of rational individual choice in that it claims that people actively engage in pro-social activities for the sole reason that it makes them feel good, either because they care about what others think of them or because they feel better about themselves, but not necessarily because they care about the public benefit *per se*. This feeling of complacency which motivates individuals to participate in society has been referred to in the literature as the "warm-glow" effect (Andreoni, 1990; Bernheim and Rangel, 2005).

The second argument challenges the purely-selfish individual concept of standard theory by asserting that, when making choices, people not only care about their own preferences but also about the preferences of others. Several theories have been put forth along these lines, stemming from notions of altruism, reciprocity, kindness, and other-oriented or other-regarding preferences, to name a few. Of particular interest –due to their ability to account for cooperative behavior even in the presence of individual incentives to free-ride– are the theories of "we-rationality"[2] proposed by Hodgson (1967) and Regan (1980) and later developed by Gilbert (1989), Hurley (1989), Sugden (1993, 2000, 2003), Hollis and Sugden (1993), Hollis (1998), Bacharach (2006), and Smerilli (2012).[3] These theories differentiate themselves from the standard "I-thinking" by allowing groups to deliberate as agents, effectively contextual-

[1] "Empirical and experimental analyses have then brought up a new series of results providing sound and robust evidence of economically relevant behaviors not motivated by self-regard. Cooperative choices registered through prisoner's dilemma experiments (even in one-shot interactions) were among the earliest 'anomalies' to be investigated" (Samuelson, 2005, p. 490).

[2] Several naming variations exist –*e.g.*, team preferences, we-reasoning or we-thinking, collective or team agency, among others– though the main concept remains for the most part unchanged.

[3] Hollis (1998) makes the following observation about cooperation even in the presence of free-riding: "Why do people who contribute to public goods fret about free-riders in some cases but not in others? There is a logic of 'enough,' I submit, which can overcome the dominance of defection, provided that a sense of membership is in play. Donors cooperate if confident that enough blood is being provided by enough members...Enough is then enough" (p. 146).

izing the individual and hence accounting for her relational nature. Individuals see themselves as members of a group or team and act accordingly, seeking an answer to the question "What should *we* do?". An optimal group action $A$ is composed by the individual actions $A_i$ of each of its members; by choosing $A_i$, each individual acts in the credence that the other group members will select their constituents of $A$ as well. This will produce the feasible outcome which is "most highly ranked in terms of the team's preferences" (Sugden, 2000, p. 196). Though by no means substituting individual rational choice, we-rationality theories surpass it in that they overcome the methodological individualism as the exclusive approach to human rationality.

Going beyond the relational context of decision-making, pro-social behaviors may be strongly influenced by characteristics which are intrinsic to the individual. For instance, a growing body of literature tries to improve understanding of a wide range of behaviors by conceptualizing choice as originating from cognitive functions, which are not only heterogeneous across subjects but also influenced by external factors. As a matter of fact, in experimental and psychological economics literature cognitive hierarchy is included in the model of decision making (Nagel, 1995; Costa-Gomes et al., 2001; Camerer et al., 2004). In addition, the relationships between cognition and outcomes in experimental settings (Brandstätter and Güth, 2002; Ben-Ner et al., 2004) and between cognitive ability and financial decisions (Christelis et al., 2010) have been broadly documented.

Nonetheless, detailed analyses on the relationship between cognitive ability and pro-social behaviors (considering in particular volunteering and civic engagement) are for the most part missing or inconclusive. Potentially, however, this relationship may represent a significant factor from both theoretical and practical perspectives. For researchers, for instance, understanding the relationship between cognitive ability and pro-social behaviors may shed light on the underlying mechanisms of cooperation among individuals. Additionally, it may help policy makers better devise inclusive policies which enhance participation and community engagement for the advancement of society as a whole.

Civic engagement has become a particularly relevant issue when considering the well-being of older individuals, either on or approaching retirement. Post-retirement engagement and socialization have been consistently shown to reduce both physical and mental decline in old age (Fratiglioni et al., 2004; **?**; Berkman et al., 2000; Zunzunegui et al., 2003; Everard et al., 2000), providing for a more socially and economically active society. However, to our knowledge empirical evidence showing a link from cognition to civic participation is still lacking. The aim and novelty of

this paper is thus exploring the causal link that cognitive abilities have on pro-social engagement in old age from an empirical perspective.

Our results, using data from the Survey of Health, Aging and Retirement in Europe (SHARE), indicate higher cognitive abilities as seemingly causal determinants of pro-social behaviors. In particular, retrospective information on the number of books at home when the respondent was ten years old as well as the respondent's height is used to instrument cognition in older age (50+) and exogenously estimate its impact on civic engagement. As a result, individuals in this age group with higher cognitive abilities are found to be significantly more willing to engage in pro-social activities.

This paper is structured as follows. The next section reviews traditional economic findings which predict uncooperative behavior as the optimal strategy in public goods games and sets the theoretical bases that justify the present work. Section 3.3 gives an overview of the data, variables and empirical methodology, while the results and a series of robustness checks are presented in Section 3.4. Section 3.5 concludes.

## 3.2 Theoretical Background

The present study builds upon two strands of economic literature. First, the literature relating uncooperative behaviors in a social dilemma situation to a higher degree of risk aversion. Second, the theoretical studies linking risk aversion to cognitive ability.

Investing one's own resources in civic activities without knowing whether other community members are willing to participate can be viewed as a risky decision. In this sense, risk aversion might influence people's behaviors toward the production of public goods. In the book *A Discourse on Inequality*, Jean-Jacques Rousseau illustrated this situation in his influential stag hunt parable, which serves as the theoretical starting point of the present paper.

Assume that two hunters have to choose simultaneously between two hunting strategies: stag or hare. If one hunts a hare, he is sure to catch it regardless of the action of the other hunter, but in order to kill a stag both hunters have to join efforts. If one hunter chases after a stag alone, he comes back empty-handed. The dilemma emerges from the fact that, on the one hand, half a deer is better than one hare. On the other hand, hunting a hare involves no risk while the success of a stag hunt depends on the willingness of both hunters to cooperate.

Rousseau's parable is represented in game-theoretical terms in Table 3.1 below, with payoffs $\pi_1 > \pi_2 \geq \pi_3 > \pi_4$. The stag hunt game has two pure-strategy equilibria:

"all stag" and "all hare." The "all stag" equilibrium payoff-dominates the "all hare" one, but the latter risk-dominates the former (Harsanyi and Selten, 1988). Nevertheless, it is not clear which of the two equilibria should be expected, as many other aspects –such as the number of hunters– must be considered in order to determine the plausibility of each equilibrium. For instance, when only two hunters are present, hunting a stag is preferred to hunting a hare provided that the second player also hunts stag with probability $\frac{1}{2}$ or higher. However, when $n$ hunters participate a stag is the optimal strategy only if there is a probability of at least $\frac{1}{2}$ that all other hunters hunt the stag. If each one hunts stag with an independent probability $p$, then this requires $p^{n-1} > \frac{1}{2}$. To illustrate, nine out of ten players must each hunt the stag with probability $p \gtrsim 0.93$ in order to make it worthy for the tenth hunter to join their efforts. As we can see, chasing after the stag is far from being the optimal strategy in a world with an increasingly large number of hunters.

**Table 3.1:** Stag Hunt Game

| | Stag | Hare |
|---|---|---|
| Stag | $\pi_1$<br>$\pi_1$ | $\pi_4$<br>$\pi_2$ |
| Hare | $\pi_2$<br>$\pi_4$ | $\pi_3$<br>$\pi_3$ |

The stag hunt game makes it clear that more risk-averse individuals might choose to engage less in civic activities or stop providing for public goods to protect themselves from the risk of others' defection. It is worth noting that, though the stag hunt game is static in nature, it is nonetheless able of mimic real world interactions where risk-dominant strategies are expected to prevail. The argument goes as follows: in a public good context, cooperating in its provision gives a higher payoff than defecting only if everyone cooperates. Otherwise, not cooperating is clearly advantageous, given that by definition an individual cannot be excluded from the public good. Since in the real world the probability that absolutely everyone contributes their share to the public good is very small (if not zero), the theory predicts rational individuals to be risk averse and thus restrain from participating. Paradoxically, cooperative behaviors are commonly observed in reality, which possibly indicates a lesser degree of risk aversion than predicted or the prevalence of myopic behaviors which may lead an individual to making "foolish" choices.

The link between participation and risk attitudes has been documented in several recent works. Most existing studies relating risk and contributions to public goods use a measure of natural risk, such as participation in the stock market. In line with

the notion that perceived risk affects contributions to a public good, Charness and Villeval (2009) find that subjects who invest more in risky assets contribute more to public goods. A similar result based on a multi-period prisoner's dilemma has been reported by Sabater-Grande and Georgantzis (2002).

The second strand of literature upon which the present paper is built regards the relationship between risk aversion and cognitive ability. Kahneman and Tversky (1981, 1984, 1986) and Read et al. (2000) proposed a theory which foresees a strong relationship between the two. The theory embodies the trouble presented by a fraction of the population in bracketing choices in a broad manner, *i.e.*, recognizing how risky decisions integrate with other assets like lifetime wealth, or conceptualizing and integrating future considerations with current goals. Narrow bracketing increases risk aversion as it impedes people from relating risky decisions with wealth, and increases myopic behaviors by augmenting people's difficulty in incorporating considerations about the future. However, there is empirical evidence that narrow bracketing is reduced when cognitive costs are lowered. For instance, Frederick (2005), Brañas-Garza et al. (2008), and Oechssler et al. (2009) find that, in general, individuals with low cognitive abilities tend to be more impatient and more unwilling to gamble, even in the domain of gains. This link between cognition and narrow bracketing provides for a mechanism directly relating risk aversion and cognitive ability.

Based on the two literature strands discussed above, it is fair to say that on one side risk aversion hinders the attainment of payoff-dominant equilibria by preventing cooperative behavior. On the other side, a positive link exists between risk aversion and cognitive ability. Put together, the theory implies that individuals with higher cognitive ability will have a lower degree of risk aversion, therefore engaging more in cooperative behaviors. The present paper aims at testing this claim empirically.

**Literature Review**

Studying the relationship between cognitive ability and pro-social behaviors is not new to economic, sociological, and psychological literature. In this regard, a variety of works suggest the existence of a positive link between educational attainment and charitable giving. Higher educational attainment has been consistently associated with a higher probability and larger amount of charitable giving (Brown and Lankford, 1992; Bekkers and Wiepking, 2011; James, 2011). However, it is possible that this association is driven by the individual's underlying cognitive ability rather than by educational attainment itself. This question is explored in a cross-sectional analysis using the Netherlands Panels Study 2003 (Wiepking and Maas, 2009). Their

cognitive measurement was a 12-item vocabulary test with a mean score of 67% correct. Following previous results, higher education was initially shown to predict greater charitable giving. However, the authors found that this relationship could be explained by the larger financial resources and stronger verbal (cognitive) abilities of those displaying higher educational attainment.

Also Bekkers (2006) examination of charitable giving using the Family Survey of the Dutch Population included a measurement of verbal proficiency. Respondents were measured on their ability to select the correct synonym from a list of five alternatives. In a two-stage Heckman regression, the author finds that verbal proficiency was a positive significant predictor of both the presence of charitable giving among all respondents and the level of charitable giving among donors. This held true even when controlling for a variety of possible mediating pathways such as income, wealth, education, subjective health, and personality.

Cognitive ability has been associated with both volunteering and civic engagement as well. In an examination using the General Social Survey, Hauser (2000) finds that verbal ability, measured by a 10-word vocabulary test, was associated with the number of organizations with which a respondent reported involvement (excluding labor unions). This relationship held even after controlling for the individuals' level of education. Verbal ability was also found to predict participation in the previous presidential election. Similarly, Hillygus (2005) employs a longitudinal study of college graduates to show that verbal SAT scores are associated with future political participation.

Denny (2003) found that a measurement of functional literacy (measured across multiple dimensions to estimate the respondents' abilities in extracting and using information from various texts) was positively associated with volunteering (given by participation in community or voluntary activities) after controlling for educational attainment. Such positive association between functional literacy and volunteering was constant across a variety of countries including Canada, Switzerland, Belgium, Chile, Czech Republic, Denmark, Finland, Germany, Great Britain, Hungary, Ireland, Italy, the Netherlands, New Zealand, Northern Ireland, Norway, Poland, Slovenia, Sweden, and the United States. In addition, studies of volunteering behavior limited to older adults have also found that volunteers score higher on tests of cognitive abilities (Glei et al., 2005; Hao, 2008).

## 3.3 Data, Variables and Methodology

### 3.3.1 Data

We use data from the second (2006) and third (2008) waves of the Survey on Health, Aging and Retirement in Europe (SHARE),[4] which surveys people aged 50 and over in 12 European countries: Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, and Switzerland.[5] SHARE is a multidisciplinary and cross-national database which provides detailed information on physical and mental health, socio-economic status, and social and family networks of respondents and their households. International comparisons are allowed by the inter-country standardization of all questions.

Furthermore, the third wave of SHARE, referred to as "SHARELIFE," provides retrospective information on respondents' life histories. It links individual micro data over the respondent's entire life with institutional macro data about the welfare state.

The current sample is made up of 5,328 persons (56% females) with complete information on cognitive abilities and civic engagement. The mean age is 63 for men and 62 for women.[6] The summary statistics of the most relevant variables in our study are presented in Table 3.2.

### 3.3.2 Variables

**Measuring cognitive abilities**

The purpose of this paper is to analyze the association between cognitive abilities and volunteering in old age. SHARE provides detailed information on several indicators of cognition, such as mathematical and recall ability. In this section we describe the nature and construction of such indicators of cognitive abilities.

[4]This article uses data from SHARE 2006 and 2008, Wave 2 and 3, release 2.5.0 and 1, respectively. The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5- CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, N$^o$ 211909, SHARE-LEAP, N$^o$ 227822 and SHARE M4, N$^o$ 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see `www.share-project.org` for a full list of funding institutions).

[5]Greece is dropped from the sample due to inconsistencies in the Greek questionnaire which make cross-country comparisons unreliable.

[6]Due to the more likely onset of degenerative diseases which may hinder pro-social behaviors, respondents aged 80 and above were excluded from the study.

**Table 3.2:** Summary Statistics

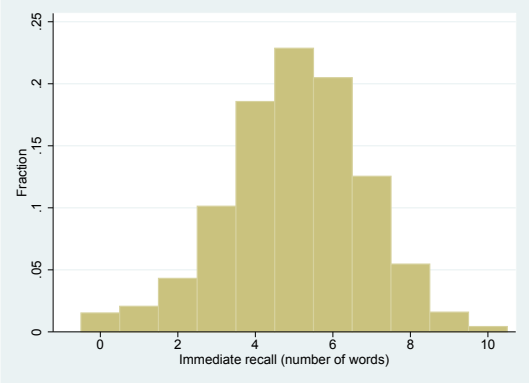
| Variable | Mean | Med. | Std. Dev. | Min | Max | N |
|---|---|---|---|---|---|---|
| Civic Activities | 0.26426 | 0 | 0.55383 | 0 | 3 | 5328 |
| Immediate Recall | 5.1164 | 5 | 1.6661 | 0 | 10 | 5328 |
| Delayed Recall | 3.6381 | 4 | 1.9457 | 0 | 10 | 5328 |
| Numeracy | 3.4872 | 4 | 1.081 | 1 | 5 | 5328 |
| Books (at 10) | 2.2768 | 2 | 1.2475 | 1 | 5 | 5328 |
| Married | 0.64302 | 1 | 0.47915 | 0 | 1 | 5328 |
| Age | 61.212 | 60 | 8.6981 | 40 | 80 | 5328 |
| Female | 0.55706 | 1 | 0.49678 | 0 | 1 | 5328 |
| Financial Distress | 0.45477 | 0 | 0.498 | 0 | 1 | 5328 |
| Chronic cond. | 0.46171 | 0 | 0.49858 | 0 | 1 | 5328 |
| Education≤HS | 0.65672 | 1 | 0.47485 | 0 | 1 | 5328 |
| Education>HS | 0.33934 | 0 | 0.47353 | 0 | 1 | 5328 |
| ADLs | 0.15822 | 0 | 0.6212 | 0 | 6 | 5328 |
| Unemployed | 0.034722 | 0 | 0.18309 | 0 | 1 | 5328 |
| Retired | 0.47166 | 0 | 0.49924 | 0 | 1 | 5328 |

Mathematical ability, also referred to as numeracy, measures the respondent's capacity to perform basic numerical operations. It is an index composed of four questions which ask the respondent to calculate (1) 10% of a number; (2) one-half of a number; (3) the number for which another given number represents a fraction of two-thirds; and (4) the total amount after a two-year period given an initial amount and an annual interest rate of 10%. Using these questions, a numeracy indicator ranging from one to five can be constructed (Dewey and Prince, 2005).

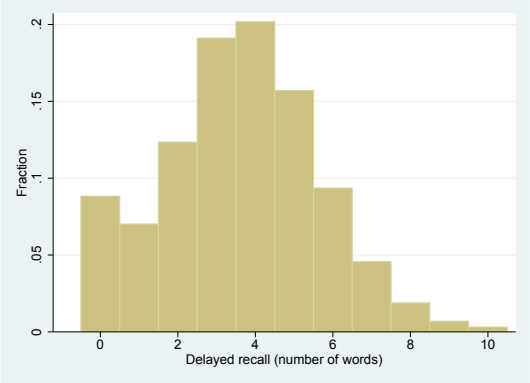
The indicator for recall ability, or memory, is in turn split up into two categories: immediate and delayed recall. Respondents are given a list of ten words and are asked to memorize them. After about a minute, the interviewer prompts the respondent to list the words she can remember. The immediate recall indicator is thus constructed based on the number of words recalled correctly, and ranges from 0 (respondent could not recall a single word from the list) to 10 (all words were correctly recalled by respondent). Unexpectedly for the respondent and after some more unrelated questions were answered, the interviewer returns to the word listing and asks the respondent to (again) name the words she can recall. This makes for a second indicator upon which the delayed recall score is constructed.[7] The sample distributions of immediate and delayed recall, as well as numeracy score, are shown in Figure 3.1. In turn, Figure 3.2

[7] All observations where the interviewer indicated that contextual factors may have impaired the respondent's cognitive performance during the interview were dropped from our study.

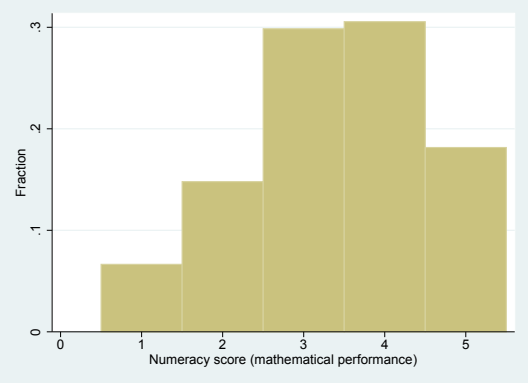
**Figure 3.1:** Distribution of cognitive indicators




**(a)** Immediate recall




**(b)** Delayed recall




**(c)** Numeracy score

provides graphical evidence of an unequal distribution of cognitive abilities across European countries, where a pseudo north-south gradient is formed.

### Measuring civic engagement

A measure of civic engagement is constructed from a set of questions indicating the different social activities performed by the respondent in the month prior to the interview. Given the gratuitous character commonly attributed to pro-social and voluntary activities, we leave out of our study those activities with strong consumption aspects attached to them, such as attending an education or training course and participating in a sport, social, or other kind of club. We therefore consider three indicators of participation in society: *a*) doing voluntary or charity work; *b*) taking part in activities of a religious organization; and *c*) taking part in political or community-related organizations. From these three categories of participation, we construct a civic engagement index ranging from 0 (no participation) to 3 (involvement in all three categories). The average civic engagement score by each of the three

**Figure 3.2:** Average cognition score by country and cognitive indicator

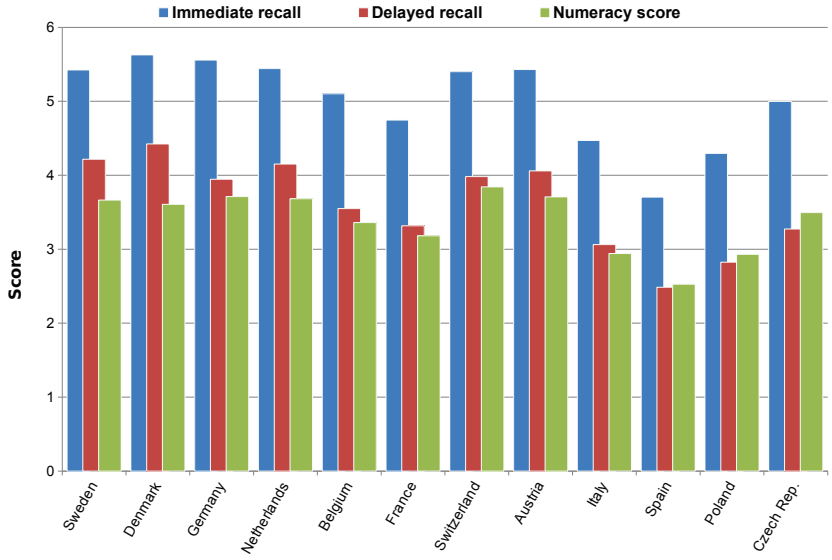
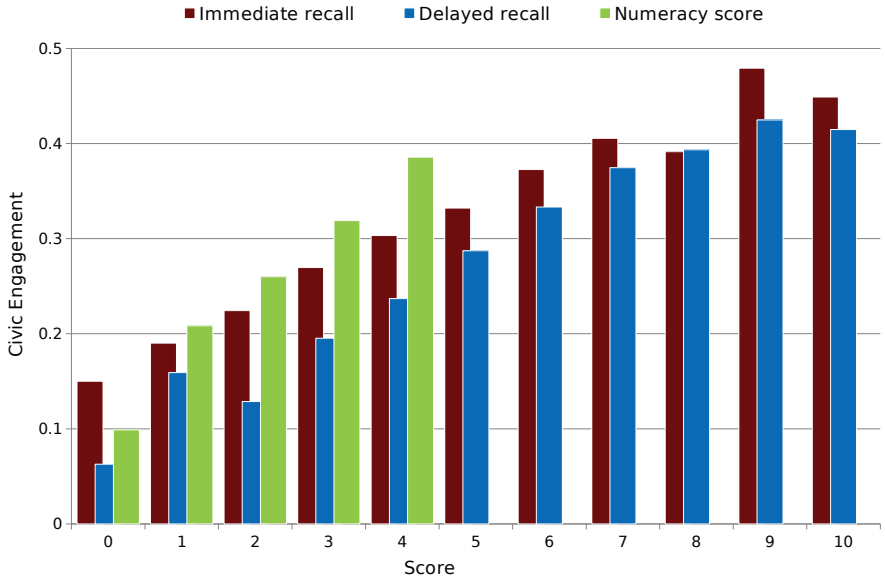



**Figure 3.3:** Average civic engagement by cognitive indicator for the pooled sample




cognitive indicators is shown in Figure 3.3; a clear positive association between civic participation and cognition can be perceived.[8]

[8]Moreover, using information on the amount of financial risks individual respondents declare to be willing to take when saving or making investments, we find a statistically significant negative correlation (at the 0.1% level) between pro-social activities and risk aversion. This is consistent with what has been previously found in the literature and exposed in Section 3.2.

### 3.3.3 Methodology

**Empirical specification**

In order to estimate the association between cognitive abilities and civic engagement we run a linear regression with a full set of controls, which include, among others, indicators of the respondent's socio-economic status as well as health conditions.

Our econometric specification is

$$Y_i = \beta_1 C_i + X_i^T \beta_2 + U_i \tag{3.3.1}$$

where $Y$ represents the number of activities to which the respondent participates, $U$ is a disturbance term, and $X \equiv \{X_k\}_{k=1}^K$ is a vector of socioeconomic and demographic characteristics which we discuss in detail below. The variable of interest, $C_i$, denotes the respondent's score for each of the three measures of cognitive abilities.

Table 3.3 shows the results of the OLS regression of civic engagement on each of the three indicators for cognition. Such results evidence a positive association between cognition and civic participation in old age, with the largest effects given by the mathematical indicator of cognitive abilities (*i.e.*, the numeracy score). Throughout this study, we control for the following characteristics of the respondent: marital status (dummy, equals one if the respondent is married and zero otherwise); age; gender (dummy, equals one for females and zero otherwise); number of years of education; number of chronic conditions (dummy, equals one if the respondent suffers from more than two chronic conditions, and zero otherwise); an additional health indicator which measures the hardship met in performing activities of daily living (ADLs); employment status (dummy, equals one if the respondent is unemployed, and zero otherwise); a retirement dummy (equals one if the respondent is retired, and zero otherwise); financial distress (measures the ability of households to "make ends meet" at the end of the month); and household income (split into intra-country quintiles). Furthermore, all regressions are estimated using calibrated weights and, although not explicitly shown in equation 3.3.1, country dummies were included in all estimations to account for cultural differences between countries.[9]

However, the aforementioned OLS estimation does not take into account the fact that cognition and civic engagement can be endogenous, which, if not addressed properly, results in biased parameters and impedes any possible statement of causality between the two. For instance, reverse causality might exist, as people who engage

[9]Survey weights are provided in SHARE with the aim of removing bias from the survey sample and thus making the resulting statistics more representative of the population as a whole.

**Table 3.3:** OLS regressions of civic engagement on the three cognitive indicators

| **Variable** | **Model 1** Civic Eng. | **Model 2** Civic Eng. | **Model 3** Civic Eng. |
|---|---|---|---|
| Immediate recall | 0.025*** | | |
| | (0.004) | | |
| Delayed recall | | 0.016*** | |
| | | (0.004) | |
| Numeracy score | | | 0.032*** |
| | | | (0.007) |
| Married | -0.006 | -0.005 | -0.007 |
| | (0.014) | (0.014) | (0.014) |
| Age | 0.003** | 0.002** | 0.002* |
| | (0.001) | (0.001) | (0.001) |
| Female | -0.017 | -0.015 | -0.001 |
| | (0.013) | (0.013) | (0.013) |
| Financial distress | -0.043*** | -0.046*** | -0.042*** |
| | (0.015) | (0.015) | (0.015) |
| Chronic disease | -0.007 | -0.008 | -0.009 |
| | (0.014) | (0.014) | (0.014) |
| Education | 0.057*** | 0.061*** | 0.058*** |
| | (0.009) | (0.009) | (0.009) |
| ADLs | -0.020** | -0.022** | -0.020** |
| | (0.010) | (0.010) | (0.010) |
| Unemployed | -0.027 | -0.024 | -0.025 |
| | (0.035) | (0.035) | (0.035) |
| Retired | 0.005 | 0.007 | 0.006 |
| | (0.018) | (0.018) | (0.018) |
| Income quintile | -0.011** | -0.010** | -0.011** |
| | (0.005) | (0.005) | (0.005) |
| Constant | -0.112 | 0.05 | 0.017 |
| | (0.108) | (0.081) | (0.082) |
| Obs. | 6650 | 6651 | 6653 |
| F | 24.93 | 24.16 | 24.50 |
| Prob>F | 0.000 | 0.000 | 0.000 |
| Centered $R^2$ | 0.076 | 0.074 | 0.075 |

Notes:

Standard errors in parentheses

***$p$ <0.01, **$p$ <0.05, *$p$ <0.1

more in society might be more likely to expose themselves to mentally stimulating situations and activities and will thus perform better in cognitive tests. Omitted variables and confounding factors for both cognitive abilities and civic engagement –such as culture and genetics– might also arise and cast doubt on our linear regression estimates, not to mention non-random selection mechanisms which might have made more likely for people with a certain cognition level to participate in the survey. In order to account for such issues and obtain consistent estimates for our structural parameters, an instrumental variables approach is adopted in this study. The two-stage instrumental variable empirical model is then given by the structural equation 3.3.1 and complemented by the following first-stage specification:

$$C_i = Z_i^T \gamma_1 + X_i^T \gamma_2 + V_i \tag{3.3.2}$$

where $Z \equiv \{Z_l\}_{l=1}^{L}$ is a vector of instruments and $V$ represents the error term.

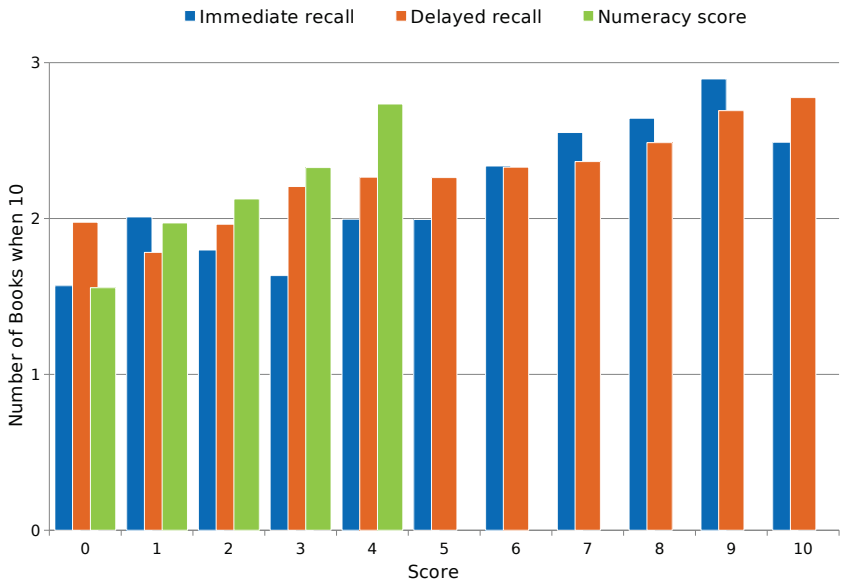
We use retrospective information on the respondent's life –available from SHARELIFE– to instrument our indicators of cognitive ability. In particular, we exploit information about the number of books[10] at the respondent's the place of residence when the she was ten years old. The justification for using this as our instrument rests upon the assumption that the number of books present at the respondent's home during childhood affects civic participation in later adulthood only through its potential effect on the respondent's cognitive abilities.[11] Put differently, in order for it to be a valid instrument, it must be directly related to the respondent's cognition (relevance requirement) and influence her civic participation only indirectly through its effects on cognition (exogeneity assumption). As shown in Figure 3.4, a clear positive relationship exists between cognitive levels in old age and the number of books at home during childhood.

We address the endogeneity issues in our data by resorting to a two-step Generalized Method of Moments (GMM) instrumental variables estimation with robust standard errors (Hansen, 1982). As opposed to the more commonly-used two-stage least squares (2SLS), GMM allows for an efficient estimation in the presence of heteroskedasticity of unknown form. In using survey data, such as SHARE, we have

[10] Magazines, newspapers, and school books are explicitly excluded from the question.

[11] Brunello et al. (2012) findings support the claim that the availability of books in the household during childhood captures the development of cognitive abilities rather than the presence of financial constraints. In other words, using international data on cognitive test scores, books are found to be significant predictors of cognitive development, even after controlling for parental education and employment. The importance and lasting effects of early life investments are also emphasized by Cunha and Heckman (2007), Cunha et al. (2010), and Heckman et al. (2012).

**Figure 3.4:** Average number of books when aged 10 by cognition level




enough reasons to presume the non-homoskedasticity of our residuals.[12] Accordingly, the *robust* option of the *ivreg2* command in Stata is employed in order to obtain standard errors and statistics which are robust to the presence of arbitrary heteroskedasticity.

## 3.4 Results

### 3.4.1 First stage results

Table 3.4 shows the estimated coefficients from the first stage regression of civic engagement on the instrument and the control variables in our model. The results confirm the relevance of the chosen instrument for all indicators of cognition (namely immediate recall, delayed recall, and numeracy). In particular, having more books at home during childhood is shown to be a strong predictor of higher mathematical ability and better memory levels in old age.

### 3.4.2 Second stage results

Table 3.5 shows the results of the second stage GMM procedure. Here, civic engagement is regressed on the estimated level of cognition obtained from the first stage

[12] See, for instance, Wooldridge (2001) and Wooldridge (2002, p. 193).

**Table 3.4:** First stage regressions instrumenting cognition with number of books at home when the respondent was ten years old

| **Variable** | **Model 1** Immediate recall | **Model 2** Delayed recall | **Model 3** Numeracy score |
|---|---|---|---|
| Number of books | 0.141*** | 0.125*** | 0.115*** |
| | (0.021) | (0.024) | (0.013) |
| Married | 0.119* | 0.123* | 0.143*** |
| | (0.047) | (0.055) | (0.030) |
| Age | -0.047*** | -0.056*** | -0.015*** |
| | (0.004) | (0.004) | (0.002) |
| Female | 0.378*** | 0.501*** | -0.238*** |
| | (0.045) | (0.053) | (0.029) |
| Financial distress | -0.151** | -0.019 | -0.144*** |
| | (0.052) | (0.061) | (0.034) |
| Chronic disease | -0.092* | -0.119* | -0.045 |
| | (0.046) | (0.054) | (0.030) |
| Education | 0.342*** | 0.412*** | 0.295*** |
| | (0.033) | (0.039) | (0.021) |
| ADLs | -0.135** | -0.138** | -0.120*** |
| | (0.041) | (0.046) | (0.026) |
| Unemployed | -0.006 | -0.148 | -0.048 |
| | (0.127) | (0.140) | (0.077) |
| Retired | 0.171** | 0.151* | 0.099* |
| | (0.060) | (0.074) | (0.040) |
| Income quintile | 0.045** | 0.045* | 0.046*** |
| | (0.016) | (0.019) | (0.010) |
| Constant | 6.551*** | 5.067*** | 3.437*** |
| | (0.249) | (0.297) | (0.164) |
| Obs. | 4475 | 4476 | 4475 |
| F | 77.25 | 74.58 | 92.21 |
| $Prob > F$ | 0.000 | 0.000 | 0.000 |
| $rk$ F-stat. | 46.971 | 26.374 | 80.413 |
| Centered $R^2$ | 0.267 | 0.256 | 0.288 |

Notes:

Standard errors in parentheses

***$p$ <0.01, **$p$ <0.05, *$p$ <0.1

regression in the previous subsection. As long as the instrument is valid, such cognition estimates should now be free from most endogeneity issues.

All three cognition indicators seem to exert a strong, positive, significant, and seemingly causal effect on the degree of civic engagement of individuals. The higher an individual's mathematical and memory levels, the more likely it is that she will reach out to her community, with long-lasting memory and numeracy as the indicators with the strongest effects on civic participation.

Interestingly enough, older people in the lower income quantiles are more likely to get involved in their society. This appears as an arguably counter-intuitive result which would need further exploration before any conclusions are drawn from it.

**IV tests**

For all three measures of cognitive abilities, the hypothesis that cognition can be treated as exogenous in the main regression is always rejected at traditional significance levels ($p$-value$<0.01$). This serves as supporting evidence in favor of our chosen empirical methods and procedures.

Our instrument, number of books when the respondent was ten, appears to be relevant to cognition as confirmed by our first stage estimates. Moreover, Stock and Yogo (2005) weak identification test is passed in all cases, as all $F$-statistics from our first stage regressions are well above the critical values. Furthermore, all $F$-values given by the Kleibergen and Paap $rk$ statistic in the first-stage regressions surpass the threshold value of 10.[13];[14] Nevertheless, given that the model is exactly identified, we are unable to provide statistical evidence for the excludability of our instrument from the main equation. In what follows we review different attempts to tackle this issue.

### 3.4.3 Robustness

The robustness of the positive effect of cognition on civic engagement is made evident by its persistence on both our first stage OLS and second stage GMM results, regardless of the different indicators used to denote cognition.

[13]Staiger and Stock (1997) show that $F$-statistics from the first stage regression should be at least ten for weak identification not to be considered a problem. This has become the "rule of thumb" for the identification of weak instrument problems, especially for situations where the *i.i.d.* property of standard errors cannot be reasonably claimed.

[14]Given its robustness to heteroskedasticity, the Kleibergen and Paap $rk$ statistic is the preferred indicator in our case (Kleibergen and Paap, 2006).

**Table 3.5:** Second stage regressions instrumenting cognition with number of books at home when the respondent was ten years old

| **Variable** | **Model 1** Civic Eng. | **Model 2** Civic Eng. | **Model 3** Civic Eng. |
|---|---|---|---|
| Immediate recall | 0.265*** | | |
| | (0.069) | | |
| Delayed recall | | 0.300*** | |
| | | (0.087) | |
| Numeracy score | | | 0.331*** |
| | | | (0.080) |
| Married | -0.023 | -0.028 | -0.038* |
| | (0.022) | (0.025) | (0.022) |
| Age | 0.014*** | 0.019*** | 0.007*** |
| | (0.004) | (0.005) | (0.002) |
| Female | -0.121*** | -0.171*** | 0.056** |
| | (0.034) | (0.050) | (0.027) |
| Financial distress | -0.007 | -0.041 | 0.001 |
| | (0.024) | (0.025) | (0.024) |
| Chronic disease | 0.012 | 0.023 | 0.002 |
| | (0.021) | (0.025) | (0.019) |
| Education | -0.041 | -0.074* | -0.048 |
| | (0.032) | (0.044) | (0.031) |
| ADLs | 0.001 | 0.006 | 0.003 |
| | (0.016) | (0.019) | (0.014) |
| Unemployed | -0.015 | 0.028 | 0.000 |
| | (0.053) | (0.059) | (0.049) |
| Retired | -0.025 | -0.025 | -0.012 |
| | (0.029) | (0.033) | (0.027) |
| Income quintile | -0.023*** | -0.024*** | -0.025*** |
| | (0.008) | (0.009) | (0.008) |
| Constant | -1.881*** | -1.666*** | -1.286*** |
| | (0.488) | (0.482) | (0.316) |
| Obs. | 4475 | 4476 | 4475 |
| AR F-test | 0.000 | 0.000 | 0.000 |
| Hansen J | n/a | n/a | n/a |

Notes:

Standard errors in parentheses

***$p$ <0.01, **$p$ <0.05, *$p$ <0.1

Yet, in order to overidentify the model and thus be able to run a Sargan-Hansen test of overidentifying restrictions, an additional instrument would be required. This will allow us to provide a clearer and more convincing statistical proof of the validity of our model. The natural candidates in our case would be the respondent's relative mathematical and language position to others when she was ten years old –information readily available in SHARELIFE. However, these variables were not considered as instruments for two main reasons. Firstly, the fact that they are very similar in nature to our instrument (number of books at age ten) makes it hard to trust the Hansen J test –recall that such procedure assumes the validity of at least one instrument in order to test the overidentifying restrictions. In other words, given their similarity in design and scope, assuming that one of the instruments is valid will likely imply that the others are as well. For this reason, heterogeneity of instruments is usually advised as a more credible framework for the Hansen J test of overidentifying restrictions.

Secondly, the empirical inclusion of relative mathematical and linguistic position at age ten seems to lead to a violation of the monotonicity assumption: their association to cognition in the first stage OLS regression seems to run in the opposite direction to what would otherwise be commonly believed (*e.g.*, better mathematical and language position relative to others in childhood is negatively related to all three cognition indicators in later adulthood).[15] Intuitively, treatment in an instrumental variables exercise is designed to produce a certain effect in a given population. When such effect goes –against all forecasts– in the opposite direction, a contravention of the monotonicity assumption is said to exist and the results are regarded as invalid.

Both individually and when combined with the number-of-books instrument, mathematical and language ranking in childhood fall short from instrumental validity. Thus, we find no statistical grounds whatsoever for including these variables as additional instruments in our model.

An alternative strategy to overidentify our model is to instrumentalize the cognition level of each respondent also with their reported height.[16] Several studies have reported a strong correlation between height and cognitive abilities (Abbott et al., 1998; Case and Paxson, 2008b,a; Maurer, 2010). In this logic, the validity of height as an instrument will depend on its relation to cognition levels and the conjecture that height is not a relevant factor to the engagement-in-society decision. That is, inde-

[15]Moreover, the inclusion of these variables as instruments causes the model not to reject the exogeneity of cognition assumption at the 5% significance level.

[16]SHARE provides information on basic physical attributes of respondents, such as height, weight, and grip strength.

pendent of their height, everyone has the same possibilities to engage in volunteering activities or participate in a political or religious organization.

Table 3.6 displays the results of the second stage regressions using both height and books when aged ten as instruments for cognition. The results are satisfactory in that the positive and statistically significant effect of cognition on civic engagement is confirmed and the Hansen J test fails to reject the exogeneity of instruments assumption for all three regressions (with $p$-values of 0.95, 0.57, and 0.87 for immediate recall, delayed recall, and numeracy, respectively). However, the low significance level of height in the first stage regressions given in Table 3.7 seems to point to an apparent weak instrument problem, in particular for the second model where cognition is proxied by delayed recall. This is confirmed by the violation of the "rule of thumb" requiring the $F$-statistics in the first stage regressions to be greater than ten; in our case, only in the second model does the *rk* $F$-statistic falls slightly below this level (with a value of 9.12).

In the presence of weak instruments, inference should be made with caution. Weak –as well as too many– instruments may cause the instrumental variables estimator to be more biased than its OLS counterpart. Since standard errors from the first stage are not considered in the second-stage estimation, the resulting estimated variance will be biased downwards; this would in turn cause the null hypothesis to be too often rejected.

Albeit still an area of intense ongoing research, various methods are currently available to carry out inference in the presence of weak instruments. For instance, two alternatives which are robust to this problem –in the case of one endogenous regressor– are the Anderson-Rubin test (Anderson and Rubin, 1949) and the more recent conditional likelihood ratio (CLR) (Moreira, 2003). Both procedures build confidence intervals that allow for fully robust inference even in the presence of weak instruments. Econometrical preferences have lately sided with the latter test since it has been shown to be approximately optimal, dominating the other alternatives in terms of power (Andrews et al., 2008).

In what follows, both methods are employed to correct for the presence of weak instruments in our models. The results of the CLR, AR, and J tests for all three indicators of cognition are given in Table 3.8.[17] Notably, both the CLR and the AR tests confirm the robustness of the previously-obtained results in that cognition is a significant determinant of civic participation. Moreover, the J test reinforces our exogeneity-of-instruments presumption in all three cases.

[17] These tests are readily available under the *weakiv* Stata command written by Finlay et al. (2013).

**Table 3.6:** Second stage regressions instrumenting cognition with height and number of books at home when the respondent was ten years old

| **Variable** | **Model 1** Civic Eng. | **Model 2** Civic Eng. | **Model 3** Civic Eng. |
|---|---|---|---|
| Immediate recall | 0.296*** | | |
| | (0.085) | | |
| Delayed recall | | 0.337*** | |
| | | (0.111) | |
| Numeracy score | | | 0.397*** |
| | | | (0.103) |
| Married | -0.02 | -0.011 | -0.033 |
| | (0.027) | (0.030) | (0.027) |
| Age | 0.014*** | 0.019*** | 0.007*** |
| | (0.004) | (0.007) | (0.002) |
| Female | -0.129*** | -0.183*** | 0.067** |
| | (0.039) | (0.060) | (0.033) |
| Financial distress | -0.024 | -0.037 | 0.003 |
| | (0.026) | (0.030) | (0.028) |
| Chronic disease | 0.016 | 0.036 | 0.01 |
| | (0.025) | (0.031) | (0.023) |
| Education | -0.061 | -0.087* | -0.076** |
| | (0.039) | (0.053) | (0.039) |
| ADLs | 0.013 | 0.022 | 0.007 |
| | (0.021) | (0.026) | (0.017) |
| Unemployed | -0.033 | 0.002 | -0.021 |
| | (0.065) | (0.072) | (0.060) |
| Retired | -0.025 | -0.014 | -0.015 |
| | (0.035) | (0.040) | (0.033) |
| Income quintile | -0.026*** | -0.026** | -0.031*** |
| | (0.010) | (0.012) | (0.010) |
| Constant | -1.981*** | -1.843*** | -1.493*** |
| | (0.578) | (0.619) | (0.406) |
| Obs. | 3534 | 3535 | 3534 |
| AR F-test | 0.000 | 0.000 | 0.000 |
| Hansen J | 0.947 | 0.567 | 0.873 |

Notes:

Standard errors in parentheses

***$p$ <0.01, **$p$ <0.05, *$p$ <0.1

**Table 3.7:** First stage regressions instrumenting cognition with height and number of books at home when the respondent was ten years old

| **Variable** | **Model 1** Immediate recall | **Model 2** Delayed recall | **Model 3** Numeracy score |
|---|---|---|---|
| Number of books | 0.128*** | 0.102*** | 0.098*** |
| | (0.023) | (0.028) | (0.014) |
| Height | 0.007* | 0.009* | 0.006** |
| | (0.004) | (0.005) | (0.003) |
| Married | 0.139*** | 0.098 | 0.137*** |
| | (0.054) | (0.063) | (0.034) |
| Age | -0.044*** | -0.053*** | -0.014*** |
| | (0.004) | (0.005) | (0.003) |
| Female | 0.439*** | 0.580*** | -0.166*** |
| | (0.069) | (0.082) | (0.043) |
| Financial distress | -0.067 | -0.017 | -0.119*** |
| | (0.058) | (0.069) | (0.037) |
| Chronic disease | -0.08 | -0.129** | -0.045 |
| | (0.051) | (0.061) | (0.034) |
| Education | 0.348*** | 0.387*** | 0.296*** |
| | (0.038) | (0.045) | (0.023) |
| ADLs | -0.154*** | -0.162*** | -0.101*** |
| | (0.048) | (0.053) | (0.028) |
| Unemployed | 0.049 | -0.062 | 0.007 |
| | (0.146) | (0.155) | (0.088) |
| Retired | 0.190*** | 0.139* | 0.120*** |
| | (0.066) | (0.083) | (0.044) |
| Income quintile | 0.058*** | 0.052** | 0.054*** |
| | (0.018) | (0.021) | (0.012) |
| Constant | 5.066*** | 3.546*** | 2.445*** |
| | (0.788) | (0.925) | (0.487) |
| Obs. | 3534 | 3535 | 3534 |
| F | 56.91 | 54.28 | 68.59 |
| Prob>F | 0.000 | 0.000 | 0.000 |
| *rk* F-stat. | 17.248 | 9.117 | 27.213 |
| Centered $R^2$ | 0.263 | 0.246 | 0.291 |

Notes:

Standard errors in parentheses

***$p$ <0.01, **$p$ <0.05, *$p$ <0.1

**Table 3.8:** Weak instrument robust tests for the cognition parameters ($p$-values)

| Test | Imm. Recall | Delayed Recall | Numeracy |
|---|---|---|---|
| CLR | 0.000 | 0.000 | 0.000 |
| AR | 0.000 | 0.000 | 0.000 |
| J | 0.685 | 0.851 | 0.892 |

*Notes:* $p$-values for the CLR and AR tests correspond to the null hypothesis of $H_0$: $\beta_k = 0$, where $k$ represents the cognition indicator. The J test, on the other hand, tests the null of instrument exogeneity $H_0$: $E(Zu) = 0$. Failure to reject the latter suggests that exogeneity conditions are generally satisfied. All tests are robust to heteroskedasticity and have been clustered by individual respondent.

Our instrumental variables model of the effects of cognition on civic engagement appears to be robust to different checks and specifications, even in the presence of a presumably weak instrument (*height*). These results favor the claim that smarter individuals will also behave as better and more participatory citizens, for which we turn to the next section.

## 3.5 Conclusions

Using data on the elder European population from the SHARE database, we are able to examine the relation between cognitive abilities (as measured by three different indicators) and the degree to which an individual engages in society (an index made up of voluntary and charity activities as well as of participation in religions and/or political organizations). Through the use of both height and the availability of books when the respondent was ten as instruments for cognitive abilities, we find evidence of a seemingly strong causal link from cognition to participation: the higher the cognitive state of an individual, the more likely it is that she will be involved in her community. In other words, smarter individuals do seem to behave as better Samaritans.

Although the sample is made up of older adults aged 50 and over from twelve European countries –and who may arguably have more time at hand for recreational activities than other age-groups– it would be interesting to assess if the effect found in the present study holds true for the adult population as a whole. Moreover, the inclusion of a greater diversity of indicators for both cognitive ability and pro-social behaviors could help verify –or challenge– the robustness of the results. Improvements are also at hand if different degrees of availability of civic activities by geographical area could be accounted for. To our knowledge, however, the present study constitutes

the first serious attempt to scrutinize the relationship between cognition and civic engagement through a non-experimental approach.

The impact of these results is manifold. For economists and game theorists, it supports the ample plea to move beyond the standard theory of individual choice in the direction of more versatile theories of collective decision, able to provide a better account of the contextual reality of humankind. We-rationality and team-preference theories constitute two current efforts that go in this direction. For policy makers, on the other hand, it is an appeal not to underestimate the importance of keeping a mentally active society even in advanced age, which will potentially result in better and more participatory citizens and thus in the construction of a stronger democracy. However, improving cognitive abilities is a lifelong endeavor, as it heavily relies on the available educational and personal development opportunities in a given society. Our findings are in line with those of Jones (2006), in that improving a population's cognition levels (*e.g.*, through better nutrition, health and school systems, particularly in the poorest countries), will increase commitment toward society and thus pave the road for a more cooperative world.

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# Estratto della Tesi di Dottorato

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**Ciclo:** 26

**Titlo della tesi:** Contestualizzando l'*Homo Economicus*: Saggi su Rapporti Non-Instrumentali, Partecipazione Civica, e Benessere

***Estratto:*** Con questa tesi s'intende evidenziare l'importanza di ricontestualizzare l'individuo nelle analisi economiche. In particolare, viene enfatizzato l'aspetto non-strumentale nei rapporti umani come l'elemento fondamentale per lo studio del benessere e la qualità della vita. Nel Capitolo 1 s'introduce il concetto di rapporti non-strumentali e viene descritto il problema del loro continuo declino negli ultimi anni. Una classificazione alternativa di questo tipo di rapporti viene proposta e accompagnata da un modello teoretico dove i rapporti non-strumentali vengono combinati con mecanismi di segnali intesi a preservare la loro stabilità dall'interno. Inoltre, è stato realizzato un modello di capitale relazionale dove i rapporti non-strumentali sono dei beni che possono essere non solo consumati ma anche prodotti attraverso investimenti di tempo e di altre risorse del mercato. Nel Capitolo 2 viene documentato il legame positivo fra una forma di rapporto non-strumentale –i legami familiari– e la qualità della vita. Utilizzando l'estimatore *DID propensity score matching*, viene elaborata una meticolosa analisi empirica sul rapporto fra il benessere psicologico di generazioni di adulti sopra i 50 anni e le loro scelte co-abitative. I risultati sottolineano il fatto che i rapporti familiari possono avere un ruolo di supporto sopratutto per persone in età avanzata. In particolare, è stato documentato un forte calo nel livello di depressione di quelle persone che abitano in paesi Europei di tradizione Cattolica e per le quali è stato riportato un riavvicinamento dei figli nel tempo. Il Capitolo 3 propone il gioco dello *stag-hunt* per esemplificare i due tipi di equilibrio presenti nella fornitura di beni pubblici: l'equilibrio rischio-dominante e l'equilibrio profitto-dominante. Un approccio empirico di variabili non-strumentali viene utilizzato per documentare il legame forte e positivo fra abilità cognitive e comportamenti partecipativi in età avanzata. In particolare, viene riscontrato come le abilità cognitive sembrino porre una forza causale e positiva sulla participazione civica. Questo risultato empirico conferma le teorie di agenzia collettiva –come quelle di we-rationality e team-thinking– e avvalora i risultati sperimentali esistenti, nei quali i partecipanti coi livelli cognitivi più alti tendono ad essere meno avversi al rischio e di conseguenza più favorevoli a scegliere l'equilibrio profitto-dominante in un contesto di gioco *stag-hunt*.